United Nations
Educational, Scientific and
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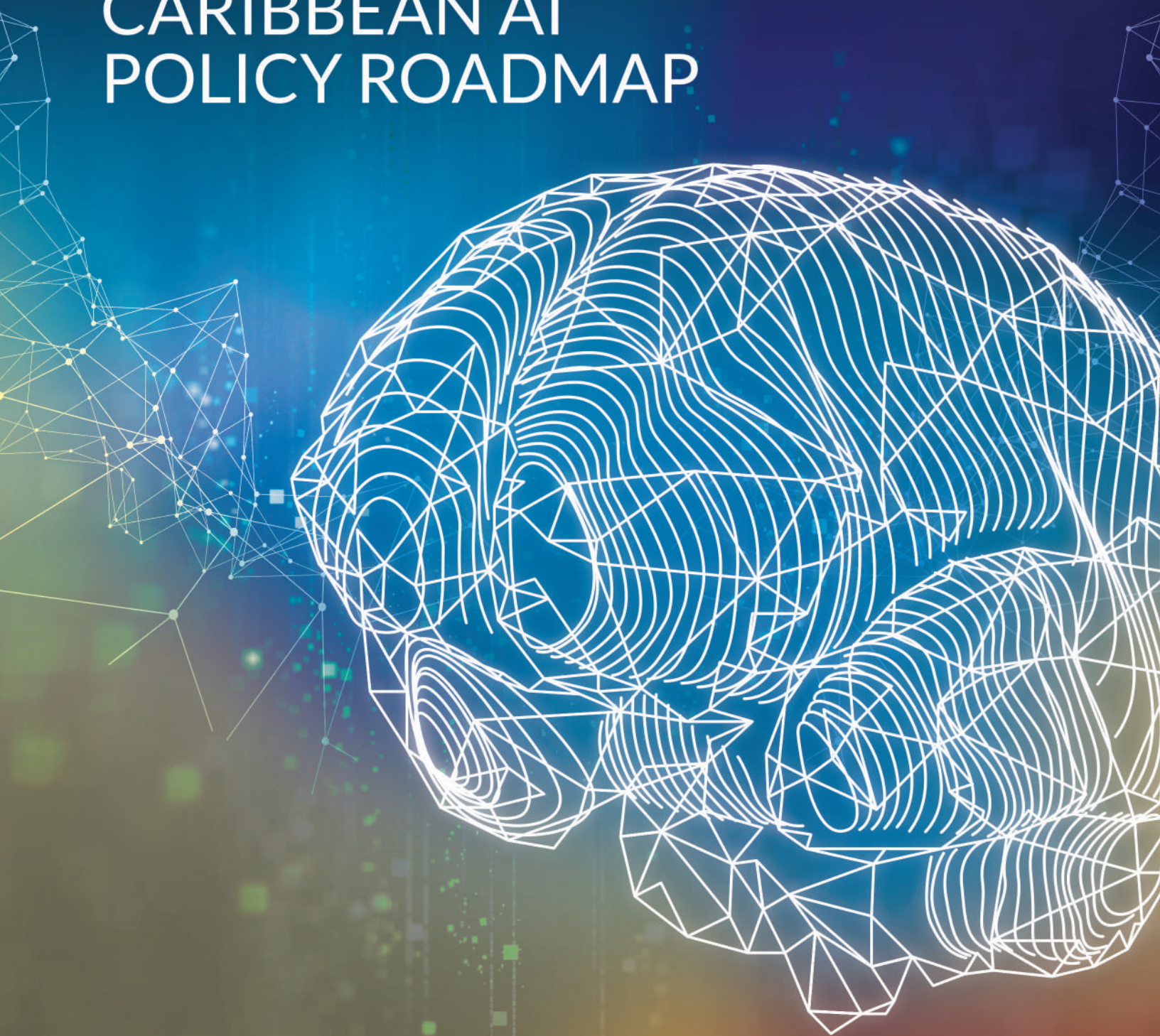
ADVOCATING FOR
SMALL ISLAND
DEVELOPING STATES

CARIBBEAN
ARTIFICIAL INTELLIGENCE
INITIATIVE

BROADCASTING
COMMISSION
PEOPLE▸TRANSITIONING▸DIGITAL

UNESCO
CARIBBEAN AI POLICY ROADMAP



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United Nations Educational, Scientific and Cultural Organization

ADVOCATING FOR SMALL ISLAND DEVELOPING STATES

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PEOPLE TRANSITIONING DIGITAL

UNESCO CARIBBEAN AI POLICY ROADMAP

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ACKNOWLEDGEMENTS

This Caribbean AI Policy Roadmap is a combination of the authors' insights and findings culled from available policy research, select speeches and stakeholder consultations, and is a culmination of the work of numerous individuals and organizations. It was produced under the auspices of the United Nations Educational, Scientific, and Cultural Organization (UNESCO) Caribbean Cluster Office's Caribbean Artificial Intelligence Initiative and the UNESCO Information for All Programme.

The UNESCO Caribbean AI Policy Roadmap was developed under the direction of the Broadcasting Commission of Jamaica Cordel Green (Executive Director) and his team including Sasha Harrison (Economist).

This policy document was co-written by Erica Simmons, Executive Director, Centre for Digital Innovation, Caribbean Maritime University and Andrea M. Davis, IP and Creative Industries Consultant.

It sets out a framework to guide the Caribbean nation states in developing, deploying, procuring, and employing Artificial Intelligence (AI) in governance, administration, and in the delivery of services.

The policy recommendations were informed by a series of UNESCO-sponsored multi-stakeholder events, discussions, online surveys as well as contextualized research and analysis related to Artificial Intelligence in the Caribbean carried out in 2020 and early 2021.

EXECUTIVE SUMMARY

"The difficulties facing the region are no longer simply about competing effectively in a globalising economy. Rather, they are 'existential threats' which bring into question the fundamental viability of Caribbean society itself. Climate change, transnational crime, the decline of regional industries, food security, governance challenges, international diplomacy … are becoming increasingly acute in the immediate present; failure to act immediately, decisively and coherently at the regional level could quite conceivably herald the effective decline of Caribbean society as a 'perfect storm' of problems gathers on the horizon."[1]

- Sir Shridath Ramphal, former Guyana Government Minister, UWI Chancellor and three-term Secretary General of the Commonwealth at Inaugural G. Arthur Brown Lecture hosted by the Bank of Jamaica 2011

The Caribbean is a glorious pepperpot soup bursting with the diverse flavours of humanity and reflecting the innovative spirit and resiliency of its ancestors.

Often referred to as a 'zone of peace' and a 'melting pot' because of the rich cultural, linguistic, ethnic and environmental diversity among its nation states, the Caribbean's uniquely vibrant and multifaceted culture has been global exports for centuries. Reflecting the inclusive nature of the Caribbean's diversity in terms of race, ethnicity, language and culture, forty-four million persons call the cluster of islands home.

The Greater Caribbean region boasts linguistic plurality as a result of its colonial history: English, French and Spanish are the three main languages spoken in the Region, which are among the most spoken languages in the world and could offer the region a competitive advantage in relation to trade, investment and tourism.[2] Representing approximately 0.56% of the total world population, the islands in the Caribbean region are considered Small Island Developing States (SIDS).[3] SIDS are extremely important for global biodiversity as islands harbour 20% of all plant, bird and reptile species in only about 3% of the Earth's land surface. New data on the benefits that coral reefs provide to the travel industry and the region's economy reveal that the value of reef-associated tourism is estimated at more than US$7.9 billion annually from over 11 million visitors. This accounts for 23% of all tourism spending and is equivalent to more than 10% of the region's GDP (gross domestic product).[4]

SIDS were recognized as a special case, both for their environment and development, at the United Nations Earth Summit held in Rio de Janeiro, Brazil (3–14 June 1992). The islands are a part of a distinct group of developing countries facing specific social, economic and environmental vulnerabilities. The *SIDS Accelerated Modalities of Action (S.A.M.O.A) Pathway an outcome of the 'Third International Conference on Small Island Developing States (SIDS Conference)* in 2014, acknowledged that the identification of SIDS priorities was needed in the formulation of the 2030 Agenda.[5]

Despite the challenges and marginalization that slavery, stagnant growth and climatic threats have posed to the region and while the Caribbean exited colonialism largely without a development pact, it has produced excellence across fields. Its people have continued to emerge as some of the most warm, resilient, innovative and globally competitive human resources and cultural creators of *non-perishable consumables* - Nobel laureates, exceptional sportsmen and sportswoman, globally influential artistes, thinkers and leaders. If data and information that is produced within the region by these leaders on art, music, film, fashion or sports is characterized as 'thought data', 'physical data' and 'cultural data', one can begin to contextualize the national, global, economic and social importance of Caribbean creativity.

Artificial Intelligence (AI) is a dynamic technology of the 4th Industrial Revolution. Its effects are forecasted to impact every aspect of society. As the discussions about AI heightens, many SIDS including those in the Caribbean, have yet to develop strategies and national policies to manage the impacts of AI on their society even as the citizens interact with AI in daily life. As an underrepresented stakeholder in the AI ethics debate, Caribbean SIDS must begin to articulate the indigenous knowledge, cultural and ethnic pluralism, and diverse value systems that define the region.

These characteristics should underpin the humanistic development and ethical deployment of

1 Lowrie-Chin, J., 2011 The Only Things That Separates Us. Retrieved from https://jamaicans.com/weseparatesus/

2 Artificial Intelligence and the Caribbean, Lodewijk Smets - Zubin Deyal, Caribbean Dev Trends.com, November 20, 2018, https://blogs.iadb.org/caribbean-dev-trends/en/9397/

3 https://www.worldometers.info/world-population/caribbean-population/

4 EcoEarnings: A Shore Thing – The Ocean Foundation - EcoEarnings: A Shore Thing (jetblue.com)

5 The SAMOA Pathway, http://www.2030caribbean.org/content/unct/caribbean/en/home/sustainable-development-goals/samoa-pathway.html#:~:text=The%20SAMOA%20Pathway&text=The%20SIDS%20Accelerated%20Modalities%20of,September%202014%20in%20Apia%2C%20Samoa.

AI technologies in the region and guide it towards service to the people. This context must be reflected in the region's policy discussions.

Critical questions such as how AI should be deployed in the Caribbean, so it does not cannibalize this region's human creativity but serve to enhance or even amplify it. How can AI be combined with the diversity of the region to produce products that fight AI bias, discrimination and threats to security? How can AI help the Caribbean overcome historical developmental challenges such as poverty, crime, stagnant growth and the impacts of climate change? Answers to these questions may provide a starting point for how to contextualize the needs of the people and how AI can support the Caribbean's social, cultural and environmental wellbeing.

While AI has generally contributed to improved performance and productivity where deployed, its employment has commonly seen a variety of 'blind spots' or risks related to the infringement and exploitation of citizen data privacy.

AI systems raise new types of ethical issues that include, but are not limited to, their impact on decision-making in employment and labour, social interaction, health care, education, media, freedom of expression, access to information, privacy, democracy, discrimination, and weaponization. Furthermore, new ethical challenges are created by the potential of AI algorithms to reproduce biases, for instance regarding gender, ethnicity, and age, and thus to exacerbate already existing forms of discrimination, identity prejudice and stereotyping. As Caribbean nations expand their adoption of AI tools and other exponential technologies, stakeholders (policymakers, citizens, private sector, academia, and NGOs) must proactively collaborate to create strategies for the humanistic development of guidelines, regulations and laws. Boundaries should be defined to regulate the AI decision-making, AI rights, inclusion of manual overrides and AI accountability protocols.

"Intelligence used to be the province of only humans but it no longer is. We don't programme the machines, they learn by themselves. Affective computing – AI that interprets and simulates human emotions. Machines will interact with humans just as we interact with one another – through perception and through conversation so we want to build emotion AI that enables machines to have empathy"[6]

- How Far is Too Far? | The Age of A.I. , The Age of A.I.

The future of Artificial Intelligence predicts that all industries will eventually be affected by AI technologies. The international audit and consultancy firm PWC, has estimated that the *global market for AI, the general-purpose technology, in 2020 was US$2.43 trillion, and by 2030 is expected to grow to US$15.7 trillion up to 14% higher in 2030 because of the accelerating development and take-up of AI.*[7] As a General-Purpose Technology, AI is both a horizontal and vertical industry with diverse applications and the ability to learn almost any task. It is forecasted that AI will move to revolutionize every field it touches.

The big industries in the Caribbean poised for regional development as defined by the *CARICOM Council for Trade and Economic Development (COTED)* includes: Healthcare, Financial Services, Education, Security, Environment, Culture, Manufacturing, Agriculture and Tourism. All these industries could stand to gain greatly by the application of Artificial intelligence technologies adding up to 5.4% to the regions GDP.[8] In support of the region's digital transformation, Caribbean SIDS should develop a plan to enable collective action in areas such as joint procurement of ICT equipment; regional VAT holidays; data capture, storage and management; and to deliver full access to the Internet and bandwidth to all citizens as a human right.

As AI is a cognitive technology and its implications are intricately connected to the central domains of UNESCO: education, sciences, culture, and communication. UNESCO aims to be a catalyst in bringing together multidisciplinary, universal and holistic approach to the development of AI in the service of humanity, sustainable development, and peace. The human-centered design includes the participation of stakeholders in the design and implementation of the AI system. It is believed that this strategy can help provide essential perspectives in the design or redesign of governance systems in the Caribbean context.[9]

6 How Far is Too Far? | The Age of A.I. , The Age of A.I. S1 • E1, December 18, 2019, https://www.youtube.com/watch?v=UwsrzCVZAb8&ab_channel=YouTubeOriginals

7 Sizing the Prize: What's the real value of AI for business and how can you capitalize? PWC, https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf

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9 UNESCO 2020. First Draft of the Recommendation of the Ethics of Artificial Intelligence, 40 C/37, Pub UNESCO.

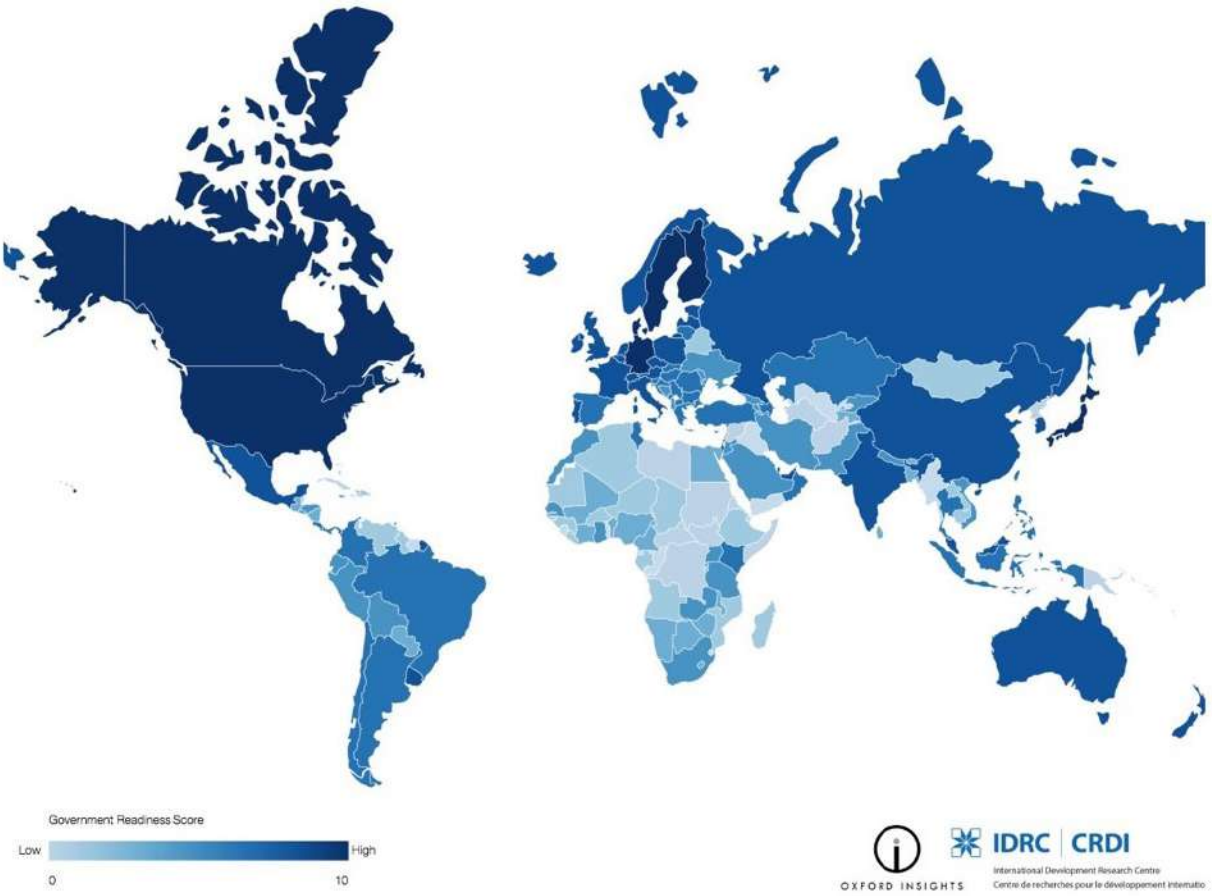


Figure 1. IDRC | CRDI Government Readiness Score

While the rest of the world is investing in AI, the Caribbean is still talking about it [10]

- Leslie Lee Fook, Director, A.I., Analytics and Automation, Incus Services

The integration of AI and automation in the Caribbean must not compromise the region's most valuable renewable resource - human creativity. Data is such an important topic for today and into our future as it has been noted that 'we are our data', and *'data rights will be the civil rights of our time'* [11].

It is therefore critical that a multi-disciplinary, multi-stakeholder Caribbean Small Island Developing States (SIDS) strategy and action plan be developed to further govern the deployment of AI technologies in the region. AI is an industry that must have regulations to manage the span of its integration in the lives of people. Without it, there is a risk of tipping the balance of power in favour of corporate affective computing over human rights and well-being.

According to the World Bank, *"Data collection and processing requires an adequate framework, extensive digital infrastructure, stringent regulations for privacy protection, and tools to mitigate risks of harm to data subjects."*[12] Developing nations often lack the data necessary to fine-tune development interventions as data collection has long been a regional weakness. The need for big data will require a big push representing significant new job opportunities for women, youth and disabled people. AI's ability to tackle unstructured data such as text, images, and audio will be useful for extracting existing knowledge from legacy systems. The information is needed to improve strategic planning and better ensure sustainable development.

10 Leslie Lee Fook, Director, A.I., Analytics and Automation, Incus Services, Lee Fook, L. (2021, Feb 19). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Online forum]. ttps://www.youtube.com/watch?v=_ylq0KmHG2Q&t=327s

11 Renee Cummings, Criminologist, Criminal Psychologist, AI Ethicist, Data Activist Cummings, R. (2021, Feb 18). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Online forum]. https://www.youtube.com/watch?v=FSY4rAgpIFc

12 Peersman, G. (2014).Overview: Data Collection and Analysis Methods in Impact Evaluation, Methodological Briefs: Impact Evaluation 10, UNICEF Office of Research, Florence.

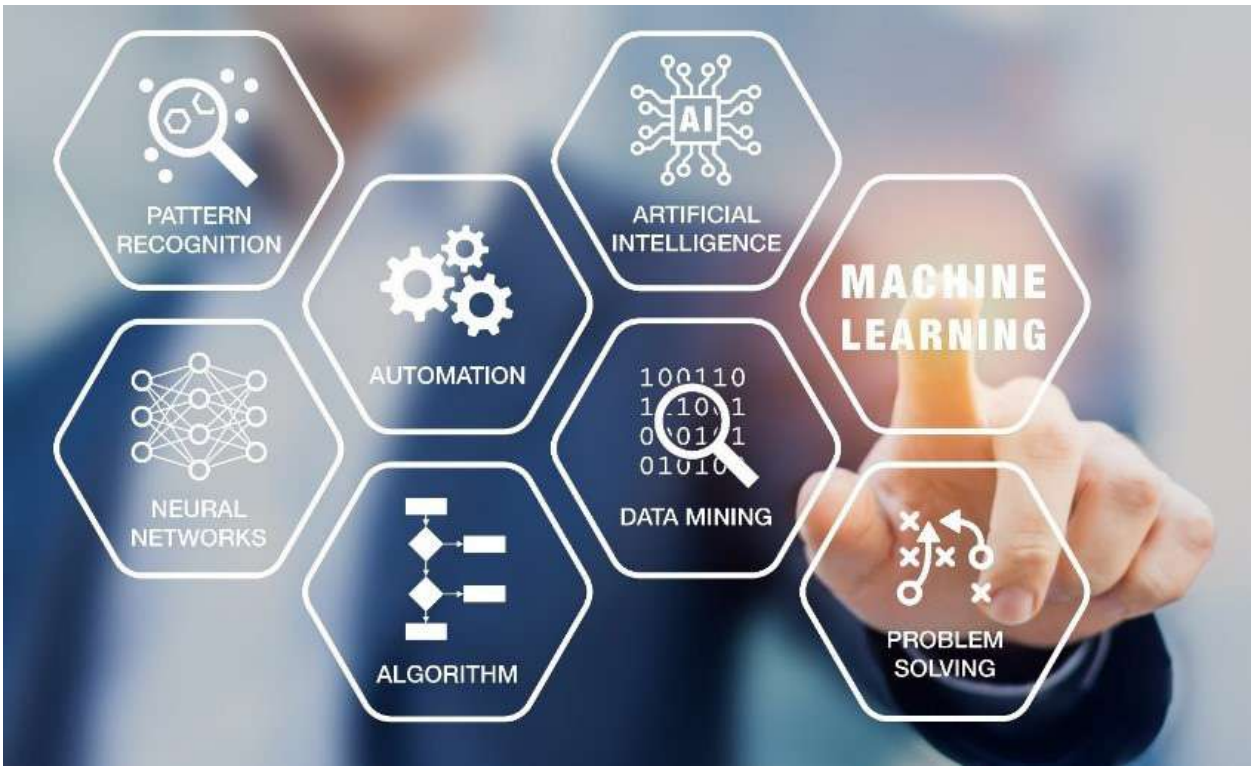


Figure 2. *Machine Learning*

Policymakers should equip themselves with the requisite knowledge and skills to inform legislation and regulations to effectively govern the further deployment Artificial Intelligence technology in the Caribbean region.

We stand to leave so many of our practitioners and stakeholders behind if we do not consider the role of AI in actually streaming the ecosystem.[13]

- Dr. Marielle Barrow, Program Coordinator at the Caribbean Development Bank

The upskilling and reskilling of the regional workforce must be facilitated to support education targeted at AI literacy and development of requisite skills. Derived from input of diverse stakeholders across the Caribbean islands, this framework for AI technologies and its social implications, take into consideration their well-being, social values and ethical principles.

13 Dr. Marielle Barrow, Program Coordinator at the Caribbean Development Bank

ASSUMPTIONS

For the purposes of developing this policy roadmap, the following assumptions were made regarding the Caribbean and Artificial Intelligence:

- Human creativity is inextricably linked to Caribbean identify, economic viability and sustainable development
- AI is a product of human creativity
- AI in service of humanity
- AI is transformative
- AI Industry is vertical and horizontal
- AI must be inclusive, fair, transparent, accountable
- AI is an existential threat to humanity
- AI must be regulated
- Human rights supersede AI rights
- AI not eligible for human rights
- AI is global
- AI is the most important general-purpose technology of the century
- AI and 5G are inevitable
- Bias is everywhere in AI
- We Are Our Data
- Data rights will be the civil rights movement of the 21st century
- Broadband access will be a human right in the 21st century
- New skills education and training are essential

Considering the challenges and opportunities linked to AI technologies, these principles and objectives are recommended to support AI integration in the Caribbean.
The Caribbean stakeholder consensus was clear that human creativity can never be sacrificed and that AI must work in service to the people to enable greater productivity especially among women, youth and disabled persons. In addition, AI should be employed in service of the preservation and protection of each Caribbean nation's creative advantages, socio-cultural heritage and natural environment. The Caribbean rejects technological determinism and embraces human centered AI design for the good as the way forward.

The proposed framework for the Caribbean AI Policy Roadmap is built on six (6) principles. These principles include national and regional strategies and deliverables recommended to enable the Caribbean's effective adaptation of AI technologies and digital transformation of its economies.

1. **Resiliency** to enable environmental
2. management and fight climate change.
3. **Governance** to enable regulation, legislation to enhance safety, security, and accountability of AI – Do No Harm.
4. **Transformation** through investment in smart island digital infrastructure & public sector digital transformation.
5. **Upskilling** of human capital with digital skills to contribute to regional industry productivity.
6. **Preservation** of Caribbean cultural data using capture, storage and digitalisation technologies.
7. **Sustainability** strategies to support Caribbean attainment of the UN SDGs including gender equality, poverty eradication, climate justice and environmental protection.

