### Water Scarcity in Madagascar

#### Background

#### 1.1 Background and Status of the Crisis

Madagascar, an island nation off the southeastern coast of Africa, faces a severe water scarcity crisis compounded by climate and the influence of government policies. Renowned for its exceptional ecological diversity and unique flora and fauna, Madagascar's distinctive geographic characteristics place it at the forefront of climate-related challenges. The island's rich biodiversity has earned it the title of a global biodiversity hotspot, making it not only an ecological wonder but also highly susceptible to the impacts of climate change.

Madagascar's environment poses a severe water scarcity crisis that goes beyond the usual resource challenges. Climate change, marked by rising temperatures, shifting rainfall patterns, and the increasing frequency of extreme weather events, has intensified the nation's vulnerability to water-related crises.<sup>1</sup> Coastal cyclones, sea-level rise, and climate-induced floods cast a shadow over the country's water security, affecting both urban and rural areas, particularly in urban centers like Antananarivo, where aging water processing and sanitation infrastructure have struggled to cope with the increasing demands.<sup>2</sup> The human cost of the water scarcity crisis in Madagascar is starkly evident. Consecutive years of failed rains have given rise to the worst drought since 1981, leading to a devastating impact on agriculture, with this year's harvest of crops such as rice, maize, cassava, and pulses expected to be less than half the five-year average, according to the World Food System.<sup>3</sup> This has had a devastating impact on food security, with millions of people at risk of hunger. The crisis has also had a significant impact on health, which has led to an increase in waterborne diseases like diarrhea, especially among children.<sup>4</sup>

<sup>&</sup>lt;sup>1</sup> United Nations. "Water – at the Center of the Climate Crisis | United Nations." *United Nations*, www.un.org/en/climatechange/science/climate-issues/water.

<sup>&</sup>lt;sup>2</sup> <u>'Life Brought Me Here.' Madagascar Adapts to a Changing Climate - The New York Times,</u>

https://www.nytimes.com/2022/11/17/world/africa/madagascar-climate-change-drought-cyclone html <sup>3</sup> Southern Madagascar at risk of famine amid worst drought in 40 years.

https://www.climatechangenews.com/2021/05/13/southern-madagascar-risk-famine-amid-worst-drought-40-years/

<sup>&</sup>lt;sup>4</sup> Bringing Safe, Clean Water and Better Sanitation to Madagascar | UNICEF USA

The Madagascan government has taken some steps to address the water scarcity crisis, such as The National Water Project (NWP).<sup>5</sup> However, more must be done to ensure sustainable water access for all. Government policies ought to focus on improving water resource management, investing in water infrastructure, and educating the public on water conservation. It is also important to consider the needs of marginalized communities, who are often disproportionately affected by water scarcity. Therefore, this research examines the extent to which government water policies in Madagascar impact community water habits with the goal of promoting a more sustainable future. It delves into the intricate web of government policies and their outcomes, with a focus on the experiences of marginalized communities. By unraveling the policy landscapes and assessing their effectiveness, this study aims to identify opportunities to improve climate preparedness, ensure sustainable water access, and mitigate the dire consequences of water scarcity in Madagascar.

#### 1.2 Discussion of Key References and Their Limitations

In our research to explore the interconnection between water scarcity, community habits, and government policies in Madagascar, we examined three key references provided to us: McArthur, Amar Bhattacharya, Homi Kharas, Mertz, et al., and Al-Zu'bi. These references, while informative in their own right, collectively shed light on certain limitations that are pertinent to our research focus on the impact of government policies on water resource management and clean water access in Madagascar.

Each of these references offers valuable insights into the challenges developing nations face and their vulnerability in the context of climate change. McArthur, Amar Bhattacharya, and Homi Kharas emphasize the vulnerabilities of emerging markets and developing economies (EMDEs) and their need for support from advanced economies. <sup>6</sup> Mertz et al. stress the importance of adaptation strategies in developing countries. <sup>7</sup> Al-Zu'bi's work highlights the need for intersectoral approaches in climate change governance. <sup>8</sup> However, when considering

<sup>&</sup>lt;sup>5</sup> Madagascar: \$220 Million to Improve Basic Water and Sanitation Services and Supply

<sup>&</sup>lt;sup>6</sup> Why developing country voices will shape the global climate agenda | Brookings,

https://www.brookings.edu/research/why-developing-country-voices-will-shape-the-global-climate-agenda/

 <sup>&</sup>lt;sup>7</sup> Adaptation to Climate Change in Developing Countries | SpringerLink, https://doi.org/10.1007/s00267-008-9259 3

<sup>&</sup>lt;sup>8</sup> Jordan's climate change governance framework: from silos to an intersectoral approach | SpringerLink, https://doi.org/10.1007/s10669-016-9602-9

our specific case study in Madagascar, these references collectively fall short in addressing the intricate relationship between government policies, water resource management, and clean water access. None of the references directly address the impact of government policies on these critical aspects in Madagascar. Their discussions, while relevant in a broader context, do not delve into the local dynamics and concrete policy actions taken by the Madagascan government to mitigate climate-induced water scarcity and improve access to clean water.

These limitations underscore the significance of our research, which aims to provide a focused examination of Madagascar's unique challenges concerning water scarcity, community action, and government policies. We will explore a specific government policy in Madagascar and its effects on community water consumption habits, water resource management, clean water access, and their broader implications for climate adaptation. By doing so, we aspire to bridge the existing gap in the literature and contribute to a more comprehensive understanding of the multifaceted water and climate challenges faced by Madagascar.

#### **Literature Review**

During our initial literature review, we understood that the aforementioned three sources did not address the specific country we wished to focus our research on to analyze trends of climate-related impact. Therefore, we sought out several new literature sources that address Madagascar and analyzed data regarding water sustainability within the country.

Our literature review addresses and analyzes the hazardous results of climate change on the island of Madagascar. Madagascar's position as an island in the southern part of the Indian Ocean off the coast of Africa offers a unique set of circumstances and conditions that make Madagascar vulnerable to climate change. This is compounded by the fact that Madagascar has an environment "favorable to the development of fauna and flora that are most unique in the world."<sup>9</sup> This situation means Madagascar is at a higher risk for climate change-related consequences and disasters than most countries worldwide.

The first article we analyzed, *A detailed study of climate change and some vulnerabilities in Indian Ocean: A case of Madagascar island*, seeks to address and measure the impact of

<sup>&</sup>lt;sup>9</sup> Modeste Kameni Nematchoua et al., "A Detailed Study of Climate Change and Some Vulnerabilities in Indian Ocean: A Case of Madagascar Island," Sustainable Cities and Society 41 (August 1, 2018): 886–98, https://doi.org/10.1016/j.scs.2018.05.040.

various climate-related phenomena across multiple regions and situations within Madagascar, providing empirical data to show the "instability and vulnerability of Madagascar in the face of climate change" and how the conditions have worsened for the environment, the population, and the region.<sup>10</sup> This provides much of the empirical data we can utilize to demonstrate the effects of climate change, including the effects on water sustainability within Madagascar and how it can vary across multiple regions on the island. However, for the purpose of our study, it fails to provide sufficient policy examples of how Madagascar has attempted to mitigate these effects, allowing us more room to explore alternative research for policy documentation.

The second article, *The Impact of Rainfall on Drinking Water Quality in Antananarivo, Madagascar*, provided an in-depth study of the deterioration in water quality in the capital city of Madagascar, Antananarivo. The article addresses "between rainfall patterns and microbial water quality," especially within a relatively poorly developed city such as Antananarivo.<sup>11</sup> This literature is key in providing an empirical observation of how the quality of water, impacted by climate (through rainfall) can have consequences for the country's population. This can better give us information on how to quantify the change in water through various mediums. However, it does not describe any policies the Madagascar government, or the city government, have taken to mitigate or solve this issue. It also fails to address what potential actions or input the community of Antananarivo has expressed or how they have been impacted by changes in water quality. This will also give us room to explore potentially more refined and focused policy documentation implemented to mitigate these climate-related issues.

Overall while our literature provided the key data we can use to move forward for empirical analysis, these cases fail to address which policies the Madscagan government has used or any survey data from the local populace of Madagascar and how changes in water quality have impacted them. This highlights the gap in our research which we will need to address going forward to answer our research question. Given these understandings of our references and what they failed to address, this led us to our final research question: *How do community voices and government policies impact water scarcity in Madagascar*? By exploring this question and topic,

<sup>&</sup>lt;sup>10</sup> Modeste Kameni Nematchoua et al., "A Detailed Study of Climate Change and Some Vulnerabilities in Indian Ocean: A Case of Madagascar Island," Sustainable Cities and Society 41 (August 1, 2018): 886–98, https://doi.org/10.1016/j.scs.2018.05.040.

<sup>&</sup>lt;sup>11</sup> Bastaraud, Alexandra, et al. "The impact of rainfall on drinking water quality in Antananarivo, Madagascar." PloS one 15.6 (2020): e0218698.

we aim to provide valuable insights and recommendations for furthering progress in mitigating Madagascar's water crisis.

#### **Conceptual Framework**

After reviewing the existing research surrounding the influence of water scarcity on Madagascar's climate preparedness, as well as the gaps within that research, we propose our research can expand the knowledge of the subject using the following conceptual framework, displayed in *Figure 1.1*. We will be using this framework to investigate our proposed hypothesis: *Government water policies and community water habits decrease the level of water scarcity in Madagascar*.



*Figure 1.1*: Causal pathway between Government Water Policies, Community Water Habits, and their influence on Water Scarcity.

This theoretical framework was derived from the Nematchou, et al. 2018 and Bastaraud, et al. 2020 studies included in the literature review, where results indicated a cyclical relationship between the implementation of government water policies and the level of water scarcity.<sup>12</sup> This study will focus on expanding that theoretical understanding to include the influence of

<sup>&</sup>lt;sup>12</sup> Bastaraud, Alexandra, et al. "The impact of rainfall on drinking water quality in Antananarivo, Madagascar." PloS one 15.6 (2020): e0218698.

Modeste Kameni Nematchoua et al., "A Detailed Study of Climate Change and Some Vulnerabilities in Indian Ocean: A Case of Madagascar Island," Sustainable Cities and Society 41 (August 1, 2018): 886–98, https://doi.org/10.1016/j.scs.2018.05.040.

community water consumption habits throughout Madagascar, both how they are affected by government water policies and how they influence nationwide levels of water scarcity. This piece of the causal pathway has not been specifically defined in the existing literature, but further study on it has been broadly recommended by the academic field surrounding this issue. In order to define the correlations between how government policies determine community water habits, a section of our data collection surveys will ask respondents to identify their awareness of government water restrictions/conservation policies and describe how these policies have influenced their water consumption within the last two years. In order to define the correlations between community water consumption and overall levels of water scarcity, a section of our data collection surveys will ask respondents to describe their perceived difficulty in accessing safe drinking water, and also compare this difficulty to what they experienced two years prior. Following this model will allow us to hone in on the role that community habits play within the larger cycle of water policies and water scarcity.

The nation of Madagascar already faces significant climate vulnerabilities as a result of its location, geographical characteristics, and poor climate infrastructure.<sup>13</sup> Madagascar's unique position as a large island off the Southeastern coast of Africa makes it highly vulnerable to coastal cyclones, sea level rise, and climate-related floods (*Figure 1.2*).<sup>14</sup> Each of these environmental challenges contributes to rising water insecurity in Antananarivo and the surrounding towns with water processing and sanitation capabilities. While various government policies have been implemented by the government of Madagascar in response to these risk factors, our study will use one of these policies as a central case study.

<sup>&</sup>lt;sup>13</sup> World Bank Group, "Madagascar: \$220 Million to Improve Basic Water and Sanitation Services and Supply," World Bank, June 20, 2022.

<sup>&</sup>lt;sup>14</sup> "World Bank Climate Change Knowledge Portal," n.d.

Average Annual Natural Hazard Occurrence for 1980-2020



Figure 1.2: Percentage of Annual Hazard Occurrence in Madagascar, 1980 - 2020.

Within our theoretical framework, we will use Madagascar's National Water Project (NWP)<sup>15</sup> as a case study for a nationwide government policy focused on water infrastructure and conservation. The NWP is a nationwide \$220 million initiative aimed at improving water security in Antananarivo and other cities across Madagascar, with a secondary focus on climate resiliency and emergency response.<sup>16</sup> As part of the project, the NWP aims to repair over 700 water wells across Madagascar that are currently in various states of disrepair.<sup>17</sup> Our aim with this portion of the framework is to measure how water scarcity has changed in Madagascar since the implementation of the NWP, as well as the influence the NWP has had on individual water consumption habits. Existing studies have failed to demonstrate the causal connections between the implementation of the NWP and its effect on water consumption at the community level. In our analysis, we intend to use the NWP as an example of a water policy that is representative of other Madagascan government policies regarding water security.

#### **IRB** and Ethical Considerations

<sup>&</sup>lt;sup>15</sup> "The Madagascar Water Project Inc - Clean Water, Poverty," The Madagascar Water Project, June 3, 2022.

<sup>&</sup>lt;sup>16</sup> "The Madagascar Water Project Inc - Clean Water, Poverty," The Madagascar Water Project, June 3, 2022.

<sup>&</sup>lt;sup>17</sup> The Madagascar Water Project, June 3, 2022.

