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in Latin America and the Caribbean

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## Executive Summary

This research project “Harnessing Open Data to Achieve Development Results in Latin America and the Caribbean”, was executed by the Caribbean Open Institute as part of a larger collaboration with partners ILDA, Fundacion Avina, ECLAC and the OAS. The project builds on the earlier work and outcomes of the IDRC-funded study “Open Data in the Caribbean – 106099-004”, and seeks to provide evidence-based research that contributes to understanding the relationship between open data initiatives and socioeconomic development in the Caribbean.

The overall research program was conducted in the following structured phases:

1. **Mapping/Scoping Studies** – four (4) comprehensive studies were completed in key sectors in the Caribbean, including the identification of key sector stakeholders, policies or initiatives as well as public data practices and policy that provide potential enablers or constraints for Open Data opportunities and interventions.
2. **Strategic Interventions** - Based on the information gathered through the mapping/scoping exercise, 4 x strategic interventions are currently being implemented in key sectors related to one or more of the following issues: governance structures, capacity/community building, standards development and inclusion/cognitive divide. These strategic initiatives are geared towards developing the open data ecosystems and testing / validating core “theories of change”
3. **Research Evaluation & Dissemination** – critical evaluation of the outcomes of the interventions were guided by the robust application of the Outcome Mapping methodology for the research design, monitoring & evaluation.

The Open Data landscape in the Caribbean is still quite nascent, and targeted research is needed to inform institutional actors both within and outside Government about what problems need solving, and how open data works (Noveck, 2012). This collection of sector studies and targeted strategic initiatives provide important insights in helping to determine the attributes, value-opportunities, enablers and constraints of an emergent open data ecosystem in the key Caribbean sectors of Community Tourism, Agriculture, and Protected Areas.

Some of the key insights derived from this study include the following:

The critical role of intermediaries both as catalysts and enablers on the supply and demand side of open data initiatives was demonstrable in each of the Sector initiatives. Innovation fellowships, in the case of the Agriculture initiative, data aggregation in the case of the Protected Areas initiative, and partnership brokering in the case of the community tourism initiative, all demonstrate different models of intermediation that catalysed the initiatives.

Developing open data as a public infrastructure enables a broader impact across issues and sectors. The work on Agriculture Digital Service model demonstrates a novel approach to developing a key public infrastructure that can enhance information sharing among actors in the Agriculture value chain. In the domain of Community Tourism, designated Government agencies have created and maintained community mapping data for some time, but this has traditionally been disseminated in the form of

paper maps, rather than being made available as openly accessible data resource. The community tourism initiative has visibly demonstrated the value of open geoData generated by the community as publicly accessible data, in enabling the creation of derivative products and services and attendant economic opportunities. The development of a data harvesting system to interface with the BIOPAMA Caribbean gateway<sup>1</sup> has enhanced the sharing of data between government agencies, Protected Areas (PA) administrators and other civil society interests.

Building sustainable open data infrastructures and enabling the effective use of open data in the Caribbean, requires actors from all sectors (public, private, media, civil society) to invest in individual and community capacity across the whole open data value-chain. The enabling power of capacity building was visibly demonstrated in the community tourism initiative, whereas the Protected Areas project highlighted that lack of readiness (awareness) and capacity can be a serious deterrent that must be addressed at the outset. Preliminary activities on the Caribbean School of Data initiative demonstrate the potential and imperative for developing training delivery models that are flexible, interactive and openly accessible.

The next frontier for the evolving Caribbean open data program is the challenge of getting to scale. This is a perennial development challenge that hinges on finding sustainable mechanisms to enable these innovations to have a transformational impact on the peoples of the Caribbean. Conventional thought suggests that development trajectories, especially for small island developing economies confined by small markets and natural/financial/human resource deficits, are constrained to modest incremental progress, which is typically fragile and readily reversed by traumatic uncontrollable events such as hurricanes, or the global financial crisis. The question that remains to be tackled by future research is: *How can scalable Digital transformation, using Open Data as an enabling platform, disrupt this convention and accelerate the region up the development ladder?*

Keywords: *Open Data; Open Government Data; Open ICT Ecosystems; ICT4D; Agriculture; Tourism; Marine Protected Areas; Developing the Caribbean; public-private sector innovation*

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<sup>1</sup> Biodiversity and Protected Areas Management Programme - <http://caribbean-rris.biopama.org/>

## The Research Problem

Releasing open data is not an end in and of itself, but becomes the cornerstone of an ecosystem of actors, institutions and information flows that has the potential to create value. As Noveck (2012) argues: *“Creating a participatory innovation ecosystem is about a lot more than just publishing data sets. It requires doing the hosting, convening, persuading, and demonstrating involved in inviting diverse people to participate. The institutional players have to be prepared to collaborate with the innovators; those outside government have to know how to collaborate; civil society activists have to ensure that innovators know the problems that need solving; and **research is needed** to figure out what works.* (Noveck, 2012) ”

The research project therefore sought to evaluate the potential for open data innovation and initiatives to strengthen the effectiveness of public institutions, improve public services, and fuel economic growth in specific sectors in the Caribbean. The specified research objectives were:

- To improve understanding of the demand and use of Open Data for development in the Caribbean
- To support the collaborative development of products and services between government, civil society, academic institutions and entrepreneurs
- To promote the development and adoption of emerging open standards that enable open data initiatives to scale up
- To explore mechanisms for open data to address the needs of marginalized groups, focusing particularly on youth, women and urban poor
- To build the capacity of the Caribbean Open Institute to act as a knowledge sharing platform fostering dialogue with governments that feeds to the initiative

The four sector mapping/scoping studies completed in Agriculture, Tourism, Marine Protected Areas and Official Statistics across multiple Caribbean countries, have helped to characterize the existing data eco-system in these key sectors, including the identification of key sector stakeholders, policies or initiatives as well as public data practices and policy that provide potential enablers or constraints for Open Data opportunities and interventions. Based on these insights, the 4 x strategic initiatives to evaluate sector-specific *“theories of change”* were undertaken to collectively examine discrete hypotheses derived from the sector studies. The IDRC Outcome Mapping methodology used for the design, monitoring and evaluation of progressive outcomes arising from the various strategic interventions provided robust testing of the potential developmental outcomes and impact of open data.