The recommended strategies from the consultations and stakeholder presentations in 2020 and early 2021, are reflected in the principles, objectives, guidelines, actions and deliverables outlined in the roadmap below.

Caribbean AI Policy Roadmap

Figure 3. Caribbean AI Policy Roadmap

RESILIENCY

GUIDELINES	OBJECTIVES	ACTION	DELIVERABLES
Disaster Mitigation	Environmental Management Save Lives Climate Change Fight Decarbonization Improve Food Security Reduce Climate Risks	**Early Warning Systems** Earthquakes | Hurricanes | Rising Seas **Environmental Monitoring** Report Trouble Spots Using Satellite Imagary **Disaster Management | Public Education**	Save Lives Minimize Risk & Economic Loss Predictive Analysis
Resource Management		**Monitor** Oceans | Rivers | Ports | Volcanoes | Carbon Emissions	Decarbonization Improve Food Security
Predictive Analysis		**Monitor** Weather | Rainfall | Temperature Reefs |Pollution |Climate	Improve Responsiveness

GOVERNANCE

GUIDELINES	OBJECTIVES	ACTION	DELIVERABLES
Ethics	Do No Harm Fairness Data Protection Accountability Explainability Autonomy Stewardship Reduce Bias Responsible AI Interoperability Standards Values IOT Innovation Improved Citizen Services	Establish Regional **Common Values And Principles** Establish **National And Regional Ai Offices And Data Trusts** Develop **Technical Code Of Conduct** (Developers) Develop **Procurement Guidelines** (Buyers) Encourage Companies To Develop Ai Design | Use Principles **Reference Ieee P7000™Series Of Standards** For Ethically Aligned Design	Fairness | Stewardship Reduced biases Raise Awareness of responsible AI Responsible AI Strategies Interoperability of Systems Standards | Values
Legislation		**Ai Policy | Regulations | Penalities** Review Policy & Legislation On Ict And Cybercrimes To Align With Responsible Ai Governance Establish Longterm Policy, Soft Laws And Legislative Framework To Address Ai Harms, Responsibiliy And Liability Adaptation Of **New Financial Instruments** Including Digital Currencies **Lobby For Fiscal And Policy Space To Align Frameworks** (National | Regional | International)	Enforcement | Deterrent Integration | Adaptation Investment | Trade Public Health
Transparency, Explainability & Accountability		**Create Caribbean AI Standards Authority to aggregate the specialized competencies that would be required to evaluate & approve deployment of proposed AI solutions** Require **AI data sheets** with training process explained	Explainability Accountability
Safety & Wellbeing		Develop **AI to test AI for biases** **Identify** AI applications to assist with safety & wellbeing and AI applications in most need of governance **Design Manual Override Options** (Kill Switch) **Establish AI Innovations and framworks for Justice Reform & Law Enforcement** **Online Dispute Resolution System** **Defend Human Rights** **(create | own | marry | reproduce etc)**	Risk Impact Do No Harm Technology Protect and Save Lives Retain Human Control
Equity		Provide **equitable high speed internet access** and broadband Create flexible strategies to ensure **technology access** Recruit women and youth to inform and develop software Utilize **equitable machine learning algorithms**	Access | Inclusion | Increased participation - women-youth-disabled Increase sharing
Advocacy		**Participate in Global AI Discourses** **Promote AI regional/global networks** **Launch software conference targeting software developers** **Lobby big tech** companies to collaborate with the Caribbean Issue **Papers on AI** | Responsible AI Training | AI Policies **Participate** in global AI forums | Data Protection **Public Education**	Data Privacy Informed Consent Autonomy Increase Sphere of Influence

SUSTAINABILITY

GUIDELINES	OBJECTIVES	ACTION	DELIVERABLES
Service to Humans	Sustainable Development Improve Citizen Wellbeing Decision-Making Gender Equity Structural Improvements	**Use as tool** in creation | production | protection | preservation Establish **Caribbean AI Governance Network** comprised of a network of experts to recommend new AI developments Establish Data Bank in National Archives Structural Improvements | Digitize Operations	Cultural Preservation Predictive Analysis Increased Efficiency
Global Goals		Implement programmes leveraging AI in Poverty Reduction Clean Energy I Economic Development (Women and Youth) Reduce Digital Gender Gap | Upgrade Systems	Sustainable Development

TRANSFORMATION

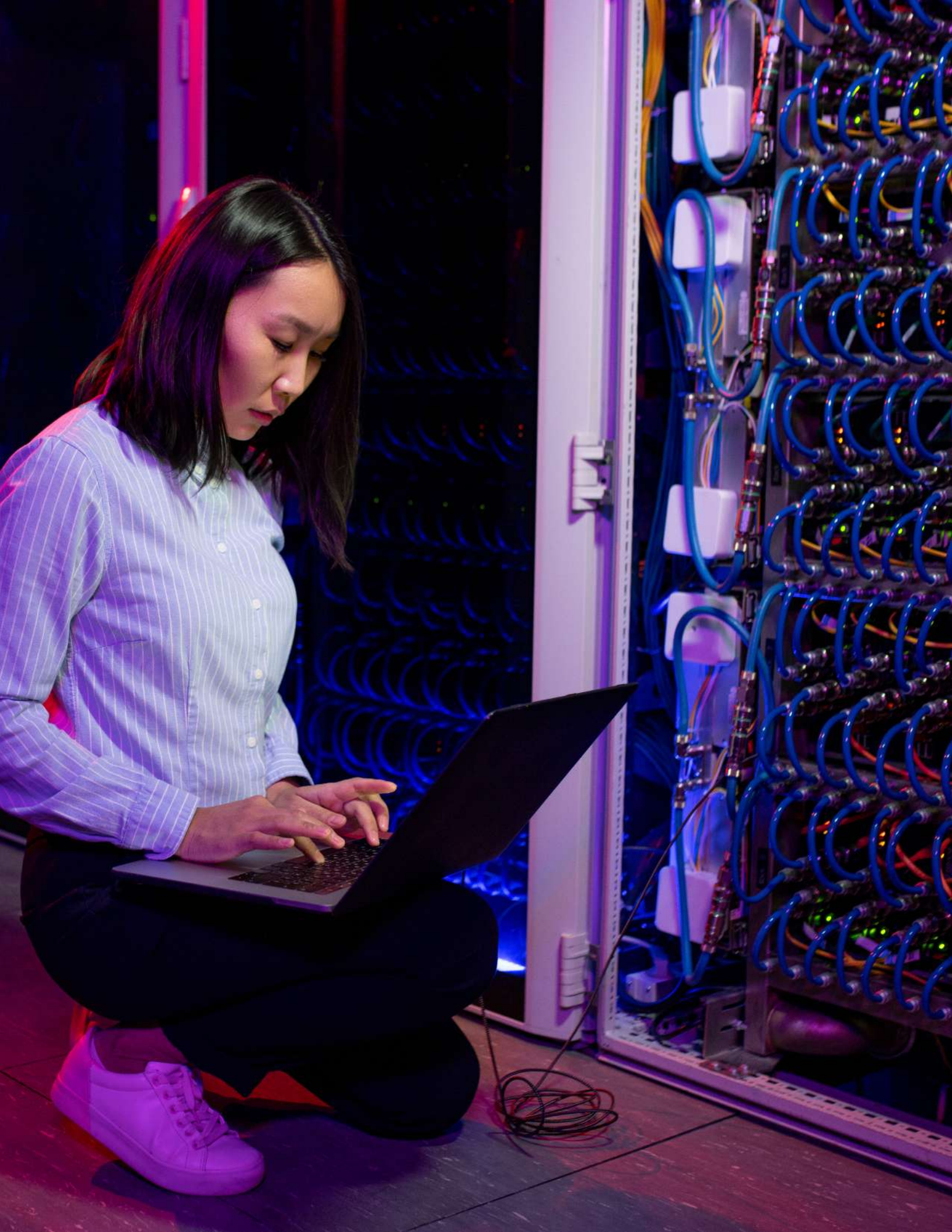
GUIDELINES	OBJECTIVES	ACTION	DELIVERABLES
Public Sector	Investment Infrastructure Modernize Digital Economy Improved Efficiency Monitize Data New Industries	Introduce **Efficiency Programmes** (crime|education|health|energy) maintenance) with public/private partnerships Public sector efficiency programmes ex. patent and trademark examination, management and forecast of traffic, the development of predictive capabilities for emergency responses AI Assistants to Improve citizen engagement and services such as online experiences for website visitors and reducing the number of people entering brick and mortar service centres Paperless **Data Integration** Support Caribbean **IOT Innovation**	Digital Transformation Improved Efficiency Digital Economy
Smart Island Infrastructure		**Establish National and Regional Data Banks (governance)** **Establish secure, energy efficient renewable energy based Data Centres (storage) |Data Hubs (R&D | products)** Establish **Internet Infrastructure** - Broadband | WiFi | 5G **Establish secure regional computing cloud**	AI Infrastructure (Physical | Digital) Digital Autonomy

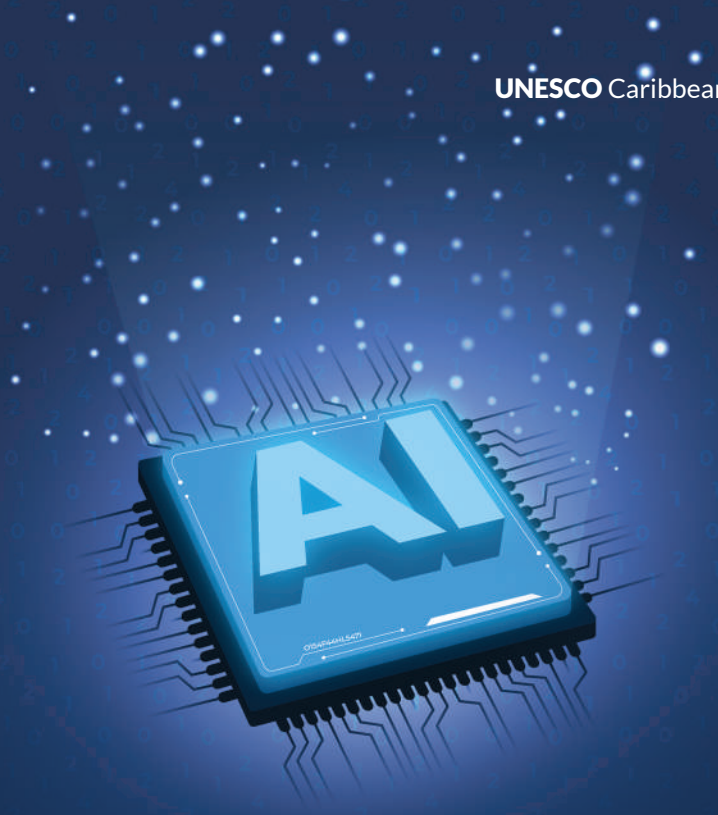
UPSKILLING

GUIDELINES	OBJECTIVES	ACTION	DELIVERABLES
Innovation	Innovation | Monitization Digital Skills | Digital Literacy | AI Adoption Responsible AI Culture | R&D | Innovation Increase Data Management Capacity | Improved AI Curriculum | Increased Awareness | Increase Work Pool	**New Programmes for women, youth, disabled** **Public Education on Media and Information Literacy** **MOOC Courses for public sector** **Establish Regional AI Incentives for** Academia | Private Sector Create a AI **R&D Tech Fund | Regional AI R&D Cloud** **Initiate and Strengthen Strategic Alliances** **Establish new AI assisted industries** Medical Cannibis| E-Health| E-Sports | E-Education Mariculture | Wellbeing Management Software Development **Increase Productivity Across Industries** Manufacturing-Regenerative Agriculture-Tourism-Transportation-Criminal Justice-Financial Services-Creative Industries	Expand Digital Skill Pool New Products Wealth Generation Transform Industries Increase Efficiency & Productivity Enhance Customer Service Diversify Consumer Experience
Monitization		**Develop AI Bias Test Software Algorithms for efficient AI training** Optimize algorithms for efficient testing (energy optimization) **Leverage Linguistic Plurality develop AI tools to support inclusion online such e-translation systems** **Stucturing Data to extract value** **Digitize Creative and Environmental Content** **Develop Digital Content | Promote Data Services** **E-Tourism and Creative Industries** **Augmented Reality Experiences** **Mentoring, Training and Accelerator Programmes for women, youth and disabled**	Revenue Generation Diversify AI Economy Increase Trade E-Translation Services Increase Knowledge Services

PRESERVATION

GUIDELINES	OBJECTIVES	ACTION	DELIVERABLES
Data Capture	Culture | Environment | Society Data Archives Data Security Data Utility Structured Data Virtual Tourism Experirences Cultural Heritage Preservation	Launch **National and Regional Preservation Programmes** **Establish National and Regional Data Banks** Recruit and train youth and creatives to work as preservationists	Accurate Digital Data
Data Storage		Ensure there are Secure **National and Regional Storage Platforms** Recruit and train women, youth, disabled and creatives to handle **data**	Data Security
Data Preservation		**Clean public data | prepare machine readible format** classify, label, archive and manage content **Recruit and train women, youth, disabled and creatives in archival and data cleaning services**	Data Utility
Data Management		**Capture | Classify | Clean | Format | Store | Analyze | Archive**	Structured Data Socio-Culural Environmental Heritage Preservation
Data Monitization		**3D Mapping of Caribbean SIDS Capitals (28)** Cultural | Historical | Social | Environmental **Augmented Reality Experiences | Increase Financial Literacy**	Virtual Tourism Experiences Cultural Heritage Preservation





UNESCO's 'Algorithms for All' agenda seeks to encourage the creation of diverse, equitable, communicative AI using multidisciplinary, holistic and ethical approaches to protect humanity and the environment; enable sustainable development and promote human rights. [14]

- Sadia Sanchez-Vegas, Director, UNESCO Cluster office for the Caribbean

In UNESCO's Developing Competencies for the AI Era Forum held December 7-8, 2020, UNESCO called on Member States to recognize the increasing importance of developing AI literacy and AI competencies for all citizens.

The debates over the two days recognized that the pervasive use of Artificial Intelligence will be the distinct feature of the future. Living and working with AI will not be optional, and therefore, preparing to live and work safely and effectively with AI has become a shared challenge at global level. The speakers noted that countries face diverse development challenges and possible futures, which implies that development of AI competencies and the use of AI will need to account for the diversity of local contexts. It is recognized that the potentials of AI - including automation of low-skill tasks, augmentation of human capacities, and amplification of business models - should be used for the benefit of society and for the common good. Aligned with the humanistic approach UNESCO takes towards the use of AI, humans should be protected from becoming victims of AI tools. AI should be designed and deployed as a tool at the service of humans towards a sustainable development that is economically and socially just and inclusive. Keeping AI under control should be from, and by, design. AI developers need to be regulated, and the design of AI should be based on accountability, transparency and 'explainability'. AI by nature has the power to transcend borders. It is therefore imperative that cross-border regulations be developed and executed to ensure that AI is designed for and serves the common good. The work of UNESCO in developing the Recommendation on the Ethics of Artificial Intelligence was presented and was recognized as one of the most important international response to the need.[15]

While most believe in the uniqueness of human intelligence, creativity and ethical reasoning, people need to understand the theory and practice of artificial intelligence. The UNESCO debates suggested that:

- AI Literacy should include understanding how AI collects and can manipulate data
- Data Literacy and the skills to ensure safety and protection of our personal data
- Algorithm Literacy that comprises knowledge of how algorithms process data and control behaviour through personalized human-machine communication

14 Sanchez-Vegas, S. (2020, Dec 10). Artificial Intelligence In the Caribbean Context: What Are We Talking About? [Online forum]. https://www.youtube.com/watch?v=_yIq0KmHG2Q&t=327s

15 International education community gathers to deliberate on the development of AI competencies for all, UNESCO https://en.unesco.org/news/international-education-community-gathers-deliberate-development-ai-competencies-all

PURPOSE

The guidelines reflected in this document are intended to provide a roadmap for developing AI policy within the Caribbean context and reflects UNESCO's human-centered, multi-stakeholder vision for developing standards for AI use including cooperation, human rights and sustainable development.

HOW THE POLICY ROADMAP WAS DEVELOPED

The findings and analyses of this paper are limited primarily to Caribbean Small Island Developing States (SIDS). These guidelines were informed by a broad consultative process through UNESCO sponsored stakeholder forums produced by the Broadcasting Commission of Jamaica that provided a platform to share perspectives from a variety of experts to better reflect the regional landscape. Stakeholders including private sector, government and relevant NGOs, as well as academics were engaged. Also included were perspectives from women, youth and disabled persons, representing traditionally underserved communities. Their collective contributions are woven into the policy roadmap and reflected in key quotes throughout the document highlighting perspectives of AI in the Caribbean.

This policy roadmap also builds on and refers to guidance provided in key related resource documents including -

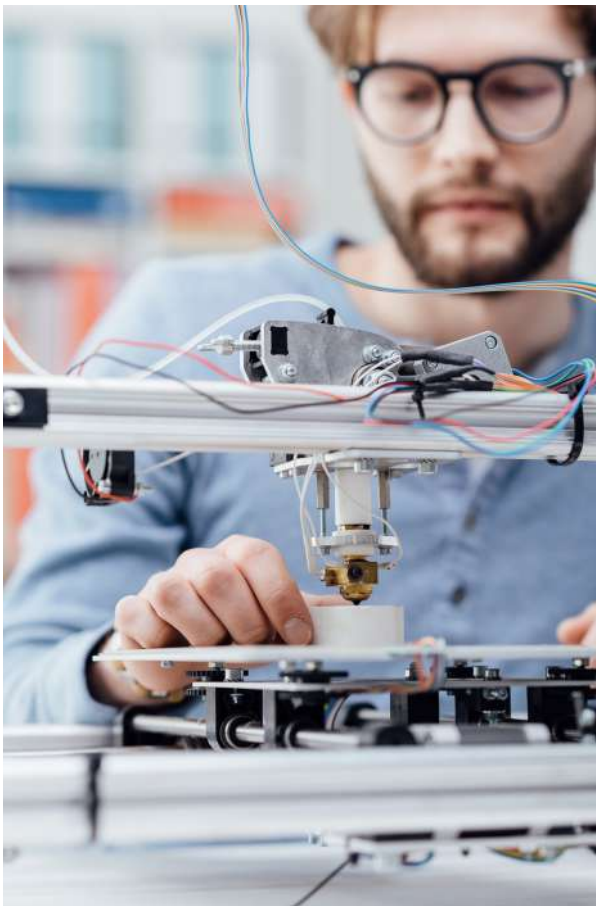
- UNESCO Ad Hoc Expert Group (AHEG)'s First Draft of the Recommendation on the Ethics of Artificial Intelligence
- *Universal Declaration of Human Rights (1948)*, including Article 27 emphasizing the right to share in scientific advancement and its benefits
- Small Island Development States Accelerated Modalities of Action (S.A.M.O.A) Pathway (2014)
- UN Guiding Principles on Business and Human Rights (2011)
- UN Policy Brief: Impact of COVID-19 on Women (2020)
- UNICEF Policy Guidance on AI for Children (2020)
- UNICEF I CAPRI The Effect of COVID-19 Pandemic on Jamaican Children – Preliminary Results (2021)
- IEEE Ethically Aligned Design: A Vision for Prioritizing Human Well-being with Autonomous and Intelligent Systems (2020)
- National Institute of Standards and Technology: Four Principles of Explainable Artificial Intelligence (2020)
- European Commission White Paper on Artificial Intelligence – A European Approach to Excellence and Trust (2020)
- The European Commission's High-Level Expert Group on Artificial Intelligence Ethics Guidelines for Trustworthy AI (2020)

This paper was compiled using multiple sources of information including a combination of desk research and literature review of information from the United Nations, World Bank, The World Economic Forum and the Organization for Economic Co-operations and Development and other statistical data sources. Reports from local news outlets were also used to gather relevant information on activities of individual Caribbean SIDS nations to provide a wide range of views and opinions. All sources are referenced in a brief footnote. Full details of all sources cited and consulted are found alphabetically in the bibliography. Information deficits were observed including numerous data constraints posed by limited, fragmented or non-existent data on the topic of AI by nation and as a region.

HOW TO USE THE POLICY GUIDANCE

The guidance herein can be used in a variety of contexts:

- When educating stakeholders about the opportunities and risks of AI – important when developing the life cycle of policy and technology development, within Caribbean governments and companies
- When creating, reviewing and/or updating AI policies, strategies or codes of conduct
- When developing and implementing AI systems that interact with or impact women, youth, disabled and other at-risk communities



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- AI must be inclusive, fair, transparent, accountable
- AI is an existential threat to humanity
- AI must be regulated
- Human rights supersede AI rights
- AI not eligible for human rights
- AI is global
- AI is the most important general-purpose technology of the century
- AI and 5G are inevitable
- Bias is everywhere in AI
- We Are Our Data
- Data rights will be the civil rights movement of the 21st century
- Broadband access will be a human right in the 21st century
- New skills education and training are essential

AI & THE CARIBBEAN

AI Definition

In 1956, an American computer and cognitive scientist John McCarthy coined the term artificial intelligence (AI)[16] as the science and engineering of making intelligent machines. UNESCO's first draft on the recommendation on the ethics of Artificial Intelligence approaches AI systems as technological systems which have the capacity to process information in a way that resembles intelligent behaviour and, typically includes aspects of reasoning, learning, perception, prediction, planning or control.[17]

The European Commission's High-Level Expert Group on Artificial Intelligence Ethics Guidelines for Trustworthy AI said

"Artificial Intelligence (AI) systems are software (and possibly hardware) systems designed by humans, that given a complex goal, act in the physical and digital dimension by perceiving their environment through data acquisition, interpreting the collected structure of unstructured data, reasoning on the knowledge, or processing the information, derived from this data and deciding the best actions(s) to take to achieve the given goal. AI Systems can either use symbolic rules or learn a numeric model, and they can also adapt their behaviour, by analysing how the environment is affected by their previous action."[18]

The growing capabilities of these systems and their horizontal impact help to categorize AI as a General-Purpose Technology (GPT). General-Purpose Technologies are technologies or clusters of related technologies defined by the potential for pervasive use in a wide range of industry sectors and by their technological dynamism.[19] Characterized as engines of growth, some examples include the steam engine, the electric motor and the microprocessor.

AI systems train using large data sets to identify patterns, make predictions, recommend actions, and figure out what to do in unfamiliar situations, learning from new data and thus improving over time. This new learning is called Machine Learning or Deep Learning also encompassed under AI make these systems descriptive, prescriptive and predictive in nature. Their use will continue to be introduced to the daily lives of Caribbean people much more than they are today.

CHARACTERISTICS OF AI

- 4th Revolution (3,000x im pact of 1st Revolution)
- Product of the Human Mind
- Horizontal and Vertical Industry
- General-Purpose Technology
- Cyber-Physical Systems
- Transformative
- Amoral
- Cognitive
- Disruptive
- Descriptive
- Predictive
- Prescriptive

Figure 4. Characteristics of artificial intelligence

Forms of AI in use today include digital assistants, chatbots and machine learning amongst others.

- Automated Intelligence: Automation of manual/cognitive and routine/nonroutine tasks.
- Assisted Intelligence: Helping people to perform tasks faster and better.
- Augmented Intelligence: Helping people to make better decisions.
- Autonomous Intelligence: Automating decision-making processes without human intervention.

16 Professor John McCarthy - Artificial Intelligence (stanford.edu)

17 UNESCO. 2020. First Draft of the Recommendation of the Ethics of Artificial Intelligence, 40 C/37. Paris: UNESCO.

18 European Commission's High-Level Expert Group on Artificial Intelligence, 'Ethics Guidelines for Trustworthy AI' (2019) p. 36

19 Timothy F Bresnahan and Manuel Trajtenberg. General purpose technologies 'engines of growth'? Journal of econometrics, 65(1):83–108, 1995.

Human + AI	AI
Asisted Intelligence	**Automation**
Assisted in making decisions and taking actions	Automation of routine tasks
Augmented Intelligence	**Augmented Intelligence**
Human decision makingautomation	Adaptation to different situations, acting without human assistance

Figure 5. PWC AI Report

As of 2021, there are nine companies that steer the future of Artificial Intelligence. Six of these nine companies are in the United States including: IBM, Facebook, Apple, Google and Amazon, and the remaining three are in China (Tencent, Alibaba and Baidu). [20] Caribbean SIDS rely heavily on trade and other technologies from the economic giants and technology creators in the US and China. However, Artificial Intelligence technologies are being developed by groups of persons that may not be cognizant of diverse socio-cultural and historical context that exist in the Caribbean and as such may cause adverse effects on countries if these algorithms are deployed out of the box.[21] Across the world, COVID 19 has accelerated the creation and deployment of digital offerings by seven (7) years.[22]

Since Artificial Intelligence (AI) and Machine Learning are fundamental technologies of the future, it will therefore be important that the Caribbean puts greater focus and accelerate the understanding of it. The international audit and consultancy firm PWC, has estimated that the global market for AI, the general-purpose technology, in 2020 was US$2.43 trillion, and by 2030 is expected to grow to US$15.7 trillion up to 14% higher in 2030 because of the accelerating development and take-up of AI.[23]

Machine Learning Tips

Rule #1: Always start with data
Rule #2: Focus on the main ideas
Rule #3: Have empathy for the audience.