Our research on water scarcity, community habits, and government policies in Madagascar demands a nuanced understanding of the ethical landscape. As we explore the intricate fabric of this unique environment, we must consider the multifaceted challenges associated with achieving informed and voluntary consent. Drawing insights from the "Consent to Research in Madagascar: Challenges, Strategies, and Priorities for Future Research" paper by Elysée Nouvet and colleagues, published in the Canadian Journal of Bioethics, we can shed light on some key considerations.<sup>18</sup>

The linguistic landscape of Madagascar presents a challenge. Being a primarily Francophone country, with Malagasy as the official language, the role of translators becomes pivotal, especially as English might not be widely comprehended, more so in rural pockets. The process of 'back-translation' will be employed, starting with English questions which will then be translated into Malagasy or French.<sup>19</sup> To ensure the sanctity of meaning, a second translator will translate these back into English. A team of 3-4 translators will be essential to ensure the consistency and accuracy of this procedure.<sup>20</sup>

However, it's important to recognize, in line with Nouvet et al.'s observations, that certain technical terms lack precise equivalents in local languages. This linguistic challenge may introduce complexity to interviews, as participants may struggle to fully grasp these technical concepts.<sup>21</sup> To mitigate this limitation, researchers, as emphasized by Nouvet and her colleagues, must proactively ensure that technical terms are explained clearly and with cultural sensitivity during interviews. This may involve simplifying language or providing practical examples to enhance participants' understanding while preserving research data accuracy.

Alongside language and translation challenges, cultural nuances, particularly those concerning gender, come into play. For example, some communities might view it as inappropriate for researchers of one gender to interview participants of the opposite gender. Fostering familiarity with local customs and heightened awareness of gender dynamics is crucial

<sup>&</sup>lt;sup>18</sup> Nouvet, Elysée, et al. "Consent to Research in Madagascar: Challenges, Strategies, and Priorities for Future Research." Canadian Journal of Bioethics 5.1 (2022): 36.

<sup>&</sup>lt;sup>19</sup> Bullen, Piroska Bisits. "How to Write Awesome Survey Questions - Part 1." Tools4dev, 26 Jan. 2022, tools4dev.org/resources/how-to-write-awesome-survey-questions-part-1/.

<sup>&</sup>lt;sup>20</sup> Marshall, Catherine, et al. "Managing, Analyzing, and Interpreting Data." Designing Qualitative Research, Sage, Thousand Oaks, CA, 2014, p. 210.

<sup>&</sup>lt;sup>21</sup> Nouvet, Elysée, et al. "Consent to Research in Madagascar: Challenges, Strategies, and Priorities for Future Research." Canadian Journal of Bioethics 5.1 (2022): 36.

to address this potential limitation. Our research approach includes the engagement of both male and female translators and field assistants. This proactive strategy ensures that research activities respect cultural norms and preferences while upholding ethical standards.

The influence of traditional leaders, known as "Les Chefs," in Malagasy communities, introduces a distinctive challenge to the principle of individual consent, as highlighted by Nouvet and her colleagues. Norms of respect for these leaders may require researchers to seek consent from them before approaching potential participants. The impact of leaders' approvals or refusals on individual participants' decisions remains ambiguous.<sup>22</sup> In this context, researchers in our study should approach 'chiefs' respectfully and adhere to the necessary procedures for gaining permission to conduct research and interviews within their communities.

It's worth noting that politeness norms in some Malagasy communities prioritize agreement, and participants may hesitate to decline participation when invited.<sup>23</sup> This cultural aspect can present a challenge in the context of research, as participants may be hesitant to refuse participation when invited, fearing that declining may be perceived as impolite or disrespectful. Researchers must create an environment where participants are informed of their right to decline without fear of social repercussions. This emphasizes the need for clear and transparent communication, where participants are reassured that their decision to participate or not is entirely voluntary and respected.

The study also identified widespread apprehension among people in Antananarivo about signing or consenting to anything. Foreign documents, in particular, are met with mistrust.<sup>24</sup> This skepticism, as the study concluded, traces back to historical distrust stemming from colonial government missions when outsider researchers with dishonest intentions posed risks of harm and deception, as detailed by Nouvet and her colleagues in their work.

To address the widespread apprehension in Antananarivo, and other communities, about signing or consenting to foreign documents, our study will engage in community outreach and educational activities to build trust. We will prioritize transparency, collaborate with local partners, and demonstrate cultural sensitivity. Establishing feedback mechanisms, involving

<sup>&</sup>lt;sup>22</sup> Nouvet, Elysée, et al. "Consent to Research in Madagascar: Challenges, Strategies, and Priorities for Future Research." Canadian Journal of Bioethics 5.1 (2022): 38.

<sup>&</sup>lt;sup>23</sup> Nouvet, Elysée, et al. "Consent to Research in Madagascar: Challenges, Strategies, and Priorities for Future Research." Canadian Journal of Bioethics 5.1 (2022): 36.

<sup>&</sup>lt;sup>24</sup> Nouvet, Elysée, et al. "Consent to Research in Madagascar: Challenges, Strategies, and Priorities for Future Research." Canadian Journal of Bioethics 5.1 (2022): 36.

community members, and providing information about our research's ethical conduct are essential components of our strategy. Our goal is to overcome historical mistrust and ensure that our study respects the unique cultural and historical context of the communities in Antananarivo while upholding the highest ethical standards.

Furthermore, Madagascar's infrastructure woes pose a significant impediment to our research efforts. According to World Bank data, the availability of basic infrastructure, such as electricity and digital resources, is strikingly inadequate, especially when compared to Sub-Saharan Africa as a whole. To illustrate, in 2023, a mere 33.7% of the population has access to electricity, a figure that significantly lags behind the regional average of 48.4% recorded in 2020.<sup>25</sup> The repercussions of this infrastructure shortfall are dire, with over 18 million individuals lacking electricity access, a distressing statistic that places Madagascar 13th on the list of countries grappling with the largest unelectrified populations on a global scale.<sup>26</sup>

Moreover, the World Bank data suggests that these challenges spill over into the domain of digital connectivity and broadband services. Despite some limited advancements in recent years, Madagascar continues to languish in terms of connectivity and accessibility. Internet usage has displayed a gradual uptick, with roughly 22% of the population gaining online access in 2021, compared to a meager 5.1% back in 2016. Nevertheless, this rate of penetration remains among the lowest worldwide and notably falls short of the 33% regional average observed in Sub-Saharan Africa.<sup>27</sup>

These infrastructure limitations are critical considerations for our research, particularly in the context of data storage, member communication, and online research activities. The scarcity of electricity and limited access to the internet can impede our ability to engage with diverse communities in Madagascar effectively. In response to these challenges, we are committed to employing alternative communication methods and proactive awareness campaigns to bridge the

<sup>&</sup>lt;sup>25</sup> "Madagascar Set to Expand Access to Renewable Energy and Digital Services thanks to \$400 Million Credit." The World Bank, 7 April 2023, https://www.worldbank.org/en/news/press-release/2023/04/07/madagascar-afe-set-to-expand-access-to-renewable-energy-and-digital-services-thanks-to-400-million-credit.

<sup>&</sup>lt;sup>26</sup> Madagascar Set to Expand Access to Renewable Energy and Digital Services thanks to \$400 Million Credit." The World Bank, 7 April 2023, https://www.worldbank.org/en/news/press-release/2023/04/07/madagascar-afe-set-to-expand-access-to-renewable-energy-and-digital-services-thanks-to-400-million-credit.

<sup>&</sup>lt;sup>27</sup> Madagascar Set to Expand Access to Renewable Energy and Digital Services thanks to \$400 Million Credit." The World Bank, 7 April 2023,https://www.worldbank.org/en/news/press-release/2023/04/07/madagascar-afe-set-to-expand-access-to-renewable-energy-and-digital-services-thanks-to-400-million-credit.

awareness gap and ensure that our research reaches and benefits as many people as possible in Madagascar.

From an ethical perspective, obtaining approvals from the Institutional Review Board (IRB) is an essential and non-negotiable step before commencing any research involving human subjects. The IRB plays a crucial role in ensuring that research involving human participants adheres to the highest ethical standards and follows established ethical guidelines. It is responsible for reviewing and monitoring research proposals to protect the rights, well-being, and privacy of research participants.

In the context of Madagascar, it's important to recognize that the country might have its indigenous review mechanisms in place. These indigenous review mechanisms could be specific to the local context and cultural norms. Researchers conducting studies in Madagascar should respect and adhere to these mechanisms when they exist. These mechanisms may offer additional layers of ethical oversight, tailored to the unique ethical considerations of the local community.

The inclusion of both IRB approvals and compliance with indigenous review mechanisms demonstrates a commitment to ensuring that the research is conducted ethically and in a manner that respects the local values, traditions, and ethical principles of the communities involved. This dual approach helps maintain the highest ethical standards while addressing any unique ethical considerations that may arise in the research context.

In our comprehensive study of water scarcity, community habits, and government policies in Madagascar, we recognize the intricate ethical landscape shaped by linguistic, cultural, and infrastructure challenges. Insights from Elysée Nouveta and colleagues' research underscore the importance of addressing these complexities. Our approach involves meticulous translation, clear explanation of technical terms, and a diverse team to ensure meaningful and culturally sensitive consent.

Gender dynamics and the role of traditional leaders require respect and understanding. Historical mistrust about signing documents is addressed through community outreach and transparency. Furthermore, data from the World Bank highlights the significant disparities in infrastructure, with over 18 million people lacking access to electricity and limited internet penetration. Despite these challenges, our research endeavors to navigate this terrain while upholding the highest ethical standards and respecting the unique context of Madagascar's communities.

#### Methodology

With NWP being the case study for this project, this will entail a mixed-methods approach, which includes interviews and document analysis.<sup>28</sup> Qualitative data will be collected from in-person interviews and analyzed alongside existing quantitative data on Madagascar's level of water scarcity for contextual purposes, which would be in line with an "exploratory sequential research design" as described by Creswell and Clark.<sup>29</sup> The kinds of insights we hope to draw from the interviews in particular lie within the tentative coding scheme below. Coding in general will be necessary for this project in order to conduct a fruitful relational content analysis of the interview results. This will allow us to draw patterns between the water quality and availability in Southern versus Northern towns while taking into account the weather patterns, for example. Furthermore, the questions that will be coded are the ones most fundamental in answering the research question at hand. The inductive, anticipated themes are based on the contents of the literature review. These will then be further expanded upon through "in vivo" coding in the later stages of the data collection process as sub-themes emerge from the in-person interviews.<sup>30</sup>

#### Data Collection

In terms of sample selection criteria, NWP seeks to increase clean water access in the cities and towns of Antananarivo, Antsiranana, Mahajanga, Antsirabe, Fianarantsoa, and Manakara, so stratified sampling will be utilized to interview a sample of residents from each of these cities.<sup>31</sup> Conveniently, the geographic position of the preceding cities will provide a diversity of answers, since the cities are spread all across Madagascar. For example, according to the United States Agency for International Development (USAID), Southern Madagascar is said to be more drought-prone, while Eastern Madagascar experiences higher rates of precipitation.<sup>32</sup> So, answers from Fianarantsoa (South) compared to Antsiranana (North) will allow the research

<sup>&</sup>lt;sup>28</sup> Marshall, Catherine, et al. "The How of the Study: Building the Research Design." Designing Qualitative Research, Sage, Thousand Oaks, CA, 2014, p. 103.

<sup>&</sup>lt;sup>29</sup> Creswell, John W., and Vicki L. Plano Clark. "Collecting Data in Mixed Methods Research." Designing and Conducting Mixed Methods Research, CORWIN Press INC, 2017, p. 185.

<sup>&</sup>lt;sup>30</sup> Marshall, Catherine, et al. 2014, p. 218.

<sup>&</sup>lt;sup>31</sup> World Bank, June 20, 2022.

Creswell, John W., and Vicki L. Plano Clark, 2017, p. 177.

<sup>&</sup>lt;sup>32</sup> Madagascar Water Resources Profile Overview, United States Agency for International Development, winrock.org/wp-content/uploads/2021/08/Madagascar\_Country\_Profile-Final.pdf.

team to control for the differences in climate-induced weather events experienced by different parts of the island. Additionally, this sample will ideally mimic the age, income, and gender demographics of the Madagascan population.

As for the interview itself, it will be a semi-structured, in-depth interview with a combination of open- and closed-ended questions asked in person.<sup>33</sup> The interviews will be oneon-one between an interviewer and the interviewee to eliminate the risk of answers being swayed by the presence of other people. The interviews will need to be digitally recorded in order to back-translate the responses to English for the analysis phase.<sup>34</sup> Prior to the interviews, a survey needs to be disseminated to take note of any special accommodations, but most importantly, to note the native language of the interviewee, since both Malagasy and French are the official languages of Madagascar.<sup>35</sup> We will have interviewers who can speak either Malagasy, French, or both, so the research team is not limited to a certain sample of people within each city.

Another step to take place before conducting the interviews would be to create a focus group of select people from the sample to participate in a community mapping session. According to Preston City Council, community mapping is a participatory evaluation technique "...involving residents in identifying the assets of their neighborhood, looking at opportunities and creating a picture of what it is like to live there."<sup>36</sup> In this project, a community map would give the research team an idea of the proximities between the interviewees and La Jirosy Rano Malagasy (JIRAMA) locations and the kinds of weather events that may affect where they get their water. JIRAMA is a state-run water company that distributes and manages water services in all regions of Madagascar.<sup>37</sup> It is also the same company that is being financially supported by the World Bank through the NWP.<sup>38</sup> Conducting a focus group to create a community map would essentially allow the research team to view a unique map of nearby water sources known by locals who live in each of the cities, and this map could also be utilized in the analysis phase to visualize the concentration of interviewees within each city. The outcome of the focus group

<sup>&</sup>lt;sup>33</sup> Creswell, John W., and Vicki L. Plano Clark, 2017, p. 179.