Overall, the project has been relatively effective in experimentation and building demonstration pilots of open data innovation in various sector contexts that provide pragmatic insights into the connections and pathways between open data initiatives and development. In Agriculture, the use of innovation fellowships to design / develop an Agriculture Digital Service model demonstrates a novel approach to establishing a key public infrastructure that can enhance information sharing among actors in the Agriculture value chain; the community tourism initiative has demonstrated the value of citizen-generated, publicly accessible open *geoData*, in enabling the creation of derivative tourism products and services and attendant economic opportunities in a key development sector for Caribbean economies.

These examples and others provide powerful use cases of open data for development, that demonstrate significant opportunities for integrated approaches to evolving the Caribbean Open Data ecosystem, and more importantly, its developmental impact.

The case studies also provide additional empirical support for a number of the key premises asserted by prior GovLabs research (Verhulst & Young, 2016) that influence the impact of open data in developing contexts. The following are noteworthy:

#	Premise	Empirical Support
1	Intermediaries and data collaboratives allow for enhanced matching of supply and demand of data	<ul style="list-style-type: none"> <li>The critical role of intermediaries both as catalysts and enablers on the supply and demand side of open data initiatives is demonstrable in each of the strategic initiatives. Innovation fellowships, in the case of the Agriculture initiative, data aggregation in the case of the Protected Areas initiative, and partnership brokering in the case of the community tourism initiative, all demonstrate different models of intermediation that catalysed the initiatives</li> </ul>
2	Developing open data as a public infrastructure enables a broader impact across issues and sectors.	<ul style="list-style-type: none"> <li>The Agriculture Digital Service model demonstrates a novel approach to developing a key public infrastructure that can enhance information sharing among actors in the Agriculture value chain</li> <li>Specific Government agencies have created and maintained community mapping data for some time, but this has never been made available as open data. The community tourism initiative has visibly demonstrated the value of open <i>geoData</i> generated by the community as publicly accessible data, in enabling the creation of derivative products and services and attendant economic opportunities</li> <li>The development of a data harvesting system to interface with the BIOPAMA Caribbean gateway has enhanced the sharing of data between government agencies, PA administrators and other civil society interests</li> </ul>
5	The lack of readiness or capacity at both the supply and demand side of open data hampers its impact	<ul style="list-style-type: none"> <li>Building sustainable open data infrastructures and enabling the effective use of open data in the Caribbean, requires actors from all sectors (<i>public, private, media, civil society</i>) to invest in individual and community capacity across the whole open data value-chain. The enabling power of capacity building was visibly demonstrated in the community tourism initiative, whereas the Protected Areas project highlighted that lack of readiness (awareness) and capacity can be a serious deterrent that must be addressed at the outset.</li> </ul>
7	Open data does pose a certain set of risks, notably to privacy and security; a greater, more nuanced understanding of these risks will become necessary	<ul style="list-style-type: none"> <li>Understanding the nuances of data privacy and the potential tensions between privacy and the benefits of openness within a specific context was visibly demonstrated by the agriculture initiative, and highlighted the attendant hazards of unilaterally adopting / applying standards and models from other contexts.</li> </ul>

The next frontier for the evolving program is the challenge of getting to scale. This is a perennial development challenge that hinges on finding sustainable mechanisms to enable these innovations to have a transformational impact on the peoples of the Caribbean. Conventional thinking suggests that development trajectories, especially for small island developing economies confined by small markets and natural/financial/human resource deficits, are constrained to modest incremental progress, which is typically fragile and readily reversed by traumatic uncontrollable events such as hurricanes, or the global financial crisis. The question that remains is: *How can scalable Digital transformation, using Open Data as an enabling platform, disrupt this convention and accelerate the region up the development ladder?*

In general, the prospects for scaling Open Data initiatives in the Caribbean are confronted by distinct challenges that are characteristic of the nature of most countries in the region as small island developing states. Unlike some of the pioneering Open Data initiatives in the US (data.gov) and the UK (data.gov.uk), regional Governments and public sector agencies typically fall short of having the internal capacity, technical expertise and resource slack to initiate and undertake Open data initiatives, even with good intent. Intermediaries are therefore required to play a significant role both as catalyst and enabler of the emerging Open Data initiatives in the Caribbean.

Capacity building and facilitating the emergence of such intermediaries, standards and practices that can contribute to the long-term sustainability of regional Open Data initiatives is an important element of the ongoing research agenda. Open Data and open approaches in general, have created space for a new kind of participatory dialogue and collaboration between regional Governments, academia and the private sector that has the potential to become a catalyst for new and innovative approaches in the application of ICT to tackling some of the perennial challenges that confront Caribbean societies. In particular, the notion of a Caribbean Digital Commons as a central repository for sharing digital assets including software, data and content and knowledge assets for reuse across governments and civil society across the region is a compelling prospect and one to be further explored and developed through additional research initiatives.

## Progress towards research objectives

#	Project Objectives	Contributing Research Activities / Deliverables
1.1	To improve the understanding of the demand and use of open data for development in the Caribbean	<ul style="list-style-type: none"> <li>Completed 4 x sector mapping/scoping studies in Agriculture, Tourism, Marine Protected Areas and Official Statistics;</li> <li>Three of four strategic initiatives were completed each of which informs a Theory of Change about open data in a specific sector context (<b>See Section: Project Outputs</b>)</li> </ul>
1.2	To support the collaborative development of products and services between government, civil society, academic institutions and entrepreneurs	<ul style="list-style-type: none"> <li>The work on Agriculture Digital Service model demonstrates a novel approach to developing a key public infrastructure that employed an innovation co-production partnership model between a Government Agency (RADA) and technologists (Slashroots)</li> <li>Collaboration with the PLPU, a joint initiative of the Ministry of Security and Agriculture to combat the prevalence of praedial larceny in Jamaica in the development of the AgroCheck mobile</li> </ul>