-Joshua Starmer, StatQuest

Figure 6. Machine Learning TIps

20 Davos 2019 - Setting Rules for the AI Race: https://www.youtube.com/watch?v=Lzqw5c0Myqw

21 Noble, Safiya. Algorithms of Oppression How Search Engines Reinforce Racism. New York: NYU Press, 2019

22 How Covid 19 Has Pushed Companies Over the Technology Tipping Point – and Transformed Business Forever, Oct 5, 2020, McKenzie and Company.

23 Sizing the Prize: What's the real value of AI for business and how can you capitalize? PWC, https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf

AI CHALLENGES

Norwegian diplomat Christian Louis Lange made the statement that *"Technology is a useful servant but a dangerous master"* in his Nobel Peace Prize acceptance speech in 1921 about the advancements of technology in the 20th century.[24] This statement predicted the advancement of technology as a useful tool to aid humans in their work, but also warned of the possibility that it could evolve and become an uncontrollable entity. Lange's prediction came true, as ninety five years later, technology has captured the people's attention, making them the servants. This damaged the relationship between people and nature to the point where people are more concerned with the health of their technology rather than the health of their environment.

As AI technology increasingly impacts society, key affiliated challenges include:

1. Existential Threat
2. Ethics-Bias-Harm
3. Big Data Rights
4. Job Loss
5. Equity
6. Cyber-Security

The dangers of advanced AI have been popularized in the late 2010s by Stephen Hawking, Bill Gates & Elon Musk. For Tesla CEO and tech maverick Elon Musk, *"AI is a rare case when we need to be proactive instead of reactive with regulations".*[25] He thinks the advent of digital superintelligence is by far a more dangerous threat to humanity than nuclear weapons and that the field of AI research must have government regulation.

24 Posner, T., 10.29.2018, Artificial Intelligence for All: A Call for Equity in the Fourth Industrial Revolution, Our World, Retrieved from https://ourworld.unu.edu/en/artificial-intelligence-for-all-a-call-for-equity-in-the-fourth-industrial-revolution

25 Elon Musk: Superintelligent AI is an Existential Risk to Humanity, Science Time, December 12, 2020, https://www.youtube.com/watch?v=iIHhl6HLgp0&ab_channel=ScienceTime

TOP 9 ETHICAL ISSUES IN ARTIFICIAL INTELLIGENCE

According to the World Economic Forum (2016), the top nine ethical issues associated with AI include

1. **Unemployment** - Increasing fears of job loss due to increased automation and the use of robots
2. **Inequality** - The potential for AI technologies to create an increasing wealth divide
3. **Humanity** - Particularly the implication of machines on human behaviour and interaction
4. **Artificial Stupidity** - The possibility of intelligent technology making mistakes
5. **Racist Robots** - The generation of biased outcomes with discriminatory effects
6. **Security** - The importance of cybersecurity and data protection
7. **Evil Genies** - The possibility of unintended consequences which may be as extreme as rogue AI
8. **Singularity** - The ability to retain human control over such complex systems; Roboot rights - the 'humane' treatment of AI robots

Figure 7. Top 9 Ethical Issues in Artificial Intelligence

In the long term, AI systems could challenge human's special sense of experience and agency, raising additional concerns about human self-understanding, social, cultural and environmental interaction, autonomy, agency, worth and dignity.

"So far AI is exacerbating structural inequalities and creating new inequities and millions are falling the below the digital literacy poverty line."

- Wendell Wallach, Co-Convener, International Congress for the Governance of AI (ICGAI)

Implementation of AI's automated decision making technologies are impacting decision-making on employment and labour, social interaction, health care, education, media, freedom of expression, access to information, privacy, democracy, discrimination, and weaponization. Furthermore, the potential of AI algorithms to reproduce biases that perpetuate already existing forms of discrimination, identity prejudice and stereotyping including gender, ethnicity, and age are a *"threat to cultural, social and ecological diversity"*.[26] These concerns surround the biases that the developers of these systems can embed that can potentially exacerbate or perpetuate inequality, exclusion, and a threat to cultural, social and ecological diversity and social or economic divides.[27]

"AI systems should be ethically designed, deployed and used to not exploit lack of necessary infrastructure, education and skills, as well as legal frameworks, particularly in low-and middle-income countries and Small Island Developing States (SIDS)."

- Cordel Green, Executive Director, Broadcasting Commission, Jamaica

What has become clear over the last decade is that AI systems raises fundamental ethical concerns. AI systems require explanations, justification and contextual information about how algorithms are designed. Algorithms must always be transparent, accountable, explainable, accurate, auditable and responsible. Efforts must be made to ensure that AI is designed ethically by using interdisciplinary and multidisciplinary approaches. A new kind of respect for data will need to be developed to help detect, monitor and mitigate against AI bias and risks.

Interestingly, software development, unlike other professions that require high ethical discipline, is for the most part, a profession that has no consolidated professional code of conduct or licensing requirements to operate. This is a real dilemma when you consider the impacts that these systems have. These powerful tools are now available and in the hands of professionals and novices alike. This is perhaps a broader discussion on how to regulate and license professionals and companies operating in the industry.

One thing the technologies can't do is answer the moral issues they raise. Who is going to be held accountable when they go wrong? What responsibility do we as creators or users have?

- Wendell Wallach, Co-Convener, International Congress for the Governance of AI (ICGAI)

UN Special Representative John Ruggie proposed a framework on business and human rights to the UN Human Rights Council in June 2008, resting on three pillars to guide businesses:

1. State duty to protect against human rights abuses by third parties, including business
2. Corporate responsibility to respect human rights
3. Greater access by victims to effective remedy, both judicial and non-judicial

2011, the United Nations endorsed the *Guiding Principles for Business and Human Rights* [28], which defines the responsibilities that businesses and states have to protect the rights and liberties afforded to all individuals. Protection of human rights should be the first foundational principle that technology is built upon; however, it is not sufficient on its own. The paper however noted that additional guidelines and principles are needed to protect society from harms still worth addressing that are not necessarily a violation of human rights and offers the *United Nations "Protect, Respect and Remedy" Framework* as a roadmap. The Caribbean should ensure that there is representation on these standards bodies to provide diversity and influence

26 UNESCO. 2020. First Draft of the Recommendation of the Ethics of Artificial Intelligence, 40 C/37. Paris: UNESCO.
27 IBID.

28 United Nations Guiding Principles for Business and Human Rights https://www.ohchr.org/documents/publications/GuidingprinciplesBusinesshr_eN.pdf

on the technical standards by which these products will be created. It is an important pathway and point of influence for the Caribbean to be involved with the development of the standards that govern these systems.

> *"We need 'Caribbean research expertise on big questions facing AI tools"*
>
> *- Dhanaraj Thakur,*
> *Research Director Center for Democracy & Technology*

According to the World Bank, *"Data collection and processing requires an adequate framework, extensive digital infrastructure, stringent regulations for privacy protection, and tools to mitigate risks of harm to data subjects."*[29] The data that is used by machine learning can analyse patterns found in your online behaviour and disclose your political beliefs, religious affiliation, race, ethnicity, health conditions, gender and sexual orientation, even if you have never revealed this information to anyone online hence privacy concerns with AI remain a critical challenge.

According to Criminologist Renee Cummings, "we have experienced the hidden effects of algorithms, algorithmic discrimination, algorithmic profiling, algorithms marginalizing and victimizing, algorithms replicating and reinforcing racial disparities, economic disparities, creating a digital form of system racism and discrimination. We have seen the dangers of arraignment by AI, algorithms changing the way justice is administered, outsourcing of criminal justice decision making to algorithms and risk scores which have been disproportionally unfair and racially biases against black and brown defendants. Machine bias, algorithms codifying unconscious bias and systemic racism and criminal justice. Proxies for race such as criminal history, financial history, education, employment, neighborhood or zip code slip into data classification. AI is presenting new challenges and new risks for vulnerable populations".[30]

"In developing AI policy, it is important to remember that it is not only about privacy and data protection, but in terms of innovation and development, we need

29 Peersman, G. (2014).Overview: Data Collection and Analysis Methods in Impact Evaluation, Methodological Briefs: Impact Evaluation 10, UNICEF Office of Research, Florence.

30 Cummings, R. (2021, Feb 18). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Online forum]. https://www.youtube.com/watch?v=FSY4rAgpIFc

to think of more comprehensive models of how to address data models for reuse, local entrepreneurs, open data policy" according to Carolina Aguerre, Director at the Center for Technology and Society at the University of San Andres.[31]

By 2025, it is estimated that annual savings from replacement of employees by AI will reach U$9 trillion with an additional cost reduction of U$8 trillion from efficiencies gained in manufacturing healthcare and further U$2 trillion in efficiency gains from deployment of self-driving cars and drones. (Bank of America | Merrill Lynch) .[32] The emergence of these systems will drive efficiency and see automated systems managing a growing number of tasks including reasoning, planning, learning, and problem solving in ways far beyond the capacity of humans to undertake.

When it comes to AI and creativity, what is not clear is the degree to which human-level ability to experience art is required to create art. Can AI create art on par with human composers or painters despite lacking the ability to experience art, and reality, like humans do? Growing empirical evidence, especially in painting and music, suggest that artistic creativity may not require the capacity for subjective experience but instead be learnable by AI from human-created art and feedback. We believe that as AI becomes better at patterns and associations learning, and as it receives more feedback from people, it will create art capable of eliciting increasingly rich multi-sensory and emotional human experiences with increasingly complex associations: namely, increasingly better art, possibly moving beyond art created by humans.[33]

"Intelligence used to be the province of only humans but it no longer is. We don't programme the machines, they learn by themselves.""Affective computing – AI that interprets and simulates human emotions. Machines will interact with humans just as we interact with one another – through perception and through conversation so we want to build emotion AI that enables machines to have empathy"[34]

How Far is Too Far? | The Age of A.I. , The Age of A.I.

Broadening access and inclusion for AI not only mitigates the risks of inequality and disenfranchisement, but it also ensures that AI reaches its fullest potential. The fourth industrial revolution can bring prosperity, health, and stability to the globe. But it can also accelerate our worst natures, driving marginalisation, inequality and destructive growth. By granting access to the revolutionary potential of AI to all of us, we can harness the best of humanity for all of humanity.[35]

A critical factor underpinning the institutional environment for disruptive technologies is trust. Consumers and stakeholders must trust that privacy of children and other stakeholders will be respected, that data are used responsibly, that technologies are adopted in a way that is environmentally and socially sustainable, and that in particular, these technologies are adopted in a way that support inclusion and equity.

AI integration will also lead to increased Cyber Attacks which are particularly problematic and dynamically changing areas of protection and Cybersecurity. The right mechanisms to protect data and systems against cyberattack are not in place in the Caribbean and there are limited penalties legislated for Cybercrimes vis a vis physical crimes. This constraint also offers opportunity for new businesses geared toward data protection, data security red teams, bug-bounties, and secure storage services.

If it were measured as a country, then cybercrime — which is predicted to inflict damages totaling $6 trillion USD globally in 2021 — would be the world's third-largest economy after the U.S. and China. Cybersecurity Ventures expects global cybercrime costs to grow by 15% per year over the next five years, reaching $10.5 trillion USD annually by 2025, up from $3 trillion USD in 2015. This represents the greatest transfer of economic wealth in history, risks the incentives for innovation and investment, is exponentially larger than the damage inflicted from natural disasters in a year, and will be more profitable than the global trade of all major illegal drugs combined. The damage cost estimation is based on historical cybercrime figures including recent year-over-year growth, a dramatic increase in hostile nation-state sponsored and organized crime gang hacking activities, and a cyberattack surface which will be an

31 Carolina Aguerre, Director, Center for Technology and Society, University of San Andres Aguerre, C. (2021, Feb 18). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Online forum]. https://www.youtube.com/watch?v=FSY4rAgpIFc

32 Bank of America | Merrill Lynch

33 Supercreativity, AI may soon surpass human artistic creativity, Serafim Batzoglou and Theodoros Evgeniou, August 21, 2019, https://towardsdatascience.com/supercreativity-b4114ebd0357

34 How Far is Too Far? | The Age of A.I. , The Age of A.I. S1 • E1, December 18, 2019, https://www.youtube.com/watch?v=UwsrzCVZAb8&ab_channel=YouTubeOriginals

35 Posner, T., 10.29.2018, Artificial Intelligence for All: A Call for Equity in the Fourth Industrial Revolution, Our World, Retrieved from https://ourworld.unu.edu/en/artificial-intelligence-for-all-a-call-for-equity-in-the-fourth-industrial-revolution

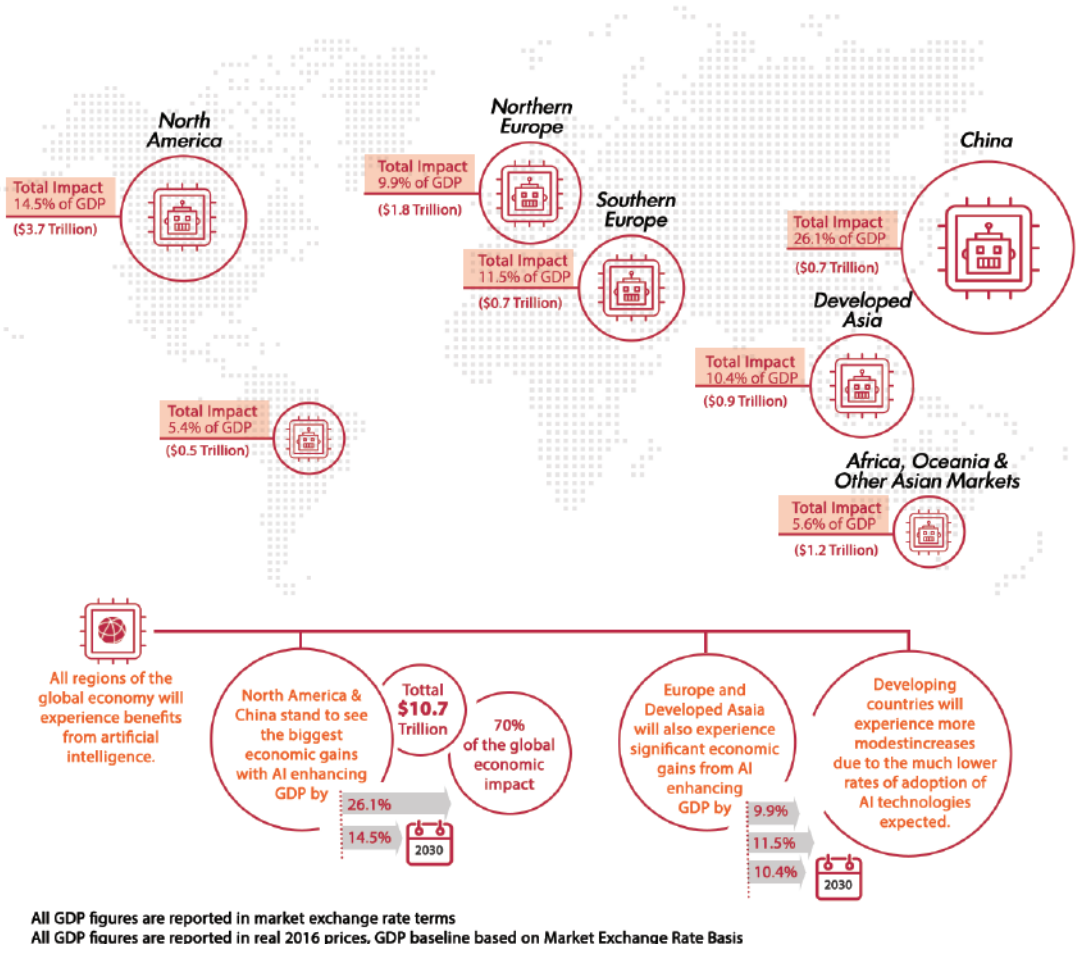


Figure 8. *Predicted regional gains from AI*

order of magnitude greater in 2025 than it is today. Cybercrime costs include damage and destruction of data, stolen money, lost productivity, theft of intellectual property, theft of personal and financial data, embezzlement, fraud, post-attack disruption to the normal course of business, forensic investigation, restoration and deletion of hacked data and systems, and reputational harm.[36]

AI OPPORTUNITIES

The current utilization of AI across Caribbean industry is poised to expand and if done properly, the industry sector should see more efficiencies and new industry opportunities unfold by 2030 due to data efficiency and management. Automation and AI-assisted decision-making will enable businesses in the region to be more efficient and do more with less.

Artificial intelligence (AI) will have an economic impact comparable to the steam engine and could boost global gross domestic product by 1.2% per year by 2030, delivering an additional US$13 trillion in economic value. AI is rapidly becoming more adept at performing complex tasks thanks to dramatic increases in data processing speed, storage capability and transfer rates. IBM CEO Ginny Rometty has recently said that AI will impact "100% of jobs, professions and industries." But beyond these impending economic shifts, the real promise of AI lies in its potential to tackle global challenges like hunger, poverty, and climate change.[37]

According to global advisory firm PwC, the global GDP will be up to 14% higher in 2030 because of the accelerating development and take-up of AI – the equivalent of an additional $15.7 trillion.[38] The economic impact of AI will be driven by:

36 Morgan, S. Nov 20, 2020, Cybercrime To Cost The World $10.5 Trillion Annually By 2025: Special Report: Cyberwarfare In The C-Suite, Cyber Crime Magazine https://cybersecurityventures.com/hackerpocalypse-cybercrime-report-2016/

37 Posner, T., 10.29.2018, Artificial Intelligence for All: A Call for Equity in the Fourth Industrial Revolution, Our World, Retrieved from https://ourworld.unu.edu/en/artificial-intelligence-for-all-a-call-for-equity-in-the-fourth-industrial-revolution

38 Sizing the Prize: What's the real value of AI for business and how can you capitalize? PWC, https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf

1. Productivity gains from businesses automating processes (including use of robots and autonomous vehicles).

2. Productivity gains from businesses augmenting their existing labour force with AI technologies (assisted and augmented intelligence).

3. Increased consumer demand resulting from the availability of personalized and/or higher-quality AI-enhanced products and services.

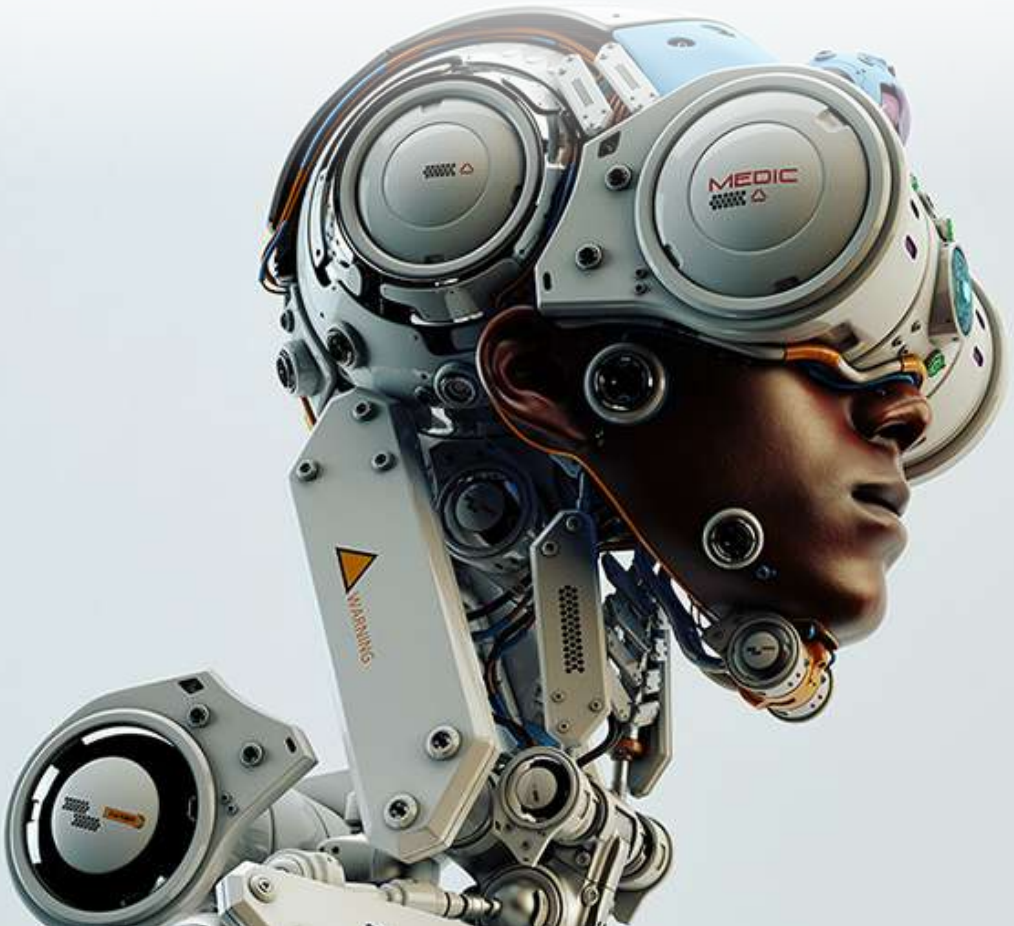
The region can reallocate savings earned from these increased efficiencies, to invest in infrastructure development, poverty eradication, improving healthcare and education systems, protecting the environment, emergency management capacity and other areas critical to the sustainable development of the region.

In considering the future of Caribbean workers who will be affected by AI, Professor Anthony Clayton, Director of the Institute of Sustainable Development, UWI, Mona and Chairman of Broadcasting Commission of Jamaica, poised critical questions at the UNESCO| Broadcasting Commission regional stakeholder forum including:

What will happen to the unskilled and to those whose skills are no longer necessary? If no solution, this could lead to poverty and civil unrest. We need to have a fundamental rethink of the nature of work and education and what is going to be the relationship between qualifications and the means by which we earn a living in the future.[39]

In 2020, the *Institute of Electrical and Electronics Engineers (IEEE) issued its seminal piece Ethically Aligned Design: Prioritizing Human Wellbeing with Autonomous and Intelligent Systems.* The guidelines stated that 'to be human-centered, businesses must first establish a culture of trust, transparency, and accountability internally' in order to effectively code these values into products.

39 Pedro, F. (2021, Feb 18). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Online forum]. https://www.youtube.com/watch?v=FSY4rAgpIFc



The IEEE technical community has created guidelines for developing these systems and the IEEE P7000™ series of standards[40] are recommended to be considered for adoption by the Caribbean:

- **P7001™** Transparency of Autonomous Systems
- **P7002™** Data Privacy Process
- **P7003™** Algorithmic Bias Considerations
- **P7004™** Standard on Child and Student Data Governance
- **P7005™** Standard on Employer Data GovernanceP7006™ Standard on Personal Data AI Agent Working Group
- **P7007™** Ontological Standard for Ethically driven Robotics and Automation Systems
- **P7008™** Standard for Ethically Driven Nudging for Robotic, Intelligent and Autonomous Systems
- **P7009™** Standard for Fail-Safe Design of Autonomous and Semi-Autonomous Systems
- **P7010™** Recommended Practice for Assessing the Impact of Autonomous and Intelligent Systems on human well-being

40 IEEE Ethics in Action: Ethically Aligned Design https://ethicsinaction.ieee.org/#series

CARIBBEAN SMALL ISLAND DEVELOPING STATES

The Caribbean's dynamic culture and environmental diversity have made it one of the number one destinations on the planet for centuries.

"Because of its diversity, the Caribbean has the capacity to build bridges not only among classes and races of people from countries across the region but also between continents of the world which are represented in the Caribbean through centuries of voluntary and involuntary migration which is now continued via tourism, commercial transaction, and professional contacts."[41]

Professor Rex Nettleford,
Expressions of the Mind: Philosophy and the Making of the Caribbean Nation Symposium, 2008

The Caribbean region is referred to as a melting pot because of the high cultural, linguistic and ethnic diversity among each of its 28 nations. Forty-four million persons call the Caribbean cluster of islands home, representing about 0.56% of the total world population and each with a unique economic, cultural and historical flavour. The Caribbean region are considered Small Island Developing States (SIDS) and each country has a unique economic, cultural and historical flavour. The islands are characterised as developing nations because they facing specific social, economic and environmental vulnerabilities.