<sup>&</sup>lt;sup>34</sup> Creswell, John W., and Vicki L. Plano Clark, 2017, p. 180.

<sup>&</sup>lt;sup>35</sup> Madagascar: The Impact of Language Policy and Practice on Children's Learning: Evidence from Eastern and Southern Africa 2017, UNICEF, 2017, www.unicef.org/esa/sites/unicef.org.esa/files/2018-09/UNICEF-2016-Language-and-Learning-FullReport.pdf.

<sup>&</sup>lt;sup>36</sup> The Community Mapping Toolkit, Preston City Council, ucanr.edu/sites/CA4-HA/files/206668.pdf.

<sup>&</sup>lt;sup>37</sup> "JIRAMA." Association of Power Utilities of Africa, APUA, apua-asea.org/en/page-de-profil-utilisateur/jirama-/profil/.

<sup>&</sup>lt;sup>38</sup> World Bank, June 20, 2022.

may also lead the research team to refine interview questions if needed and solidify themes in the coding scheme, almost like the purpose of a "pilot study."<sup>39</sup>

#### Interview Questions and Coding Scheme

Background Questions:

- 1. What is your name?
- 2. What is your age?
- 3. What is the highest education level you have attained?
- 4. What is your employment status?
- 5. If applicable, what is your occupation?
- 6. What is your income (MGA biweekly)?
- 7. What neighborhood/city do you live in?
- 8. How many people live in your household, and what is their relationship to you?

Water Usage and Access Questions:

- 1. What do you use water for on a daily basis?
- 2. Who or what is your primary source of water?
- 3. Do you track your water usage?
  - a. If so, can you estimate the amount of water you use on a daily basis?
- 4. Please describe how easy or difficult it is to acquire water that is sufficient for you and your household's daily needs.
- 5. What is different from your daily water needs 2 years ago?
  - a. Please describe how easy or difficult it was to acquire water that was sufficient for you and your household's daily needs *2 years ago*.
- 6. Please describe the *current* water quality from your primary water source.
- 7. Please describe the water quality from your primary water source 2 years ago.

Policy Perception and Awareness Questions:

1. Are you aware of any government water restrictions/policies?

<sup>&</sup>lt;sup>39</sup> Marshall, Catherine, et al. 2014, p. 105.

- 2. Are you aware of the National Water Project?
  - a. If so, what do you know about the National Water Project?
- 3. To what extent government water restrictions/policies have influenced your water consumption within the last two years?
- 4. In your opinion, how has the National Water Project (initiatives) contributed to your water quality and access in your community?

Other Questions:

1. Is there anything else you would like to share about your water usage, water access, or relevant policies?

	Key Questions	Responses (Clusters/Themes) <sup>40</sup>	Sub-clusters
1	What neighborhood/city do you live in?	Antananarivo	
		Antsiranana	
		Mahajanga	
		Antsirabe	
		Fianarantsoa	
		Manakara	
2	What is your primary source of water?	Groundwater	
		River water	
		Community fountain	
		Rainwater	

<sup>&</sup>lt;sup>40</sup> Marshall, Catherine, et al. 2014, p. 221.

		Tapwater (house)	
		Other	
3	Please describe the quality of water from your primary source. (Applicable to current and two years before NWP.)	Clean	
		Dirty	
4	Please describe how easy or difficult it is to acquire water that is sufficient for you and your household's daily needs. (Applicable to current and two years before NWP.)	Easy	
		Neutral	
		Difficult	
5	Are you aware of any government water restrictions/policies?	Yes	
		No	
6	Are you aware of the National Water Project?	Yes	
		No	
7	To what extent have government water restrictions/policies influenced your water consumption within the last two years?	Influential	
		Neutral	
		Not influential	
8	In your opinion, how has the National Water Project (initiatives) contributed to your water quality and access in your community?	Big contribution	
		Neutral	
		Little to no contribution	

## Climate Change Policy Implementation in Weak Institutional Environments

#### **INTRODUCTION**

Climate change and its effects present a unique and pernicious global challenge. Just a handful of wealthy countries have contributed the majority of cumulative global CO2 emissions, while poor countries struggle to find economic development strategies that do not rely on heavy emissions. Leaders of poor countries struggle to balance the immediate concerns of poverty reduction against the persisting concerns of climate change. Adding to the difficulty, international and domestic political processes frequently set climate change aside as a "scientific," rather than "societal" issue, cutting crucial policymakers out of the loop. Amid this backdrop, global temperatures rise at a blistering pace, threatening environmental and economic stability and putting human lives in danger (Hausfather 2023).

Developing countries face a unique set of challenges in adapting to and mitigating climate change, due to limited financial and technical resources and their reliance on climate-sensitive sectors such as agriculture and commercial fishing. Their citizens tend to be poorer and more insecure, with less capacity to adapt to external shocks. Developing countries also face pressure from wealthy countries and international organizations to embrace so-called "green" development strategies.<sup>1</sup> A global approach to climate change policy accounts for the inequities among countries, tailoring its recommendations to the capabilities and debilities of each participating country.

The literature on global climate change policy asks what policy solutions are appropriate and effective to reduce global carbon emissions and prepare and protect the globe from the already-changing climate. The prescribed policy solutions are as broad and diverse as the challenges they seek to overcome. Some question whether the institutional frameworks exist to implement effective policy solutions (Ojha 2016). Many caution against the hypocrisy of wealthy countries demanding that poorer countries not exploit their own fossil fuels, and others

<sup>&</sup>lt;sup>1</sup> https://www.oecd.org/greengrowth/whatisgreengrowthandhowcanithelpdeliversustainabledevelopment.htm

recommend that international scientific experts consult with local leaders to find locally appropriate solutions (Sovacool 2016). The literature demonstrates that policy is a context-dependent endeavor (McArthur 2022, p. 14). Where the literature falls short is in producing specific policy recommendations for specific policy contexts. The next step is to move beyond merely showing *that* context matters and instead studying *where* a certain policy is most likely to be effective. This paper seeks to fill this gap and determine the most effective set of climate change policies in developing countries with weak institutional environments. Put differently, we ask: what sorts of policies are most likely to improve the climate change crisis, either by limiting carbon emissions or making communities more resilient to its effects, in countries with low quality governance? Are there effective policies that do not rely on strong institutions?

This paper begins with a review of five articles that engage the topic of global climate change policy. The articles vary in scope, but all demonstrate that developing countries' participation is essential in a global climate strategy. Then, the paper builds a theoretical framework of climate-related policy and domestic political struggles. Next, we prepare to gather qualitative data on how various climate policies perform in different institutional contexts, considering cases of success and failure. Finally, we analyze our data and evaluate which types of policies are most likely to find success before our concluding remarks.

#### LITERATURE REVIEW

The five articles we reviewed for this paper highlight the challenges of climate change policy implementation in developing and low-income countries. An underlying theme in the literature is that developing countries are crucial to the global effort to meet climate goals and that equitable pathways are central to net-zero emissions, climate adaptation, and protecting natural capital (Battacharya et al., 2022). The challenge, though, of effectively implementing climate policy in developing countries, was that such countries had low adaptive capacity to react to climate change or shore up resistance to vulnerabilities that would be exacerbated in those countries by climate change (Mertz et al., 2009).

One particular vulnerability stood out as we examined climate policy implementation in Jordan, Nepal, and Ecuador. In each of these developing countries, governance limited the success of climate policies. In Nepal, a country characterized by political unrest due to social exclusion, Ojha et al. (2015) critiques the lack of inclusion of vulnerable groups in climate policies and makes the case that climate policies must address the real world contexts of developing nations with instability in its governance. Al-zu'bi (2016) also focuses on the government and argues that successful implementation of climate policy in Jordan relies on better governance tools and improved cooperation between the government and stakeholders. Sovacool and Scarpaci (2016) examine Ecuador's failed Yasuní-ITT Initiative, which offered to leave oil underground in the Amazon rainforest in exchange for billions of dollars in international funding, flipping the oil industry on its head. The Yasuní-ITT initiative struggled in part due to friction between governmental departments and international partners, and highlighted the challenges of developing countries in balancing economic and social development with climate-friendly growth. These cases emphasize that the most effective way to prepare developing countries for the impacts of climate change is through a holistic approach that integrates climate adaptation into broader development agendas (Mertz et al., 2009).

This literature also reveals one main gap in research on this topic. The literature falls short when identifying specific government implementation strategies and effective policies that will strengthen cooperation between governments and stakeholders. Multiple authors argue that broad development agendas with climate policy implementation will prove to be the best strategy for climate adaptation, but fail to provide specific examples of such strategies. The research raises several important questions. What are the structural issues in developing countries that need to be addressed in order to effectively implement climate change policy? Which policies work in developing states with weak governance?

It is important to continue to study these issues because implementation of robust climate policies in developing and low income countries is a crucial step toward reaching climate policy goals. Furthermore, without successful climate adaptation policies in developing countries, they will soon face serious problems adapting to the impacts of climate change which will negatively impact the further development of these countries.

#### THEORY

Institutions are the established rules and norms that govern human behavior within a society (North 1990). Countries with strong institutions are better able to implement and enforce complex climate policies, which help ensure compliance and lead to long-term policy success. In contrast, countries with weak institutions struggle to address environmental challenges due to shortcomings in governance and regulation (Ionata 7-8). In this study, we focus on the countries with weak institutions. While some recent work concludes that institution-building is a necessary condition for climate policy implementation, we argue that an institution-first model ignores the importance of policy design (Khan 2020, p. 9-10). Instead, we show how policy design is a crucial mediating factor between institutional strength and policy outcomes.

Institutions with strong bureaucratic characteristics exhibit a clear hierarchy, well-defined roles and responsibilities, and a rule-based system of governance (Weber, 1947, p. 333-334). These organizations prioritize the application of impersonal rules and procedures to achieve efficiency and consistency in decision-making processes. Institutional strength, therefore, refers to the capacity of an institution to establish and maintain such a rational-legal authority, facilitating the implementation of policies, the enforcement of regulations, and the execution of functions with consistency and predictability. We follow Fakuda-Parr and define institutional strength as "the ability to perform functions, solve problems, and set and achieve objectives" (2002, p. 8).

Countries with weak institutions struggle to develop effective public policy (Spiller & Tommasi 2003, Levitsky & Murillo 2009, p. 125). Weak institutions are comparatively less capable of policy implementation and enforcement and suffer from a lack of technocratic expertise that is necessary to steer complex policies. Specifically, our study focuses on countries where the public bureaucracies charged with economic management, environmental protection, and social welfare are poorly funded and historically politicized. This includes regulatory, legal, and judicial institutions. We restrict our universe of cases to countries where these institutions are weakest and ask: what policy designs are most likely to be effective given severe institutional constraints?

Policies are not random, and some are more likely to succeed than others because of their design. We expect that climate change policies that consider autochthonous challenges and opportunities are more likely to succeed than policies that are simply copied from one environment to another. Our goal is to identify the best policy designs for countries with weak institutions. Countries with weak public institutions face a different set of challenges to policy implementation than countries with historically strong and capable public institutions. Skocpol (1985, p. 7), following Weber's conceptualization of the state, writes that "administrative and legal" organizations are at the "core of any state." We agree with this view and argue that the state's administrative and regulatory bureaucracy is crucial for implementing effective climate change mitigation and adaptation policies. But when state capacity falls short, what policies are most likely to be successful? This question vexes global climate policy experts and is the core of our research agenda.

To show that we have a basis for comparison, we will assess the impact of climate policies on carbon emission reduction, increased adaptive capacity, and any improved environmental conditions using metrics such as mortality rates, crop yields, and infrastructure improvements. We will compare these measurable outcomes to the stated goals of the policy at the time of its implementation. A policy that meets or exceeds its stated goals will be considered successful, while a country that fails to meet most of its stated goals will be considered a failure. We will conclude the study by developing our theory of change utilizing the lens of the local context and stakeholders and develop a theory of how these policies (carbon reduction, adaptive capacity, and improved environmental conditions) have worked and which policies are the most effective in the developing nations with weak institutional structures.

Effective climate policies in developing countries require a holistic approach that integrates adaptation and mitigation efforts to build resilience, considering local governance quality and the required institutional capacity-building efforts. Climate resilient development strategies contribute to both mitigation and adaptation efforts. The impact of governance quality on local-level adaption is significant, emphasizing the need for context-specific policies. Measurable outcomes and well-defined theory are crucial for comprehensive policy assessments.

#### **RESEARCH DESIGN**

To understand the complexities of policy implementation in weak institutional environments, we use paired case studies with elite interviews. We compare a successful case of policy implementation with a failed case, holding constant confounding variables. We then interview

policymakers to elucidate the policy selection and implementation process. This design allows us to identify the policy design elements that contribute to success.

We use a most similar systems (MSS) design in our case studies. This design, based on John Stuart Mill's Method of Difference, holds all variables constant except for the variable of interest (Przeworski and Teune 1982). Logically similar to the large-N method of matching, MSS designs depend on identifying cases that are as similar as possible, except that they differ along the independent variable (Seawright and Gerring 2008). In practice, it is difficult or impossible to find truly identical cases. However, cases that share similar histories, relative economic parity, and close political affinity are generally good candidates for most MSS case studies. Conversely, cases that differ along a theoretically relevant confounding variable are not suitable for MSS design. In our study, we study climate change policy implementation in two similar countries. In one country, the policy was successful, and in the other, it failed.