		<p>application that helps police officers trace the provenance of agricultural produce to establish whether they have been legally obtained, and are being legally transported. This is a production evolution of the CLIP pilot developed in the previous research initiative.</p> <ul style="list-style-type: none"> <li>• The community tourism initiative has visibly demonstrated the value of open <i>geoData</i> generated by the community as publicly accessible data, in enabling the creation of derivative products and services and attendant economic opportunities.</li> <li>• The development of a data harvesting system to interface with the BIOPAMA Caribbean gateway has enhanced the sharing of data between government agencies, PA administrators and other civil society interests.</li> <li>• The DevCA Conference/Codesprint has been used as collaborative innovation platform/process to tackle key national / regional issues eg. Election monitoring in DomRep / Zika virus resilience in the Jamaica</li> </ul>
1.3	To promote the development and adoption of emerging open data standards that enable open data initiatives to scale-up	<ul style="list-style-type: none"> <li>• No scale-up implementation opportunities have been realized as yet, however efforts have been made to guide Open Data policy initiatives in Jamaica &amp; St.Lucia to adopt the standard principles and language of the Open Data Charter</li> <li>• Use of standard APIs (eg. OGC standards - Catalog Service for the Web) for the harvesting of data for the Caribbean Protected Areas Gateway.</li> <li>• The establishment of a de Facto digital services model for a Farmer Register in Agriculture is providing the basis for a de facto platform standard for the sharing of Agriculture data across various constituents in the Agriculture ecosystem, and also helping to shape formative policy dialogue on open data and data privacy within the Government of Jamaica.</li> </ul>
1.4	To explore mechanisms for open data to address the needs of marginalized groups, focusing particularly on youth, women and urban poor	<ul style="list-style-type: none"> <li>• The Interactive Community mapping strategic initiative conducted Action Research in an inner-city community to explore the use of community mapping augmented by open <i>geoData</i> as a means of community engagement, empowerment and economic lift. The engagement and empowerment of <b>youth</b> in the community was particularly effective and impactful.</li> </ul>
1.5	To build the capacity of the Caribbean Open Institute to act as a knowledge sharing platform fostering dialogue with governments that feeds to the initiative	<ul style="list-style-type: none"> <li>• The COI has expanded it's Research capacity through the engagement of lead researchers on each of the Sector studies and strategic initiatives; The use of Outcome Mapping as a standard Research M&amp;E methodology across all initiatives has enhanced the resident capability and the rigor and consistency of the Action Research initiatives;</li> <li>• Preliminary work on the Caribbean School of Data initiative has started to build capacity at the UWI to develop interactive and responsive eLearning content; 1<sup>st</sup> module developed on Open Data applications in Agriculture: <a href="http://csd.learndata.info/">http://csd.learndata.info/</a></li> <li>• Several research articles have been published in peer-reviewed conferences and journals</li> <li>• The COI website has been upgraded to become a more effective knowledge and information repository about Caribbean Open Data <a href="http://caribbeanopeninstitute.org">http://caribbeanopeninstitute.org</a></li> </ul>

## Synthesis of research results and development outcomes

Considering the overall research project objective to “*evaluate the potential for open data innovation and initiatives to strengthen the effectiveness of public institutions, improve public services, and fuel economic growth in specific sectors in the Caribbean*”, we examine the main research outcomes in each of the following areas:

### Sector Understanding and Insights

Each of the sector studies highlighted key findings that improved the understanding of the potential demand and use of open data for development in the Caribbean

a) **Tourism:** the study considered the primary tourism datasets - *tourist arrivals, tourism assets and tourism service providers*, used by the public agencies with responsibility for tourism data in the following countries: Antigua & Barbuda, Barbados, the Dominican Republic, Jamaica, and Trinidad and Tobago. The findings highlight challenges of multi-agency involvement with tourism data and data provenance issues with respect to the sources, owners and custodians of tourism data. Analysis suggests that with more effective policies and access, open data use and re-use can potentially improve the productivity of the Caribbean tourism sector by as much as 10% and facilitate greater linkages between tourism activities and other economic sectors in the region. Community Tourism, in particular, presented a uniquely interesting domain for participatory engagement and innovative applications of bottom-up, demand-driven Open Data Initiatives.

b) **Fisheries/MPAs:** The scoping study identified the most widely collected data sets (*catch and effort, fishers and vessels, and habitat*), that are important to evidence-based decision making across three key domains (*socio-economic, biophysical and governance*); On examination of the various dimensions of openness for data in five Caribbean territories: Bahamas, Barbados, Dominican Republic, Jamaica and Trinidad and Tobago, It found that while data are generally stored in some digital form and available at no charge, it does not generally meet other key criteria for openness. While highlighting a number of cultural and practical challenges to open data adoption in Caribbean fisheries and MPAs, the study finds that there is generally no fundamental barrier to open data and identifies points of leverage that it deems both necessary and available for the establishment and maintenance of an open data regime in the sector.

c) **National Statistics:** The peculiarities of Small Island Developing States (SIDS), small land masses and low population numbers, influence the approach to open data and official statistics in the Caribbean, given that existing statistical processes are anchored in the precepts of protection of the identity of individual data provider, being a natural person or a corporate entity. The review of four (4) countries in the Caribbean (Jamaica, Trinidad & Tobago, Dominican Republic & St. Lucia) to determine their readiness for the publication of Official Statistics in an open data format reveals a number of challenges associated with data collection and sharing practices within both the private and public sectors and well as the cultural disposition within the organizations themselves. Necessary steps to mitigate these barriers include: (a) review and modernization of the legal framework covering the collection, analyzing and dissemination of official statistics; (b) Implementing change management procedures to transform a culture of secrecy and privacy towards confidentiality; (c) Developing a dissemination strategy that

identifies those products that could be published at a lower level of disaggregation without breaching the legal requirements and publish them as open data.

d) **Agriculture:** the initial baseline research underscored general consensus across key stakeholder institutions on the importance of data and information within the agriculture sector, and recognition of the value-add that open agricultural data offers, including (i) greater access to information for academic research, policy or entrepreneurship; (ii) catalyst for economic activity and entrepreneurship; and (iii) increased farmer productivity. While many institutional agriculture stakeholders are accustomed to data and information sharing practices amongst themselves and understand its value, opening data more broadly for consumption by innovators or the general public is not a common practice with only a few agriculture focused data sets were being published online, with fewer still classifiable as open data. Nevertheless there was strong recognition and interest among these key stakeholders on the potential for open data-related initiatives to tackle problems ranging from the effects of climate change on crop yield, managing farmer registration information, praedial larceny, and the control of pests and invasive species. A key factor in advancing these initiatives is providing mechanisms for stakeholders to be more aware of what data assets are available, how to access them, and Meta data specifics, such as frequency of updates, data sources, formats and accuracy.