SIDS were recognized as a special case both for their environment and development at the United Nations Conference on Environment and Development (UNCED), also known as the Earth Summit, held in Rio de Janeiro, Brazil (3–14 June 1992). *The SIDS Accelerated Modalities of Action (S.A.M.O.A) Pathway an outcome of the 'Third International Conference on Small Island Developing States (SIDS Conference)'* acknowledged that the identification of SIDS priorities was needed in the formulation of the 2030 Agenda (UN Sustainable Development Goals).[42]

41 La Rose, M., 2008 September 5, Caribbean culture too diverse to be labelled – Prof Nettleford, Guyana News, retrieved from https://www.stabroeknews.com/2008/09/05/news/guyana/caribbean-culture-too-diverse-to-be-labelled-%E2%80%93-prof-nettleford/

42 The SAMOA Pathway,http://www.2030caribbean.org/content/unct/caribbean/en/home/sustainable-development-goals/samoa-pathway.html#:~:text=The%20SAMOA%20Pathway&text=The%20SIDS%20Accelerated%20Modalities%20of,September%202014%20in%20Apia%2C%20Samoa

Figure 10. *Caribbean SIDS*

CARIBBEAN TRADITION

- **Advocacy**

  Uniquely positioned to advocate based on the Caribbean DNA and resistance history
- **Challenge Injustice**

  Marcus Garvey-Pan Africanism | Reggae Music-Apartheid
- **Context**

  Cultural | Sociological | Anthropological | Historical
- **Creativity**

  Globally competitive creators of non-perishable consumables
- **Identity**

  Who we are | Global village reflection | Diverse | Multi-ethnic
- **Revolution**

  Enslaved African people – Maroons (Jamaica) | Toussaint (Haiti) | Bussa (Barbados)
- **Resistance**

  Bob Marley *(global symbol of freedom)*
- **Movements**

  Rastafari *(revolutionary | way of life | global)*

Figure 9. *Caribbean Tradition*

CARIBBEAN CHALLENGES

The poverty and inequality in the region may, to an extent, be associated with structural heterogeneity and low-productivity sectors, which account for more than half of all jobs in some Caribbean countries. Income is an important driver for addressing inequality, and across the Caribbean there are significant disparities in this area (ECLAC, 2018). Concerns loom that AI may widen gaps between countries, reinforcing or even exacerbating current socio-economic divides.

"Our region, as resilient as we are, continues to face existential threats such as, the effects of climate change and vulnerability to natural disasters, the rise in crime and violence associated with organized criminal enterprises in narco-trafficking, small arms trafficking, contraband trafficking, human trafficking and money-laundering, energy and commodity price instability and high indebtedness. This is further exacerbated by our generally small size and economic openness. While we focus individually on our respective national challenges, it is imperative that we engage and develop regional and international strategies in our efforts to achieve economies of scale and collectively address those issues that affect us in common".

- Prime Minister Andrew Holness, Jamaica
The Opening Ceremony of the Thirty-Seventh Regular Meeting of the Conference of Heads of Government of the Caribbean Community (CARICOM) Georgetown, Guyana, 4– 6 July 2016

Caribbean SIDS have been disadvantaged in their development process. The common challenges faced by these countries are:

- Narrow resource base depriving them of the benefits of economies of scale
- Small domestic markets and heavy dependence on a few external and remote markets
- High costs for energy, infrastructure, transportation, communication and servicing
- Long distances from export markets and import resources
- Low and irregular international traffic volumes
- Little resilience to natural disasters
- Growing populations
- High volatility of economic growth
- Limited opportunities for the private sector and a proportionately large reliance of their economies on their public sector
- Fragile natural environments.

Despite the challenges and marginalization that slavery, stagnant growth, climatic threats and exiting colonialism without a development pact, the Caribbean has produced excellence across fields. Its people have continued to emerge as some of the most warm, resilient, innovative and globally competitive human resources and cultural creators of non-perishable consumables. The national, global, economic and social importance of Caribbean creativity - 'thought data', 'physical data' and 'cultural data' developed in the region by globally influential artistes, thinkers, leaders, Nobel laureates, and exceptional sportsmen and sportswoman, is an invaluable asset and must be protected at all costs.

The island nations continue to have mounting resource constraints and sustained developmental challenges. They include environmental vulnerability due to climate change, natural disasters and pollution; social challenges due to lack of resources focused on key developmental challenges such as poverty, crime and education; and economic constraints due to persistent negative trade, high public debt and fiscal imbalances. Compounding challenges threaten to widen the digital divides in the Caribbean and among individual nations.

ENVIRONMENT & CLIMATE CHANGE

The Caribbean is the second most environmental hazard-prone region in the world. Between 2000 and 2019 over 152 million people have been affected by over 1,205 natural disasters. These natural disasters include over 500 floods, 330 storms, 75 earthquakes, 74 droughts, 66 landslides, 50 extreme temperature periods, 38 volcanic events and 24 wildfires. While natural disasters are a main environmental challenge, concerns about climate change, loss of biodiversity, anthropogenic stressors on freshwater ocean systems including land-based sources of pollution. The

Caribbean is more dependent on tourism than any other region in the world and is an essential pillar of all Caribbean economies accounting for 15% of GDP and 13% of jobs.[43]

This dependency and leverage by the tourism industry has also put pressure on the regions natural ecosystems. *"The Covid-19 pandemic has impacted our global village in quite significant ways. One of the impacts will be on the youngest generation's attitude to travel and exploration of different places. We have had over a million persons pass away due to COVID 19 over the past year and a half, and this will impact the persons' desire to travel as they did pre-Covid 19. In addition, changed economic circumstances, family units and the mental health development of children are also factors that will become more and more relevant as time goes by. Therefore, SIDS should shift their tourism oriented focus to rely more on e-Tourism ventures, I am suggesting that the region should focus its energies (and money) on developing a niche in the area of well-being management that enables augmented reality to be a significant part of the package. In other words, place Well-being management under the umbrella of E-Tourism and develop it as such. So the virtual Carnival concerts, virtual Panoramas, virtual fetes and accompanying exercise programmes geared towards the existing tourists niche, can also be used as part of a Well-Being Management Programme."*

Keri A. Kitson
Civil Attorney at Law, Author and Former Credit Union Director

New data on the *benefits that coral reefs provide to the travel industry and the region's economy reveal that the value of reef-associated tourism is estimated at more than US$7.9 billion annually from over 11 million visitors. This accounts for 23% of all tourism spending and is equivalent to more than 10% of the region's GDP (gross domestic product)*.[44] Studies have shown that there is evidence of over 60% decline of living corals in the Caribbean in just the last three decades alone since the region first raised the global alarm about climate change, and now SIDs must bear the weight of the world's destructive behaviour.

43 UN Office for the Coordination of Humanitarian Affairs: Natural Disasters in Latin America and the Caribbean (2000 – 2019) https://reliefweb.int/report/world/natural-disasters-latin-america-and-caribbean-2000-2019

44 EcoEarnings: A Shore Thing – The Ocean Foundation

The Nature Conservancy is currently deploying innovative solutions to protect and restore coral reefs throughout the region. "Millions of people in the Caribbean depend on coral reefs as a source of livelihood and the region is known as paradise to many travellers from around the globe. It is ours our responsibility to protect the natural wonders, like coral reefs, that sustain both the Caribbean economy and tourism alike. We must however move faster to outpace the current rate of degradation and increasing threats to coral reefs" noted Dr. Luis Solórzano, Executive Director of The Nature Conservancy in the Caribbean during the recent regional stakeholders consultation. [45]

These catastrophic environmental threats like the coral reef deterioration is causing lingering damages such as eroding coastlines from rising seas, vanishing ground water, increasing frequency of extreme weather events, temperature fluctuations and drought. These events are compounded by man-made damage caused by pollution, coastal development and overfishing and is threatening the precious ecosystem. The continued depletion of the Caribbean's natural resources could lead to severe economic and social fallout for the region by threatening important bio-diversity and geo-heritage sites. Moreover, the people of the Caribbean will require international assistance and cooperation to deal with climate change and challenges to food security.

It has been noted that "Caribbean countries import more than US $4 billion in food; this represents more than 60% of the total food that they consume (FAO, 2015). This is expected to increase to US $8-10 Billion by 2020 as Caribbean populations increase and climate change reduces the region's food production."[46]

45 Regional-economies-face-peril-with-declining-coral-reefs-report, Jamaica Observer, https://www.jamaicaobserver.com/news/Regional-economies-face-peril-with-declining-coral-reefs-report_18827999

46 Artificial Intelligence and the Caribbean, Lodewijk Smets - Zubin Deyal, Caribbean Dev Trends.com, November 20, 2018, https://blogs.iadb.org/caribbean-dev-trends/en/9397/

WOMEN, YOUTH AND COVID-19

"The voice of AI is Female"… Did you notice?
Hon Olivia Grange, CP, MP,

Minister of Culture, Gender, Entertainment and Sports;
Chair, Jamaica National Commission For UNESCO

Caribbean women have played an essential part in the region's history, development and culture. They have been strong, resilient and responsible partners in nation building, in all walks of society from the arts to science, law and politics. Today Caribbean women outpace men in the years of secondary school education and tertiary institution enrolment but due to ongoing gender inequities, make only 60-70% percent of every dollar made by their male counterparts with comparable skills in the same position.[47] The protections against gender inequity and pay discrimination vary widely across the region. Guyana is the only Caribbean nation that has established a legal framework for equal pay and job access for women while across the Caribbean, women have other professional challenges including family leave.

Globally, the COVID 19 pandemic has had an exponentially negative impact on at high-risk groups including people of colour, women, youth and the elderly. The pre-existing systematic inequities common within these groups including poor living standard, inadequate healthcare, low wages and poor housing have been further exacerbated by the repeated lockdowns and job losses suffered since March 2020. Women are more vulnerable, not only COVID-19–related economic effects, but also to threats based on increased automation as many work in jobs slated to be made redundant.

A study by Harvard Business Review found that depending on the pace of automation around the world, between 40-160 million women (as many as

47 Bando, R. Evidence-based gender equality policy and pay in Latin America and the Caribbean: Progress and Challenges. Lat Am Econ Rev 28, 10 (2019). https://doi.org/10.1186/s40503-019-0075-3

one in four women employed today),[48] may need to transition into new occupations and often into higher-skilled roles, in order to remain employed and seize new job opportunities.

It is estimated that 90% of the 400 million jobs that will be replaced by AI are in low-income countries and that by 2050, there will be about 6 billion people in the world's workforce with about 5 billion of them, doing jobs that don't exist today (The Millennium 2020 Project).[49]

Children in particular need to be protected from any harmful and discriminatory impacts of AI systems and be provided leeway to interact with them in a safe way. AI systems should also be leveraged to actively protect children from harm and exploitation to support the rights foreseen under the CRC (Child Rights Convention) until they reach the age of 18 even if they reach the age of digital consent, which begins at 13 years old in many countries. AI systems must be developed and deployed in a way that simultaneously upholds children's collective rights to protection, provision and participation.

The following highlights UNICEF policy guidance for AI and Children, drafted in September 2020 :

1. Children need to be protected from any harmful and discriminatory impacts of AI systems and interact with them in a safe way.

2. AI systems should also be leveraged to actively protect children from harm and exploitation.

3. Children are entitled to the rights foreseen under the CRC (Convention on the Rights of the Child) until they reach the age of 18.

4. Reaching the age of digital consent, which begins at 13 years old in many countries, does not mean they should then be treated as adults.

5. AI systems must be developed and deployed in a way that simultaneously upholds children's collective rights to protection, provision and participation.

6. The opportunities that AI systems bring to children of all ages and backgrounds – such as to support their education, health care and right to play – need to be fully leveraged when, and this is critical, it is appropriate to use AI systems.

AI inclusion by design approach ensures that all children can use AI products or services, regardless of their age, gender identities, geographic and cultural diversity. This can ensure relevance for and use by children that may otherwise be excluded through bias, discrimination or profiling. Include a broad range of stakeholders in design teams, such as parents, teachers, child psychologists, child rights experts, and, where appropriate, children themselves. If all these challenges are taken in context, AI could be a useful tool in provide solutions to these challenges. AI could be focused on helping to improve learning equity and reduce losses.

COVID-19's adverse impact on at-risk segments of women, youth and disabled, has been evident and therefore it is imperative that these vulnerable

48 As Jobs Are Automated, Will Men and Women Be Affected Equally? (hbr.org)
49 The Millenium Project, http://www.millennium-project.org/2020/01/

groups be targeted for re-education and new skills training to enable them to find employment and opportunity in the post COVID digital economy.

According to a recent UNESCO report on Caribbean school closures, *7 million learners and over 90 000 teachers across 23 countries and territories are grappling with the new reality of distance-learning.*[50] With the declaration of the pandemic in March 2020, the effects on Caribbean youth has been profound. UNESCO's Education Response to Covid 19 in the Caribbean Report recognized that almost all education institutions are now providing their services online due to the pandemic with loss measured in terms of learning, colleagues and equity:[51]

1. **Learning Loss** – It is estimated that if they could reopen now the learning loss because of COVID-19 is at 15/30% of what the students would have retained. This is a Massive loss.

2. **Loss of Colleagues** – We may see a big dropout rate as female students may not return when school reopens.

3. **Loss of Equity** – Only about 1 in 2 homes have appropriate equipment and the right bandwidth to take classes online. Most households lack access to quality internet access and bandwidth.

50 Education Response to COVID-19 in the Caribbean
51 IBID

DIGITAL INFRASTRUCTURE

Information and Communication Technologies (ICTs) including the deployment of high-performance computing such as GPU computing is needed. Lack of access to broadband and big data pose big challenges to the region and can potentially impact or even arrest the rate of digital transformation. Research done by the International Telecommunications Union show that there is a strong correlation between a region's income levels and the number of fixed-telephone and fixed-broadband connections per 100 inhabitants, reflecting the price and availability of fixed connections.[52]

Indeed access to bandwidth and internet is being considered a 21st century human right.

- Dr. Francesc Pedró, Director, UNESCO International Institute for Higher Education in Latin America and the Caribbean

AI adoption attitudes in the region are in need of improvement according to the INCUS AI in Caribbean Industries Survey which indicates that[53]

- 91% agreed or were neutral that AI is critical to their survival
- 12% of businesses in the Caribbean are using AI - Adoption is low even among the large digital leaders in the region
- 91% spend nothing or very little on AI

Jason Mars, Assistant Professor of Computer Science at University of Michigan & Co-founder of Clinc Inc noted during the stakeholders consultation that *"We can build the Caribbean in AI with Community, Culture, Communication, Mentorship and a little investment capital. We need to collect the data – this is the most expensive process if there is not a strong technical infrastructure."*[54]

Essentially if we are the data that is being created, the question to be asked, according to Executive Director, Caribbean Competition Authority Nievia Ramsundar is, *"how can the consumer remain in personal ownership of their unique identity and not have it traded by external parties like common stock."*[55]

Caribbean nations need to improve the efficiency of the security and criminal justice systems. The high cost of crimes such as homicide and assault plagues the region.[56] The estimated costs include public expenditure on public safety (police, criminal justice, and prison administration), private expenditure on security by firms and households, and the social costs of crime (poorer quality of life due to victimization and the foregone income of the prison population).

The majority of public and private funds are used for security primarily in policing and surveillance while lesser funds are invested into the judicial system that has been found to be plagued by excessive processing delays, long backlogs, and soaring incarceration rates. Prisoner volume exceeds prison capacity by more than 70% across Caribbean countries and 40% of prisoners are on pretrial detention awaiting trial. Given these statistics, it is not surprising that crime is impacting economic development of the region.

The rise of nationalism across the world is challenging basic assumptions of global interconnectedness and threatens to fragment nations and regions. In so far as the Caribbean is known to be mostly peaceful with stable democracies, the region cannot ignore the threat that AI is having on human rights, security, media & democracy. Civil society's basic role to enable trust, safety and support to citizens is under threat from Mis, Dis and Mal Information produced and perpetuated by AI technology.

The January 2021 attack on the United States Capital Building is a case study on democracy's fragility vs the power of misinformation. If it can happen to one of the world's oldest and most developed democracies, with its established infrastructure and ecosystem, what would happen to any of the Caribbean's relatively younger, less economically developed democracies? It is doubtful that the Caribbean nations' smaller size, younger institutions and struggling GDPs would have the same chance at resiliency as the US.

52 International Telecommunications Union Measuring digital development – Facts and Figures (2019)
53 Incus Services State of AI in the Caribbean Survey - http://incusservices.com/ai/
54 Jason Mars, Caribbean Stakeholders Consultation
55 Ramsundar, N. (2021, Feb 19). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Online forum]. ttps://www.youtube.com/watch?v=_yIq0KmHG2Q-&t=327s
56 IADB Publication (2017). The costs of crime and violence: new evidence and insights in Latin America and the Caribbean / editor, Laura Jaitman.

CARIBBEAN OPPORTUNITIES

AI can support the challenges of Caribbean SIDS sensitive to its cultural, social and anthropological histories. A region-wide strategy can be created and expanded to:

- Align AI strategy with regional developmental plans for education, food security, climate change, digital transformation
- Expand regional digital skills and AI capability integrating more women, youth and disabled
- Build strong digital infrastructure (5G, High performance computing, GPUs, Cyber Security) to support AI deployment, content development and guaranteed access to the Internet
- Establish AI-appropriate governance for security, risk mitigation regional strategy implementation
- Invest in education and R&D in science, technology and engineering led by public sector digital transformation and provision of incentives for business transformation

Unite to rebuild the region stronger post COVID-19 using digital and smart island transformation as a lever

AI governance is needed in the region to enable regulation, legislation and to enhance safety, security and accountability. Caribbean SIDs should establish regional common values and principles to promote the development of human-centered AI. The region should also review existing policy and legislation on ICTs to align with responsible AI governance. Long term policy considerations should include soft laws and legislative frameworks to address potential harm, responsibility and liability related to AI. The region should create a standards authority with responsibility for transparency, safety and wellbeing. The Caribbean SIDS should increase participation in international AI forums and discussions as well as continue the region's tradition of advocacy against harm and biases which may marginalize, discriminate or codify prejudice and stereotyping of people in the digital age.

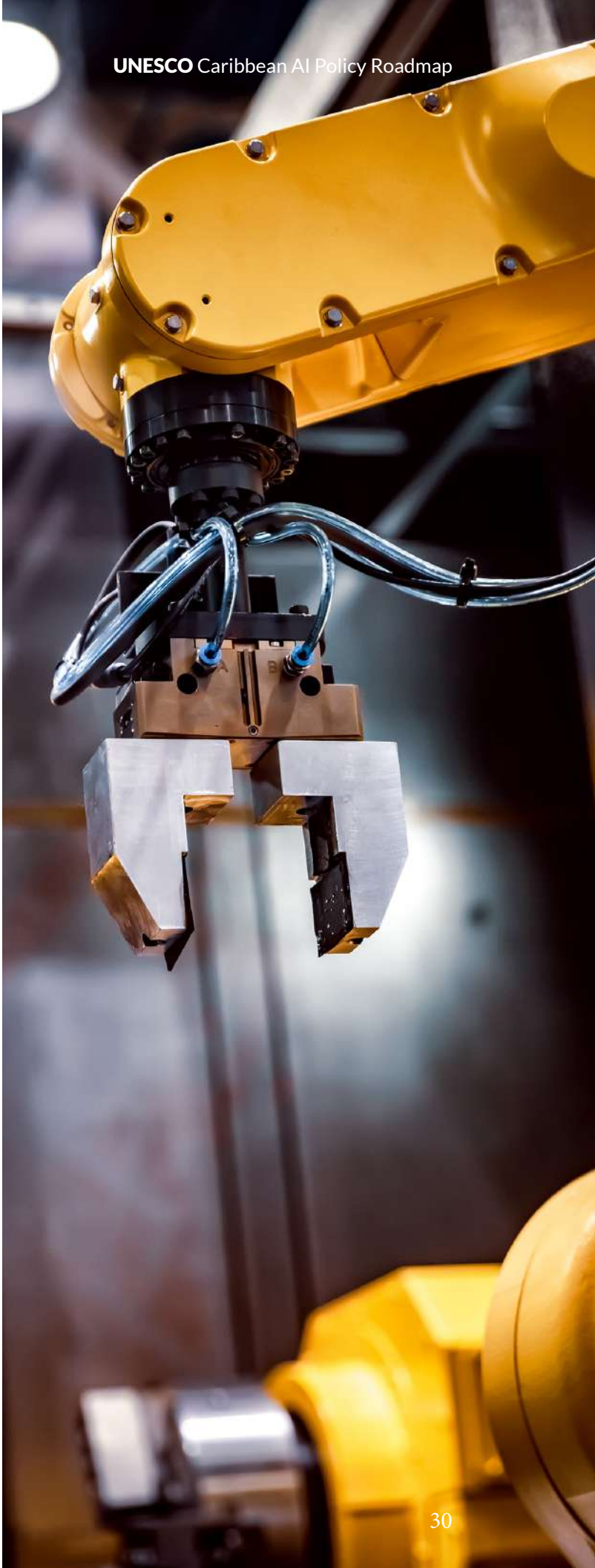


Figure 11. UNESCO ROAM Principles for Internet Universality

Information and Communication Technologies (ICTs) are key building blocks of the digital economy, to facilitate trade and drive e-commerce.[57] The *UNESCO Internet Universality Principles of Rights*, Openness, Access to All and Multi-Stakeholder Participation should be applied to cross the cutting issues of Internet access in the Caribbean. Priority should be placed on collaboratively prioritizing and mobilizing the requisite investment in digital infrastructure to ensure all citizens have access to the internet, regional computing resources and data centres.

Indeed access to bandwidth and internet is being considered a 21st century human right.

- Dr. Francesc Pedró, Director, UNESCO International Institute for Higher Education in Latin America and the Caribbean

Public sector digital transformation projects should be encouraged to increase public sector efficiency, new jobs, new skills development. Caribbean nations can improve their security and criminal justice systems with AI systems. Professor Richard Susskind, global leader in technology and the judiciary research, says the legal system will change more in the next 10 years than it has in the last 200. In neighbouring territories like Brasil, *"the discussions now is about the criminal justice system and is NOT IF AI WILL REPLACE, BUT HOW AND WHERE it can replace in a safe way"* according to Brasilian Federal Judge Isabela Ferrari.[58]

AI can assist in increasing the efficiency of Caribbean justice in a number of ways such as case research, scheduling, drafting decisions and precedents, resulting in a more effective, efficient and just criminal justice system for citizens. Caribbean SIDs should transform into smart islands. Smart islands use big data and other information technology resources to manage everything from public transport to garbage collection to the use of water and other resources. This strategy includes using the Internet of Things (IOT), sensors, software and 5G technologies connect devices and systems to the Internet. In 2022, Internet data traffic is projected to be three times that of 2017, and the share of licensed IoT devices is predicted to rise from 13% in 2018 to 28% in 2025.[59]

AI systems can be deployed for climate change mitigation and environmental preservation including early warning systems, remote monitoring, disaster management, structural improvements and public education. AI could reduce imports of foreign food by helping local farmers create better conditions for crop growth, especially in response to different weather patterns using predictive analysis, early warning systems and the like. There is an opportunity for the Caribbean to contribute to the development of AI tools that are focused on fighting bias, discrimination and promote transparency and fairness.

The region has a very vibrant cultural and creative industry that can be paired with technology and engineering to produce tools and solutions that aid in transparency and understandability

57 Aid For Trade At A Glance 2017: Promoting Trade, Inclusiveness And Connectivity For Sustainable Development Oecd, Wto 2017

58 Judge Isabela Ferrari, Federal Judge, Brazil (2021, Feb 18). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Online forum]. https://www.youtube.com/watch?v=FSY4rAgpIFc

59 Gartner, Inc Report - CIO Agenda 2019: Digital Maturity Reaches a Tipping Point

of the workings of algorithms and the data with which they have been trained with. These tools could focus on predicting or scoring the potential impact on human dignity, human rights, gender equality, privacy, freedom of expression, access to information, social, economic, political and cultural processes, scientific and engineering practices, animal welfare, and the environment and ecosystems.

"With automation impacting employment, public policies strategies and programs are most needed to ensure that Artificial Intelligence empowers people not replace people."

- Paula Istúriz Cavero, Programme Specialist, Social and Human Sciences, UNESCO Cluster Office for the Caribbean

Data has renewable exponential value. The Caribbean need and capacity for big data will increase too because AI needs data to learn these trends will supercharge the development of more powerful AI technologies. A lot of data in the Caribbean is available but not yet ready for general consumption of AI systems. Given the value of the region's cultural and environment heritage, the power of AI technologies can be applied to data capture, storage and management of existing works. This is an area which will require new skills training and offer business opportunities to focus on digitalisation services for these unstructured data. Therefore the youth should be targeted for inclusion and trained in data capture, storage, cleaning and management services. Data collection and cultural heritage preservation can become an active engine for digital skilled jobs, upward mobility and economic growth while sensitizing youth to value their country and its social, cultural and environmental assets. This would transfer the responsibility for preservation to the next generation aided by AI, mobile phones, and the Internet for which this generation is wired.