When analyzing the policy provisions of our case studies we will identify common objectives for good climate governance and consider whether each case applies these objectives. The field of climate governance is broad and there is a deep variety of literature. However, most agree that there are four main objectives for effective environmental governance success. Environmental policies should be; effective, equitable, responsive, and robust (Bennett and Satterfield 2018). When analyzing the policy texts we will determine the effectiveness by looking for certain attributes: clear direction, coordination, capacity, information availability, and accountability. In evaluating the equitability of these policies we will focus on whether the policies are; inclusive, participatory, fair, and just. Additionally, to determine the responsiveness of the policy. Lastly, to evaluate the robustness of the policy we will look at whether the government policies and institutions are legitimate and connected. As well as whether the primary institution is nested in a government decision-making authority while also being decentralized for institutional diversity.

Interviews of elite policymakers will help explain the policy selection and implementation process and assist in identifying why the climate policies succeeded or failed. They help elucidate the "black box" of causality by revealing the mechanisms that link the independent and dependent variables (Falleti and Lynch 2009; Gerring 2008). Interviews with those that helped

select the policy provide a check against the alternative explanation that a third, "hidden" variable explains both the choice of policy and its outcome.

#### DATA COLLECTION, INSTRUMENT DESIGN, CODING, & DATA ANALYSIS

The countries selected for our paired case studies are countries with weak institutions, with low stability and low enforcement of institutions (Levitsky and Murillo 2009). Countries with low stability experience more frequent changes to institutions (such as formal rules) compared to other similar countries. Enforcement refers to the practical behaviors associated with rules: whether they are enacted, enforced, or ignored. To conduct our research for the paired case studies, we will collect and analyze news articles, policy documents, and economic and/or climate data documenting the outcomes of the climate policy. Policy documents and economic or climate data before and after the policy implementation will be compared and analyzed to understand the conditions under which the policy was implemented and to evaluate the effectiveness of the climate policy. Since our research primarily concerns weak institutional governments, qualitative analysis of the institutional environment will be necessary to understand the context under which the policy was implemented.

Interviews will be conducted to supplement the policy documents and quantitative data gathered. Interviews will be conducted with policymakers directly involved with the design, selection, and implementation of the policy, focusing on policymakers' efforts to gain financial, political, and popular support for the policy, the challenges faced by the policymakers, and on their efforts to mitigate those challenges. One-on-one interviews will be conducted with open- and close-ended questions tailored to the participant. Interviews will be recorded, translated, and transcribed.

#### **Interview Questions**

- 1. What drove your interest in developing this environmental project?
- 2. What did you hope to achieve with this project?
- 3. Were you driven by any or all of the pressures of a need to improve the environment,
- politics, economics, widespread approval, or other forces we have not accounted for?
- 4. How heavily did any of these considerations weigh your decision to proceed with the project?
- 5. What factors led to the decision to pursue this specific project?
- 6. What were your feelings about the project before it began?

7. What obstacles did you encounter during the operation of the project? If the project is still active, what obstacles have you encountered?

8. What were the specific results of the project?

9. What would you have done differently, given a second chance to develop another

environmental project?

#### Figure 1: Questionnaire for semi-structured interviews

We designed our questionnaire to elicit responses from selected national elites on their opinions regarding the selection, the process, challenges faced, and the assessment of environmentally focused projects supported in their region. Considering their societal position or involvement in the project reviewed, elites will be selected. The potential list of interviewees could include national political leaders, local community leaders, project managers, developers, environmental activists, and any additional key figures in the decision or execution of the project in question.

For the coding process for the interviews, there are several themes we are expecting to develop in the answers: Working with other countries, political motivations and outcomes, costs and economic benefits. The actual themes that develop will come from the coding process of responses. We will be coding for patterns, and looking for any overlapping of responses from interviewees from both countries. The coding process will take the work of at least two people. Having more than one person work on the coding will help improve the quality of codes, help counteract bias from an individual, and bring in creative perspectives to the coding cycles.

Before the first cycle of coding, we will highlight phrases in responses that stand out as surprising, powerful, or controversial. We will start doing this right after the interviews have been transcribed and translated, because we want to keep in mind how long we will remember the experience of interviewing the key figures. We will also explain any key acronyms as needed and make language clear. The first cycle of coding will be taking responses and coding to describe responses in short phrases, and the second cycle will shorten the phrases.

The second cycle coding method will be pattern coding, because it is suitable for interview transcripts, and evaluation coding because the interview is about the "merit and worths of the program or policy" (Saldaña 2009, p. 102). After the second cycle of coding, we will start to put together categories and subcategories by grouping codes. Theming will happen after the coding cycles. After coding, we can reflect and pull out the codes that stood out the most from answers to questions.

Data collected on the countries before and after the policy implementation will be analyzed to determine to what extent goals were met, and if goals were met partially. In analyzing the case studies and interviews, we will codify the data into different categories and each case will receive a score from 1-5. A score of 5 will represent the top score representing policy success in the category, and 1 representing no success in the category. Since the coding process is cyclical, we will go through the coding of responses more than once. Success will be evaluated based on the average score of the interview in each category, an average score above 3 will be evaluated as a successful implementation whereas an average score below 3 will be considered a weak implementation of the policy.

The research will be conducted with subject stakeholders in two countries. We will speak with policymakers, political leaders, and other individuals that took part in selecting, designing, and implementing the policies examined in our paired case studies. The protection of individuals participating in this study is paramount. Using the method of in-person one-on-one interviews is considered a minimum risk; that does not mean there is no risk for our team to mitigate. The interviews conducted during this study will be in person subjects known to the researchers. Subjects will be over the age of 18, will have signed an informed consent waiver in a language that the subject understands, and will have had the opportunity to review and have any questions addressed to the satisfaction of the subject. Names of the participants will not be published.

Before the interviews are conducted, translations of the informed consent waivers will be confirmed for their accuracy by two independent vetted sources. This will ensure the waiver uses easily understandable language to concisely explain the study and emphasize that participation is voluntary. Data collected will be stored on a dual verification platform, tracked to identify researchers' times of entry of data and any replication or sharing of the data.

#### References

- Al-Zu'bi, M. Jordan's climate change governance framework: from silos to an intersectoral approach. *Environ Syst Decis* 36, 277–301 (2016). <u>https://doi.org/10.1007/s10669-016-9602-9</u>
- Bennett, NJ, Satterfield, T. Environmental governance: A practical framework to guide design, evaluation and analysis. *Conservation Letters*. 2018; 11:e12600. https://doi.org/10.1111/conl.12600
- Fukuda-Parr, Sakiko, et al. Capacity for Development: New Solutions to Old Problems. United Nations Development Programme, 2002.
- Falleti, Tulia G, and Julia F Lynch. 2009. "Context and Causal Mechanisms in Political Analysis." *Comparative Political Studies* 42(9): 1143–66. http://cps.sagepub.com (October 22, 2018).
- Gerring, John. 2008. "Review Article: The Mechanismic Worldview: Thinking inside the Box." *British Journal of Political Science* 38(1): 161–79.
- Hausfather, Zeke. 2023. "I Study Climate Change. The Data Is Telling Us Something New." The New York Times. https://www.nytimes.com/2023/10/13/opinion/climate-change-excessive-heat-2023.html.
- Ionita, Sorin. Poor Policy Making and How to Improve It in States with Weak Institutions. International Policy Fellowship Program Open Society Institute, July 2006.
- Levitsky, Steven, and María Victoria Murillo. 2009. "Variation in Institutional Strength." *Annual Review of Political Science* 12(1): 115–33.
- McArthur, Amar Bhattacharya, Homi Kharas, and John. "Why Developing Country Voices Will Shape the Global Climate Agenda." *Brookings*, 27 July 2022, <u>https://www.brookings.edu/research/why-developing-country-voices-will-shape-the-global-cli</u> <u>mate-agenda/</u>.
- Mertz, O., Halsnæs, K., Olesen, J.E. *et al.* Adaptation to Climate Change in Developing Countries. *Environmental Management* 43, 743–752 (2009). <u>https://doi.org/10.1007/s00267-008-9259-3</u>

- North, Douglass C. 1990. *Institutions, Institutional Change and Economic Performance*. New York: Cambridge University Press.
- Ojha, Hemant R. et al. 2016. "Policy without Politics: Technocratic Control of Climate Change Adaptation Policy Making in Nepal." Climate Policy 16(4): 415–33. http://www.tandfonline.com/doi/full/10.1080/14693062.2014.1003775.

Przeworski, Adam, and Henry Teune. 1982. The Logic of Comparative Social Inquiry.

Saldaña, Johnny. The coding manual for qualitative researchers. 1st ed. London: SAGE, 2009.

- Seawright, Jason, and John Gerring. 2008. "Case Selection Techniques in Case Study Research: A Menu of Qualitative and Quantitative Options." Political Research Quarterly 61(2): 294–308.
- Skocpol, Theda. 1985. "Bringing the State Back in: Strategies of Analysis in Current Research." In Bringing the State Back In, eds. Peter B Evans, Dietrich Rueschemeyer, and Theda Skocpol. Cambridge: Cambridge University Press, 3–37.
- Sovacool, Benjamin K., and Joseph Scarpaci. 2016. "Energy Justice and the Contested Petroleum Politics of Stranded Assets: Policy Insights from the Yasuní-ITT Initiative in Ecuador." *Energy Policy* 95: 158–71. <u>https://linkinghub.elsevier.com/retrieve/pii/S0301421516302142</u>.
- Spiller, Pablo T, and Mariano Tommasi. "The Institutional Foundations of Public Policy: A Transactions Approach with Application to Argentina." Journal of Law, Economics, and Organization, vol. 19, no. 2, 1 Oct. 2003, pp. 281–306, https://doi.org/10.1093/jleo/ewg012. Accessed 13 Jan. 2020.
- Weber, Max. The Theory of Social and Economic Organization. New York, Oxford University Press, 1947, pp. 333–334.

The University of Texas LBJ School of Public Affairs

## Jordanian Farmers & Green Transition:

An evaluation of how economic development, green technology, and the amplification of farming voices can help Jordan combat climate change

Analytical Methods for Global Policy Students

#### Introduction

Climate change is an urgent global crisis. The consequences of the rising global temperature are inescapable and cause for "increased anthropogenic intervention around the world"<sup>1</sup>. From rising sea levels, increases in natural disasters, and diminished biodiversity, the effects of climate change are as far-reaching as they are devastating. Large industrial countries are the most significant contributors to pollution and Co2 emissions. However, due to their robust economies, they are also leading the way in putting considerable funding toward technologies and policy initiatives combating climate change.<sup>2</sup>

Conversely, less economically advanced countries that generally contribute much lower global Co2 emissions often experience the effects of climate change the most and cannot implement the same green initiatives due to the economic strain that would cause. The levant region and the Hashemite Kingdom of Jordan, hereby referred to as Jordan, is a perfect example of this. Though considered a minor contributor to the overall global greenhouse gas emissions (see Figure 1.1), Jordan's arid climate, high temperatures, and existing water scarcity problem make it particularly susceptible to the effects of climate change.<sup>3</sup> The temperatures in this region are rising higher than the global average (see Figure 1.2), which puts the country's environment at increased risk of experiencing the adverse effects of climate change, such as drought and damage to fertile grasslands. Due to their intrinsic reliance on the environment, climate variability, and higher rate.<sup>4</sup> As a result, farmers in Jordan are often the first communities to feel the effects of climate change in the region.

https://www.brookings.edu/wp-content/uploads/2022/07/Green\_Transitions.pdf

<sup>&</sup>lt;sup>1</sup> Mishra, S., Ghosh, A., Rai, K., Jaiswal, B., Yadav, D. S., Agrawal, M., & Agrawal, S. B. (2021). Dimensions of climate change and its consequences on ecosystem functioning. *Global Climate Change*, 112. https://doi.org/10.1016/b978-0-12-822928-6.00003-4

<sup>&</sup>lt;sup>2</sup> Amar Bhattacharya, Homi Kharas, & John W. McArthur. (2022, July). Why Developing Country Voices Will Shape The Global Climate Agenda. In The Brookings Institution. The Center for Sustainable Development at Brookings.

<sup>&</sup>lt;sup>3</sup> Verner, D., Lee, D., Ashwill, M., & Wilby, R. (2013, April 10). Increasing Resilience to Climate Change in the Agricultural Sector of the Middle East: The Cases of Jordan and Lebanon (World Bank Studies) (Illustrated). World Bank Publications.

<sup>&</sup>lt;sup>4</sup> Mertz, O., Halsnæs, K., Olesen, J. E., & Rasmussen, K. (2009, January 31). Adaptation to Climate Change in Developing Countries. Environmental Management, 43(5), 743–752. https://doi.org/10.1007/s00267-008-9259-3



CO2 emissions (metric tons per capita)

Figure 1.1: CO2 Emissions in Jordan vs. the Global Average<sup>5</sup>

## Temperature Change of Jordan vs. Global Average



Figure 1.2: Temperature Changes in Jordan vs. the Global Average<sup>6</sup>

<sup>&</sup>lt;sup>5</sup> CO2 emissions (metric tons per capita) | Data. (2019). worldbank.org. Retrieved October 16, 2022, from https://data.worldbank.org/indicator/EN.ATM.CO2E.PC?contextual=default

<sup>&</sup>lt;sup>6</sup> GISTEMP Team, 2022: GISS Surface Temperature Analysis (GISTEMP), version 4. NASA Goddard Institute for Space Studies. Dataset accessed 2022-10-15 at https://data.giss.nasa.gov/gistemp/.

