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I feel as if I have already lived on this island.

I remember arriving at the airport on the 3rd of February as if it was yesterday, and at the same time, I feel as if I have already lived on this island for way more than two months. I started this experience with a feeling of vacation, as suddenly in the first week of February I was wearing shorts and going to the swimming pool. Little did I know in those first days how much love I would end up having for this island and being able to consider it a second home. What I was told beforehand was how nice and welcoming Arubans would be. And I have experienced this since day one. It is such a privilege to have been welcomed so well in such a beautiful community where I have met very kind people, whose smiles and joy I will always remember, from the elderly couple I talked to once in the supermarket to my very beloved Aruban classmates that now I consider friends.

Also, the unique natural environment of the island has captivated me every week I have spent and discovered new

places. Having cacti surrounding me everywhere while doing a hike or seeing more than 20 lizards in one spot at the beach truly left me both surprised and amazed. I could make a very long list with all the places that have a place in my heart, but I want to highlight seeing the coral ecosystem and all the fish that live there and seeing sea turtles. These two experiences made me discover the ocean and its life below water in a way I have never done before. Also, I appreciate deeply having been able to see the sunset turn the water orange while swimming in the sea, and it became one of my favourite things to do in my time here.

All this and more, has made my time in Aruba a time for both personal and academic growth. Coming to do a consultancy project has allowed me to put into practice what I have learned in the last three years of university. It has also made me learn a lot of skills that you can only learn by doing a real-life project. It has been a pleasure to

see the excitement for our contribution to our client Santa Rosa's mission. Having a department of the government communicating to you the value of our project and being able to see it as we lived in the community and engaged with it has given me great academic motivation. Furthermore, even in "paradise" life has its good and not-so-easy moments. And living these in Aruba has taught me a lot about myself and about the beauty of counting on and sharing this journey with amazing people. Masha danki Aruba.

Sustainable Water Governance: Exploring Political Factors Shaping Rainwater Harvesting Implementation in Aruba.

Marta Ramos Monzón

“If you have the right people and the right pulling systems, you can do it”

Introduction

Aruba is dedicated to sustainability, and the government of the island has committed to implementing the SDGs on a national scale. The visions of the government are “sustainable economic growth, a robust social welfare system, a strong focus on the marginalised in society, all the while in balance with the protection of the island’s natural resources in order to improve the wellbeing of its citizens and align with the SDGs” (Overheid van Aruba, 2024). To make this vision a reality, it has set the objective of further shaping policy sustainably and strengthening implementation (Overheid van Aruba, 2024).

Water is an important sustainability challenge on the island, and it is addressed in SDG 6 on clean water and sanitation, as well as SDG 14 on life below water. The sources of freshwater, including rain and groundwater are limited due to the island’s arid climate (Van Sambeek et al., 2000). The seasonality of rain makes this resource intermittent which reduces its availability. This can be worsened by climate change (Kaidou-Jeffrey et al., 2018). Furthermore, the island’s past of natural resource exploitation during colonial

rule disrupted the natural vegetation and water resources processes (Derix, 2016). These two freshwater sources, rain and groundwater, were the main resources used in the past for all purposes. However, since the beginning of the 20th century desalinated water was introduced as a new water resource for potable and non-potable purposes (WEB Aruba N.V. | *Water- En Energiebedrijf Aruba N.V.*, n.d.). Water desalination expanded and became the main supply of freshwater for all uses on the island, providing drinking and industrial water to all of the island. However, this supply has come with a huge carbon footprint, as the island’s water production process is based on fossil fuels, as well as negatively impacts marine ecosystems in Aruba’s surroundings (Marchena & Halman, 2018). Furthermore, this water resource’s dependence on heavy fuel oil imports and monopoly in the supply brings vulnerability to external shocks. The water challenge is very interconnected with the food security challenge on the island. Local food production is very limited; however, the growth of sustainable agriculture is key to achieving food resilience and security, which is covered in SDG 2 on zero hunger (United Nations, n.d.). Now, water for agriculture is either supplied from desalination or freshwater sources. Relying on water supply from desalination comes with high economic costs, as explained by Cooley et al. (2006), even the lower price of desalinated water is still above the price of water typically paid in urban environments and well above the price paid by farmers.

Political institutions have a fundamental role in the navigation of these sustainability challenges and taking action to achieve sustainability goals by setting them in the agenda and putting them into practice (Jordan, 2008). Political decisions, policy-making and institutional and regulatory frameworks are essential in effectively achieving Aruba's sustainability goals. Furthermore, the political decisions that have been made in the past have shaped the challenges that Aruba faces today. Therefore, the current sustainability governance must work towards reducing the carbon footprint of the water supply, increasing resilience to crises by empowering independence of the water and food production processes, equitable and affordable water supply, and decreasing the environmental impacts of water production. Rainwater harvesting is considered one of the most sustainable water supplies by Rahman et al. (2014) and thus can contribute to tackling some of the previously mentioned sustainability challenges. Water management, and specifically rainwater harvesting on the island, can be influenced by political decisions, policy-making, regulatory frameworks and other political factors. However, there is a gap in research on these influences in Aruba's rainwater management. Therefore, this paper aims to provide an overview of what barriers and challenges shall be considered in the governance of sustainable water management, by specifically presenting these factors that may influence the implementation of rainwater harvesting in Aruba. To achieve this aim, the following main research question will be answered: *How do past and present political factors influence the implementation of RWH systems in Aruba?*

The paper is structured as follows: first, a methods section explains how the data is collected and analysed. Then, the theory section introduces the relevant concepts and literature. After this, the results are presented, followed by a discussion and conclusion as the final section, including a reflection on the methods and results, together with suggestions for further research.