### **Scientific, research, and knowledge innovations**

Several artifacts have been produced to disseminate the outcomes, findings and insights emerging from the various research activities. These outputs are detailed in the Section: **Project Outputs**, and includes Blogs, Technical Reports, Conference and Journal publications. For instance, each of the strategic sector initiatives produced three (3) Blogs that provide progressive accounts of the research activities in addition to the initial sector study and a comprehensive final report.

### **Research capacities and relationships**

The sector studies and strategic initiatives have contributed to expanding the research capacity of the Caribbean Open Institute, both by increasing the number of experienced researchers actively involved in the open data research agenda, as well as adding to the COI's library of research production output towards becoming an important knowledge broker for fostering dialogue and policy advice with emerging government-led open data initiatives in the region. The use of Outcome Mapping as a standard Research M&E methodology across all initiatives has enhanced the resident capability and robustness of research outputs. This increased research capacity manifested in three papers from the COI being accepted for the recent 2016 Open Data Research Symposium and one paper from the previous Research Symposium held in Ottawa, 2015 being published in a special issue of the peer-reviewed, open access *Journal of Community Informatics*.

### **Boundary Partner Impact**

Each of the strategic initiatives employed the Outcome Mapping Methodology as the structured approach to program design, monitoring and evaluation and therefore were able to identify specific contextual settings of boundary partners, targeted behavioural change outcomes, strategies employed and emergent findings. The evaluation methods allowed each initiative to identify and articulate what influence the project had on boundary partners.

A few examples of key boundary partner outcomes are summarized in the following table. Details of these outcomes and corresponding empirical support are contained in the Outcome journals of each of the initiative reports (See section: Project Outputs).

Boundary Partners		Outcomes (Changes in behaviour, capacities, or relationships)
Agriculture Digital Services	RADA	Through the execution of the project, RADA has developed a greater appreciation of the principles (theory of change) that motivate an open platform approach to supporting innovation in the agriculture sector and increased access, usage and quality of data available to its stakeholders. They have become increasingly accommodating of necessary data integration between the technology systems and have shown greater interest in the utilization of the platform for their own services. They have committed to adopting the organization's first data privacy policy based on insights from the research done.
	Praedial Larceny Unit & Officers	The Praedial Larceny Prevention Unit & Officers have committed to integrating the ADS-enabled tools (AgroCheck) into the Praedial Larceny strategy and operations. They have actively collaborated through the design stages, and beta testing and are currently in dialogue about a field launch.
Interactive Community Mapping	Community Youth Residents	Community youth have actively participated in both the capacity building exercise, focus group and the development of the August Town tour. They acquired new skills in community mapping and actively participated in the identification and mapping of community assets. Their demonstrated capabilities and enthusiasm has led to active discussions and engagement with a local government agency to provide mapping support for various community initiatives that promote school safety, support community resilience and response to the Zika virus threat. Several of the community mappers have also participated in training workshops to become certified tour guides
	The Source – Community Resource Centre	The Source, a community resource centre, was actively engaged at almost all events around the project and served as a hub for community mapping activities and later on as the visitor centre for the August Town Tour product. By so doing, The Source has become a focal point and facilitator for community mapping and will served as a host for future ICM training activities, as part of the sustainability model.
Protected Areas Gateway	Government Agencies with jurisdiction over Protected Areas	In the absence of official open data policies in most of the targeted countries, many Data custodians were initially sceptical about providing data to support this initiative. Providing a written briefing on the scope and rationale of the initiative as well as introducing the provision of open data license agreements was able to increase receptiveness and willingness to release data to support the project.
	Protected Areas Administrators	Most PA administration and management faced a challenge in collecting, handling and storing data due to limited human resources and technical capacity. The development of a data harvester ( <a href="http://padata.caribbeanopeninstitute.org/">http://padata.caribbeanopeninstitute.org/</a> ) that provides an intermediary system for data extraction and sanitization of data from multiple sources to populate the Caribbean Gateway for Protected Areas has facilitated the data collection and integration activity.

## Policy influence

Active consultation on Open Data policy initiatives in Jamaica & St.Lucia to adopt the standard principles and language of the Open Data Charter. Additionally, insights from the problem discovery phase of the ADS strategic initiative are helping to influence and inform RADA's first data privacy policy.

## Technology development, adoption, and adaptation

Technology innovations developed through the various strategic initiatives include:

- Re-development of an earlier prototype of HarvestAPI as a scalable platform at the core of the Agriculture Digital Services (ADS) strategic initiative that facilitates the sharing of agricultural data across government agencies and with the technology community.
- Development of the AgroCheck mobile application that helps police officers trace the provenance of agricultural produce to establish whether they have been legally obtained, and are being legally transported. This is a production evolution of the CLIP pilot developed in the previous research initiative, and was developed in collaboration with the PLPU, a joint initiative of the Ministry of Security and Agriculture to combat the prevalence of praedial larceny in Jamaica.
- Development of the “August Town Virtual Tour” mobile App that demonstrated how the digital assets created by interactive community mapping and Open *geo*Data enabled the development of derivative tourism products and services and attendant economic opportunities for the participating community interests.
- Development of a data harvester system (<http://padata.caribbeanopeninstitute.org/>) that provides an intermediary system for data extraction and sanitization of data from multiple stakeholders to populate the Caribbean Gateway for Protected Areas
- The DevCA Conference/Codesprint continued to evolve as an innovation platform/process with extended engagements with institutional partners being used to tackle key national / regional issues and produce useful innovations eg. Election monitoring in the Dominican Republic and Zika resilience in Jamaica.