Associate Professor, Penn-State University and Founder of PlantVillage David Hughes has proposed youth engagement as an effective strategy to data collection and reporting. *"They can make observations using smart phones and apps. We can democratize the access to AI and put problem-solving AI to work for everyone, in service of humanity".*[60]

The Caribbean cultural and creative industries could also be engaged to provide training in digitalising, categorizing and data analysis services. The preservation programme would create digital jobs, build archives, preserve cultural heritage and enable monetization of data.

60 David Hughes, Associate Professor, Penn-State University and Founder of PlantVillage Hughes, D. (2021, Feb 19). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Online forum]. ttps://www.youtube.com/watch?v=_yIq0KmHG2Q&t=327s

Figure 12. The Basic, Standard and Advanced 'Computer Skills of the Future' Pyramid
Source: Author and ITU skill frameworks

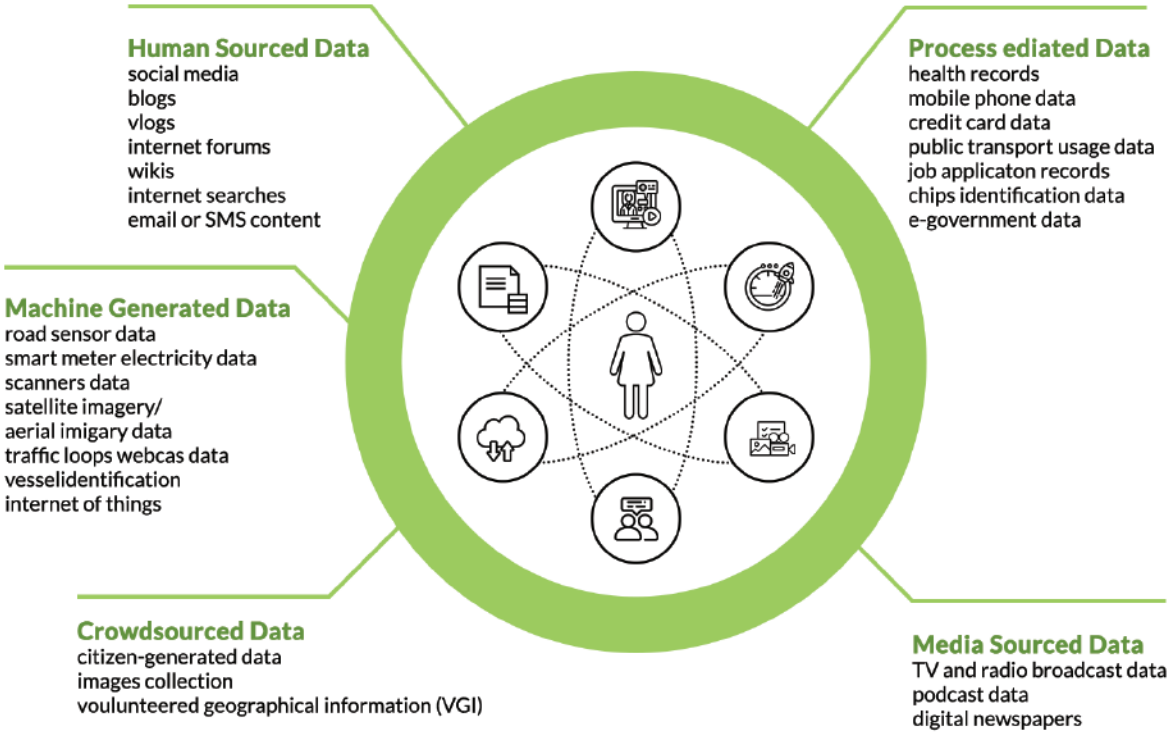


Figure 13. Current Data Sources for Big Data

The big industries in the Caribbean are poised for regional development as defined by the *CARICOM Council for Trade and Economic Development (COTED)* includes: Healthcare, Financial Services, Education, Security, Environment, Culture, Manufacturing, Agriculture and Tourism. All these industries stand to gain greatly by the application of Artificial intelligence technologies adding up to 5.4% to the regions GDP.[61] In support of the region's digital transformation, Caribbean SIDS should develop a plan to enable collective action in areas such as joint procurement of ICT equipment; regional VAT holidays; data capture, storage and management; and to deliver full access to the Internet and bandwidth to all citizens.

New business models and new revenue streams can be created with investment. Technology funding is critical according to Grammy award winning producer Walshy Fire who noted *"We need to inspire our people to engage tech, create tech and to fund tech"*[62] SoftBank's investment vehicle, the U$100 billion Vision Fund, invests in emerging technologies like artificial intelligence, robotics. The value of the fund is U$10 billion more than the entire of GDP of every CARICOM member combined according to Leslie Lee Fook, Director, A.I. Analytics and Automation at Incus Services. Digital transformation in the region will rely on investment in infrastructure, education and training required to integrate AI in the region.

Robust AI curricula must ensure balance between human-orientated and technology-mediated approaches. AI literacy should also be integrated into lifelong learning programmes, so that all citizens can understand how to interact with AI systems and make informed decisions. It is also key to support youth to achieve higher levels of AI competence, and engage youth in the design and implementation of IT systems. (UNESCO.org)

Healthcare is an industry that can greatly benefit from the adoption of AI technologies as evidenced by the success of regional healthcare advances aided by AI include the*" first prostate cancer cell line from the Caribbean, only one of three in the world for men of African descent, which was developed with AI accessing the resources and characterizing the cell line based on other big data."*[63]

61 Sizing the Prize: What's the real value of AI for business and how can you capitalize? PWC, https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf

62 Walsh, L. (2021, Feb 19). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Online forum]. ttps://www.youtube.com/watch?v=_yIq0KmHG2Q&t=327s

63 Henkel Valentine, PhD Candidate & Researcher in Prostate Cancer, The University of the West Indies, Mona, Jamaica
Valentine, H., UNESCO | Broadcast Commission Panel (2021, Feb 19).
Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Online forum]. ttps://www.youtube.com/watch?v=_yIq0KmHG2Q&t=327s

The Cultural and Creative Industries (CCI) is currently estimated at US$3 trillion and the AI industry is an estimated to reach US$4 trillion in value by 2022,[64] making their of pace of growth and value close. Integration of AI technologies to create an enabling environment for the cultural and creative industries in the Caribbean would enhance the packaging of destination spaces and e-Tourism user experiences. Intellectual Property assets can be developed to provide tools that will increase creativity, productivity, marketing and distribution of creative and cultural products and services. Legislative framework for policy, regulations and ethical guidelines would be required for effective governance.

Potential AI applications in the creative and cultural industries can be categorized as follows:

1. Content Creation
2. Data Analysis
3. Content Enhancement
4. Information Extraction And Enhancement
5. Data Compression

Given the Caribbean's athletic talent, legacy and brand reputation, opportunities will exist to expand the revenue generation through adaptation of AI technologies. Delivery of virtual variations for coaching, events and master classes would be part of a growing e-learning and virtual event market. There is a lane for Caribbean masters in the eSports race using AI technologies such as avatars to enable the development of digital players, leagues and events that can access the e-sports market which estimated to reach U$1.8 trillion by 2026.[65]

64 Chung, A. (2021, Feb 19). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Online forum]. ttps://www.youtube.com/watch?v=_yIq0KmHG2Q&t=327s

65 Esports Market Size is Projected to Reach USD 1860.2 Million by 2026 at CAGR 15.1% | Valuates Reports https://www.prnewswire.com/in/news-releases/esports-market-size-is-projected-to-reach-usd-1860-2-million-by-2026-at-cagr-15-1-valuates-reports-822454230.html#:~:text=The%20global%20Esports%20market%20size,the%20forecast%20period%202021-2026.

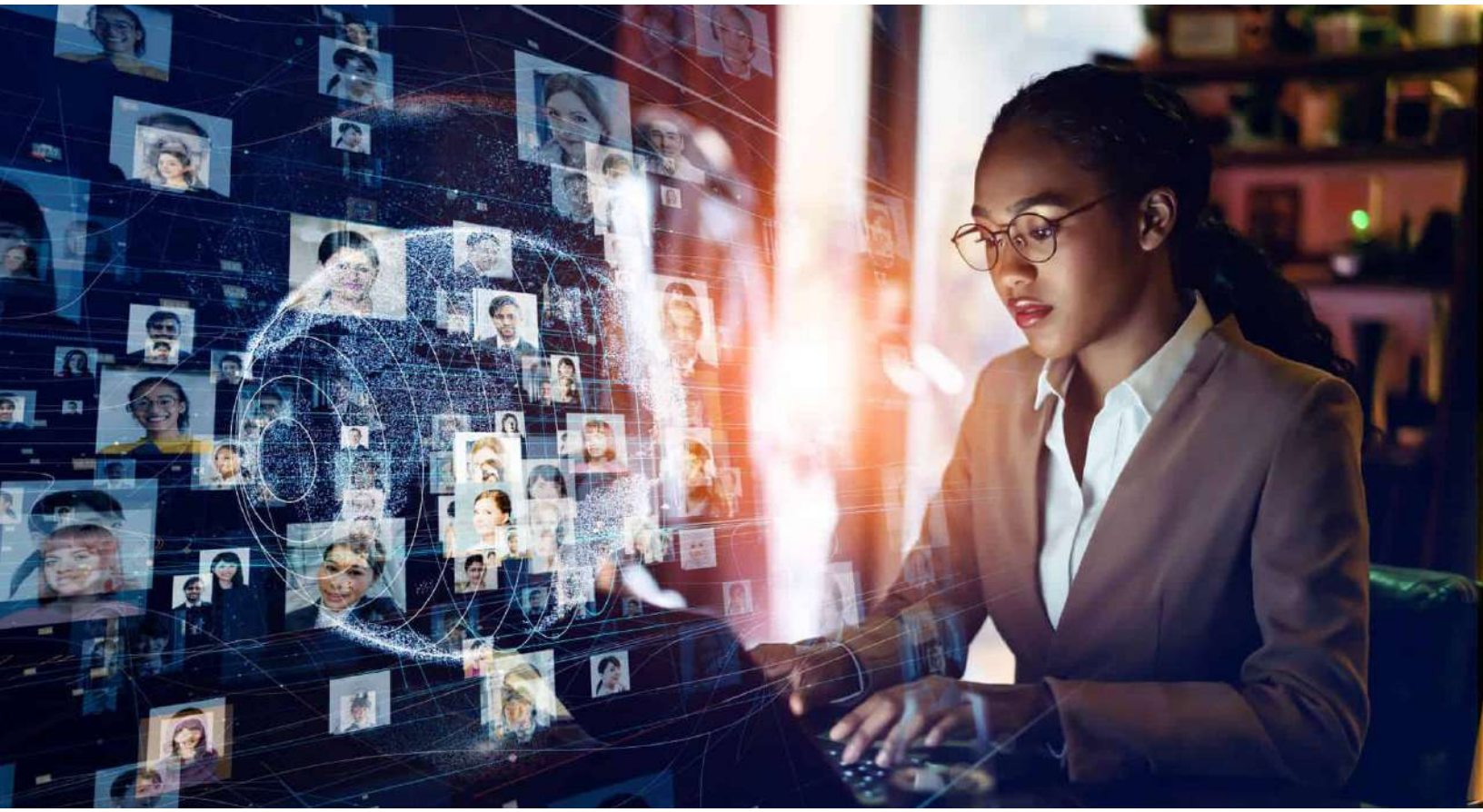


Figure 14. Smart City Benefits

CHARACTERISTICS OF SMART ISLANDS

The transformation of the Caribbean into Smart Islands will enable companies and users to create an unprecedented amount of data, drive the upskilling of people and contribute to the productivity across all sectors of Government. The following characteristics are indicative of smart island economies :

- Using Information and Communications Technologies (ICT)
- Building automation and control – efficient energy generation and savings
- Efficient urban planning – smart electrification such as IOT and LED street lights
- Urban mobility and sustainable public transport – smart traffic solutions, e-Mobility, parking space management
- Smart solid waste management – IoT garbage collection and recycling
- Concern for social environment – technology to support crime
- Technology applied to education – learning analytics, personalized education
- Technology applied to health
- E-commerce and digital money systems
- Public transparency of data and information
- Shared and open data

(Source: IESE Cities in Motion (2017)

HEALTH AND WELLNESS

AI promises to use biological, medical and pharmaceutical data along with advance analytics to provide ground-breaking solutions for the diagnosis and care of disease. In the Caribbean, opportunities exist to use scientific and medical expertise to achieve better care outcomes and improve the productivity and efficiency of care delivery. It can also improve the day-to-day life of healthcare practitioners, letting them spend more time looking after patients and in so doing, raising staff morale, and improving retention. Better customer service thru smarter scheduling (e.g., appointments and operations) and insurance claim management is expected. In addition, the Caribbean can tap into data-driven diagnostics and virtual drug development to produce results such as the one of three prostate cancer cell line for African males developed using Caribbean medical research and AI.

FINANCIAL SERVICES

The financial services industry has been integrating AI in the form of ATMs and other back-office technology such as solution to identify common customer transaction patterns and better understand the key triggers driving variances. However, there is now opportunity to integrate in technologies dealing with automated insurance underwriting and robotic process automation in areas such as finance and compliance. AI developments such as robo-advice have made it possible to develop customized investment solutions for mass market consumers in ways that would, until recently, only have been available to high-net-worth clients. The regions banking sector must take seriously the transition to digital money and digital banking and the use of the blockchain.

EDUCATIONAL SERVICES

AI has already been applied to education primarily in some tools that help develop skills and testing systems. The opportunity for AI With learning loss in the region of 15% - 30% due to COVID-19, AI must be put in service to students and teachers. The market is there to support the investment in this area to drive efficiency, personalization and streamline admin tasks to allow teachers the time and freedom to provide understanding and adaptability. A humanization and transformation of the pedagogy can happen. In 2019, the global AI in education market reached $1.1 billion and is predicted to generate $25.7 billion in 2030, advancing at a 32.9% CAGR during the forecast period (2020-2030). There stands to be an explosion of student and learning data with the deployment of Online Learning Management Systems.

INFORMATION & COMMUNICATION TECHNOLOGIES

The ICT industry sector in the Caribbean perhaps has the most important opportunities including build out of the Internet infrastructure and creation of AI based products for the region. Multiple benefits across both hardware and software is expected as the forecast for new applications to support citizen services such as justice, cybersecurity, labor and market collaboration, media and communications will be needed. The development of a strong and regional technology ecosystem is needed. The opportunities to connect the Caribbean with the global ecosystem of AI development are vast. Access to the internet for all regional citizens should be accelerated.

ENVIRONMENT

Environmental resiliency is imperative for SIDs. Technologies that support environmental protection, preservation and study can be leveraged to attain the climate goals. AI can support Geo-heritage and Geohazard Resilience by supporting the data collection/Data acquisition/Data Mining of environmental data. AI can be used to support campaigns that promote the reduction of plastics pollution and the preservation of environmental resources such as water and Caribbean forestry. AI can be used to study the ocean ecosystem to learn more about how new industries in the blue economy can benefit Caribbean SIDS.

CULTURE AND CREATIVE INDUSTRIES

The culture, the region's most visible export is well suited to advances due to AI. These include making the industry supply chain more efficient, opening new markets, and allowing for the digitalization of cultural heritage including media creation, classification, archiving. Additionally, opportunities for cultural and creative industry to be more integrated into ICT should be considered. The sector can add to the humanistic development into the IT sector. Other forms of access to the Digital Economy can be attained for the creative industries. Caribbean cuisine which is a fusion of global traditions, is internationally recognized as one of the premium culinary experiences in the world. Application of AI technologies to Caribbean cuisine can enhance R&D, production efficiencies, export potential and marketing impact.

MANUFACTURING

Three areas with the biggest AI potential in manufacturing include giving even greater ability to monitor and auto-correct the manufacturing process and support On-demand production. Predictive analytics will allow for supply chain and production optimization. Self-learning monitoring will make the manufacturing process more predictable and controllable, reducing costly delays, defects, or deviation from product specifications. There is huge amount of data available right through the manufacturing process, which allows for intelligent monitoring.

AGRICULTURE

Food security and crop optimization could be achieved by the implementing robotics and artificial intelligence systems. Hyperlocal weather forecasts that can be aggregated by AI systems can help to support crop risk management. Additional solution includes automated farming activities such as identification of pests and disease, managing crop quality with agricultural drones & robots, Crop health monitoring systems, Precision farming and Automated Irrigation Systems could support the transformation of the agricultural sector.

TOURISM

The tourism industry is set to benefit from AI post COVID. For example, artificial intelligence can be used to improve personalization, tailor recommendations, and guarantee fast response times, even in the absence of staff. Other operational efficiencies such as energy savings, logistics and supply chain gains and asset management should be achieved with the implementation of AI based Internet of Things products. Blockchain technologies leveraging AI can also provide benefits to tourism.

Figure 15. Opportunities for AI in Caribbean Industries

SWOT ANALYSIS

STRENGTHS

- Creative Culture (music | art | drama | fashion etc)
- Entrepreneur Culture *(SMEs | innovation)*
- Diversity *(racial | ethnicity | cultural | language)*
- Location *(proximity | climate | global transportation zone)*
- Environment *(fauna | flora | marine | fisheries | birds | agriculture etc)*
- Hospitality *(personnel | training | personality)*
- Cuisine *(flavours | techniques | presentation)*
- Sports *(talent | legacy)*
- Hospitality Infrastructure *(resorts | community tourism | air b&bs | attractions | transportation | ICTs)*
- Independent Democracies *(votes | human rights | civil society | freedoms)*
- Stable Governance *(peaceful transfer of power)*
- Tech Saavy Consumers *(mobile | AI | social media etc)*
- Regional Finance *(Jamaica Stock Exchange|Eastern Caribbean Stock Market|East Caribbean Dollar (ECCU|OECS)*
- Regional Educational Institution UWI *(regional tertiary institution | research)*
- Resiliency *(disasters | healthcare | economic)*
- History *(Africa | Colonial Lessons | Independence Experience)*

WEAKNESSES

- Sustainable Governance *(long term planning)*
- *Regional Integration (economy | security | justice | politics)*
- Regional *(Caricom | copyright | courts)*
- Digital Infrastructure *(wifi | bandwidth | regulatory)*
- Fluctuating Exchange Rates *(weak dollars)*
- Trade Imbalance *(high power costs = weak manufacturing)*
- AI Literacy
- AI Education & Training across society
- Development Finance
- Capital Access
- Shipping Capacity *(third party reliance)*
- Colonial Legacy *(mindset)*
- At Risk Communities

OPPORTUNITIES

- Technology & Innovation *(renewables | software)*
- Creative Industries *(music | film | art || design etc)*
- Health & Wellness Products | Services *(e-health | ganja | herbs | nutriceuticals etc)*
- Digital Services *(data collection | cleaning | storage | management} Preservation (jobs | archives | youth engagement)*
- Digital Economy *(digital currencies | new business stocks)*
- New Digital Jobs
- New AI Assisted Industries *(mariculture | e-manufacturing | e-education I e-tourism)*
- Increased productivity in traditional industry sectors

THREATS

- Climate Change *(rising seas | sargasso seas | extreme weather)*
- Food Security *(coral reefs | overfishing)*
- Pandemics *(covid | chick V | etc.)*
- Crime & Violence
- AI & Automation
- Brain Drain
- Capital Flight
- Lack of action on upskilling
- Lack of quality broadband access
- Lack of collective governance plan
- Lack of regional digital currencies
- Slow government digital transformation
- Slow private sector investment in digital transformation
- Learning loss

Figure 16. Caribbean Swot Analysis

CARIBBEAN AI POLICY ROADMAP RECOMMENDATIONS

There are several existing frameworks that could be used as a starting point for developing a roadmap. These include *Asimov's Three Laws of Robotics*, *IEEE The General Principles of Ethically Aligned Design*,[66] *UK House of Lords Select Committee: Five Core Principles to Keep AI Ethical*,[67] and the *European Commission's High Level Expert Group on AI Ethics Guidelines for Trustworthy AI* to name a few.

UNESCO is the United Nations' lead agency concerned with the humane dimensions of the Information society and the ethical implications of AI. *UNESCO's Ad Hoc Expert Group (AHEG)'s Outcome document: First Draft of the Recommendation on the Ethics of Artificial Intelligence*[68] document is UNESCO's first normative instrument on a process for the elaboration of a Recommendation on the Ethics of AI was selected as the right place to start looking for guidance.

UNESCO aims to be a catalyst in bringing together multidisciplinary, universal and holistic approach to the development of AI in the service of humanity, sustainable development, and peace. The human-centered design includes the participation of stakeholders in the design and implementation of the AI system.

These policy guidelines were created to aid in the development and deployment of AI in the Caribbean. The policy focuses on the amplification of the governance, skills and infrastructure needed to preserve human creativity and protect the environment. These strategies and objectives support safe, responsible, and accountable AI –

The proposed framework for the Caribbean AI Policy Roadmap is built on six (6) principles. These principles include national and regional strategies and deliverables recommended to enable the Caribbean's effective adaptation of AI technologies and digital transformation of its economies.

1. **RESILIENCY** - **Enable Environmental Management and Climate Change Fight** by protecting the environment, leveraging the power AI to produce strategies and solutions for climate change mitigation and environmental preservation including early warning systems, remote monitoring, disaster management, structural improvements and public education. AI technologies must be used to mitigate climate change effects and protection in SIDS reducing carbon-emissions to improve food security and citizen well-being.

2. **GOVERNANCE** - **Develop Responsible AI Governance, Oversight, Principles & Policies** to Do No Harm and to enhance safety, security and accountability of AI. Promote AI as a tool for service to humanity. Establish common values and principles to ensure fairness, transparency and accountability in digital transformation and increased integration of AI algorithms. Develop policy and legislation to enable the establishment of national and regional AI Governance Committees / Oversight Boards as well as national and regional licensing regime to manage and monitor the development of standards that govern the industry including technical code of conduct for developers, procurement guidelines for buyers, design and use principles and ethically aligned design standards that include manual override option and open data protocol. Leverage existing ICT and/or science policies. Regulate AI industry to provide redress and punishment for individuals & companies that violate citizen rights and wellbeing including banning cyberbullying, hate crimes, discriminatory algorithms, disinformation and graphically violent images inclusive of penalties and fines. Develop an AI Appeal Court and Online Dispute Resolution System. Increase advocacy for AI ethics by targeting software developers at global forums and hosting a global software conference to network, lobby, share research and initiate collaborations with big tech. Develop AI software to test AI for biases and identify

66 IEEE The General Principles of Ethically Aligned Design, https://ethicsinaction.ieee.org/
67 UK House of Lords Select Committee: Five Core Principles to Keep AI Ethical, https://publications.parliament.uk/pa/ld201719/ldselect/ldai/100/100.pdf
68 UNESCO. 2020. First Draft of the Recommendation of the Ethics of Artificial Intelligence, 40 C/37. Paris: UNESCO.

AI applications in most need of governance. Protect citizen privacy and instill trust. Introduce new financial instruments including digital currencies and align legislative frameworks nationally, regionally and internationally. Create regional data trust to establish data licensing best practices aligned with AI offices.

3. **TRANSFORMATION** – **Transform through investment in infrastructure and smart island digital transformation** of citizen services via increased operational efficiency and income generation for AI and R&D in AI for Good. Launch Caribbean R&D Tech Fund and regional AI incentives to establish new AI assisted industries including medical cannabis, e-health, e-education, mariculture, wellbeing management, software development, e-sports, e-translation services and data management services leveraging linguistic plurality and cultural diversity. Existing industries should be modernized including manufacturing, agriculture, transportation, tourism, financial services and the creative industries. Acquire high speed broadband and independent secure storage space. Create AI data hubs aligned with tertiary institutions for R&D and give access to AI technologies for innovation generation.

4. **UPSKILLING** – **Upskill the human capital** by increasing education and training to develop digital skills and media and information literacy at all levels of society on AI and digital transformation including the development of regional research, innovation and entrepreneurship hubs to specifically include diverse populations including women, youth and differently abled people. Provide equitable access to quality high-speed internet as a basic human right and utilize equitable machine learning algorithms to develop online platforms facilitating e-learning and public education. Launch the Caribbean AI Institute to offer diploma and certificate programmes, integrate AI into primary and secondary school courses to facilitate technical AI training and advance regional AI research and development with collaborative research resources such as computing. Develop localized media campaigns and MOOC courses for digital literacy public education and MOOC Courses for public officials in AI | AI Ethics | AI in Public Sector Transformation as well as Sensitivity Training. Engage creative professionals and youth to develop AI collaterals, courses and messaging for digital literacy programmes.

