CWWA Thematic Area: General Topic

How does the Paris Agreement potentially affect the water and waste sectors in the Caribbean?

1.0 Introduction

In December 2015, at the 21st meeting of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 21), 195 countries agreed to a new international treaty with the objective of *"Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels"*.[1]

This historic agreement essentially replaces the Kyoto Protocol (KP), which was established in 1997 and entered into force in 2005, with the first commitment period from 2008 - 2012. The second commitment period of the KP will end in 2020, the year that the Nationally Determined Contributions (NDCs) submitted by Parties, as part of the Paris Agreement, are due to commence. The KP placed limits on greenhouse gas (GHG) emissions from participating developed countries. The USA never ratified the KP, Canada withdrew in 2013 and New Zealand, Japan and Russia refused to join the second commitment period, reducing the current coverage of the Protocol to less than 15% of global emissions[2].

[1] Article 2 of the Paris Agreement
[2] http://www.bmub.bund.de/en/topics/climate-energy/climate/international-climate-policy/kyoto-protocol/

Unlike the KP, the Paris Agreement (PA) contains legally binding provisions for all countries, including the small islands of the Caribbean that ratify the agreement. This paper investigates the implications for the water and waste sectors of the Caribbean.

2.0 The Structure and Legal Form of the Paris Agreement

On December 12th, 2015, Parties at COP 21 in Paris agreed the text of a 25-page document that when (i) ratified by at least 55 countries, and (ii) those that have ratified represent at least 55% of global emissions, will become a legally binding international treaty. As of September 3rd, 2016, 26 countries (representing approximately 39% of global emissions) had ratified[3]. The United Nations Secretary General will host a climate summit in late September 2016 in an attempt to accelerate the ratification process. It is possible that the conditions for the Agreement to enter into force could be met before the end of 2016, particularly as the world's two largest emitters (USA & China) have now ratified.

The PA contains 29 Articles. There is also an accompanying decision (1/CP.21) that seeks to implement aspects of the Agreement. The Articles of the PA cover, inter alia, the following elements.

2.1 Mitigation

Article 2 sets a temperature goal of of pusuing a limit of 1.5ºC above pre-

[3] http://unfccc.int/2860.php

industrial levels. The reference to 1.5 degrees was considered a major victory for the Alliance of Small Island States (AOSIS), a grouping of 44 (39 members / 5 observers) of the most vulnerable developing countriessmall island and low-lying states[4]. Article 3 introduces the concept of Nationally Determined Contributions, which are discussed in greater detail in Section 3 of this paper. To achieve the temperature goals referred to in Article 2, Article 4 aims to achieve a peaking of emissions as soon as possible, with net zero emissions by 2050. Article 5 promotes the conservation of sinks for GHGs through, for example, payment for ecosystem services and reducing emissions from deforestation and forest degradation (REDD). Article 6 allows for the creation of a new market mechanism (for trading of carbon credits) and for voluntary cooperation amongst Parties to meet their NDCs. Article 6 has created opportunities for the water and waste sectors that are discussed in Section 3 of this paper.

2.2 Adaptation

Some of the impacts of climate change are now inevitable; no matter what emissions trajectory the world follows in the future. According to the IPCC, sea levels will rise by between 0.4 – 0.63 metres by the end of this century as a result of the CO_2 that we have already emitted[5]. However, the most recent science (e.g. Hansen, et. al., 2016)[6] predicts an even higher rise in sea levels

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[5] Church, J.A., P.U. Clark, A. Cazenave, J.M. Gregory, S. Jevrejeva, A. Levermann, M.A. Merrifield, G.A. Milne, R.S. Nerem, P.D. Nunn, A.J. Payne, W.T. Pfeffer, D. Stammer and A.S. Unnikrishnan, 2013: Sea Level Change. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

[6] Hansen, J., Sato, M., Hearty, P., Ruedy, R., Kelley, M., Masson-Delmotte, V., Russell, G., Tselioudis, G., Cao, J., Rignot, E., Velicogna, I., Tormey, B., Donovan, B., Kandiano, E., von Schuckmann, K., Kharecha, P., Legrande, A. N., Bauer, M., and Lo,

by 2100. Global mean temperatures had already increased by 0.85^{o}C over the period 1880 to 2012[7]. 2016 is set to break all temperature records, with the first six months of 2016 being on average 1.3^{o}C warmer than in the nineteenth century, pushing 2015 into second and 2014 into third place[8]. The initial mitigation contributions promised by Parties in Paris, even if fully implemented, will still have the world on a path for between 2.6 – 3.1^{0}C of warming[9]. It is not surprising therefore that the inclusion of provisions in the Agreement to build adaptation capacity was a priority for the most vulnerable countries. Article 7 introduces the adaptation goal of:

- enhancing adaptive capacity,
- strengthening resilience, and
- reducing vulnerability to climate change.