## Economic, social, health, political, or environmental impact

The interactive community mapping initiative had the explicit goal of evaluating the potential of open data to build community resilience and provision of socio-economic opportunities for the benefit of community members in the target August Town community. The results contributed to a demonstration and understanding of how use of crowd-sourced open *geodata* can benefit a local community and improve the social and economic well-being of residents. This was done by creation of open mapped data and then leveraging these digital assets to create a community tourism tour product. The initiative has demonstrated strong alignment and resonance with the Jamaica’s stated Community Tourism Vision: *an invigorated tourism sector in communities that enriches community quality of life through social, cultural, economic and environmental benefits, exemplifies sustainable livelihoods, and strengthens Jamaica’s national policy values and interests”*.

The Protected Areas Gateway initiative employed several mechanisms to highlight the importance for data collected about Protected Areas to be shared and open to the public for use by various organizations to better inform policy and decision making about the Caribbean’s protected resources.

## Lessons learned – Caribbean Open Data Research Program

As a research methodology, Outcome Mapping was particularly effective in isolating the desirable change outcomes in the targeted boundary partners and the planned strategic interventions to bring about these changes. This structured approach to program design, monitoring and evaluation was

valuable in helping to unpack the emergent insights and lessons learned into one or more “Theory of Change”. The overall Action Research approach to engagement with key Government Agencies using Innovation fellowships and other partnership mechanisms has been an important strategy for engagement, especially in an environment where there is no formal open data policy context. The important and enabling effects of capacity building was visibly demonstrated in the community tourism initiative, whereas the Protected Areas project highlighted that lack of readiness (awareness) and capacity can be a serious deterrent that must be addressed at the outset of any open data initiative. Building sustainable open data infrastructures and enabling the effective use of open data in the Caribbean, will require actors from all sectors (public, private, media, civil society) to invest in individual and community capacity building across the whole open data value-chain.

Policy influence continues to be modest at best, due to the persistent apathy of political leadership in the Caribbean towards the open data/open government agenda. Recent changes in political administration in countries such as Jamaica, Trinidad and St.Lucia have had the effect of slowing momentum, as relationships and advocacy cultivated with various government leaders have to be re-built. The complementary open data initiatives, facilitated by the World Bank, to conduct open data readiness assessment(s) in several countries and attendant support on policy and government portals, has had some impact. However the greatest gains and engagement have continued to be at a direct Agency level while collaborating on sector-specific initiatives.

There was limited involvement of other donors in this project, however there was considerable complementary synergy with the national open data initiatives in the Caribbean, funded by the World Bank/UK DFID. Open Data Readiness Assessment (ODRA) studies conducted by the Governments of Jamaica, Trinidad & Tobago, St. Lucia, and the Dominican Republic highlighted the significance of the influence of this project through DevCA and the work of the Caribbean Open Institute in stimulating the awareness, demand and capacity for Open Data in the region. This was reflected in the “Open Data Ecosystem” receiving the highest rating of the seven pillars of Open Data Readiness in the Jamaica ODRA assessment. The COI actively participated in the follow-on activities of the World Bank-led program in Jamaica and St.Lucia, including open data policy formulation and the publishing of government open data portals.

## Methodology

Lead researchers with domain expertise in the respective sectors were engaged to conduct the sector studies and strategic initiatives as follows:

- **Tourism** - Michelle McLeod, PhD - Mona School of Business & Management, UWI
- **Marine protected areas** - Patrick McConney, PhD / Julian Walcott, Ph.D. - CERMES, UWI Cave Hill, Barbados
- **National Statistics** – Indianna Minto-Coy, PhD - Mona School of Business & Management, UWI
- **Agriculture** - Matthew McNaughton / Slashroots Foundation, Jamaica

The sector studies were conducted using a combination of desk research, surveys and semi-structured interviews. A modified version of the common assessment framework proposed for the study of open data, by World Wide Web Foundation and The Governance Lab at NYU, adapted for the Caribbean context, was employed across all studies. A survey instrument, designed based on this framework, was also administered by several of the researchers. Copies of the various research instruments employed are contained in each of the Sector study reports (See section on Project Outputs).

The strategic initiatives were designed and implemented using the IDRC Outcome Mapping Methodology. According to the Sunlight Foundation aggregated case study report ‘Social Impact of Open Data’ (Júlia Keserű & Chan, 2015), OMM provides an appropriate framework (relative to other more linear assessment methods) for capturing the longer term social change typically associated with open data initiatives, that are effected through their contribution to outcomes produced by a complex ecosystem of stakeholders. A 2-day Outcome Mapping workshop was conducted in Jamaica (facilitator: Yacine Khelladi) to familiarize each of the lead researchers with the OMM methodology for research planning, monitoring and evaluation. Each researcher was then required to prepare the OMM Intentional Design and Inception plan for their respective projects, which were used for the ongoing monitoring and subsequent evaluation of outcomes. A common template for the final reports was provided to each of the researchers to facilitate sufficient consistency and comparability across the main strategic initiative research outputs.

OMM was particularly effective in isolating the desirable change outcomes in the targeted boundary partners and the planned strategic interventions to bring about these changes. This structured approach to program design, monitoring and evaluation was valuable in helping to unpack the emergent insights and lessons learned into one or more “Theory of Change”.