The agricultural communities in Jordan are especially vulnerable to the adverse effects of climate change. According to data from the World Bank, agriculture, forestry, and fishing only account for 5.2% of the country's GDP.<sup>7</sup> However, the agriculture industry "consumes 65-75 percent of Jordan's water resources...[and] employs 15% of the labor force.<sup>w</sup><sup>8</sup> With 15% of the labor force's livelihoods directly dependent on the environment, the significance of climate change on the region cannot be ignored. Furthermore, due to their dependence on grasslands and raising livestock, dairy farmers in Jordan are especially vulnerable to climate variability and water scarcity. Jordan has over 90,000 dairy cows which produce about 75% of the country's milk.<sup>9</sup> For Jordanian dairy farmers, drought can drastically affect their dairy cows' milk production. A key aspect of our research is the inclusion of Jordanian farming voices to discover what climate change technologies and policies would be the most helpful and accessible to them.

Creating a framework to address climate change in Jordan is no easy task. All of the literature we reviewed identified the difficulties less economically developed countries face when trying to combat the adverse effects of climate change. All three articles posed the question of how to comprehensively address climate change in economically developing countries in an effective and intersectional manner. Climate change is not only an environmental issue; it is a complex problem affecting developing countries in various areas and at different degrees. To address this, developing countries must make changes across multiple sectors of society.<sup>10</sup> With this in mind, our proposed research question is as follows:

# How can the three factors of economic development, farming voices, and green technology help Jordan farmers pursue a green transition?

It is important to note that in this study we define what we mean by a green transition, as it can be difficult to define. For our research we are defining a green transition as any adoption of policies or technologies that will aid Jordanian farmers in addressing climate change, helping them grow their businesses sustainably while mitigating environmental risks.<sup>11</sup> In order to answer

<sup>11</sup> Lamperti, F., Napoletano, M., & Roventini, A. (2019, February 6). GREEN TRANSITIONS AND THE PREVENTION OF

ENVIRONMENTAL DISASTERS: MARKET-BASED VS. COMMAND-AND-CONTROL POLICIES. Macroeconomic Dynamics, 24(7), 1861–1880. https://doi.org/10.1017/s1365100518001001

<sup>&</sup>lt;sup>7</sup>Agriculture, forestry, and fishing, value added (% of GDP) | Data. (n.d.). Retrieved October 16, 2022, from

https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS?contextual=default

<sup>&</sup>lt;sup>8</sup> Jordan - Agricultural Sectors | Privacy Shield. (n.d.). Retrieved October 16, 2022, from

https://www.privacyshield.gov/article?id=Jordan-Agricultural-Sectors

<sup>&</sup>lt;sup>9</sup> Ata, Mysaa, Mohammad Altarawneh, and Motasem Al-Masad. "Climate change perceptions and adaptations for dairy cattle farmers in Jordan: Case study in North East Region-Al-Dhulel Area." New Medit: Mediterranean Journal of Economics, Agriculture and Environment= Revue Méditerranéenne d'Economie Agriculture et Environnement 20, no. 2 (2021).

<sup>&</sup>lt;sup>10</sup> Al-Zu'bi, M. (2016, June 8). Jordan's climate change governance framework: from silos to an intersectoral approach. Environment Systems and Decisions, 36(3), 277–301. https://doi.org/10.1007/s10669-016-9602-9

our research question, this project will contain multiple sections that constitute our theorization plan. The first section will cover a brief literature review of articles relating to Jordan's agricultural communities, climate change, and green transition frameworks. Why this is an important area of interest will be further explained, and the research gaps in existing literature will be identified. The conceptual framework of our empirical study will then be identified and described in detail. We will then discuss our research design plans, including our research approach and data collection design. Lastly, we will clarify our data coding scheme and strategy for data analysis. Human subject considerations will also be identified. By doing this, we hope to illustrate how taking into account economic development factors, the perspectives of Jordan farmers, and the adoption of green technology can help Jordan successfully pursue a green transition.

#### **Literature Review**

We sought to answer the question of how a green transition can be influenced by economic development, the inclusion of farming voices, and the implementation of green technology in Jordan. In order to understand this question further and to grasp the policy implications posed by this issue, we focused our primary research on five pre-existing analyses of state implications of, and adaptation to, the effects of climate change, and climate change and economic development as it relates to Jordan.

#### State implications of the effects of climate change

In order to understand climate change implications in Jordan, it was important to first understand how climate-related changes affect states differently. Factors that contribute to how states can adapt to these changes include, resource availability, economic status, and social initiatives already in place. From the research conducted, it is clear that developing states will be disproportionately affected by the impacts of climate change.

According to Amar Bhattacharya et al., the past few years have seen economically advanced states putting considerable funding toward technologies and policy initiatives with the goal of combating climate change. However, countries with smaller or emerging markets and developing economies (hereby referred to as EMDE)<sup>12</sup>, cannot invest in the same manner as their more economically advanced counterparts without facing severe consequences to their

<sup>&</sup>lt;sup>12</sup> Amar Bhattacharya, Homi Kharas, & John W. McArthur. (2022, July). Why Developing Country Voices Will Shape The Global Climate Agenda. In *The Brookings Institution*. The Center for Sustainable Development at

Brookings. pp. 1. https://www.brookings.edu/wp-content/uploads/2022/07/Green\_Transitions.pdf

economies. Because of this, EMDE countries have historically viewed climate change policies, or green initiatives, as an often unattainable luxury. Moreover, the fact that EMDEs are experiencing climate change effects that are a consequence of the pollution and CO2 emissions created by more economically advanced countries further exacerbates the inequality and injustice surrounding the global discussion of climate change.<sup>13</sup> Yet, despite these challenges, "a growing range of voices within developing countries are arguing that major transitions towards sustainable energy... are compatible with, and indeed central to, new development opportunities."14

Given their unique challenges and vulnerabilities, EMDEs must adopt policies that correctly address the urgency of climate change while also elevating their economies. Furthermore, these policies must "engage, respect, and promote the livelihoods of individuals affected by climate action."<sup>15</sup> Luckily, the increasing affordability of low-carbon systems makes them a viable option for EDMEs to adopt. In addition, EDMEs have the unique "opportunity to gain from recent advances and ongoing cost-reductions in low-carbon technology."<sup>16</sup> Investing in climate-friendly infrastructure, which is often more affordable than updating existing buildings, and initiatives that promote emission mitigation and climate adaptation "can provide a demand-side economic stimulus through job creation, training, and enterprise growth."<sup>17</sup> To achieve an equitable global green initiative, there are three main objectives to keep in mind:<sup>18</sup>

- 1. setting an equitable path to reach net-zero global emissions by 2050,
- 2. taking more aggressive actions on climate adaptation and resilience, and
- 3. protecting and restoring natural capital.<sup>19</sup>

In order for these measures to be effective in combating the issues relating to climate change, EDMEs must implement these initiatives in ways that prove functional for their particular cultural and community needs. EDMEs must also take into account their biodiversity and environmental requirements. Access to costly technological advancements that combat climate change is another hurdle EDMEs face.

Developing countries often experience the effects of climate change at more extreme

<sup>&</sup>lt;sup>13</sup> Bhattacharya et al., 2022, pp. 4.

<sup>&</sup>lt;sup>14</sup> Bhattacharya et a , 2022, pp 1

<sup>&</sup>lt;sup>15</sup> Bhattacharya et al., 2022, pp. 3.

<sup>&</sup>lt;sup>16</sup> Bhattacharya et al., 2022, pp. 5.
<sup>17</sup> Bhattacharya et al., 2022, pp. 6.
<sup>18</sup> Bhattacharya et al., 2022, pp. 7.

<sup>&</sup>lt;sup>19</sup> Bhattacharya et al., 2022, pp. 7.

levels than developed countries do.<sup>20</sup> Climate factors and the implications of poverty make traditional agricultural societies the most at risk communities.<sup>21</sup> Yet developing countries have not prioritized mitigation efforts because they have been focused on adjusting to short-term climate implications that are viewed by the state as a more immediate priority.<sup>22</sup> There is no information to indicate when or if these short-term climate effects will subside and, because of this, many governments are unable to invest in "climate resilient development strategies" such as infrastructure or green energy because the investment funds are more urgently needed to combat immediate issues.<sup>23</sup> When assessing their abilities to establish mitigation infrastructure, developing countries do not have the financial or administrative means to fully implement these advances themselves and thus require the assistance of developed states.<sup>24</sup>

The arguments made by Amar Bhattacharya et al. in their article are fairly broad, which presents a significant gap when it comes to having a complete and thorough understanding of the issue. However, this provides room to adapt the study when applying these concepts to Jordan. The article has a limited analysis of how EDME's could benefit from receiving funds from economically advanced countries to offset their costs. The analysis done by Mertz et al. does not outline the specific adaptation methods used in the various regions. There needs to be more information on how climate mitigation could increase income and resource input within developing states as compared to their economic output. From these critiques, we want to further our understanding of the implications of climate change on the state level by understanding how the three main objectives outlined by Amar Bhattacharya et al., can be implemented in our study's framework.

#### Climate change and economic development as it relates to Jordan

Poverty is a socio-economically defined issue that is often hard to address due to an inability to accurately measure poverty. These measurements struggle to identify the problems at the root of poverty within a community. Poverty can be defined in many ways with different parameters that classify it as such. These parameters are important to define in order to accurately measure poverty. Because poverty statistics are easily manipulated, they are unreliable

<sup>&</sup>lt;sup>20</sup> Mertz, O., Halsnæs, K., Olesen, J. E., & Rasmussen, K. (2009, January 31). Adaptation to Climate Change in Developing Countries.

Environmental Management, 43(5), 744. https://doi.org/10.1007/s00267-008-9259-3

<sup>&</sup>lt;sup>21</sup> Mertz et al., 2009, pp. 745.

<sup>&</sup>lt;sup>22</sup> Mertz et al., 2009, pp. 750.

<sup>&</sup>lt;sup>23</sup> Mertz et al., 2009, pp. 750.

<sup>&</sup>lt;sup>24</sup> Mertz et al., 2009, pp. 743-752.

when looking at data sources presented by the government of Jordan.

Solutions to poverty must be tailor-made for the region they are hoping to address; the 'one-size fits all' approach does not work because there are many factors that go into the creation and mitigation of the effects of poverty.<sup>25</sup> Taking an anthropological approach to understanding poverty and its effects can provide insights that are often missed by a less dynamic analysis.<sup>26</sup> There must also be an understanding of the historical and cultural roots of economic behaviors which can be a fundamental aspect of poverty.<sup>27</sup> There is an analysis of poverty that isn't just an economic state of being, "rather, it is a system of images, feelings, perceptions, and symbols that are produced by people identified as poor and should be studied when analyzing poverty."<sup>28</sup>

The rural economy in Jordan expands beyond agriculture, but because agriculture is a major component of the local economy and is most threatened by climate change, it is important to look at. Residents in rural Jordan often have limited access to advancement and alternative means of employment.<sup>29</sup> As a result, they must make the most of the "limited opportunities to diversify their farming enterprises [which have developed] due to low rainfall, poor soil quality, and the topography of the land that they cultivate."<sup>30</sup>

The poorest communities in Jordan live in the areas with the lowest rainfall and most degraded ecosystems.<sup>31</sup> These are also the areas most susceptible to the immediate impacts of climate change. These effects are exasperated by the "social and economic inequalities" that are already prevalent in those areas as a result of poverty.<sup>32</sup> Drought puts disproportionate pressure on the poor, as does "desertification and deterioration of pastureland."<sup>33</sup> This has been evident through the decrease of animal husbandry as a means of subsistence.<sup>34</sup>

The study conducted by Maha Al-Zu'bi, addressed the deficits in state efforts to address climate change in Jordan. Researchers discussed the lack of consideration of intersectoral efforts to address all factors that contribute to their climate change problems within Jordan. The researchers described climate change as "not just an environmental problem – it also involves

- <sup>30</sup> Tarawneh and Al Husban, 2011, pp. 100. <sup>31</sup> Tarawneh and Al Husban, 2011, pp. 97.

<sup>&</sup>lt;sup>25</sup> Tarawneh and Al Husban, 2011, pp. 95.

<sup>&</sup>lt;sup>26</sup> Tarawneh and Al Husban, 2011, pp. 95.

<sup>&</sup>lt;sup>27</sup> Tarawneh and Al Husban, 2011, pp. 95. <sup>28</sup> Tarawneh and Al Husban, 2011, pp. 96.

<sup>&</sup>lt;sup>29</sup> Tarawneh and Al Husban, 2011, pp. 100.

<sup>&</sup>lt;sup>32</sup> Tarawneh and Al Husban, 2011, pp. 97.

<sup>&</sup>lt;sup>33</sup> Tarawneh and Al Husban, 2011, pp. 97.