5. **PRESERVATION** - **Preserve and manage unique cultural, historical & sociological data.** AI should be used to support Caribbean creativity, preserving the regions historical and sociological context, such as language and diversity. Building archives thru data banks and empowering youth thru education and training. The Caribbean region should develop tools and programmes to support AI literacy which reflects the region's linguistic plurality and diversity making it a globally applicable dataset with aggregated regional data banks to handle big data. Seek to establish new modes of digitalization and monetization of Caribbean culture. Digitize creative, cultural and environmental content while building data management capacity and services among youth, women and disabled people. Develop e-tourism and e-culture augmented reality experiences for the region's globally competitive hospitality and creative industries. Initiate 3D Mapping of Caribbean SIDs Capitals and their cultural, historical, social and environmental assets. Establish a big data preservation programme anchored by national and regional tri-level data management infrastructure to capture, classify, clean, format, store, analyze and archive data banks.

6. **SUSTAINABILITY** - **Sustainability strategies** to support Caribbean attainment of the UN SDGs including gender equality, poverty eradication, climate justice and environmental protection and to transform the economy, enable creativity and improve citizen wellbeing. Promote innovation and investment in the application of AI to attain the UN SDG.

Incentives support AI development and implementation across industries in Caribbean SIDS

1. Attract engineering and R&D entities to establish operations in Caribbean SIDS
2. Establish and offer advanced testing, prototyping and other innovation services
3. Encourage development of AI solutions in the region aligned to global industry standards for human-centered design
4. Promote the creation, proper attribution and retention of intellectual property
5. Create additional jobs for the digital future such as digital archiving or data classification
6. Create collaborative partnerships between academia, government and industry and create opportunities for women, youth and disabled people to work
7. Create incentives for industry citizens to be involved in starting new digital businesses
8. Deploy innovation and commercialization labs across the region to support technological innovation
9. Create a digital services industry based on exportable digital services
10. Promote the development of future skills courses at all levels of society to promote the expansion of the digital economy in the region
11. Promote industry internships that allow women, youth and differently abled people to be involved in innovation and transformation

Figure 17. *Incentives support AI development and implementation across industries In Caribbean SIDS*

UNESCO Caribbean AI Policy Roadmap Recommendations

Figure 3.

The recommended strategies from the consultations and stakeholder presentations in 2020 and early 2021, are reflected in the principles, objectives, guidelines, actions and deliverables outlined in the roadmap below.

RESILIENCY

GUIDELINES	OBJECTIVES	ACTION	DELIVERABLES
Disaster Mitigation	Environmental Management Save Lives Climate Change Fight Decarbonization Improve Food Security Reduce Climate Risks	**Early Warning Systems** Earthquakes | Hurricanes | Rising Seas **Environmental Monitoring** Report Trouble Spots Using Satellite Imagary **Disaster Management | Public Education**	Save Lives Minimize Risk & Economic Loss Predictive Analysis
Resource Management		**Monitor** Oceans | Rivers | Ports | Volcanoes | Carbon Emissions	Decarbonization Improve Food Security
Predictive Analysis		**Monitor** Weather | Rainfall | Temperature Reefs |Pollution |Climate	Improve Responsiveness

GOVERNANCE

GUIDELINES	OBJECTIVES	ACTION	DELIVERABLES
Ethics	Do No Harm Fairness Data Protection Accountability Explainability Autonomy Stewardship Reduce Bias Responsible AI Interoperability Standards Values IOT Innovation Improved Citizen Services	Establish Regional **Common Values And Principles** Establish **National And Regional Ai Offices And Data Trusts** Develop **Technical Code Of Conduct** (Developers) Develop **Procurement Guidelines** (Buyers) Encourage Companies To Develop Ai Design | Use Principles **Reference Ieee P7000™Series Of Standards** For Ethically Aligned Design	Fairness | Stewardship Reduced biases Raise Awareness of responsible AI Responsible AI Strategies Interoperability of Systems Standards | Values
Legislation		**Ai Policy | Regulations | Penalities** Review Policy & Legislation On Ict And Cybercrimes To Align With Responsible Ai Governance Establish Longterm Policy, Soft Laws And Legislative Framework To Address Ai Harms, Responsibiliy And Liability Adaptation Of **New Financial Instruments** Including Digital Currencies **Lobby For Fiscal And Policy Space To Align Frameworks** (National | Regional | International)	Enforcement | Deterrent Integration | Adaptation Investment | Trade Public Health
Transparency, Explainability & Accountability		**Create Caribbean AI Standards Authority to aggregate the specialized competencies that would be required to evaluate & approve deployment of proposed AI solutions** Require **AI data sheets** with training process explained	Explainability Accountability
Safety & Wellbeing		Develop **AI to test AI for biases** **Identify** AI applications to assist with safety & wellbeing and AI applications in most need of governance **Design Manual Override Options** (Kill Switch) **Establish AI Innovations and framworks for** **Justice Reform & Law Enforcement** **Online Dispute Resolution System** **Defend Human Rights** **(create | own | marry | reproduce etc)**	Risk Impact Do No Harm Technology Protect and Save Lives Retain Human Control
Equity		Provide **equitable high speed internet access** and broadband Create flexible strategies to ensure **technology access** Recruit women and youth to inform and develop software Utilize **equitable machine learning algorithms**	Access | Inclusion | Increased participation - women-youth-disabled Increase sharing
Advocacy		**Participate in Global AI Discourses** **Promote AI regional/global networks** **Launch software conference targeting software developers** **Lobby big tech** companies to collaborate with the Caribbean Issue **Papers on AI** | Responsible AI Training | AI Policies **Participate** in global AI forums | Data Protection **Public Education**	Data Privacy Informed Consent Autonomy Increase Sphere of Influence

TRANSFORMATION

GUIDELINES	OBJECTIVES	ACTION	DELIVERABLES
Public Sector	Investment Infrastructure Modernize Digital Economy Improved Efficiency Monitize Data New Industries	Introduce **Efficiency Programmes** (crime|education|health|energy) maintenance) with public/private partnerships Public sector efficiency programmes ex. patent and trademark examination, management and forecast of traffic, the development of predictive capabilities for emergency responses AI Assistants to Improve citizen engagement and services such as online experiences for website visitors and reducing the number of people entering brick and mortar service centres Paperless **Data Integration** Support Caribbean **IOT Innovation**	Digital Transformation Improved Efficiency Digital Economy
Smart Island Infrastructure		**Establish National and Regional Data Banks (governance)** **Establish secure, energy efficient renewable energy based Data Centres (storage) |Data Hubs (R&D | products)** Establish **Internet Infrastructure** - Broadband | WiFi | 5G **Establish secure regional computing cloud**	AI Infrastructure (Physical | Digital) Digital Autonomy

UPSKILLING

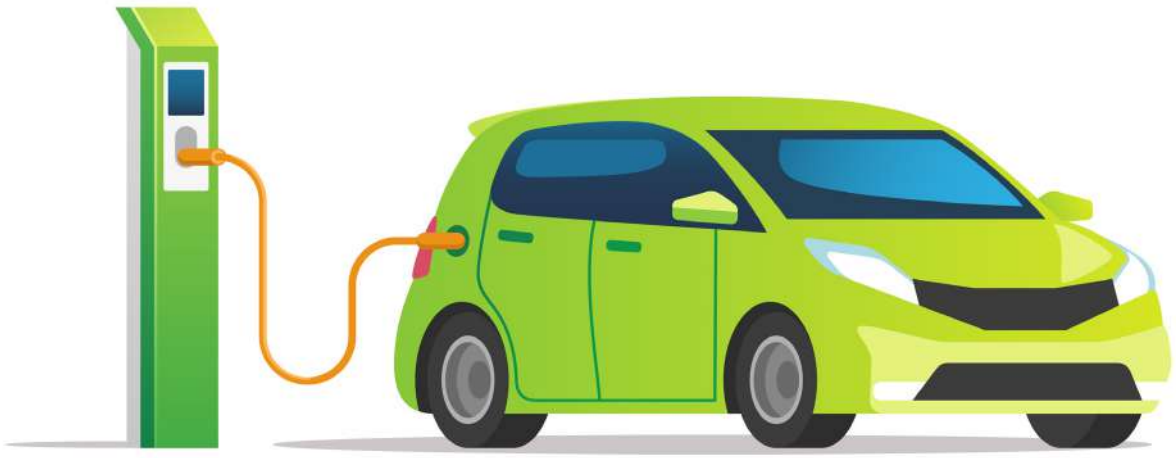
GUIDELINES	OBJECTIVES	ACTION	DELIVERABLES
Innovation	Innovation | Monitization Digital Skills | Digital Literacy | AI Adoption Responsible AI Culture | R&D | Innovation Increase Data Management Capacity | Improved AI Curriculum | Increased Awareness | Increase Work Pool	**New Programmes for women, youth, disabled** **Public Education on Media and Information Literacy** **MOOC Courses for public sector** **Establish Regional AI Incentives for** Academia | Private Sector Create a AI **R&D Tech Fund | Regional AI R&D Cloud** **Initiate and Strengthen Strategic Alliances** **Establish new AI assisted industries** Medical Cannibis| E-Health| E-Sports | E-Education Mariculture | Wellbeing Management Software Development **Increase Productivity Across Industries** Manufacturing-Regenerative Agriculture-Tourism-Transportation-Criminal Justice-Financial Services-Creative Industries	Expand Digital Skill Pool New Products Wealth Generation Transform Industries Increase Efficiency & Productivity Enhance Customer Service Diversify Consumer Experience
Monitization		**Develop AI Bias Test Software Algorithms for efficient AI training** Optimize algorithms for efficient testing (energy optimization) **Leverage Linguistic Plurality develop AI tools to support inclusion online such e-translation systems** **Stucturing Data to extract value** **Digitize Creative and Environmental Content** **Develop Digital Content | Promote Data Services** **E-Tourism and Creative Industries** **Augmented Reality Experiences** **Mentoring, Training and Accelerator Programmes for women, youth and disabled**	Revenue Generation Diversify AI Economy Increase Trade E-Translation Services Increase Knowledge Services

PRESERVATION

GUIDELINES	OBJECTIVES	ACTION	DELIVERABLES
Data Capture	Culture | Environment | Society Data Archives Data Security Data Utility Structured Data Virtual Tourism Experirences Cultural Heritage Preservation	Launch **National and Regional Preservation Programmes** **Establish National and Regional Data Banks** Recruit and train youth and creatives to work as preservationists	Accurate Digital Data
Data Storage		Ensure there are Secure **National and Regional Storage Platforms** Recruit and train women, youth, disabled and creatives to handle **data**	Data Security
Data Preservation		**Clean public data | prepare machine readible format** classify, label, archive and manage content **Recruit and train women, youth, disabled and creatives in archival and data cleaning services**	Data Utility
Data Management		**Capture | Classify | Clean | Format | Store | Analyze | Archive**	Structured Data Socio-Culural Environmental Heritage Preservation
Data Monitization		**3D Mapping of Caribbean SIDS Capitals (28)** Cultural | Historical | Social | Environmental **Augmented Reality Experiences | Increase Financial Literacy**	Virtual Tourism Experiences Cultural Heritage Preservation

SUSTAINABILITY

GUIDELINES	OBJECTIVES	ACTION	DELIVERABLES
Service to Humans	Sustainable Development Improve Citizen Wellbeing Decision-Making Gender Equity Structural Improvements	**Use as tool** in creation | production | protection | preservation Establish **Caribbean AI Governance Network** comprised of a network of experts to recommend new AI developments Establish Data Bank in National Archives Structural Improvements | Digitize Operations	Cultural Preservation Predictive Analysis Increased Efficiency
Global Goals		Implement programmes leveraging AI in Poverty Reduction Clean Energy I Economic Development (Women and Youth) Reduce Digital Gender Gap | Upgrade Systems	Sustainable Development



CONCLUSION

WHERE DO WE GO FROM HERE ; LOOKING FORWARD

We may not be where we want to be today, but we have a lot of opportunities for making things better right now and building a better future.

- Dorothy Gordon, Chair,
UNESCO Information For All Programme (IFAP)

All around the world, Artificial Intelligence (AI) is being employed to respond to challenges by providing innovative technological solutions to a host of social, economic, environmental, political, and security concerns. The response to the COVID-19 global pandemic, has benefitted from the use of AI for example in the fast track development of vaccines and remote healthcare tools. The opportunities for AI's to address the multiple development challenges that the Caribbean faces is an undeniable motivator and attractive value proposition. Since its declaration in March 2020,[69] the global pandemic continues to negatively impact the region. ECLAC's Preliminary Overview of the Economies of the region forecasted an average contraction of -7.7% for 2020 , the largest in 120 years.[70]

Strategies to help the region rebuild after the pandemic should be immediately deployed. First, there should be focus on the strengthening the regional digital infrastructure for internet access and build local data centres and GPU capacity. Equitable access to the Internet in the region must be expanded and costs kept low so that every

69 Preliminary Overview of the Economies of Latin America and the Caribbean 2020 – Economic Commission for Latin America and the Caribbean
70 Ibid

citizen has opportunity to participate in the digital economy. There are existing ICT frameworks and science policies that can be amended to address the growing opportunities of AI. This means a collective investment to build critical infrastructure in a way that scales the services across all 28 Caribbean SIDS.

It will be critically important to begin the upskilling of the work force where AI education and development can begin with media and information literacy campaigns. AI education and development should be encouraged, and rewards put in place to build AI tools in service to humanity such as tools to reduce bias by testing algorithms before acquisition. The Caribbean is the perfect melting pot to ensure that this AI development can happen in this human centric way. More awareness is needed and digital literacy and awareness campaigns should continue and a new intensity started. A key driver to the upskilling will be the collaboration between the public and private sector. Governments should take a collaborative approach to deployment of technologies to support the modernization of citizen services and promote the transformation into smart island economies. However before this can be done, the humanistic deployment of ethical best practices, frameworks, policies and laws to ensure, safety, trust and protection of human creativity and human rights, should be encouraged.

The chasm to development for Caribbean SIDS is quite large and has surely been exacerbated by the COVID-19 pandemic, however, they can act quickly to embrace the opportunity to pivot and reorient the region to the digital future using AI. This general purpose technology is here with its advantages and disadvantages but the opportunities for development too large to ignore. In the Caribbean stakeholder consultations, the participants agreed that with all that is at stake, the region's humanity must be preserved and that AI in the Caribbean must serve the people. Caribbean SIDS must act now to develop a multi-dimensional strategy that pushes AI governance, education and digital infrastructure across the region while preserving human creativity, increasing trust and protecting the environment. The magnitude of AI must be taken seriously as it could poise an existential threat to Caribbean society. The task ahead may be daunting and will require long term vision, strong leadership, investment and cohesive action to enable the transformation and survival of the Caribbean SIDS in the digital age.

The Caribbean is a glorious and harmonious microcosm of humanity, reflecting the collective potential of its people to create and innovate as they transform to meet the challenges and opportunities of the times. AI is a hallmark of the fourth industrial revolution. The benefits that AI can deliver towards the regions sustainability is a big driver for action. The plan for the future requires leadership to chart a strategic course for the future which will support the region's competitive advantages and address its developmental challenges.

"Caribbean states have done well to manage and contain the spread of the pandemic within our jurisdictions, but our tourism-dependent, open economies have had little defence against the global economic contagion that has followed." She further stated that the "way forward for our countries lie in developing emerging technologies and innovations that solve issues affecting small island developing states. Technologies that allow us to overcome the vulnerabilities of our small populations, our small economies, and our vulnerabilities to natural disasters. Technologies that allow us to leverage our assets of climate, geographic location, and of course, our collective creativity. The time is now to unleash the power of our creative imagination to move our islands beyond cautious incrementalism, and to enter a period of rapid, large-scale transformation and global distinction. We have been that region that has led the world in humanization and has continued to focus on the centrality of that individual person and we have sought more for social justice and continue to point the way forward"

Prime Minister Mia Mottley, Barbados, Pivot Conference 2020

APPENDIX

APPENDIX #1

Summary of Stakeholder Consultations: Forum 1

Caribbean AI Initiative
FORUM 1 Summary
December 10, 2020

FORUM SPEAKERS

Sadia Sanchez-Vegas
Director of UNESCO Cluster Office for the Caribbean
"AI and AI Applications are developing at tremendous speeds raising several ethical, legal and humanistic concerns."

Dorothy Gordon
Chair, UNESCO Information for All Programme (IFAP)
"We may not be where we want to be today, but we have a lot of opportunities for making things better right now and building a better future."

Erica Simmons
Exec Director, Caribbean Maritime University
"The most important General-Purpose Technology of our Era is here, we cannot let this opportunity pass us by."

Prof Paul Golding
School of Business & Management, University of Technology, Jamaica
"Each country should not go it alone."

Eldon Marks
CEO, V75
"There should be a certain degree of concern, even now, given the interplay between technology and society and our common commodity – Data"

Policy & Strategy Recommendations

1. Any policies, laws or regulations must be grounded in Human Rights FIRST
2. Science and Technology policies should be developed at National and Regional Level.
3. Pay attention to Data and Digital Infrastructure
4. There are tools and other strategies for the Caribbean nations including UNESCO's leading with an International Standard Setting Instrument to help with AI Policy.
5. Caribbean SIDS must come together to develop AI competencies with the goal to be producers of AI technologies appropriate for the region. Data Literacy is an important area of AI competency.
6. Caribbean SIDS need AI Infrastructure including GPU and 5G.
7. Caribbean SIDS should consider developing in depth guidelines for AI that will guarantee a certain level of transparency and trust. Including a procurement guide for government officials.
8. Caribbean SIDS should create policies that encourage the creation of unique datasets for the Caribbean focusing on structured and unstructured information as a service.
9. Caribbean SIDS can develop a specialization in

the humanistic methodologies or approaches that can assist companies to balance commercial opportunity against the human ethical side of AI solution development.

10. USE global policy guidelines from IEEE, UNESCO, UNICEF and others to leverage the learnings from these international organizations in policy and regulation development.
11. A regional AI ecosystem should be created and collaboration on the development of AI across the region such as each country having specific specialization with regards to the regional AI ecosystem approach.
12. As positioning as an AI service region would fit well with our already service focused so these services are possible areas that we can excel in.
13. Policy development can come under existing frameworks. CARICOM has a policy regionally for the harmonization of ICT and this is probably a natural place for policies about AI to come under
14. Promote the use of anonymized data in AI Innovations where applicable.
15. Support the use of AI models which require less training data.
16. Devise and enforce appropriate data protection policies.
17. Encourage the development of AI technologies that combat the destructive uses of AI Technology. This includes the creation of NGOs and other organizations that promote AI for Social Good.
18. Policies should be put in place that foster innovation of AI-based specializations at the industry level within the region.
19. Make a meaningful bridge between academia and industry to enable true utilitarianism at the tertiary institutions and enable the research in motion within industry.
20. Meaningful investments to develop the skills and capabilities of AI development in the region starting from primary school.

APPENDIX #2

Summary of Stakeholder Consultations: Forum 2

Caribbean AI Initiative
FORUM 2 Summary
February 18 – 19, 2021

ARTIFICIAL INTELLIGENCE: OPPORTUNITIES TO ACCELERATE HUMAN PROGRESS FOR SUSTAINABLE DEVELOPMENT

EXECUTIVE SUMMARY

Initiative to raise awareness on the scope of opportunities for AI and encourage Caribbean SIDS and inform the preparation of a policy brief for the region.

Sadia Sanchez-Vegas
Director of UNESCO Cluster office for the Caribbean

Dorothy Gordon
Chair, Information for All Programme (IFAP)

Hon Olivia Grange, CP, MP Minister of Culture, Gender, Entertainment and Sports; Chair, Jamaica National Commission For UNESCO

Carolina Aguerre
Director, Center for Technology and Society
University of San Andres

Dhanaraj Thakur
Research Director
Center for Democracy & Technology

Patrick Lafayette
Veteran Jamaican Broadcaster

Deidre Williams
Teacher, Librarian and Administrator
St Lucia

Wendell Wallach
Co-Convener, International Congress for the Governance of AI (ICGAI)

Renee Cummings
Criminologist, Criminal Psychologist, AI Ethicist, Data Activist

Chief Justice Ivor Archie
Trinidad and Tobago

Judge Isabela Ferrari
Federal Judge, Brazil

Dr. Francesc Pedró,
Director
UNESCO International Institute for Higher Education in Latin America and the Caribbean

Dr. Gunjan Mansingh
Head of Department of Computing
University of the West Indies, Mona

Professor Anthony Clayton
Director, Institute of Sustainable Development, UWI, Mona
Chairman of Broadcasting Commission of Jamaica

Dr. Royston Emmanuel
E-Learning Specialist & Head of E-Learning Academy
The Sir Arthur Lewis Community College (SALCC), Saint Lucia

Jane Zavalishina
President and Co-Founder of Mechanica AI

Nievia Ramsundar
Executive Director, Caribbean Competition Authority

Leslie Lee Fook
Director, A.I., Analytics and Automation, Incus Services

Jason Mars
Assistant Professor of Computer Science at University of Michigan & Co-founder of Clinc Inc

Nicholas Kee
Executive Director, Next Gen Creators

David Hughes
Associate Professor, Penn-State University and Founder of PlantVillage

Rakesh Bhukal
PhD Candidate, Founder, Managing Director & Specialist in Aquaculture, Aquaponics & Hydroponics, Aquatic solutions, Trinidad and Tobago

Professor Lloyd Waller
Executive Director, The Global Tourism Resilience and Crisis Management Centre (GTRCM)

Jhannel Tomlinson
PhD Candidate, Climate and Agriculture, The University of the West Indies, Mona, Jamaica

Henkel Valentine
PhD Candidate & Researcher in Prostate Cancer, The University of the West Indies, Mona, Jamaica

Dr. Sherene James-Williamson
Associate Dean, Undergraduate Matters, Senior Lecturer & Museum Curator, The University of the West Indies, Mona

Leighton Paul Walsh (Walshy Fire)
DJ, MC, Grammy Award Winning Record Producer, Member of "Major Lazer"

Andrea Dempster Chung
Executive Director,
Kingston Creative

Dr. Marielle Barrow
Program Coordinator, Caribbean Development Bank

Octavio Kulesz
Digital Publisher, Entrepreneur, & Director of Teseo

Cordel Green
Cordel Green, Executive Director, Broadcasting Commission of Jamaica and UNESCO Representative

Isabel Viera Bermúdez
Advisor for Communication and Information, UNESCO Cluster Office for the Caribbean

Paula Istúriz Cavero
Programme Specialist, Social and Human Sciences, UNESCO Cluster Office for the Caribbean

Erica Simmons
Executive Director, Centre for Digital Innovation, Caribbean Maritime University

Professor Paul Golding
Associate Professor, College of Business and Management, University of Technology

M Georgia Gibson Henlin
QC Managing Partner
Henlin Gibson Henlin, Attorneys-at-Law

Eldon Marks
Founder & CEO of V75 Inc.