### Developing the Caribbean (DevCA) Conference & Codesprint

The annual “Developing the Caribbean (DevCA)” Open Data Conference & Codesprint continued to be an important pillar for the regional open data advocacy, engagement and outreach strategy, with the staging of two editions over the course of the research project. While many similar events have succumbed to “Hackathon fatigue” DevCA continues to be relevant to the Caribbean open data discourse, due to the uniquely configured conference & codesprint combination which allows it to evolve as a significant regional innovation and engagement platform. The DevCA2016 conference themed “Towards a Caribbean Data Revolution”, situated Open Data within the larger Data ecosystem

needed to support the sustainable development goals, and the capacity needs of Caribbean institutions in the public & private sectors. The conference continued to elevate DevCA’s positioning as the signature Open Data forum in the region, and also featured the staging of the Open Data for Business Roundtable in partnership with the Center for Open Data Enterprise (with funding support from the Open Data Charter). Cuba has continued to be a significant participant, while St. Kitts & Nevis participation in DevCa2016 provides a beachhead into the OECS community. The DevCA Codesprint has also been pivoted from being just an event to becoming an innovation process through extended engagements with institutional partners. The DevCA2016 codesprint in the Dominican Republic focussed on the DR’s national, provincial and municipal election monitoring in partnership with NGO “Participación Ciudadana”, while the codesprint in Jamaica tackled the Zika Challenge in collaboration with the Ministry of Health and their regional and international development partners (i.e. PAHO and CARPHA)

## Project Outputs

The outputs of the project activities took several forms, including workshops, websites, blog posts, presentations, reports and articles. These are summarized in the table below:

Information sharing and dissemination	
<p><b>DevCA2016 / 2015 Caribbean Open Data Conference</b></p>	<ul style="list-style-type: none"> <li>o <a href="http://developingcaribbean.org/">http://developingcaribbean.org/</a></li> <li>o <a href="#">2015 Executive Summary Conference Report</a></li> <li>o <a href="#">2016 Executive Summary Conference Report</a></li> </ul> <p><b>Blogs:</b></p> <ul style="list-style-type: none"> <li>o Open Data for Business in Jamaica: Initial Findings and Recommendations: <a href="http://caribbeanopeninstitute.org/od4b_roundtable_jamaica">http://caribbeanopeninstitute.org/od4b_roundtable_jamaica</a></li> <li>o Caribbean Youth #Hackzika!: <a href="http://caribbeanopeninstitute.org/hack_zika">http://caribbeanopeninstitute.org/hack_zika</a></li> <li>o Is there a place for data journalism in Caribbean Newsrooms? Journalists see value, but face challenges: <a href="http://caribbeanopeninstitute.org/node/126">http://caribbeanopeninstitute.org/node/126</a></li> <li>o DevCA2015 JA: Exploring the Business of Open Data: <a href="http://caribbeanopeninstitute.org/node/120">http://caribbeanopeninstitute.org/node/120</a></li> <li>o DevCA2015 TT: Which came first, the API or the APP?: <a href="https://irwinium.wordpress.com/2015/02/19/which-came-first-the-api-or-the-app/">https://irwinium.wordpress.com/2015/02/19/which-came-first-the-api-or-the-app/</a></li> </ul> <p><b>News Media:</b></p> <ul style="list-style-type: none"> <li>o <a href="http://jamaica-gleaner.com/article/news/20160518/open-data-conference-success">http://jamaica-gleaner.com/article/news/20160518/open-data-conference-success</a></li> <li>o <a href="http://www.loopjamaica.com/content/region-could-tap-us272-million-through-release-open-data-%E2%80%93-devca">http://www.loopjamaica.com/content/region-could-tap-us272-million-through-release-open-data-%E2%80%93-devca</a></li> </ul>
<p><b>Technical Reports</b></p>	<p><b>Sector Studies</b></p> <ul style="list-style-type: none"> <li>o Jackson, S. (2015). <i>Official Statistics and Open Data: A Small Island Developing State (SIDS) Perspective</i>. retrieved from: <a href="http://caribbeanopeninstitute.org/civicrm/profile/view?reset=1&amp;id=1230&amp;gid=13">http://caribbeanopeninstitute.org/civicrm/profile/view?reset=1&amp;id=1230&amp;gid=13</a></li> <li>o Mallalieu, K., &amp; McConney, P. (2015). <i>Caribbean Open Data Scoping Study: Fisheries and Marine Protected Areas (MPAs)</i>. retrieved from: <a href="http://caribbeanopeninstitute.org/civicrm/profile/view?reset=1&amp;id=1231&amp;gid=13">http://caribbeanopeninstitute.org/civicrm/profile/view?reset=1&amp;id=1231&amp;gid=13</a></li> <li>o McLeod, M. T. (2015). <i>Caribbean Open Data Scoping Study: Tourism Sector</i>. retrieved from: <a href="http://caribbeanopeninstitute.org/civicrm/profile/view?reset=1&amp;id=1232&amp;gid=13">http://caribbeanopeninstitute.org/civicrm/profile/view?reset=1&amp;id=1232&amp;gid=13</a></li> </ul>