<sup>&</sup>lt;sup>34</sup> Tarawneh and Al Husban, 2011, pp. 97.

economic, natural, and social sectors."35 The researchers believed that "understanding climate change requires the perspective of multiple organizations, stakeholders, and any identified solution requires the involvement, commitment, and coordination of all related organizations and stakeholders."<sup>36</sup> The study included "data collection (policy document review, interviews, focus group discussion, workshop), transcribe and/or review data analysis of this material was comprehensive enough to give a clear understanding and suggest recommendations."<sup>37</sup> The researchers discussed the Policy (Jordan climate change policy) recommendations and it "was to establish a national institutional framework for climate change mitigation and adaptation that incorporates the policy-making level, the decision-making level, and the executive level while facilitating the involvement of all relevant stakeholders in developing response actions and strategies corresponding implementation plans."<sup>38</sup> The researchers found that a lack of national-based financial resources is a major factor limiting progression in climate change efforts. Furthermore, they discovered that "financial resources were considered among the major factors that limit the success or progress in meeting climate change-related strategic targets, particularly the lack of national-based resources and funding."<sup>39</sup> The researchers recommended that Jordan improve their climate change governance and management systems and develop a better understanding of policy-making for informed policies.

The study conducted by Mysaa Ata et al., was designed to understand the ways in which climate change has impacted dairy farming within the Al-Dhulel region of Jordan. Understanding the impacts to dairy farming is important because "dairy farming contributes to maintaining the ecological system by providing an important product to the human wellbeing."40 The researchers used information provided by farmers in the Al-Dhulel region and their understanding of climate change and its impacts. By assessing adaptations already underway, the researchers concluded that farmers lack forthcoming information sources; they lack clear answers regarding the major impacts to their dairy farms. Mysaa Ata et al. support increasing organizations devoted to farmers, increasing financial support for farmers, a decrease in

<sup>&</sup>lt;sup>35</sup> Al-Zu'bi, M. (2016, June 8). Jordan's climate change governance framework: from silos to an intersectoral approach. *Environment Systems* and Decisions, 36(3), pp. 277. https://doi.org/10.1007/s10669-016-9602-9

<sup>&</sup>lt;sup>36</sup> Al-Zu'bi, 2016, pp. 278.

<sup>&</sup>lt;sup>37</sup> Al-Zu'bi, 2016, pp. 282.

<sup>&</sup>lt;sup>38</sup> Al-Zu'bi, 2016, pp. 288.

<sup>&</sup>lt;sup>39</sup>Al-Zu'bi, 2016, pp. 293.

<sup>&</sup>lt;sup>40</sup> Ata, Mysaa, Mohammad Altarawneh, and Motasem Al-Masad. "Climate change perceptions and adaptations for dairy cattle farmers in Jordan: Case study in North East Region-Al-Dhulel Area." New Medit Mediterranean Journal of Economics, Agriculture and Environment= Revue Méditerranéenne d'Economie Agriculture et

Environment 20, no. 2 (2021). pp. 98.
government regulations, and an increase in support for resistant cow strains.<sup>41</sup>

The study conducted by Tarawneh and Husban explored many mitigation tactics for combating the issue of poverty and economic insecurity, but it fails to address how the agricultural sector can address the issue of climate change and the impact it is having on farmers in the rural regions of Jordan. Their article discusses ways in which income can be (and is currently being) subsidized, but this does not touch on how these additional forms of income will be impacted by climate change or how they can be secured in the wake of desertification in rural Jordan. The study conducted by Maha Al-Zu'bi lacked a generalization of climate change adaptation information as a result of a limited perspective of participants. The lack of female participation in both the Al-Zu'bi and Ata et al. studies is a concern because women are vital to the agricultural sector in Jordan and contribute to much of the workforce and provide a "valuable source of income for poor families."<sup>42</sup> By excluding them from their research, these studies are unable to fully grasp the understanding of the Jordanian agricultural sector.

From this critique, we want to further explore the question of how current irrigation technology can be adapted in order to better serve the needs of rural farmers as they learn to mitigate the effects of a changing climate. How can these new technologies or agricultural methods be applied in rural communities who do not necessarily have the economic capital necessary to invest in new infrastructure? How can more transparent means of sharing information with farmers expedite the process of climate change adaptation? There is also the question of which current policies will be able to be adapted in order to make effective advancements to the process of mitigation. We want to understand how farmers in Jordan will be included in this transition to green technology and how their input will influence policy changes.

#### **Policy implications**

To make a realistic impact within a policy framework, we need climate change initiatives that are actionable and meet the unique needs of EDME. This is an absolute necessity for effective, and comprehensive climate change policy on both a state and global scale.

Understanding climate risks in developing states is important because people are currently, and will continue, facing extreme climate events and need to be prepared. Policymakers, NGOs and global leaders need exact information on each region, sector, and country in order to know where

<sup>&</sup>lt;sup>41</sup> Ata et al., 2021, pp. 103.

<sup>&</sup>lt;sup>42</sup> Tarawneh and Al Husban, 2011, pp. 102.

to provide region-specific mitigation support.

The impacts of climate change in the Levant region, specifically Jordan, are crucial for policymakers to understand as the region is surrounded by hostilities. As climate change continues to affect Jordan, the humanitarian situation for the large refugee population and the citizens will become a pressing issue. Furthermore, a more broadened look at the agricultural industry in Jordan will help policymakers and NGO's better advocate for change within the country due to the fact that the knowledge of varying communities will be better understood. Jordan's "legislation is reactive rather than proactive, laws and regulations are issued as a response to problems and the issuance process is bureaucratic and slow."<sup>43</sup> It will also be important to continue the discussion on "current climate governance, coordination mechanisms' challenges, and opportunities in the intersectoral approach in implementing the national climate change policy." <sup>44</sup>

The association between economic development and climate change is important to study in a holistic way because the issue of poverty is never a one-factor problem, there are often many influencers that go into creating poverty. This must be studied in Jordan specifically because they are in a region that is facing immediate effects of a changing climate–desertification. This will continue to increase the negative effects to the land, Jordan's agricultural sector, and farming communities will rapidly deteriorate if intervention is not made and steps are not taken on the domestic level by Jordan and on the international scale as well. There is a danger that these effects will become irreversible, and, consequently, an entire sector of the Jordanian economy and the communities and cultures throughout rural Jordan may be lost forever.

# **Conceptual Framework**

After a review of the current literature and the gaps within it, we are proposing that our research further the field of environmental studies by proposing the following conceptual framework displayed in Figure 2.

<sup>&</sup>lt;sup>43</sup> Al-Zu'bi, 2016, pp. 281.

<sup>44</sup> Al-Zu'bi, 2016, pp. 282.



Figure 2: Causal pathway linking Jordan Rural Poverty and a Failed Green Transition

This research study will focus on the link between impoverished rural farming communities and the failed green transition. We are proposing that the impacts of economic development, the lack of farming voices within literature, and the lack of green technology within Jordan are the main links between poverty and a green transition within Jordan. These links have not been highlighted throughout our literature review but have been hinted at in various ways.

First, rural farming communities lack alternative methods since they are truly only given two choices: "work for themselves or in agriculture." <sup>45</sup> The non-diverse economic situation that farmers are placed in describes the lack of economic development and or the insubstantial impact economic development has had on rural farming communities. Thus, our research is trying to find evidence that economic development is prohibiting a green transition because farmers are unable to focus their efforts on sustainable farming methods and a green transition at the same time.

The second link to farming voices is vastly lacking within the academic study of climate change in Joran. The lack of farming voices within the academic literature is shocking due to their impact on climate change initiatives and the severity of climate change impacts on the sector. The agricultural sector's largest impact on climate change comes from the need for water resource allocations. Only 6 to 7 percent of Jordan's land is arable land which means that

<sup>&</sup>lt;sup>45</sup> Tarawneh, Mohamed, and Abdel Hakim Al Husban. "Rural poverty in Jordan: assessment and characterisation." *Anthropology of the Middle East* 6, no. 2 (2011): 94-107.

extensive irrigation systems are needed to produce sustainable crop output which leads to 61 percent of the total water in Jordan being used for irrigation purposes.<sup>46</sup> If policymakers want to implement a more efficient strategy, it is vital to understand farmers' experiences and the farming voices. In 2015 the government launched Jordan's 2025 National Vision Strategy which included 400 policies to mitigate the effects of climate change.<sup>47</sup> With the timeframe of this plan shrinking, it is vital to understand on the ground if these policies are affecting the farmers to ensure the sustainability of climate change mitigation within the borders of Jordan.

The final link from poverty to a reduction in the green transaction has been well established in literature but not broadly generalized. In a recent study of dairy farmers in Jordan, the researchers found that 51.1 percent of dairy farmers studied lacked new technologies for farming, but 87 percent of dairy farmers studied were receptive to new technological advancements.<sup>48</sup> Although this article is influential in its approach, it lacks generalizability due to the focus on dairy farming specifically. Thus, this study is proposing that technology is an important factor that affects the entirety of the agriculture industry in Jordan. Overall, the expected outcome of this conceptual design and study is the elevation of a general understanding of the impact of climate change on farming communities using farming voices while concentrating on the impact of both economic development and technological issues within Jordan.

#### **Instrument Design & Data Collection Methods**

In order to carry out our research, we have designed a qualitative, ethnography plan in which we aim to gain a greater knowledge of the Jordanian farmer's experience. Our aim is to interview agriculture farmers<sup>49</sup> to learn firsthand the struggles they encounter with the shifting climate and temperatures. We also would like to understand how they have been coping with the changes in climate and if they have employed any sustainable practices, or if these have been out of reach (possibly due to the lack of knowledge and resources). We will start by connecting with

<sup>&</sup>lt;sup>46</sup> Tarawneh, Radi A. "The Role of Jordanian Agricultural Policies in Climate Change Responding Affecting Agricultural Production." *Journal of Agricultural Science* 13, no. 6 (2021).

<sup>47</sup> Ibid.

<sup>&</sup>lt;sup>48</sup> Ata, Mysaa, Mohammad Altarawneh, and Motasem Al-Masad. "Climate change perceptions and adaptations for dairy cattle farmers in Jordan: Case study in North East Region-Al-Dhulel Area." *New Medit Mediterranean Journal of Economics, Agriculture and Environment = Revue Méditerranéenne d'Economie Agriculture et Environment* 20, no. 2 (2021).

<sup>&</sup>lt;sup>49</sup> When interviewing these populations, sometimes we will have to account for insights and responses from family members and community leaders. We will welcome these additional insights, but our main focus will be on farmers.

local organizations that work with farmers and rural communities (see Appendix D), then enlisting their help to reach and interview the farmers. Although we have Arabic speakers in the team, only one person has been to Jordan but is not knowledgeable enough to serve as a guide; we, therefore, will require the assistance of locals who can be our guides, introduce us to farmers and translate conversations. We will further depend on the local individuals who have expertise in understanding the customs of the various communities we plan to interview, to ensure that no normative rules are broken on part of the research team. We will therefore use the online meetings to find the people most suited to our needs and ask them to enlist as part of our team while we are in their country. Of course, they must be adequately paid for their services.

#### Phase I: Making first contact.

Our research steps will follow this trajectory: first, we will contact the listed organizations in Appendix D via email to let them know who we are, what our research plan is, and what our basic needs will be. In this first email, we will also ask if they are interested in knowing more, and if so, we will then set up an appointment to speak online either in groups or individually. In these online meetings, our aim is to develop rapport and see who the best people would be that can help us. We will also ask them to advise us on finding an appropriate place to stay and keep our equipment, getting around and any other logistical details they feel we should be aware of. Once we are satisfied with our new acquaintances and we know where we will be landing, we can board our planes to go to Jordan and do our research.

#### **Phase II: Interviewing farmers.**

After having settled in Jordan, we will meet with the NGOs that are willing to work with us to review and translate both our survey and interview questions. This will allow them to help us create questions that the farming communities in Jordan can easily understand and answer. Afterwards, with the help of our local guide and interpreter, we will travel to farming communities that the various NGOs refer us to. Prior to each interview, we will ask interviewees to fill out a survey that covers both biographical data and general knowledge on the subject (See Appendix A). The survey data will be vital due to the lack of research on Jordanian farmers and will provide help with snowballing to other potential candidates for interviews. Depending on the situation, the interviews that proceed the completed survey might be done on a one-to-one basis or in small groups or even entire families (See Appendix B for Interview Protocol). The translator and or guide will help us navigate getting our feet in the doors of farmers homes by ensuring we adhere to local customs and practices. This will ensure that the local community feels comfortable with our presence and the questions we are asking them. As we move from village to village, we will follow these basic steps and adjust on a case-by-case basis, taking cues and instruction from our guide and the villagers.

#### **Data Analysis and Management.**

All interviews will be recorded. After reaching a point of saturation, we will transcribe and organize the survey answers onto both word documents as well as spreadsheets. Once all data is transcribed, we will begin to code the data with the coding schema found in Appendix C. During the coding phase, several members of the team will independently code the data and compare results to ensure quality and methodological rigor is maintained within the coding process. The coding schema might be adapted after the interviewing phase, but will remain to highlight the overall themes listed in the first column of the coding scheme in Appendix C.

#### **Human Subject Considerations**

Human subject considerations are of great importance to our team. With a reliance on the survey responses from the farming communities in Jordan, we want to make sure that we consider the saliency of our questions and how they will be perceived culturally. We want to mitigate any risks posed to our human subjects while maximizing the benefits of our survey.

To combat issues resulting from translation errors, we will partner with native Jordidian community organizers to ensure that our questions and informed consent forms are clear and understandable for our Arabic speaking participants. In addition, to address possible intimidation or coercion issues, we will continue working with these Jordanian community organizers who are already in good standing with the farming communities so that our research subjects feel comfortable sharing their honest opinions.