Methods

In order to answer the research question and sub-questions, a combination of methods was used, including a literature review, a survey and interviews. This is possible as this paper is written in alignment with the Consultancy Project which advises Santa Rosa, the Department of Agriculture, Husbandry and Fisheries (DLVV), on the wider political, environmental, and socio-economic factors shaping rainwater harvesting in Aruba. A literature review was used to gather knowledge on the context of water supply in Aruba and to build the theory for creating a conceptual framework. For this, the main search engine used was Google Scholar and WorldCat and journal articles and reports were analysed. Some of the main search terms involved were "water management", "political determinants", and "water supply in Aruba". This analysis allowed for the determination of the most relevant political influences in a policy implementation process, which in turn allowed to build a conceptual framework that was used then to analyse the current implementation of rainwater in Aruba from a political perspective. This analysis was based on the information obtained from the survey and interviews carried out for the Consultancy Project. Some of the survey questions relevant to this paper concerned the societal opinion on RWH and the perceptions of political support and barriers. For instance, "*What are existing barriers for you or other people to collect rainwater?*", "*Opinions on rainwater harvesting*", and the opinion statement: "*The government should initiate rainwater harvesting system implementation (policies, financial support, etc.)*". The semi-structured interviews aimed at understanding in-depth the perspectives of the past and present political influences on RWH on the island from the different sectors: governmental departments, consulting engineers, a farmers' organisation, a general citizen and farmer, and the hotel industry. Some of the questions asked were: "*What are the political challenges of RWH system implementation?*", "*Do you think there are any conflicting interests from the government in supporting*

RWH?”, and “Do you think the government should support more RWH? If so, in what way?” Then, data analysis for the interviews was carried out with the software NVivo, as suggested by Bryman (2012), and classified into codes, which correspond to the selected factors developed in the conceptual framework.

Theory

Water management

The implementation of rainwater harvesting, from a political perspective, is part of the concept of water resources management. This is defined as “*measures taken to ensure an adequate supply of water and a responsible utilisation of water resources*” by *UNEP Law and Environment Assistance Platform* (n.d.). Literature that places water management in the context of climate change and sustainability transitions, highlights the importance of including flexibility in water management to be able to deal with the uncertain changes and challenges that adapting to the climate crisis context may bring. It is also recommended by Bouwer (2000) that an integrated water management approach is taken, where all the relevant factors of this transition are taken into account in the process of decision-making, which is advocated particularly for agricultural water management.

Rainwater Harvesting

Literature on the development of rainwater harvesting globally, shows that currently in many countries RWH is not only considered a viable decentralised water source but also that RWH is practised as a sustainable development strategy (Yannopoulos et al., 2019). Nonetheless, the extended use of this water resource is limited and faces some challenges that need to be overcome in a combined effort by research, financial support, education, legislation, and regulations (Yannopoulos et al., 2019). Specifically for dry climates like Aruba, the climatic vulnerabilities posed by climate change not only affect the rain patterns but also the natural recharge of groundwater, which shows the

interconnection between these two resources. The study by Bouwer (2000) suggests increasing the water storage capacity and long-term availability during periods when water is more abundant to deal with climatic extremes and changes.

RWH Implementation determinants

The importance of political factors’ influence in the management of rainwater harvesting cannot be overlooked. This is supported by the literature on the analysis of factors affecting governance reforms across different countries, where it is stated that the implementation of successful governance reforms can be frustrated if political factors are not considered properly (Robinson, 2007).

Results

The report on Integrated Water Resources Management in the Caribbean: The Challenges Facing Small Island Developing States (2014) highlights the importance of legislation. The drafting and adoption of legislation is identified as a key element for the improvement of water governance, adding that this contributes to having a facilitating environment and establishes an institutional framework. The survey and interviews indicate that legislation has a significant impact on water resources management. From a historical perspective, it especially affected rainwater harvesting, as the legislation established in the 1960s prohibited the construction of “regenbakken” (traditional rainwater cisterns) in new houses (Interviewee 1, personal communication, March 14, 2024). This legislation had strong impacts on the practices of rainwater collection, as during this period the population of Aruba grew exponentially and the number of houses constructed increased greatly, while the practice of household RWH abruptly ended. As a consequence, most new houses do not have RWH systems, the traditional “regenbakken” (Interviewee 1, personal communication, March 14, 2024); (Interviewee 7, personal communication, April 2,

2024). In 2008 this legislation was annulled (Interviewee 1, personal communication, March 2024), despite this, the survey reveals that the effects of this prohibition are still visible nowadays. For example, in response to the question “*What are existing barriers for you or other people to collect rainwater?*”, the lack of building RWH infrastructure in the construction of their households was given. In addition, 3 out of the 101 survey respondents, as well as several interviewees, are not aware that this prohibition is not in place anymore nowadays. This also shapes the societal consideration of implementing RWH today.