	<ul style="list-style-type: none"> <li>o Slashroots Foundation (2016). <i>Caribbean Open Data Scoping Study: Agriculture Sector</i>.</li> </ul> <p><b>Strategic Sector Initiatives (Technical Reports)</b></p> <ul style="list-style-type: none"> <li>o Open Data and Interactive Community Mapping: Empowering Local Community Tourism - <a href="http://caribbeanopeninstitute.org/civicrm/profile/view?reset=1&amp;id=1239&amp;gid=13">http://caribbeanopeninstitute.org/civicrm/profile/view?reset=1&amp;id=1239&amp;gid=13</a></li> <li>o Towards an Agriculture Digital Services Model for Data-Driven Agriculture Sector in Jamaica - <a href="http://caribbeanopeninstitute.org/civicrm/profile/view?reset=1&amp;id=1241&amp;gid=13">http://caribbeanopeninstitute.org/civicrm/profile/view?reset=1&amp;id=1241&amp;gid=13</a></li> <li>o Open Data and the BIOPAMA Gateway: Towards Improved Governance and Decision-Making of the Caribbean’s Protected Areas - <a href="http://caribbeanopeninstitute.org/civicrm/profile/view?reset=1&amp;id=1240&amp;gid=13">http://caribbeanopeninstitute.org/civicrm/profile/view?reset=1&amp;id=1240&amp;gid=13</a></li> </ul>
<p><b>Published Output</b></p>	<p><b>Blogs from Sector Initiatives:</b></p> <ul style="list-style-type: none"> <li>o A Hidden Gem: August Town Tour Comes to Life! <a href="http://caribbeanopeninstitute.org/ATour_pilot">http://caribbeanopeninstitute.org/ATour_pilot</a></li> <li>o Enabling Sustainable Partnerships through Open Data and Interactive Community Mapping: <a href="http://caribbeanopeninstitute.org/icm_partners">http://caribbeanopeninstitute.org/icm_partners</a></li> <li>o Empowering Local Communities with Open Data and Interactive Community Mapping: <a href="http://caribbeanopeninstitute.org/node/133">http://caribbeanopeninstitute.org/node/133</a></li> <li>o How Open Data Can Improve Tourism In The Caribbean: <a href="http://blogs.iadb.org/abierto-al-publico/2016/08/04/how-open-data-can-improve-tourism-in-the-caribbean/">http://blogs.iadb.org/abierto-al-publico/2016/08/04/how-open-data-can-improve-tourism-in-the-caribbean/</a></li> <li>o Caribbean Gateway to Open Data: <a href="http://caribbeanopeninstitute.org/open_data_caribbean_gateway_3">http://caribbeanopeninstitute.org/open_data_caribbean_gateway_3</a></li> <li>o Build it and they will come: An Open Data Fallacy?: <a href="http://caribbeanopeninstitute.org/open_data_caribbean_gateway_2">http://caribbeanopeninstitute.org/open_data_caribbean_gateway_2</a></li> <li>o Open Data and the Caribbean Gateway: Contributing to Sustainable Management of Protected Areas: <a href="http://caribbeanopeninstitute.org/open_data_caribbean_gateway_1">http://caribbeanopeninstitute.org/open_data_caribbean_gateway_1</a></li> <li>o Reimagining Jamaica's Agriculture Infrastructure &amp; Interfaces:</li> <li>o Visualising the Structure and Linkages in the Jamaican Economy Using National Statistics: <a href="http://caribbeanopeninstitute.org/node/168">http://caribbeanopeninstitute.org/node/168</a></li> </ul> <p><b>General Blogs:</b></p> <ul style="list-style-type: none"> <li>o Engaging the private sector in the open data value-chain: An innovation imperative: <a href="http://opendatacon.org/engaging-the-private-sector-in-the-open-data-value-chain-an-innovation-imperative/">http://opendatacon.org/engaging-the-private-sector-in-the-open-data-value-chain-an-innovation-imperative/</a></li> <li>o Making sense of US\$3 trillion – Estimating the value of Open Data for Small Developing Economies. In International Open Data Conference. Ottawa. Retrieved from <a href="http://opendatacon.org/making-sense-of-us3-trillion-estimating-the-value-of-open-data-for-small-developing-economies/">http://opendatacon.org/making-sense-of-us3-trillion-estimating-the-value-of-open-data-for-small-developing-economies/</a></li> <li>o Problem-Solving with Open Data: A Caribbean Perspective (Part 1): <a href="http://opendatacon.org/problem-solving-with-open-data-a-caribbean-perspective-part-1/">http://opendatacon.org/problem-solving-with-open-data-a-caribbean-perspective-part-1/</a></li> </ul>

	<ul style="list-style-type: none"> <li>o Problem-Solving with Open Data: A Caribbean Perspective (Part 2): <a href="http://opendatacon.org/problem-solving-with-open-data-a-caribbean-perspective-part-2/">http://opendatacon.org/problem-solving-with-open-data-a-caribbean-perspective-part-2/</a></li> </ul>
<p><b>Peer-Reviewed Research Output</b></p>	<p><b>Conferences</b></p> <ul style="list-style-type: none"> <li>o McNaughton, M. L., McLeod, M. T., McNaughton, M. and Walcott, J. (2016) ‘Open Data as a Catalyst for Problem Solving: Empirical Evidence from a Small Island Developing States (SIDS) Context’, in 2016 Open Data Research Symposium. Madrid, Spain. Available at: <a href="https://drive.google.com/open?id=0B4TpC6ecmrM7OEN6OVIIUXh1d1U">https://drive.google.com/open?id=0B4TpC6ecmrM7OEN6OVIIUXh1d1U</a>.</li> <li>o Minto-Coy, I., Roberts, L., Hall, B. and McNaughton, M. (2016) ‘Towards Greater Citizen Engagement and Transparency Through Open Budgeting in Jamaica’, in 2016 Open Data Research Symposium. Madrid, Spain. Madrid, Spain. Available at: <a href="https://drive.google.com/file/d/0B4TpC6ecmrM750NlaS1zWENjdIU/view">https://drive.google.com/file/d/0B4TpC6ecmrM750NlaS1zWENjdIU/view</a>.</li> <li>o McLeod, M.T. (2016) “Tourism innovation and interactive community mapping”. 2<sup>nd</sup> MSBM Business and Management Conference, 9-11 Nov 2016, Kingston</li> <li>o McNaughton, M.L., McLeod, M.T. and Boxill, I. (2014) “Tourism Open Data in Jamaica: an actor network perspective.” 3<sup>rd</sup> Interdisciplinary Tourism Research Conference, 3–8 June, 2014, Istanbul, Turkey.</li> <li>o McLeod, M. and McNaughton, M. (2015) “A methodological approach for understanding an emergent Caribbean Open Data ecosystem.” Open Data Research Symposium, 27<sup>th</sup> May 2015, Ottawa, Canada.</li> <li>o McLeod, M. and McNaughton, M. (2015) “Knowledge-based tourism policy formulation, as an application of Open Data in Caribbean tourism.” ICOT2015, 24-27 June, 2015, Middlesex University, London, UK.</li> </ul> <p><b>Book chapter</b></p> <ul style="list-style-type: none"> <li>o McNaughton, M.L., McLeod, M.T. and Boxill, I. (2016) “Tourism Open Data in Jamaica: an actor network perspective.” In Kozak &amp; Kozak, <i>Tourism and Hospitality Management</i>, UK: Emerald.</li> </ul> <p><b>Journal articles</b></p> <ul style="list-style-type: none"> <li>o McLeod, M. T. and <b>McNaughton, M. L.</b> (2016) ‘Mapping an emergent Open Data ecosystem’, <i>Journal of Community Informatics</i>, 12(2), p. 20 pages. Available at: <a href="http://www.ci-journal.net/index.php/ciej/article/view/1261">http://www.ci-journal.net/index.php/ciej/article/view/1261</a>.</li> </ul>
<p><b>Presentations / Speaking Engagements</b></p>	<ul style="list-style-type: none"> <li>o McNaughton, M. (2016) ‘Open Data as a Platform for Collaboration: A Caribbean Perspective’, in <i>CTU 14th Caribbean Ministerial Strategic ICT Seminar</i>. St. Philip, Barbados, September, 21, 2016</li> <li>o McNaughton, M. L. (2016) ‘Open Data and Development - A Caribbean Perspective’, in <i>Open Government Series - Global Affairs Canada, Ottawa, June 21, 2016</i></li> <li>o McNaughton, M. L. (2016) ‘Open data and community tourism - A strategy for empowering local communities’, in <i>6th IDB Group- Caribbean Civil Society meeting, Nassau, Bahamas, June 1, 2016</i></li> </ul>