Data security and the confidentiality, integrity, and accessibility of the data we collect for this project are of the utmost importance. With this in mind, the surveys we collect will be digitized and uploaded to our secure cloud server, with participants' personally identifiable information (PII), such as name and address, removed. This data will be password protected and require multi-factor authorization to access. Furthermore, access controls and access logs of this data will be tightly monitored.

# **APPENDIX A. Participant Survey Protocols (given prior to interview)**

Words adapted from Urban Institute 50

This survey is being conducted by a research group at the University of Texas, Lyndon B. Johnson School of Public Affairs. We are conducting an evaluation of climate change in Jordan. We are conducting a study designed to learn more about climate change impacts on farming communities in Jordan with a focus on green technology and economic development. Your participation in this survey is completely voluntary: you can choose to not answer any questions and you can choose not to return the survey, as well.

If you choose to participate in this survey, we will never give your individual answers to anyone outside the research team. Your participation will in no way affect your farm or any other activities that you discuss on the survey. Nobody outside the research team will be allowed to have access to the survey data, and those physical copies of the survey will be destroyed at the end of our research.

- 1. What is your gender?
- 2. What is your age?
- 3. What is your nationality?
- 4. What level of education do you have?
- 5. What is your total annual income?
- 6. What area of Jordan do you live in?
- 7. How long have you been farming?
- 8. What language do you speak primarily?
- 9. How much agricultural land do you have?
- 10. What is the primary crop grown on your land?
- 11. Do you have a secondary crop grown on your land? If yes, what crop is it?
- 12. What do you think about when you wake up in the morning?
  - a. The lack of representation of farmers in discourse
  - b. Your ability to provide for your family
  - c. The current climate situation of your farm
  - d. New technologies related to the agricultural industry

<sup>&</sup>lt;sup>50</sup> Anna Feiss, Joshua Bamberger, and Josh Leopold, "Moving On Initiative: Findings from Participant Interviews" (Washington DC, 2019), 21-21.

- 13. Where do you get your information about climate related issues?
- 14. Where do you get your information about farming related issues?
- 15. Where do you get your information about economic related issues?
- 16. Can you rank the following topics from most to least important (1 = lowest priority, 5 = highest priority)
  - a. Lack of information about Climate Change
  - b. Lack of Economic Opportunities
  - c. Lack of Green Technology in the Agricultural sector
  - d. Lack of Representation for Farmers in policymaking decisions
- 17. Do you know any other farmers or community members that would be interested in participating in this research study?
  - a. What is their name?
  - b. What is the best way to contact them?
  - c. What is your relationship to this person?
  - d. Is the person you indicated above a farmer? If not, what is their relationship to the agricultural sector?

# **APPENDIX B. Participant Interview Protocol**

#### Words Adapted from Urban Institute<sup>51</sup>

Hello. My name is (name), and I'm a part of a team of researchers at the University of Texas LBJ School of Public Affairs that is conducting an evaluation of climate change in Jordan. We are conducting a study designed to learn more about climate change impacts on farming communities in Jordan with a focus on green technology and economic development.

Your participation in this interview is completely voluntary: you can choose to not answer any questions and you can stop the interview at any time. If at any time I ask you a question and you don't feel comfortable talking about the topic, or you do not want to answer, feel free to say so.

If you choose to participate in this interview, we will never give your individual answers to anyone outside the research team. Your participation will in no way affect your farm or any other activities that you discuss with us. With your permission, I would like to tape record the interview to make sure I have your thoughts and experiences recorded correctly. Nobody outside the research team will be allowed to listen to the tapes, and those tapes will be destroyed at the end of our research.

#### **Consent** form

If you choose to participate in this interview, I need to go over this consent form with you. It gives you more information about the research study and a telephone number you can call if you have questions later.

#### [Read Consent Form]

Do you have any questions or comments before we continue?

I am going to turn on the tape recorder now, and we can get started.

#### I would like to begin by asking you about your current economic situation

- 1. Has your income been affected by climate change
- 2. If so, how has your income been affected by the climate?
- 3. Do you have another source of income? If so, what is your secondary source of income?
- 4. Has your income influenced any new financial decision-making?
- 5. Do you have a partner who has a source of income?
- 6. Is your income enough to meet your family's basic needs? (food, shelter, clothing)

<sup>51</sup> Ibid.

## 7. Are there accessible community resources to support your family?

# Now I would like to move on to ask you a few questions about how climate is impacting your farm

- 1. What current struggles are you facing as a result of climate change?
- 2. Have you had any struggles with growing crops due to climate change?
- 3. What is the source of the water used for your crops?
- 4. How have you had to adapt as a result of climate change?
- 5. What efforts have you already made to combat climate change?
- 6. Are you willing to transition to using green technology?

# Now I would like to ask you a few questions about green technology

- 1. Would you be willing to use green technology if it were available to you?
- 2. Would you be able to maintain newly implemented green technology?
- 3. Where would you be able to put newly implemented green technology?
- 4. Are you aware of any policies or restrictions on your land use?

# Thank you for talking with me today, I truly appreciate you taking the time to answer my questions. I just have a few final questions before we end our conversation.

- 1. Is there anything else you would like to share with me about your experiences with climate change in your farming community?
- 2. Is there anything else you would like to share with me about economic development within your farming community?
- 3. Do you have any questions for me about the research study?

# **APPENDIX C. Coding Schema Protocol**

	Code	Definition
Demographics	Age	To determine the need
	Gender	population
	Nationality	
	Education	
	Total Income	
	Primary language spoken	
	Area residing in	
Farming	Length in time farming Amount of agricultural land	To identify needed information for a problem
	Crop grown	
	Secondary crop grown	
	Struggles with growing crops	
	Policies or restrictions on land use	
	Source of water	

Beliefs	Daily routine Lack of representation Climate of situation New agricultural technologies Topic priorities	To determine the baseline beliefs of the need population
Knowledge	Climate information sources Farming information sources Farming resources	To determine the current sources of baseline beliefs
Strategy	Previous efforts made to combat climate change Adaptations as a result of climate change Transition to green technology	To create a strategy in order to locate and utilize information to fulfill the need
Economics	Ability to provide for family Economic opportunities Income affected by climate change Secondary source of income Accessible community resources	To determine the extent of resources and information to fulfill the need
Spread Knowledge	Farming relationships	To inform information to others who have need

Green technology	Green technology in the agricultural sector	To determine the current need for green technology
	New technologies related to agriculture	
	Access to green technology	
	Ability to maintain green technology	

APPENDIX D	. NGO	Connection	Points
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NGO Name	Work Area Description
WADI	Reforestation, water security
Cardne	Agrarian reform & rural development
World Food Program - Jordan	Climate change humanitarian aid
ЈНСО	Disaster relief, community development
ACTED - Jordan	Sustainable socio-economic development
Agriculture Engineers Association	Agriculture science and education
INWRDAM	Development & management of water resources
Millennium Farms	Organic farm; Research & training
MIRRA	Water & Environment; Irrigation & Agriculture
AFD	Development, infrastructure, green energy transition
Horizons for Green Development	Sustainable Development
Hudara	Poverty & climate change

## **Appendix E. Bibliography**

- *Agriculture, forestry, and fishing, value added (% of GDP)* | *Data.* (n.d.). Retrieved October 16, 2022, from https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS?contextual=default
- Al-Zu'bi, M. (2016, June 8). Jordan's climate change governance framework: from silos to an intersectoral approach. *Environment Systems and Decisions*, 36(3), 277–301. https://doi.org/10.1007/s10669-016-9602-9
- Amar Bhattacharya, Homi Kharas, & John W. McArthur. (2022, July). Why Developing Country Voices Will Shape The Global Climate Agenda. In *The Brookings Institution*. The Center for Sustainable Development at Brookings. https://www.brookings.edu/wp-content/uploads/2022/07/Green\_Transitions.pdf
- Ata, Mysaa, Mohammad Altarawneh, and Motasem Al-Masad. "Climate change perceptions and adaptations for dairy cattle farmers in Jordan: Case study in North East Region-Al-Dhulel Area." *New Medit: Mediterranean Journal of Economics, Agriculture and Environment= Revue Méditerranéenne d'Economie Agriculture et Environment* 20, no. 2 (2021).
- *CO2 emissions (metric tons per capita)* | *Data*. (2019). worldbank.org. Retrieved October 16, 2022, from https://data.worldbank.org/indicator/EN.ATM.CO2E.PC?contextual=default
- GISTEMP Team, 2022: GISS Surface Temperature Analysis (GISTEMP), version 4. NASA Goddard Institute for Space Studies. Dataset accessed 2022-10-15 at https://data.giss.nasa.gov/gistemp/.
- Jordan Agricultural Sectors | Privacy Shield. (n.d.). Retrieved October 16, 2022, from https://www.privacyshield.gov/article?id=Jordan-Agricultural-Sectors
- Lamperti, F., Napoletano, M., & Roventini, A. (2019, February 6). GREEN TRANSITIONS AND THE PREVENTION OF ENVIRONMENTAL DISASTERS: MARKET-BASED

VS. COMMAND-AND-CONTROL POLICIES. Macroeconomic Dynamics, 24(7), 1861–1880. https://doi.org/10.1017/s1365100518001001

- Lenssen, N., G. Schmidt, J. Hansen, M. Menne, A. Persin, R. Ruedy, and D. Zyss, 2019: Improvements in the GISTEMP uncertainty model. J. Geophys. Res. Atmos., 124, no. 12, 6307-6326, doi:10.1029/2018JD029522.
- Mertz, O., Halsnæs, K., Olesen, J. E., & Rasmussen, K. (2009, January 31). Adaptation to Climate Change in Developing Countries. *Environmental Management*, 43(5), 743–752. https://doi.org/10.1007/s00267-008-9259-3
- Mishra, S., Ghosh, A., Rai, K., Jaiswal, B., Yadav, D. S., Agrawal, M., & Agrawal, S. B. (2021). Dimensions of climate change and its consequences on ecosystem functioning. *Global Climate Change*, 109–149. https://doi.org/10.1016/b978-0-12-822928-6.00003-4
- Tarawneh, Mohamed, and Abdel Hakim Al Husban. "Rural poverty in Jordan: assessment and characterisation." *Anthropology of the Middle East* 6, no. 2 (2011): 94-107.
- Tarawneh, Radi A. "The Role of Jordanian Agricultural Policies in Climate Change Responding Affecting Agricultural Production." *Journal of Agricultural Science* 13, no. 6 (2021).
- Verner, D., Lee, D., Ashwill, M., & Wilby, R. (2013, April 10). Increasing Resilience to Climate Change in the Agricultural Sector of the Middle East: The Cases of Jordan and Lebanon (World Bank Studies) (Illustrated). World Bank Publications.

# Qualitative Plan Final: Women, Climate Change, and South Africa's Just Transition

# **Background and Literature Review**

Climate change forces developing countries to walk a tightrope, as they must navigate the transition to net-zero emissions as rapidly as possible without compromising other sustainable development goals (SDGs) that may take more immediate priority, such as basic poverty alleviation.<sup>1</sup> Developing countries are also disproportionately affected by climate change, as they possess greater natural and structural vulnerabilities and limited adaptive capacity given insufficient international climate financing.<sup>2</sup>

Additionally, the impacts of climate change pose differentiated risks across the population *within* developing countries. In particular, climate change compounds existing gendered stresses and power asymmetries for women in developing countries, who fulfill key roles in agricultural production and resource procurement for their households and communities, and are thus more exposed to the effects of environmental degradation.<sup>3,4</sup>

The pathway to net-zero has the opportunity to be both economically prosperous and socially just for developing countries and *all* of the people who live within them. To realize such a transition, policies must consider developing countries' specific vulnerabilities and capacities, and be uniquely tailored to address goals beyond solely mitigating carbon emissions. This necessitates strong governance frameworks, coordination, and stakeholder engagement to ensure relevant, adequate, and coherent responses.<sup>5</sup>

This study thus attempts to address both a population gap and an evaluation gap in climate change and development research. Specifically, this study seeks to extend previous qualitative research on the intersection of gender, climate change, and sustainable

https://doi.org/10.1038/s41558-019-0638-y

<sup>&</sup>lt;sup>1</sup> McArthur, Amar Bhattacharya, Homi Kharas, and John. "Why Developing Country Voices Will Shape the Global Climate Agenda." Brookings, 27 July 2022,

https://www.brookings.edu/research/why-developing-country-voices-will-shape-the-global-climate-agenda <sup>2</sup> Mertz, O., Halsnæs, K., Olesen, J.E. et al. Adaptation to Climate Change in Developing Countries.

Environmental Management 43, 743–752 (2009). https://doi.org/10.1007/s00267-008-9259-3 <sup>3</sup> Rao, N. et al. A qualitative comparative analysis of women's agency and adaptive capacity in climate change hotspots in Asia and Africa. Nat. Clim. Change 9, 964–971 (2019).

<sup>&</sup>lt;sup>4</sup> Nwogwugwu, N. (2019). Women, Climate Change, and Sustainable Development in Africa. In: Yacob-Haliso, O., Falola, T. (eds) The Palgrave Handbook of African Women's Studies. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-319-77030-7\_133-1

<sup>&</sup>lt;sup>5</sup> Al-Zu'bi, M. Jordan's climate change governance framework: from silos to an intersectoral approach. Environ Syst Decis 36, 277–301 (2016). https://doi.org/10.1007/s10669-016-9602-9

development in light of South Africa's Just Energy Transition Partnership.<sup>6</sup> The research question this study will explore is: *are the differentiated risks and goals of rural women reflected by South Africa's Just Transition framework?*<sup>7</sup> This study likewise hopes to amplify the voices of rural South African women so that their perspectives may inform the further development and implementation of the framework to ensure that South Africa's transition from coal truly is just for all.