The Agreement recognises that *"continuous and enhanced support"* needs to be provided to developing countries (in particular the most vulnerable) to meet their adaptation needs.

K.-W.: Ice melt, sea level rise and superstorms: evidence from paleoclimate data, climate modeling, and modern observations that 2 °C global warming could be dangerous, Atmos. Chem. Phys., 16, 3761-3812, doi:10.5194/acp-16-3761-2016, 2016.

7 IPCC, 2013: Summary for Policymakers. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

8 http://www.nasa.gov/feature/goddard/2016/climate-trends-continue-to-break-records

9 http://www.nature.com/nature/journal/v534/n7609/full/nature18307.html - Rogelj et. al. 2016. *"Paris Agreement climate proposals need a boost to keep warming well below 2oC"* Nature 534, pp 631 -639, June 2016

2.3 Loss and Damage

Along with the reference to 1.5 degrees, having specific provisions to deal with impacts beyond the capacity of countries to adapt was a priority for AOSIS in the Paris negotiations. In Article 8, Parties agreed, inter alia, on the following areas of cooperation:

(a) Early warning systems;

(b) Emergency preparedness;

(c) Slow onset events;

(d) Events that may involve irreversible and permanent loss and damage;

(e) Comprehensive risk assessment and management;

(f) Risk insurance facilities, climate risk pooling and other insurance solutions;

(g) Non-economic losses; and

(h) Resilience of communities, livelihoods and ecosystems.

2.4 Means of Implementation – Finance, Technology Development and Transfer, and Capacity Building

Under Article 9 of the Agreement, developed countries agreed to provide scaled-up financial resources with a balanced allocation of resources to meet adaptation and mitigation needs. The mobilisation of finance (with the developed countries taking the lead) should *"represent a progression beyond previous efforts"*. Paragraph 53 of the accompanying decision (1/CP.21) refers to a floor of USD 100 billion per year and requires Parties to set an even higher climate-financing target by 2025. The Green Climate Fund (GCF)

and the Global Environmental Facility (GEF) have been tasked to serve the Agreement.

Articles 10 and 11 include provisions to enhance technology development/transfer and capacity building in developing countries with the special needs of small island developing states being recognised in Article 11.

3.0 Implications for the Caribbean Water and Waste Sectors

All of the member countries of CARICOM (except Montserrat as a British Overseas Territory) have submitted intended Nationally Determined Contributions (iNDCs). A country's iNDC becomes an NDC (with legal implications) when the country ratifies the Agreement. As of September 4th, 2016, the Bahamas, Barbados, Belize, Grenada, Guyana, St. Kitts and Nevis, St. Lucia and St. Vincent and the Grenadines had ratified the PA[10].

An NDC is a country's stated mitigation target, with the majority of the first cycle of NDCs having a start date of 2020 and a target year of 2025 or 2030. NDCs are to be updated every 5 years and there can be no backsliding (i.e. each new NDC must be at least as ambitious as the previous). Most Caribbean countries have included conditions (provisos) that will affect their mitigation targets and have also included adaptation elements in their NDCs (see Table 1 below).

[10] http://unfccc.int/focus/ndc_registry/items/9433.php

The following table (Table 1) highlights some of the key aspects of the iNDCs submitted by Members of CARICOM, with particular reference to those aspects that would affect the water and waste sectors. Table 1 is supplemented with emissions data from the National Communications of the Member States, most of which submitted their Second National Communications to the UNFCCC in 2015 or 2016. A National Communication contains an inventory of national GHG emissions.