Furthermore, a study on the determinants of policy-making and implementation in Bangladesh carried out by Aminuzzaman (2013) identified donor support and conditionality, political will, professional skills of the public bureaucracy, and resources and supportive regulatory frameworks as factors to assess this influence. Aminuzzaman concludes that the determinants that have a stronger ability to influence the policy processes are the first three. Similarly, Quinn (1973) describes limited jurisdiction, planning responsibilities and operational responsibilities integration as institutional and political factors that affected water management in the Upper Wabash Basin. In the interview with the representative of a governmental department conducted in the framework of this research, political will was identified as a barrier to translating the measures related to RWH that are in the planning phase into real implementation (Interviewee 2, personal communication, March 22, 2024).

Robinson (2007) carried out a comparative analysis of nine cases of governance reforms in Brazil, India and Uganda, and also identified several factors that affected a reform. One of them is political commitment from the higher levels of the government, described as important to have a more successful implementation and diffuse resistance. The timing and sequencing of reforms is another factor categorised as key to having a successful reform. This was

confirmed by one of the interviewees from a governmental department when asked if there was a possibility for political support for larger RWH implementation. The answer was “If you have the right people and the right pulling systems, you can do it” (Interviewee 2, personal communication, March 22, 2024).

Bureaucratic technical capacity and societal pressures are other factors identified by Robinson (2007). These were also present in the interview answers of a representative of a governmental department: “The more support you have from the local people, the more likely it is put on the agenda” (Interviewee 2, personal communication, March 22, 2024). Bureaucracy was also discussed, explaining that the legislation is a considerably slow process in Aruba and counts with a reduced number of workers compared to other countries (Interviewee 1, personal communication, March 14, 2024). The potential for societal pressure for RWH implementation in Aruba depends on the citizens’ perception and opinion on the water resource. It has been found that 52 out of 101 participants of the survey collect rainwater in their households. The majority of the respondents think rainwater harvesting could bring them benefits, so there is a generally positive opinion on this water resource within our population sample. For the respondents, these advantages mainly concern a decrease in the water bill, or a decrease in the use of desalinated water, and finally, respondents state that rainwater is beneficial for plants. This last observation is related to the finding that the most common use of rainwater is in agriculture and gardening. Looking into the different stakeholders’ potential support for rainwater harvesting, it has been found that the governmental departments DOW and DNM support rainwater collection. The interviewee representing the hotel industry explained that, in their hotel there is currently a process of installing rainwater collection systems, and believes this water resource can be useful for non-potable purposes (Interviewee 6, personal communication, April 2, 2024). Adding to this, a

report on Integrated Water Resources Management in the Caribbean describes that to have the support of water sector bureaucrats and professionals to act as agents of change, incentives are needed. It is explained further that the explicit support of government administrative processes is key to creating change in the water sector (Global Water Partnership, 2014).

Discussion and Conclusion

To answer the research question: *How do past and present political factors influence the implementation of RWH systems in Aruba?* several political factors that influence water management have been identified through a literature review, a survey, and interviews. The determinants most mentioned in both literature and fieldwork can be grouped into: legislation, political will, bureaucracy, and societal pressure. Therefore, the relevance of these is supported by a wide range of studies carried out regarding governance in the Caribbean and globally and the input of these studies was contextualised for Aruba by the interviewee's experiences.

To further interpret the influence that these identified political and governance factors have on the implementation of Rainwater harvesting, they can be analysed as barriers and opportunities. The political determinants that may be identified as barriers in the context of Aruba include legislation, bureaucracy and political will. The 1960s prohibition of new houses with "regenbakken" caused a drastic reduction in the collection of rainwater practice and capacity, and nowadays, it still hinders the society's consideration of RWH implementation, as some citizens still consider that this is not allowed, there is a lack the infrastructure in their households, and have unlearned how to harvest rainwater. Bureaucracy and political will hinder the measures in the planning stages to reach the implementation phase. Moreover, the determinants that may be identified as opportunities for political support of

RWH implementation in the context of Aruba are societal pressures. The survey revealed the general support for RWH systems and implementation in the participants' households and farms. With an increase in this support, societal pressure can favour the implementation of rainwater harvesting.

This research has provided valuable insights that can be taken into consideration by policy-makers and civil society that want to know the factors that can influence the implementation of rainwater harvesting. However, more extensive research would lead to more in-depth knowledge of the effects that these political factors have. The population sample can be enlarged and using random sampling methods would allow for a higher representation of the Aruban society. In addition, this research can be combined with the study of other relevant factors that can also have an influence on water governance, like environmental or economic determinants.

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