Sasha Harrison
The University of the West Indies STAT
Vice-Chancellor's Ambassador & Economist, Broadcasting Commission of Jamaica

Indi McLymont-Lafayette
Development
Communications Specialist, Change Communications Limited

Dr. Sonjah N. Stanley Niaah
Director and Senior Lecturer, Institute of Caribbean Studies & Reggae Studies Unit, University of the West Indies, Mona, Jamaica

Policy & Strategy Recommendations

1. Given automation's impact on employment, public policies strategies and programmes are needed to ensure that Artificial Intelligence empowers people not replace people
2. Set goals to ensure that the voice of Caribbean AI is gender neutral
3. Establish a Caribbean AI Governance Network
4. Operationalize AI principles to avoid 'ethics washing'
5. Launch digital literacy, digital skills and digital hygiene awareness public education campaigns
6. Governments in the Caribbean have a crucial role in the policy process and identifying the themes that are most vital for AI policy, systems and potential applications in each country and the region.
7. Establish comprehensive data policy to address the industry beyond privacy and data protection concerns to include how to we create data, clean data and develop data models such as Open Data for reuse.
8. Establish AI policy areas around ethical

impact assessment, ethical governance and management, data policy, development and international cooperation, environment and ecosystem, gender, culture, education and research, economy and labor, health and social welfare to protect Caribbean people

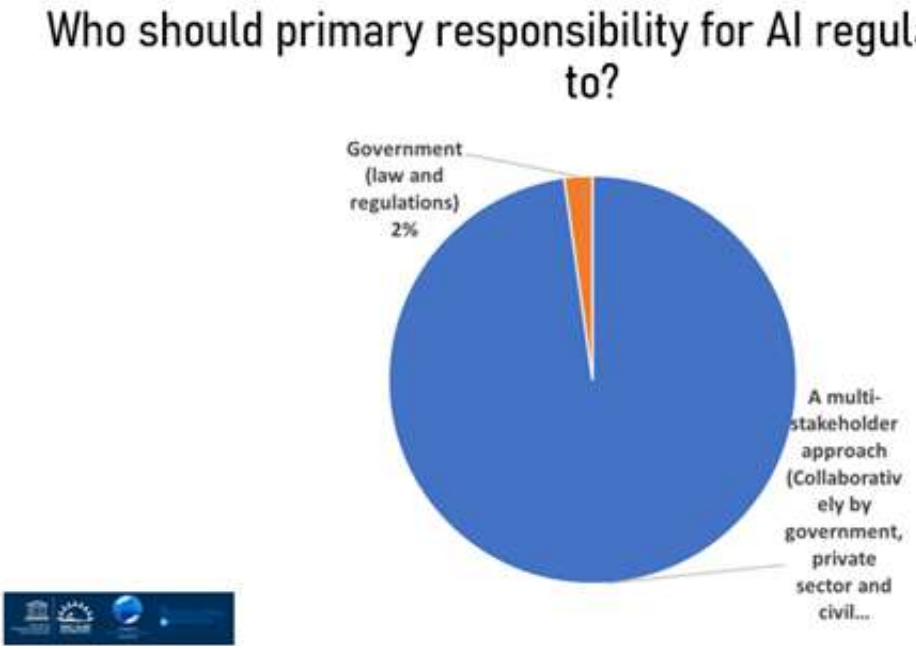
9. Address this inflection point in human history where technology radically restructuring and destabilizing human affairs
10. AI for Good and principles are mostly weak instruments in comparison to the power of the digital economy to exacerbate structural inequalities. Design regulations and laws to protect the people.
11. AI in the Caribbean should be directed to developing technological innovations that solve the region's most pressing development problems including poverty, climate change, crime and violence, public safety, healthcare and gender inequalities.
12. Create ender responsive AI Policy and make sure women are at the table when talking about gender -equitable decision making.
13. Encourage industry to hire women and promote women leadership in AI.
14. Collect trusted data on the landscape such as gender metrics for the AI industry and related sectors.
15. Create algorithmic impact assessments and explainability guidelines to help industry mitigate potential gender discrimination in their products and services (apply these to government use and procurement of AI tools).
16. Provide incentives to traditional capital sources and venture capital that promote gender equality in AI.
17. Provide finance and training to support gender equitable AI entrepreneurship.
18. Address the Social Science Gap in AI development teams so that more ethical development can happen.
19. Establish R&D centers focused on the big questions facing AI tools.
20. Improve transparency in training data sets by requiring explainability and impact assessments to be done.
21. Address affordability of the tools to assist the visually impaired individuals in the Caribbean.
22. Severely punish bias discrimination by fines or punished thru the courts.
23. Implement AI policy protects disabled people like a Watchdog for the disabled.
24. Make a concentrated effort to educate the young people to create AI technology reflective of our regional experience.
25. Create an Initiative for the collection and protection of our inclusive and accurate data in all industry sectors.
26. Require explanations, justifications, contextual information about the application of algorithms.
27. Find reasonable ways to regulate the use of algorithms and balance innovation and ethics.
28. We must design ethical AI by using interdisciplinary and multidisciplinary approaches and interventions to detect, mitigate and monitor AI risks.
29. Demand that rigorous stewardship and robust ethical guardrails are established for AU to ensure we DO NO HARM with AI.
30. Algorithms must be interrogated. Mandate audits and impact assessments that continually check for bias in algorithms.
31. We must advocate always for justice-oriented design principals and data rights.
32. The research, design, development, and deployment of AI must consider the wellbeing of humanity, the environment and sustainable development and AI systems must ensure diversity, inclusion, and gender equality.
33. Get Civil Society to raise their voice to point out issues linked to bias and discrimination, this also makes AI developers and AI developing Companies accountable.
34. Recommend that we consider AI to help in the criminal justice system. To improve citizen services by helping the judicial with decision making processes. Go back to the definition of What is a court?
35. Start conversations about how AI can be used in a safe way in the judiciary. AI gives the opportunity to expand access to justice.

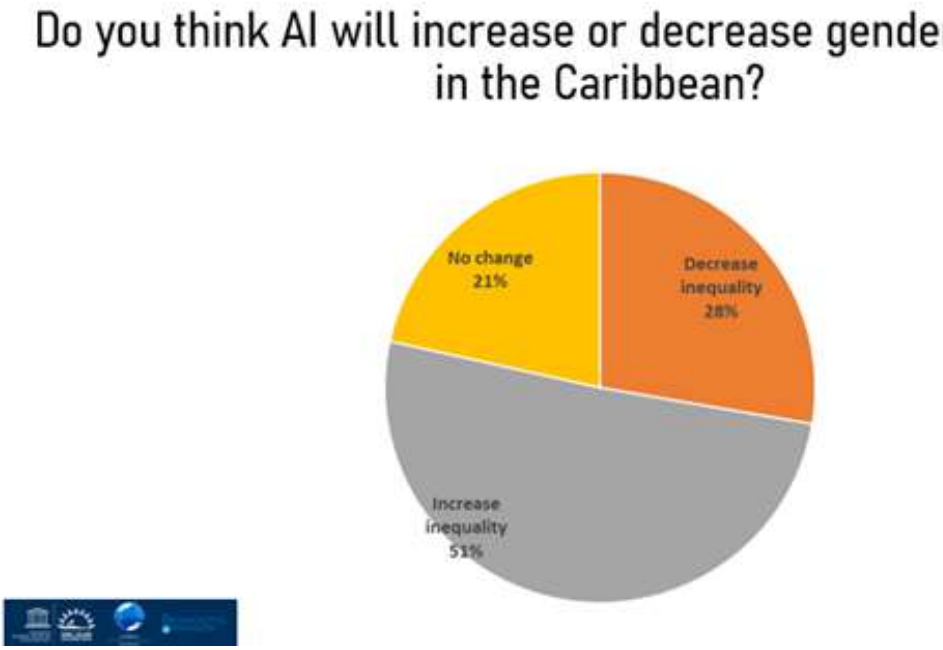
36. Ban facial recognition systems in the judiciary because of its ethical problems.
37. Employ AI in service to student's education. Determine if AI can be used to make up for the COVID-19 learning loss. We have losses of 15%-30%.
38. Provide universal access to quality internet for all citizens of the Caribbean. Access to Internet is a fundamental right.
39. Use AI to improve pedagogical outcomes for students. AI can help teachers make better more personalized decisions about teaching and learning of each student. Individualizing education. Consider learning analytics to make the teaching, learning and administration of education more efficient and personalized thereby humanizing the pedagogy.
40. Reskill large parts of the workforce especially those in repetitive jobs that are often low hanging fruit for automation – customer support, telesales, security guard, hematologists, truck driver, research analyst, radiologist.
41. Improve the technology education in schools starting at the primary level thru to secondary.
42. Fundamentally rethink the nature of work and education including the relationship between qualifications and future of work
43. Empower teachers so that they have the technical skills to use the technology.
44. Encourage curiosity in the people, get them to play with technology by providing relevant content.
45. Consider focusing on knowledge transfer industry as a regional industry strategy. Software is a weightless export product. That gives good competitive advantage and AI is a software product.
46. Review how AI works with competition. Propose regulatory intervention. Review tacit collusion because AI can create unfair competition.
47. Consider creating industry specific toolkits to help regulators respond to consumer or market harm caused by fast moving technology.
48. Invest in developing new jobs to replace the ones that will be obsoleted.
49. AI should be integrated into agriculture so that we can increase the efficiency of that sector including precision farming, disease and weather predictions, crop monitoring systems.
50. AI should help to facilitate the collection and analysis of data in the agricultural sector use R&D and University projects to support the deployment of these technology into small farmers.
51. AI can be used to support better service delivery to the Tourism sector such as keyless entry.
52. AI can be used to tackle some of the most pressing problems like finding a vaccine for COVID-19.
53. AI can be used to tread with community spread and to find out other data about how disease is spread among the populous
54. We can continue to use AI in medical research just like we did to discover one of three prostate cancer cell lines for men of African descent in the world.
55. AI can be used to make our healthcare sector more efficient; this is an area that we can focus on that will benefit the people however we must ensure transparency of AI systems in medical research.
56. AI should be used to help with research on Geoheritage and Geohazard Resiliency R&D by giving researchers more access to data to do analysis. This is a form of cultural preservation.
57. Use art to engage people with Technology applications.
58. Create multilateral relationships to help with the expansion to technology and arts.
59. Technology should help with customer service representative to deliver a better product in tourism.
60. AI is being used in arts and fashion in all kinds of creative ways and should be expanded further.
61. We must put mechanisms in place to ensure that the stakeholders of the creative industry in the region do not get left behind due to lack of digital literacy skills.
62. We need to better understand the implications of the data and backend systems that collect our data.

63. Create a cultural data bank for all citizens to deposit their data and become shareholders in the bank.
64. Determine how we can help drive AI across the Caribbean creative ecosystem to get more efficiency, more creativity, more scale across creation, production, distribution channels.
65. Ensure that our cultural expressions are free of Bias.
66. Work concurrently in the Field of Culture and AI. Bring AI into the field of Culture and bring Culture into the field of AI.
67. We cannot have ethical AI without diversity.
68. AI must be put to the service of the creative industry in the Caribbean. Making creatives more efficient.
69. We must be sensitive to intellectual property rights and sacred spaces and places and treat them with respect.
70. We should use AI to amplify what is working for us in the Caribbean such as the expertise in Carnival productions.
71. Remove the barriers for sharing data among and between Caribbean countries.
72. Create opportunities for youth to engage with technology thru cultural digitalization/ preservation - Digitalize the culture – turn physical assets into digital assets – film, tv, music, artwork, oral traditions.
73. Provide a collective backend for creatives to leverage that would help them to streamline their business.
74. Provide global leadership in AI ethics transparency.
75. Create regional infrastructure including data centres, GPUs, and access to the internet as a digital strategy

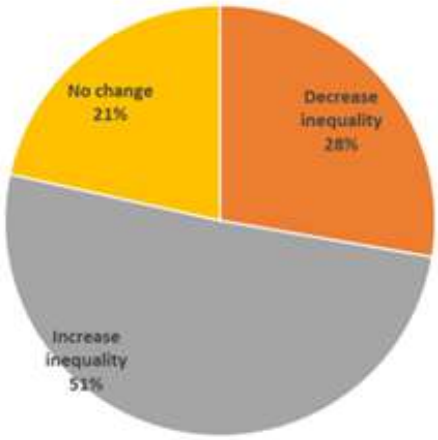
APPENDIX #3

Stakeholders' Poll Results
February 18, 2021 – Polls & Results

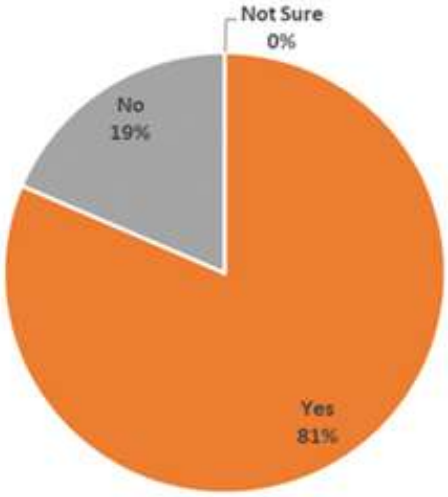




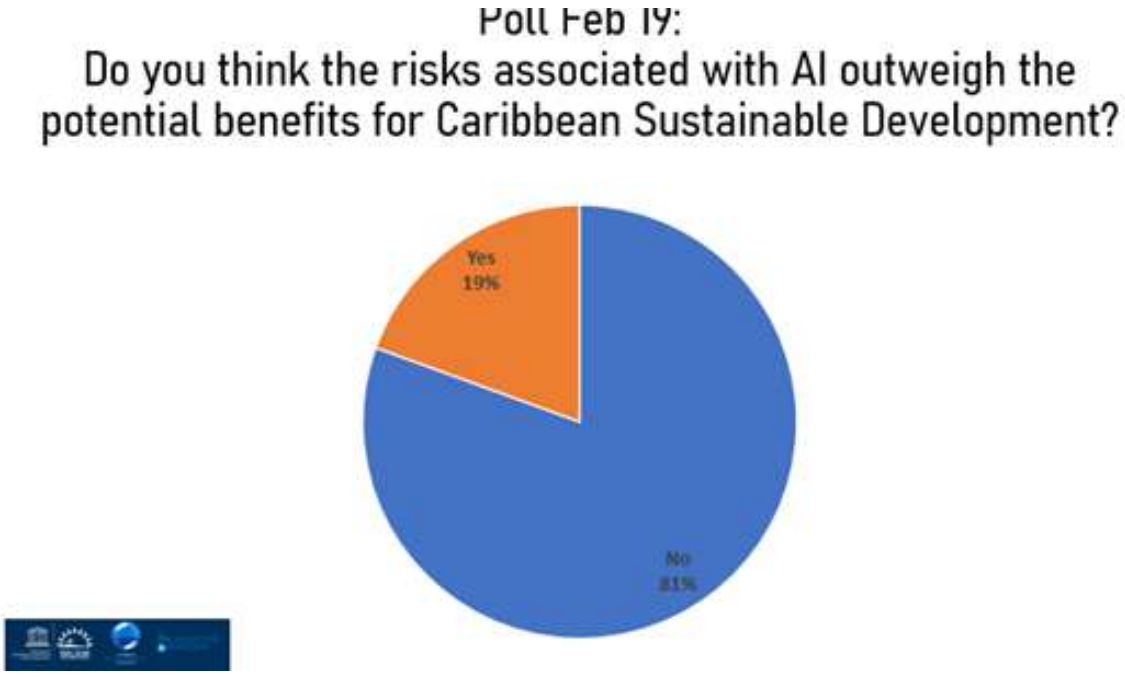
Do you think AI will increase or decrease gender-inequality in the Caribbean?

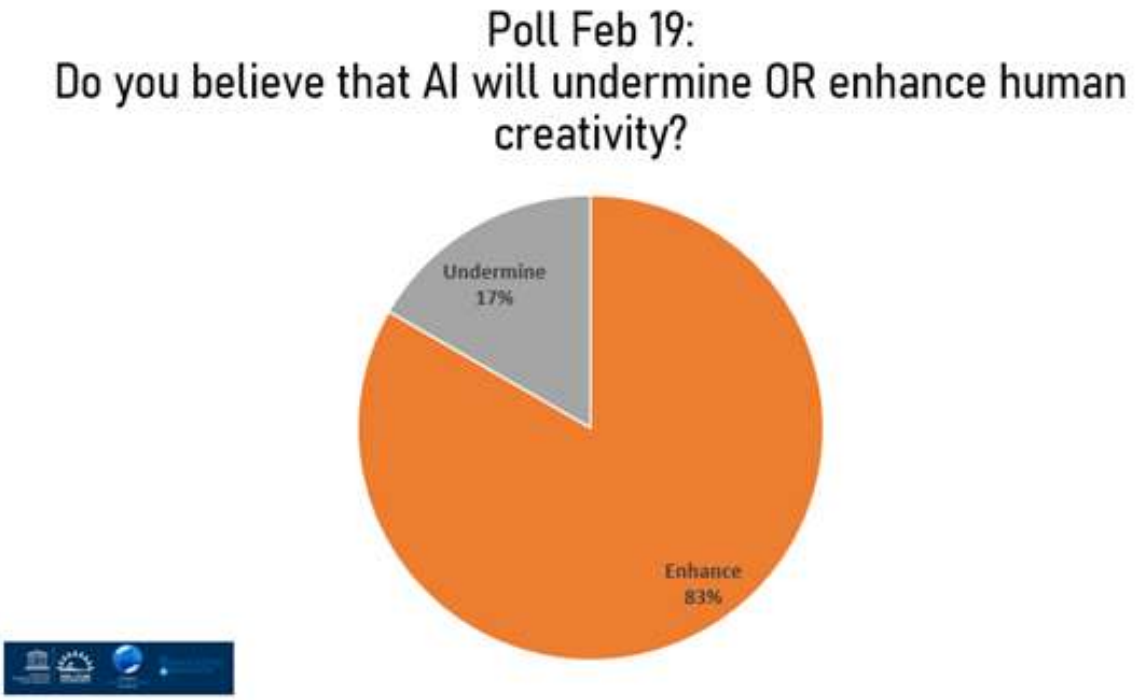


Do you believe AI will advance inclusive and sustainable economic growth, full and productive employment and decent work for all?



February 19, 2021 – Polls & Results





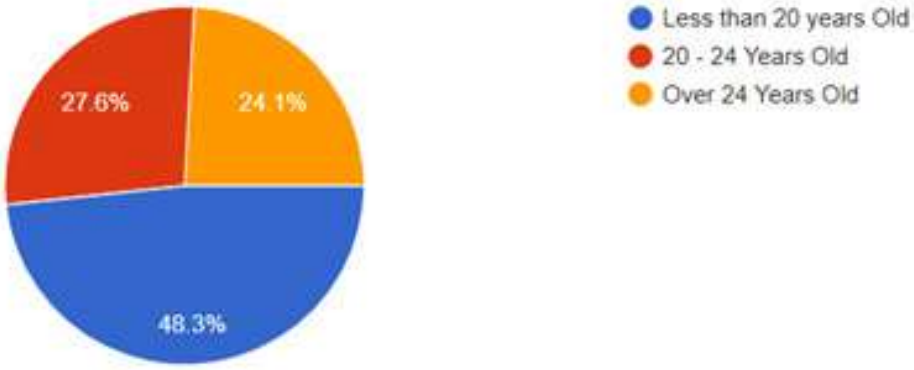
APPENDIX #4

Stakeholders' Poll Results – Reimagine the future with Artificial Intelligence: A Virtual link up for Caribbean Youth

April 28, 2021 - Polls & Results

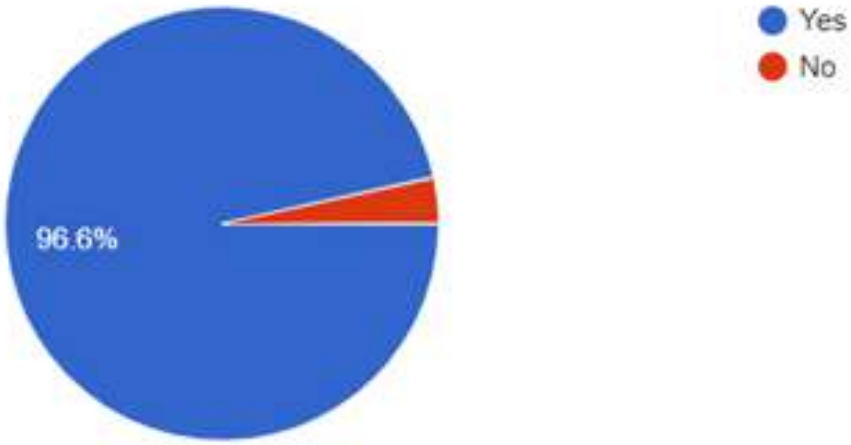
Age:

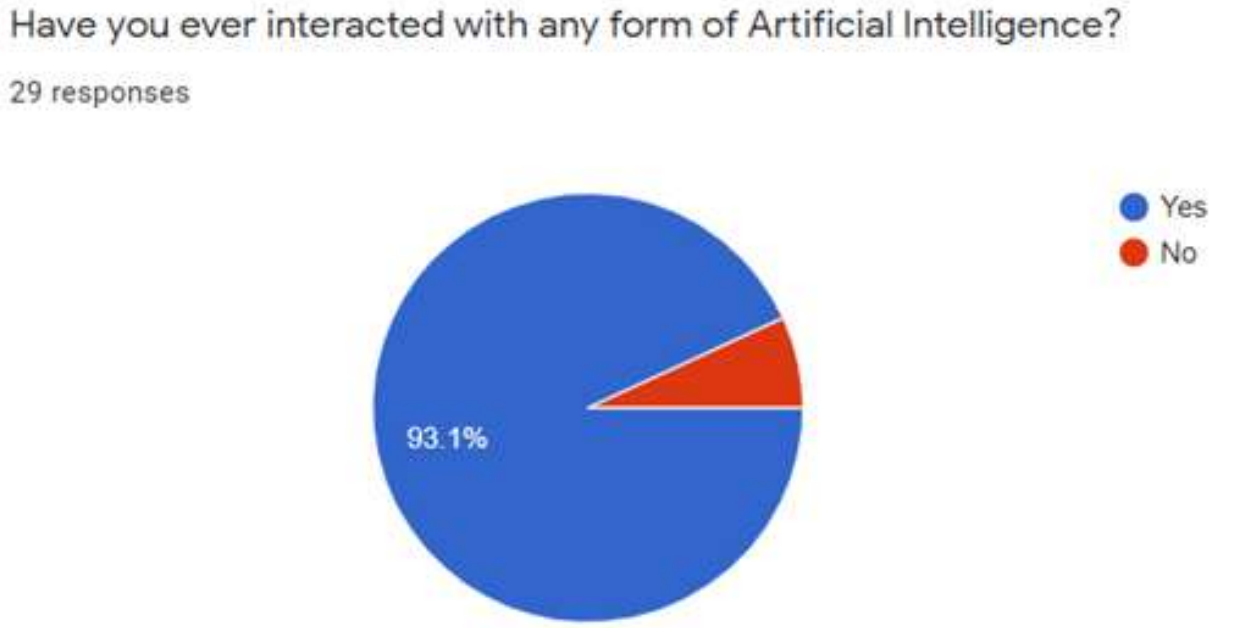
29 responses

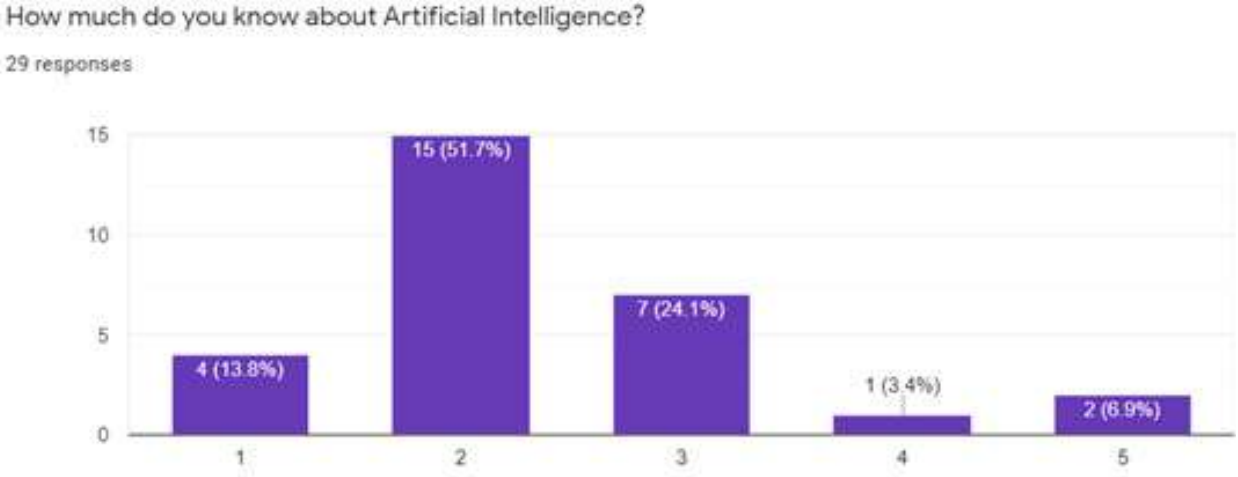


Have you heard of the term Artificial Intelligence before today?

29 responses



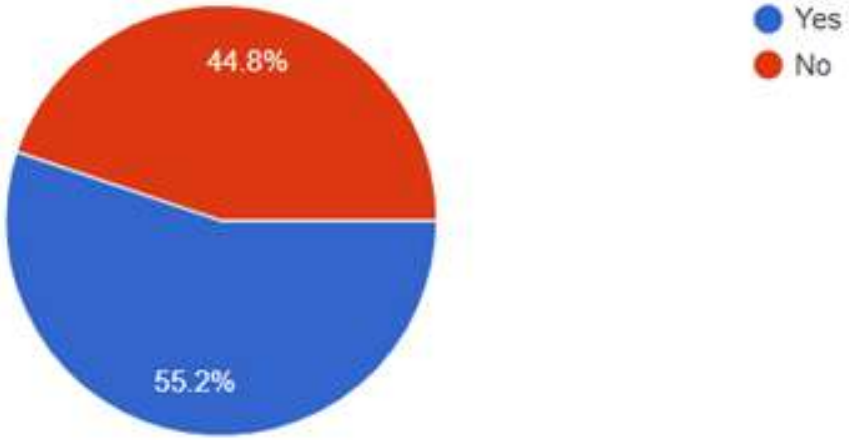




1= Novice 5=Expert

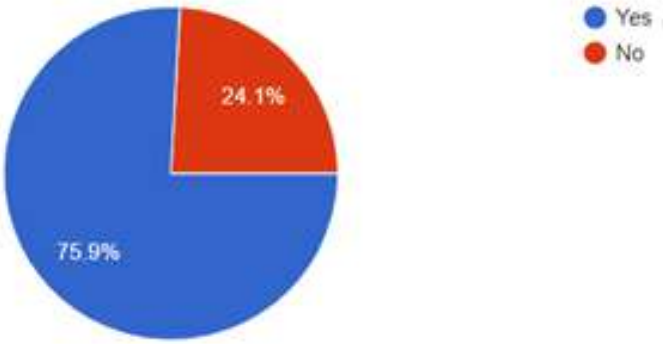
Have you ever heard the term algorithmic bias?