Table 1: Raw and Derived Data from iNDCs and National Communications Submitted by CARICOM Member States

CARICOM Member Country	Population	Estimated Annual GHG Emissions (Gg CO_{2e})	% of Total CARICOM Emissions	Per capita emissions (metric tonnes of CO2e /per capita/per year)	Mitigation Targets	Adaptation Elements in the water and waste sectors	Estimated Mitigation Costs (millions of USD)	Estimated Adaptation Costs (millions of USD)
Antigua and Barbuda	90,000	945.5	1.3	10.5	By 2030, achieve an energy matrix with 50 MW of electricity from renewable sources. By 2020, finalize technical studies with the intention to construct and operate a waste to energy (WTE) plant by 2025.	By 2025, increase seawater desalination capacity by 50% above 2015 levels. By 2030, 100% of electricity demand in the water sector and other essential services (including health, food storage and emergency services) will be met through off-grid renewable sources. By 2030,all waterways will be protected to reduce the risks of flooding and health impacts.	NA	NA
Bahamas	351,461	660.48	0.9	1.9	An economy-wide emissions reduction of 30% below Business As Usual (BAU) by 2030.	Continue the trend of employing reverse osmosis facilities throughout our islands to provide access to potable water to adapt to loss of freshwater by saltwater intrusion. As an option address retrofitting water and sewage infrastructures	900	NA
Barbados	287,400	1,782	2.4	6.2	Intention to reduce GHG emissions by 44% below BAU levels by 2030 (23% below 2008 levels) Intention to reduce GHG emissions by 37% below BAU levels by 2025 (21% below 2008 levels) Emissions from waste represented 16% of emissions in 2008. Projects are underway to divert waste from landfill and to develop waste-to-energy plants.			

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Belize	358,899	5,067	6.9	14.1	Reduction of Belize's GHG emissions by 24 million metric tonnes of CO2e over the period 2014-2033. Increase its share of renewable energy electricity mix by 85% by 2027 with a 62% carbon dioxide emissions reduction compared to BAU. Develop a solid waste management strategy including capturing and utilizing landfill gas.	Intends to use REDD. 69% of land still under natural vegetation with a network of waterways and 16 watersheds.		231.4
Dominica	71,000	164.5	0.2	2.3	Intends to reduce emissions below 2014 level as follows: 17.9% by 2020; 39.2% by 2025; and 44.7% by 2030. Will reduce ~ 11 Gg of CO_{2e} from the waste sector by managing organics and flaring landfill gas.	NA	25	
Grenada	106,300	251.6	0.3	2.4	Intends to reduce its GHG emissions by 30% of 2010 by 2025, with an indicative reduction of 40% of 2010 by 2030. Waste sector estimated to contribute 10% of emissions. Intends to capture and use LFG.	Has developed a national adaptation plan for the water sector. Rain water harvesting being pursued to improve water collection and storage capacity.	161.4	NA
Guyana	735,232	4,617	6.3	6.3	Covers CO_2 but not methane or nitrous oxide. Emissions from agriculture treated as an adaptation issue. Avoided deforestation will result in avoided emissions of 48.7 $MtCO_{2e}$ per year. 100% renewable power supply by 2025 conditional upon support.	Will continue work on integrated water management infrastructure - canals, sea defenses, water supply and sanitation.	NA	1,600
Haiti	8,578,000	7,832	10.6	0.9	Economy-wide emission reductions - 31% below BAU for period 2016 - 2030 (5% unconditional, 26% conditional)	Expecting between 6 - 20% less rainfall per year. Rehabilitation of old and construction of new water storage and supply infrastructure seen as an adaptation priority.	8,773	16,614