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<p><b>Technical Artifacts</b></p>	<ul style="list-style-type: none"> <li>o HarvestAPI: <a href="http://harvest-api-production.herokuapp.com/">http://harvest-api-production.herokuapp.com/</a></li> <li>o AgroCheck mobile application: (<a href="#">short video</a>)</li> <li>o August Town Interactive Community Mapping Website: <a href="http://icm.msbm-uwj.org/">http://icm.msbm-uwj.org/</a></li> <li>o August Town Virtual Companion” mobile App: <a href="https://play.google.com/store/apps/details?id=com.artuvic.atownvirtualcompanion">https://play.google.com/store/apps/details?id=com.artuvic.atownvirtualcompanion</a></li> <li>o BIOPAMA Caribbean gateway data harvester: <a href="http://padata.caribbeanopeninstitute.org/">http://padata.caribbeanopeninstitute.org/</a></li> <li>o Caribbean School of Data Pilot Course “Open Data and Agriculture”: <a href="http://csd.learndata.info/">http://csd.learndata.info/</a></li> <li>o Caribbean Open Institute upgraded website: <a href="http://caribbeanopeninstitute.org">http://caribbeanopeninstitute.org</a></li> </ul>
<p><b>Capacity Building</b></p>	<ul style="list-style-type: none"> <li>o 2-day workshop on Outcome Mapping methodology for 6 researchers, Feb 29<sup>th</sup> – Mar 2nd, 2016</li> <li>o 5-day interactive community mapping / OSM workshop for 15 community mappers and software developers, June 13 – 17<sup>th</sup>, 2016</li> <li>o Professional Tourist Guide training and certification for the August Town Community Heritage Tour Project, Monday, Nov 14 - 25, 2016 (40 hrs), 10 community residents</li> </ul>

## Problems and Challenges

The Caribbean open data program has made significant strides through this latest research project. The strategic initiatives provide powerful exemplar case studies that contribute important insights in helping to determine the attributes, value-opportunities, enablers and constraints of an emergent open data ecosystem in the key Caribbean sectors of Community Tourism, Agriculture, and Protected Areas. This research will inform and help to synthesize a distinctive “Theory of Change” about Open Data in the Caribbean, and provide practical, justifiable evidence of the significant opportunity that open data represents for the Caribbean community.

The primary challenges to maximizing the benefits of open data remain anchored in the following areas:

**Country leadership apathy:** The persistent apathy of political leadership in the Caribbean towards the open data/open government agenda continues to be disappointing. Notwithstanding strong advocacy efforts on multiple fronts, most countries, especially in the Anglophone Caribbean have realized little to modest gains and focus on this agenda from a policy perspective. Recent changes in political administration in countries such as Jamaica, Trinidad and St. Lucia have had the effect of slowing momentum, as relationships and advocacy cultivated with various government leaders have to be rebuilt. Emerging working collaborations on open data between the Caribbean Open Institute (COI) and the Caribbean Telecommunications Union (CTU) offers some promise for improved traction, as the long-tenured CTU brings a significant degree of Institutional legitimacy, Regional and International Partnerships and established Government liaisons. Follow-on initiatives will need to put greater emphasis on training and support to create a cadre of open data government leaders, as well as work towards a Caribbean data consensus and policy framework.

**Capacity Building:** The Caribbean region is generally regarded as “*data poor*,” not just because of limited access to high quality, locally relevant data, but also cultural and institutional habits and capacity limitations (both in the public and private sectors) often forego the use of data, and other forms of evidence, for policy and decision making. Building sustainable open data infrastructures and enabling the effective use of open data in the Caribbean, requires actors from all sectors (public, private, media, civil society) to invest in individual and community capacity across the whole open data value-chain. The Caribbean School of Data (CSOD) initiative was started in this research program and seeks to conceptualize and provide the platform for a comprehensive and sustainable “data literacy” program that will help to develop greater awareness, attitudes, competencies and capacity to build a stronger data culture across the Caribbean. This will be a critical and essential component of future open data initiatives.

**Scalability:** The challenge of getting to scale remains a perennial development challenge that limits the transformational impact that the open data innovations explored through this project can have on the peoples of the Caribbean. In general, the prospects for scaling Open Data initiatives in the Caribbean are confronted by distinct challenges that are characteristic of the nature of most countries in the region as small island developing states, and includes public sector agencies with limited internal capacity, technical expertise and resource slack to initiate and undertake Open data initiatives, even with good

intent. Continued multi-lateral funding support and key intermediaries will be required to play a significant role both as catalyst and enabler of scalable Open Data initiatives in the Caribbean.

**Institutional Capacity:** The Caribbean Open Institute (COI) as the regional OD4D node has evolved organically, primarily as a coalition of participating institutions and as a research co-ordinating entity. The scale limits of this existing institutional form will likely constrain the effectiveness of the COI's role in a scalable regional open data program. It is therefore likely that institutional strengthening of the COI and greater integration with OD4D common resources and collective action will be required to advance the Caribbean open data agenda.

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