29 responses



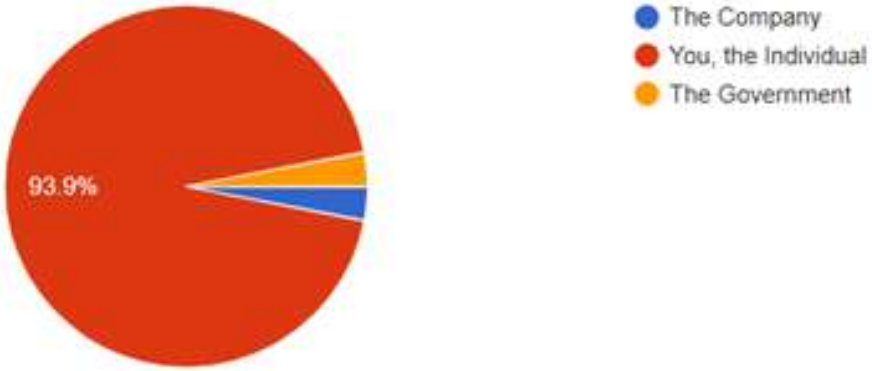
Do you think Artificial Intelligence can be biased? ex. Could the AI prefer men over women, or dogs over cats, or even rich or poor?

29 responses



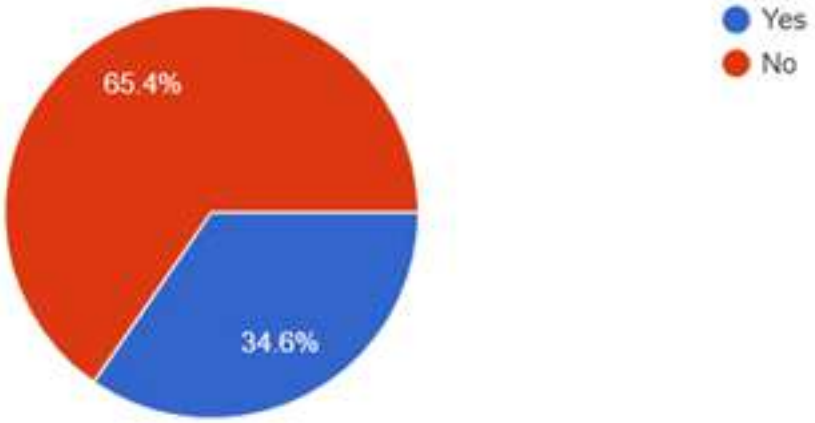
Who should own the data between you and your Personal Robot?

33 responses



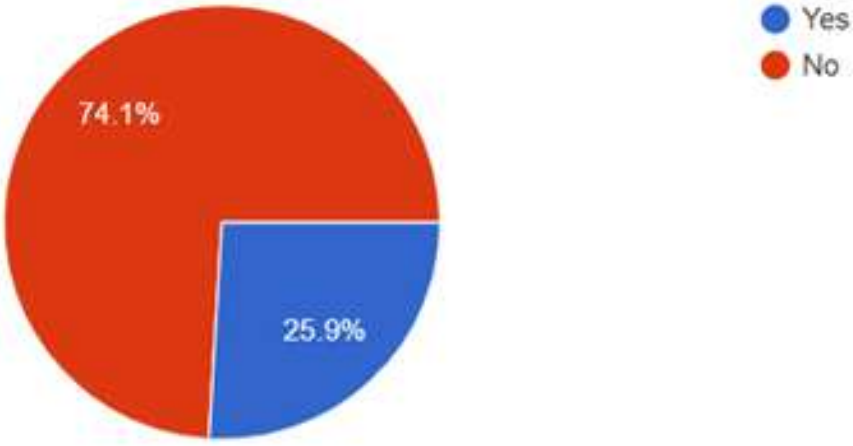
Should we be using AI for Sentencing?

26 responses



Are you being introduced to AI in school now?

27 responses



Do you have any Recommendations on the UPSKILLING Principle?

2 responses

I would recommend that the workforces/organisations should encourage their current staff to be trained technically on IT software or basic IT skills and campaign to youths to encourage the importance of IT, Digitalization and AI initatives.

Firstly, it's important to educate the public on the importance and efficiency of AI, for example; what does it entail and how do we integrate it into our everyday lives. Additionally, it's necessary to look at the different methods of integration and implementation measures needed to ensure a smooth transition from our current labour force to AI without completely disrupting the workforce. Importantly, while AI will make most positions in the workplace obsolete, other job titles may continue the use of people, a clear cut transition is needed. But AI is definitely essential. How do we do this, by engaging AI professionals to provide training sessions from as early as primary level, even if its as an introduction.

APPENDIX #5

Caribbean AI Roadmap Summary

ASSUMPTIONS

For the purposes of developing this policy roadmap, the following assumptions were made regarding the Caribbean and Artificial Intelligence:

- Human creativity is inextricably linked to Caribbean identify, economic viability and sustainable development
- AI is a product of human creativity
- AI in service of humanity
- AI is transformative
- AI Industry is vertical and horizontal
- AI must be inclusive, fair, transparent, accountable
- AI is an existential threat to humanity
- AI must be regulated
- Human rights supersede AI rights
- AI not eligible for human rights
- AI is global
- AI is the most important general-purpose technology of the century
- AI and 5G are inevitable
- Bias is everywhere in AI
- We Are Our Data
- Data rights will be the civil rights movement of the 21st century

PRINCIPLES	GUIDELINES	OBJECTIVES	RECCOMENDATIONS
Resilliance	Predictive | Disaster Mitigation Resource Management	Environmental Management | Save Lives Climte Change Fight | Decarbonization Improve Food Security | Reduce Climate Risks	Early Warning System Environmental Monitoring Systems Public Education
Governance	In Service to Humaniy | Inclusive Ethics | Equity | Data Rights | Non-Bias Non-Discriminatory | Safety & Wellbeing Transparency | Legislation | Advocacy Public Sector	Do No Harm | Fairness | Data Protection Accountability | Explainability | Autonomy tewardship | Reduce Bias | Responsible AI Interoperability | Standards | Values IOT Innovation | Improved Citizen Services	Policy | Guidelines | Regulation Penalties | Enabling Environment New Financial Instruments Data Integrity
Transformation	Access | Participation	Investment Infrastucture | Modernize Digital Economy | Improved Efficiency Monetize Data | New Industries	Investment | Infrastructure Strategic Alliances Revenue Generation | Diversify AI Economy Increase Trade | E-Translation Services
UpSkilling	Education & Training	Digital Skills | Digital Literacy | AI Adoption Responsible AI Culture | R&D | innovation Increase Data Management Capacity Improved AI Curriculum | Increased Awareness Increased Work Pool	New Programmes | Public Education MOOC Courses For Public Sector
Preservation	Data Management Culture | Heritage | Environment	Culture | Environment | Society Data Archives | Data Security | Data Utility Structured Data Virtual Tourism Experiences Cultural Heritage Preservation	Socio-Cultural Environmental Heritage Preservation Programmes Capture-Storage-Preservation-Monitization Secure Data Storage Youth Participation
Sustainability	Decision-Making | Problem Solving	Sustainable Development Improve Citizen Wellbeing Gender Equity | Structural Improvements	Digitize Operations

1. RESILIENCY

2. GOVERNANCE

3. TRANSFORMATION

4. UPSKILLING

5. PRESERVATION

6. SUSTAINABILITY

1. RESILIENCY

DISASTER MITIGATION

- Early Warning Systems
- Trouble Spot Monitoring
- Disaster Management
- Public Education
- Resiliency Framework
- Post Event Protocols (communication | security)
- Post Event Media Recovery

RESOURCE MANAGEMENT

- Monitor Oceans | Rivers
- Monitor Ports
- Monitor Carbon Emissions
- Survey Terrain for Roads
- Underground Infrastructure Resiliency
- Mobile Renewable Energy Stations
- Potable Water Machinery
- Healthcare Facilities
- Rationalization | Mobilization | Allocation

DATA MANAGEMENT

- Capture
- Classify
- Clean
- Format
- Store
- Analyze
- Archive
- Protection

PREDICTIVE ANALYSIS

- Monitor Weather | Rainfall
- Monitor Reefs | Pollution
- Monitor Climate Changes
- Monitor Natural Events ie Volcano

DELIVERABLES

- **Save Lives**
- **Minimize Risk & Economic Loss**
- **Improve Responsiveness**
- **Increase Efficiency**
- **Decarbonization**
- **Improve Food Security**
- **Structured Data**
- **Preservation**
- **Predictive Analysis**

2. GOVERNANCE

ETHICS

- Common Values & Principles
- National-Regional AI Offices | Data Trusts

STANDARDS

- Develop Technical Code of Conduct (developers)
- Develop Procurement Guidelines (buyers)
- Develop AI Design | Use Principles
- Reference IEEE P7000 Series of Standards

DELIVERABLES

- **Fairness**
- **Stewardship**
- **Reduced Bias**
- **Increase Awareness**
- **Responsible AI Strategies**
- **Interoperatbility of Systems**
- **Standards | Values**
- **Enforcement | Deterrent**
- **Integration | Adaptation**
- **Investment | Trade**
- **Public Health**
- **Explainability**
- **Accountability**
- **Responsive Legislation Framework**
- **Enhance Trust**

SAFETY & WELLBEING

- Develop AI to test AI for biases
- Identify AI applications in need of governance
- Defend Human Rights
- Establish AI innovations and framework for Justice reform | law enforcement | online dispute resolution system
- Design manual override options

EQUITY

- Provide equitable high speed internet|broadband access
- Access to technology
- Targeted recruitment – women | youth
- Equitable machine learning algorithms

LEGISLATION

- AI framework – long term policy | regulations | penalties
- Introduce laws (soft|hard) to address AI harms, responsibility, liability
- Review policy and legislation on ICT and cyber crimes
- New financial instruments
- Fiscal and policy space to align frameworks (national | regional | global)
- Enshrine AI for Good as a Human Right

TRANSPERANCY | EXPLAINABILITY ACCOUNTABILITY

- Create Caribbean AI Standards Authority to aggregate, evaluate and approve deployment of proposed AI solutions
- Corporate Responsibility Education Programme
- Enable AI assisted Cyber Security to increase data security
- Build Trust in AI among Caribbean citizens

LEGISLATION

- Participate in global AI discourse
- Promote AI regional/global networks
- Launch international developers software conference
- Lobby big tech for collaborations
- Issue academic papers on AI
- Participate in global forums
- Responsible AI Training and Policies

DELIVERABLES

- **Risk Impact**
- **Do No Harm Technology**
- **Protect and Save Lives**
- **Retain Human Control**
- **Access | Inclusion**
- **Increased participation**
- **Increased sharing**
- **Data Privacy**
- **Informed Consent**
- **Autonomy**
- **Increase Sphere of Influence**

3. TRANSFORMATION

PUBLIC SECTOR

- Introduce efficiency programmes (crime | education | health | energy)
- Paperless data integration
- Support Caribbean IOT Innovation
- Develop 'Smart Island' infrastructure
- Initiate and strengthen strategic alliances
- maintenance) with public/private partnerships to enable collective development of internet and data management infrastructure
-
- Public sector efficiency programmes re patent and trademark examination, management and forecast of traffic, the development of predictive capabilities for emergency responses
-
- AI Assistants to Improve citizen engagement and services such as online experiences for website visitors and reducing the number of people entering brick and mortar service centres
-
- Retain talent in the region

SMART ISLAND INFRASTRUCTURE

DATA TRUSTS Aligned with **NATIONAL-REGIONAL AI OFFICES**

Govern data standards and data licensing

DATA BANKS Aligned with National Archives | **REGIONAL DATA BANK**

Drive youth centered data preservation programmes to build archives and data management capacity

DATA HUBS Aligned with Tertiary Institutions

Facilitate R&D and promote AI innovation as a wealth generator

DATA CENTRES

National-Regional Secure Storage Platforms

INFRASTRUCTURE

Establish internet infrastructure (Broadband | WiFi | 5G)

CLOUD

Establish secure regional computing cloud

DELIVERABLES

- **Digital Transformation**
- **Improved Efficiency**
- **Digital Economy**
- **AI Infrastructure (Physical | Digital)**
- **Digital Autonomy**

4. UPSKILLING

INNOVATION

- Establish Regional AI Incentives for Academia | Private Sector
- Target women, youth, differently abled
- Public Education on Media and Information Literacy
- Create AI R&D Tech Fund
- Initiate and strengthen strategic alliances
- Establish new AI assisted industries (medical cannabis | e-health | e-education| e-sports | mariculture | wellbeing management | software
- Increase productivity in across industries - manufacturing | criminal justice | regenerative agriculture | tourism | transportation | financial services | creative industries

MONITIZATION

- Develop AI bias test software algorithms for efficient AI training (energy optimization)
- Leverage linguistic plurality develop AI tools to support inclusion online ie e-translation
- Structure data to extract value
- Digitize creative and environmental content
- Develop digital content
- Promote data services
- Augmented Reality Experiences - E-Tourism and Creative Industries
- Mentoring, Training and Accelerator Programmes for W, Y, DA

DELIVERABLES

- **New Products**
- **Wealth Generation**
- **Transform Industries**
- **Increase Efficiency & Productivity**
- **Enhance Customer Service**
- **Diversify Consumer Experience**
- **Revenue Generation**
- **Diversity AI Economy**
- **Increase Trade**
- **E-Translation & Knowledge Services**

5. PRESERVATION

DATA CAPTURE

- Launch national | regional preservation programmes
- Establish national | regional data banks
- Recruit and train youth and creatives to handle data

DATA STORAGE

- Ensure secure national | regional storage platforms
- Recruit and train youth and creatives to handle data

DATA PRESERVATION

- Clean public data
- Prepare machine readable format (classify, label, archive and manage content
- Recruit and train youth and creatives in archival and data cleaning services

DATA MONITIZATION

- Augmented reality experiences
- Increase financial literacy
- 3D Mapping of Caribbean SIDS Capitals (28)
- (cultural | historical | social | environmental)

DELIVERABLES

- **Accurate Digital Data**
- **Data Security**
- **Data Utility**
- **Virtual Tourism Experiences**
- **Cultural Heritage Preservation**

6. SUSTAINABILITY

SERVICE TO HUMANITY

- AI as a tool
- Establish Caribbean AI Governance Network
- Establish Data banks in National Archives
- Structural Improvements
- Digitize Operations

CARIBBEAN AI GOVERNANCE NETWORK

CARIBBEAN AI STANDARDS AUTHORITY

AI R&D TECH FUND

DATA PRESERVATION

- Implement programmes leveraging AI in Poverty Reduction
- Clean Energy I Economic Development (Women and Youth)
- Reduce Digital Gender Gap | Upgrade SystemsDigitize operations
- Automate decision-making
- Reduce digital gender gap
- Upgrade systems

DELIVERABLES

- **Cultural Preservation**
- **Predictive Analysis**
- **Increased Efficiency**
- **Sustainable Development**

APPENDIX #6

FIGURES

APPENDIX #7
Glossary

Artificial Intelligence or AI systems - Artificial intelligence (AI) systems are software (and possibly also hardware) systems designed by humans that, given a complex goal, act in the physical or digital dimension by perceiving their environment through data acquisition, interpreting the collected structured or unstructured data, reasoning on the knowledge, or processing the information, derived from this data and deciding the best action(s) to take to achieve the given goal. AI systems can either use symbolic rules or learn a numeric model, and they can also adapt their behaviour by analysing how the environment is affected by their previous actions. As a scientific discipline, AI includes several approaches and techniques, such as machine learning (of which deep learning and reinforcement learning are specific examples), machine reasoning (which includes planning, scheduling, knowledge representation and reasoning, search, and optimization), and robotics (which includes control, perception, sensors and actuators, as well as the integration of all other techniques into cyber-physical
systems). Humans design AI systems directly, but they may also use AI techniques to optimise their design.

A separate document prepared by the AI HLEG and elaborating on the definition of AI used for the purpose of this document is published in parallel, titled "A definition of AI: Main capabilities and scientific disciplines".

AI Practitioners - Individuals or organisations that develop (including research, design or provide data for) deploy (including implement) or use AI systems, excluding those that use AI systems in the capacity of enduser or consumer.

AI system's life cycle - An AI system's life cycle encompasses its development (including research, design, data provision, and limited trials), deployment (including implementation) and use phase.

Auditability - Auditability refers to the ability of an AI system to undergo the assessment of the system's algorithms, data and design processes. This does not necessarily imply that information about business models and Intellectual Property related to the AI system must always be openly available. Ensuring traceability and logging mechanisms from the early design phase of the AI system can help enabling the system's auditability.

Bias - Bias is an inclination of prejudice towards or against a person, object, or position. Bias can arise in many ways in AI systems. For example, in data-drive AI systems, such as those produced through machine learning, bias in data collection and training can result in an AI system demonstrating bias. In logic -based AI, such as rule-based systems, bias can arise due to how a knowledge engineer might view the rules that apply in a particular setting. Bias can also arise due to online learning and adaptation through interaction. It can also arise through personalisation whereby users are presented with recommendations or information feeds that are tailored to the user's tastes. It does not necessarily relate to human bias or human-driven data collection. It can arise, for example, through the limited contexts in which a system in used, in which case there is no opportunity to generalise it to other contexts. Bias can be good or bad, intentional or unintentional. In certain cases, bias can result in discriminatory and/or unfair outcomes, indicated in this document as unfair bias.

Broadband - In telecommunications, broadband is wide bandwidth data transmission which transports multiple signals and traffic types. The medium can be coaxial cable, optical fiber, radio or twisted pair. In the context of Internet access, broadband is used to mean any high-speed Internet access that is always on and faster than dial-up access over traditional analog or ISDN PSTN services.

Computer vision techniques - Techniques that provide computers with understanding of digital images or videos, such as for facial recognition.

Data - Facts, figures or information that are used to train AI about humans and the world.

Data Center - A data center or data centre is a building, dedicated space within a building, or a group of buildings used to house computer systems and associated components, such as telecommunications and storage systems.

Digital Economy - Digital economy refers to an economy that is based on digital computing technologies, although we increasingly perceive this as conducting business through markets based

on the internet and the World Wide Web. The digital economy is also referred to as the Internet Economy,

Digital Transformation - Digital transformation is the integration of digital technology into all areas of a business, fundamentally changing how you operate and deliver value to customers.

Ethics - Ethics is an academic discipline which is a subfield of philosophy. In general terms, it deals with questions like "What is a good action?", "What is the value of a human life?", "What is justice?", or "What is the good life?". In academic ethics, there are four major fields of research: (i) Meta-ethics, mostly concerning the meaning and reference of normative sentence, and the question how their truth values can be determined (if they have any); (ii) normative ethics, the practical means of determining a moral course of action by examining the standards for right and wrong action and assigning a value to specific actions; (iii) descriptive ethics, which aims at an empirical investigation of people's moral behaviour and beliefs; and (iv) applied ethics, concerning what we are obligated (or permitted) to do in a specific (often historically new) situation or a particular domain of (often historically unprecedented) possibilities for action. Applied ethics deals with real-life situations, where decisions have to be made under time pressure, and often limited rationality.

AI Ethics is generally viewed as an example of applied ethics and focuses on the normative issues raised by the design, development, implementation and use of AI. Within ethical discussions, the terms "moral" and "ethical" are often used. The term "moral" refers to the concrete, factual patterns of behaviour, the customs, and conventions that can be found in specific cultures, groups, or individuals at a certain time. The term "ethical" refers to an evaluative assessment of such concrete actions and behaviours from a systematic, academic perspective.

Ethical AI - Ethical AI is used to indicate the development, deployment and use of AI that ensures compliance with ethical norms, including fundamental rights as special moral entitlements, ethical principles and related core values. It is the second of the three core elements necessary for achieving Trustworthy AI.

Human-Centric AI - The human-centric approach to AI strives to ensure that human values are central to the way in which AI systems are developed, deployed, used and monitored, by ensuring respect for fundamental rights, including those set out in the Treaties of the European Union and Charter of Fundamental Rights of the European Union, all of which are united by reference to a common foundation rooted in respect for human dignity, in which the human being enjoy a unique and inalienable moral status. This also entails consideration of the natural environment and of other living
beings that are part of the human ecosystem, as well as a sustainable approach enabling the flourishing of future generations to come.

Idatary –coined by entertainer/tech investor Will I Am as " the marriage of my data and my identity - I'm what I like and what I don't like. I'm where I go. I'm who I know. I'm what I search. I am my thumbprint. I am my data. That's who I am."

Machine learning - A programming technique in which a software system is provided thousands of examples of a concept and searches for patterns by itself.

Natural language processing (NLP) - Systems used, for example, by chatbots and voice assistants, are designed to understand and generate human language, either written or spoken.

(Deep) neural networks - A number of information processing units that send information between each other, similarly to the way neurons work in the brain. Combined with ever-powerful computers and large amounts of data, this technique enables more efficient machine learning.

Predictive analytics - Statistical techniques that analyse data to make predictions about unknown events or outcomes.

Pattern recognition - The automated identification of regularities in data used, for example, for image processing or computer vision.

Red Teaming - Red teaming is the practice whereby a "red team" or independent group challenges an organisation to improve its effectiveness by assuming an adversarial role or point of view. It is particularly used to help identifying and addressing potential security vulnerabilities.

Reproducibility - Reproducibility describes whether an AI experiment exhibits the same behaviour when repeated under the same conditions.

Robust AI - Robustness of an AI system encompasses both its technical robustness (appropriate in a given context, such as the application domain or life cycle phase) and as well as its robustness from a social perspective (ensuring that the AI system duly takes into account the context and environment in which the system operates). This is crucial to ensure that, even with good intentions, no unintentional harm can occur. Robustness is the third of the three components necessary for achieving Trustworthy AI.

Stakeholders - By stakeholders we denote all those that research develop, design, deploy or use AI, as well as those that are (directly or indirectly) affected by AI – including but not limited to companies, organisations, researchers, public services, institutions, civil society organisations, governments, regulators, social partners, individuals, citizens, workers and consumers.

Traceability - Traceability of an AI system refers to the capability to keep track of the system's data, development and deployment processes, typically by means of documented recorded identification.

Trust - "Trust is viewed as: (1) a set of specific beliefs dealing with benevolence, competence, integrity, and predictability (trusting beliefs); (2) the willingness of one party to depend on another in a risky situation (trusting intention); or (3) the combination of these elements." While "Trust" is usually not a property ascribed to machines, it is important to stress the importance of being able to trust not only in the fact that AI systems are legally compliant, ethically adherent, and robust, but also that such trust can be ascribed to all people and processes involved in the AI system's life cycle.

Trustworthy AI - Trustworthy AI has three components: (1) it should be lawful, ensuring compliance with all applicable laws and regulations (2) it should be ethical, demonstrating respect for, and ensure adherence to, ethical principles and values and (3) it should be robust, both from a technical and social perspective, since, even with good intentions, AI systems can cause unintentional harm. Trustworthy AI concerns not only the trustworthiness of the AI system itself but also comprises the trustworthiness of all processes and actors that are part of the system's life cycle.

Vulnerable Persons and Groups - No commonly accepted or widely agreed legal definition of vulnerable persons exists, due to their heterogeneity. What constitutes a vulnerable person or group is often context-specific. Temporary life events (such as childhood or illness), market factors (such as information asymmetry or market power), economic factors (such as poverty), factors linked to one's identity (such as gender, religion, or culture) or other factors can play a role. The Charter of Fundamental Rights of the EU encompasses under Article 21 on non-discrimination the following grounds, which can be a reference point amongst others: namely sex, race, colour, ethnic or social origin, genetic features, language, religion, or belief, political or any other opinion, membership of a national minority, property, birth, disability, age and sexual orientation. Other articles of law address the rights of specific groups, in addition to those listed above. Any such list is not exhaustive and may change over time. A vulnerable group is a group of persons who share one or several characteristics of vulnerability.

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