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Jamaica	2,720,554	10,572	14.4	3.9	INDC covers only the energy sector. Unconditional: 7.8% below BAU by 2030. Conditional: 10% below BAU by 2030	Experienced 11 storm events between 2001 - 2012. Rainfall patterns are changing. Developing sectoral climate change strategies and action plans.	NA	NA
St. Kitts and Nevis	46,398	862	1.2	18.6	Covers CO_2 in the electricity and transport sectors. Intend to reduce emissions by 22% below BAU by 2025 and 35% below BAU by 2030. Primarily through the construction of a 35 MW geothermal plant. Waste sector not included.	Water resources management along with agriculture and coastal infrastructure identified as the priority adaptation areas.	NA	NA
St. Lucia	174,000	643	0.9	3.7	Conditional target of 16% below BAU by 2025; 23% by 2030. Waste sector not included. 35% Renewable Energy Target by 2025 and 50% by 2030	Community and National Level Interventions in Water Resource Conservation and Management	218	NA
St. Vincent and the Grenadines	109,188	358	0.5	3.3	An unconditional, economy-wide reduction in greenhouse gas (GHG) emissions of 22% compared to its business as usual (BAU) scenario by 2025. No specific mitigation projects in the waste sector, although waste emissions are ranked third. Relatively comprehensive analysis of GHG emissions from the waste sector in the SNC. All gases covered in all sectors	Concerns over changes in rainfall patterns particularly on agriculture and on the Grenadines. Planned projects include a reverse osmosis plant for Bequia and further deployment of rainwater harvesting technology.	NA	NA
Suriname	541,638	5,677.94	7.7	10.5	Covers carbon dioxide, methane and nitrous oxide in the energy and forestry sectors. Intends to implement waste-to-energy technology	Improvements to water resources management; micro-hydro power units in river systems	2,492	1,000

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Trinidad and Tobago	1,363,760	34,234	46.5	25.1	Unconditional (2%): 30% reduction in GHG emissions by December 31, 2030 in the public transportation sector compared to a business as usual (BAU) scenario (reference year 2013). Conditional (98%): Additional reduction achievable under certain conditions, which would bring the total GHG reduction to 15% below BAU emission levels by December 31, 2030. Three sectors covered: power generation, industry and transport.	NA	2,000	NA
Total	**15,533,830**	**73,667**	**100.0**	**4.7**			**14,569**	**19,445**

There are several items in Table 1 that may be noteworthy to managers in the water and waste sectors. Even though all CARICOM members did not estimate the costs of adaptation (up to either 2025 or 2030), the costs submitted totalled USD 19.4 billion. Excluding Haiti, the total submitted costs of adaptation are ~ USD 2.8 billion and for mitigation are USD 5.8 billion for the region.

It is evident from Table 1 that some of the submitted Second National Communications and Intended Nationally Determined Contributions attempt to inventory and mitigate methane emissions from the solid waste sector. Emissions from waste account for 16% of Barbados' total and 10% of Grenada's and are the third largest source of GHGs in St. Vincent and the Grenadines. Several of the member countries intend to deploy waste-to-energy technologies.

Methane emissions from the wastewater sector are not covered in most of the submitted iNDCs. This is a significant omission and may be corrected in subsequent submissions. However, the vulnerability of the water sector to changes in rainfall patterns, sea-level rise and increased extreme weather events has been highlighted in virtually every iNDC submitted by CARICOM member states. Reverse osmosis and rainwater harvesting are mentioned most frequently as the proposed water augmentation strategies.

A review of the iNDCS reveals that the majority of the mitigation efforts pledged by Caribbean countries is conditional upon the receipt of support.

Most of the countries expressed a desire to benefit from participating in either the Clean Development Mechanism or other carbon markets. Article 6 of the Paris Agreement allows for cooperation between states and the use of internationally transferred mitigation outcomes (ITMOs). In theory, there is now nothing preventing the creation of a CARICOM Carbon Market, with its own regulatory framework and producing its own ITMOs for sale to others. From Table 1, aggregate gross emissions from CARICOM have been estimated at ~ 74 million metric tonnes of CO_{2e} per year[11], with Trinidad and Tobago contributing almost half of that total.

4.0 Conclusions

Climate change represents a grave threat to many of the islands and low-lying coastal states in the Caribbean. The impacts of climate change are already evident at one (1) degree of warming. Containing warming to less than 1.5^{o}C will require aggressive emission reductions by all countries. The Paris Agreement represents a step in the right direction. It sets global temperature goals and identifies the need for finance and capacity building to achieve these goals and to adapt to inevitable impacts. A central component of the Paris Agreement is the submission of Nationally Determined Contributions. It is evident from a review of the submissions made by CARICOM member states, that the water sectors have been prioritised for adaptation measures. It is also evident that the waste sectors are significant contributors of GHG emissions from the region. The costs of adaptation to and mitigation of

11 Not including all gases or all sectors, and not taking land use change and forestry fully into account.

climate change have been estimated to be over USD 34 billion for CARICOM over the next 10 - 15 years.