# **Theoretical Framework**

During our initial literature review, we realized that the three original key resources did not address the intersection of gender within climate change and sustainable development policy-making processes. This led us to look for additional resources on the differentiated impacts of climate change on women in the Global South, and the potential relationship(s) between women's agency and adaptive capacity in developing countries.

Following McArthur, Bhattacharya, and Kharas (2022), this study focuses on both the environmental and economic implications of South Africa's transition to net-zero emissions for rural women.<sup>8</sup> Our theoretical framework (Fig. 1) relies on two main categories of observations and narratives that are the main priorities of our data collection: "Environmental Stresses" and "Stresses from Coal Industry." Building on the work of Rao et al. (2019), we similarly define "Environmental Stresses" to consider how rural women experience the everyday impacts of natural resource degradation, particularly in terms of water insecurity and losses to agriculture.<sup>9</sup> We additionally combine and update elements of "Environmental Stresses," "Material Conditions," and "Women's Work and Labour" from Rao et al. to define "Stresses from Coal Industry" as the risks that rural women experience in terms of damages to health, exclusion from the labor force, compounded environmental degradation as the result of pollution, and the potential economic risks perceived by women as the result of a shift *away from* coal.

"Environmental Stresses" and "Stresses from Coal Industry" in turn constitute and inform "Rural Women's Risks and Goals." Following Al-Zu'bi (2016) and Nwogwugwu (2019), our theoretical framework is concerned with rural women as stakeholders in climate and development policy-making processes. This study thus **hypothesizes** that the degree to

<sup>&</sup>lt;sup>6</sup> "Political Declaration on the Just Energy Transition in South Africa - UN Climate Change Conference." 2021. COP26. https://ukcop26.org/political-declaration-on-the-just-energy-transition-in-south-africa/.

<sup>&</sup>lt;sup>7</sup> "A Framework for a Just Transition in South Africa." Presidential Climate Commission, June 2022, https://pccommissionflow.imgix.net/uploads/images/A-Just-Transition-Framework-for-South-Africa-2022.p df.

<sup>&</sup>lt;sup>8</sup> McArthur, J. et al.

<sup>&</sup>lt;sup>9</sup> Rao, N. et al.

which both gendered "Environmental Stresses" and "Stresses from the Coal Industry" can be mitigated depends on the degree to which "Rural Women's Risks and Goals" are being intentionally integrated into the "Just Transition Framework" beyond what is currently acknowledged (Fig. 1).



Fig. 1

# **Research Design Methodology**

# Qualitative Approach

As previously defined in the research question, the present **case study** will explore how the Just Transition is being approached, benefiting or affecting rural women's lives in South Africa, specifically in the northeastern province of **Limpopo**. Limpopo was chosen for two reasons. First, it has been previously surveyed by multiple qualitative studies exploring rural women's wellbeing and empowerment, which mitigates gatekeeping concerns.<sup>10,11</sup> Second, Limpopo is one of the largest producers of coal in South Africa and thus will be one of the most impacted by the Just Transition, which makes it a particularly useful and relevant site to study.<sup>12</sup>

# Data Collection Method

<sup>&</sup>lt;sup>10</sup> Ferrari, G. What is wellbeing for rural South African women? Textual analysis of focus group discussion transcripts and implications for programme design and evaluation. Humanit Soc Sci Commun 9, 246 (2022). https://doi.org/10.1057/s41599-022-01262-w

<sup>&</sup>lt;sup>11</sup> Kim JC, Watts CH, Hargreaves JR et al. (2007) Understanding the impact of a microfinance-based intervention on women's empowerment and the reduction of intimate partner violence in South Africa. Am J Public Health 97(10):1794–1802. https://doi.org/10.2105/AJPH.2006.095521

<sup>&</sup>lt;sup>12</sup> Connolly, Katie. 2022. "5 Lessons from South Africa's Just Transition Journey | World Resources Institute South Africa's Just Transition." World Resources Institute.

https://www.wri.org/insights/5-lessons-south-africas-just-transition-journey.

The present study will **analyze multiple policy documents** from both primary and secondary sources that will allow for the most thorough understanding of how the Just Transition framework has been planned and serve as a baseline to compare with what is happening in the field regarding the experiences and perspectives of rural women in Limpopo during the transition.

In order to elevate rural women's perspectives, values, and goals regarding the energy transition that South Africa will be facing the following years, we will conduct **in-depth interviews**<sup>13</sup>. The intention is also to use the **sequential interviewing-case study logic**, such that the latter may be conceived as not small-sample studies but multiple-case studies. Hearing and understanding how women in Limpopo are experiencing the energy transition and climate change impacts, their way of working and approaching their day-to-day lives will be helpful comparing and finding relationships and overlapping with the Just Transition framework.

In terms of field work, the intention of the study will be to gain access to participants through a community gatekeeper. This gatekeeper and willing women from the population will be identified through the Intervention with Microfinance for AIDS and Gender Equity (IMAGE), a community-based project whose committee has assisted other researchers in this manner previously.<sup>14</sup> This way, the research team can be connected with at least ten women who directly engage in agricultural labor and at least ten additional women with direct or indirect relationships to coal industry labor defined to interview.

In-depth interviews will be structured with **open- and close-ended questions** and will be **tailored to the participants' profiles, languages, and responses** (see "Potential Interview Questions"). The questions and responses will be translated, recorded and transcripted.

During this process, **identifying sensitizing concepts** and **defining categories** will be crucial to **code**<sup>15</sup> **the information** and elaborate an analytical frame based on existing research and reports on the Just Transition framework.

This study will **code collected data via inductive coding**. Inductive coding means this study will screen each data sample and create a codebook from the data. While it takes

<sup>&</sup>lt;sup>13</sup> In-depth interviewing emphasizes the building of relationships and exploration of ideas with the individuals being studied. Rather than observing and participating in experiences, a researcher conducts interviews, to hear how the people in the research setting make sense of their lives, work, and relationships (Ragin & Amoroso)

<sup>&</sup>lt;sup>14</sup> Ferrari, G. What is wellbeing for rural South African women? Textual analysis of focus group discussion transcripts and implications for programme design and evaluation. Humanit Soc Sci Commun 9, 246 (2022). https://doi.org/10.1057/s41599-022-01262-w

<sup>&</sup>lt;sup>15</sup> Coding is the process of labeling and organizing your qualitative data to identify different themes and the relationships between them.

longer, it will help the research team to understand the collected data and will help the team avoid bias. As we build our codebook sample by sample we will begin to see patterns in the data. We will code using a tiered structure. This will help the team build categories of code and allows the team the ability to weight the code in a manner reflective of each response's importance as communicated by the interviewees. Instead of elaborate graphics the study will use a table (example below) to codify responses. Blank portions represent areas where inductive coding will be required to further classify interviewees' responses (if possible).

	Questions	Responses	Elaboration
1			Positively
		Yes	Neutral
	Are you affected by the coal industry in Limpopo?		Negatively
		N	Nor others
		NO	Others affected
2	How has the coal industry affected your/the	Positively	
	environment or your/the land?	Negatively	
3	Do you think the coal industry has benefited or harmed Limpopo? Please explain.	Benefited	
		Neutral	
		Harmed	
4	Do you think the coal industry has affected women differently than men in Limpopo? Please explain.	Yes	
		No	
5	What do you think about replacing the coal industry	Favor	
	with another industry or power source?	Oppose	

# **Opportunities, Limitations, and IRB Considerations**

The following represent some (but certainly not all) possible opportunities and limitations of the study:

- The study may provide an opportunity to use **dyad interviews** in an interesting way.
  - Women could be interviewed in the presence of a female family member or friend to (hopefully) promote openness, accuracy, and consistency of responses.
  - It might be necessary to interview women in the presence of a male family member or patriarch first as part of initial gatekeeping, or to provide additional data on potential agency barriers within households.
- There will be the need to hire **translators** to conduct the interviews in communities.
- Because the process involves human participants, the research draft, including the methodology and the pre-set questionnaire would need to be reviewed by the **IRB** and approved before the team can proceed with the research. When doing field research, the team will take **precautionary measures** such as introducing themselves properly to human participants and clearly disclosing the details and purpose of the study. Furthermore, all participants of this study would be required to sign a **consent agreement**. Additional informed consent procedures would be required to **guarantee that each woman interviewed gets correct and sufficient information** about the study. Before the interview begins, the women will be engaged in conversation by the researchers to ensure that they have adequate understanding and that **all of their questions**, **if any, are answered**. Personal information of the human participants and the identity of third parties that happen to be involved in the study will also be **protected**. **IRB research protocols** will be kept in mind at every stage of the research process.

# **Interview Questions**

- "Profile" Questions
  - 1. What is your name and age?
  - 2. How many people live in your household?
    - a. Please describe their relationships to you.
    - b. Please describe their work, including household work.
  - 3. Please describe a typical day in your life. What routines or responsibilities do you do everyday, or almost everyday?

- 4. Please describe your work both within and outside of your household.
  - a. (If they haven't made a personal connection to the coal industry) Do you know anyone who works in the coal industry? If so, who? What do you know about their experiences working for the coal industry?
- 5. What causes you stress?
- 6. What brings you joy?
- 7. When you think of the future, what are you concerned about?
- 8. When you think of the future, what do you hope for?

# • Environmental Stress Questions

- 1. What is your relationship to the land you live on?
- 2. If you farm, please describe your farming practices.
- 3. Do you think women have a different relationship to the environment/land than men do? Please explain.
- 4. Have you noticed changes to the environment or to the land over the course of your life? If so, please describe.
  - a. (If we've established they or someone they know works in ag and they haven't addressed this) How has your/your household member's work changed as a result?
- 5. How do you get your food? Please describe in as much detail as possible.
- 6. How do you get water? Please describe in as much detail as possible.
- 7. Have you heard about "climate change"? If so, what have you heard/what do you know?
  - a. If yes: how/where do you see climate change in your life?
  - b. If yes: what do you think should be done about climate change?

# • Coal Industry Stress Questions

- 1. Are you affected by the coal industry in Limpopo?
  - a. If yes: Please describe.
  - b. If no: Do you know anyone who is affected by the coal industry? If so, please describe.
- 2. How has the coal industry affected your/the environment or your/the land?
- 3. Do you think the coal industry has benefited or harmed Limpopo? Please explain.
- 4. Do you think the coal industry has affected women differently than men in Limpopo? Please explain.
- 5. What do you think about replacing the coal industry with another industry or power source?
- Just Transition Questions
  - 1. What does "just" mean to you?
  - 2. What does a "just world/environment" look like?

- 3. What would need to happen for a transition away from coal to be considered "just" to you?
- 4. Have you heard about South Africa's Just Transition plan? If so, what do you know/what have you heard?
  - a. If yes: What do you think about the Just Transition plan?

Water Security and Cross-Sectoral Climate Action: A Case Study from Mexico City

#### **Introduction and Background**

Mexico City is experiencing a water crisis that is projected to worsen in the coming years. Although Mexico City receives a considerable amount of yearly rainfall, projections show that climate change will reduce the city's water supply by between 10 to 17% by 2050.<sup>1</sup> The current water crisis in Mexico City serves as a potent Latin American water insecurity case study, where the vulnerabilities of aged city pipes, inefficient water management systems, and the depletion of the capital's water supply are being exacerbated by climate change.<sup>2</sup> While the Mexican constitution guarantees access to water for personal and domestic consumption, the rapid urbanization of the capital tied with the growing climate and water crisis threatens residents' rights to accessible water.<sup>3</sup> Currently, several international organizations, local non-profits, and government entities are active in mitigating the water crisis in Mexico City. These state and non-state actors are listed in *Figure 1.1*.

Our literature review broadly addresses the adverse effects of climate change in developing countries. Such regions face heightened vulnerabilities in climate change and lack financial assets to both adapt to and mitigate climate issues. According to Mertz et al. (2009), the "linkages between vulnerability, adaptive capacity, and adaptation are often circular rather than linear in nature." These linkages ultimately influence the way developing countries are able to plan and implement climate change adaptation and mitigation programs. Research from McArthur et al. (2022) indicates that green infrastructure and investment are needed to mitigate climate change, but developing countries are not currently in a position to finance the initiatives necessary to address climate change. Thus, developing countries are faced with an impossible task as the effects of climate change become more pronounced each year.

Two climate change case studies are explored in Jordan and Mexico, which broadens our understanding of how these two developing countries have addressed climate change. Jordan serves as a case study of adaptation to climate change within the Middle East, where Al-Zu'bi's research has demonstrated a better and more nuanced understanding of the country's multi-sectoral

<sup>&</sup>lt;sup>1</sup>Martinez, Sandra, Stefanie Kralisch, Oscar Escolero, and Maria Perevochtchikova. 2015. "Vulnerability of Mexico City's Water Supply Sources in the Context of Climate Change." *Journal of Water and Climate Change* 6 (3) (09): 518-533. doi:https://doi.org/10.2166/wcc.2015.083.

<sup>&</sup>lt;sup>2</sup>Ibid.

<sup>&</sup>lt;sup>3</sup>Ibid.

approach is needed to develop appropriate mitigation and adaptation strategies that can effectively tackle climate change.<sup>4</sup> Martinez et al. (2015) positions Mexico City as a megacity at risk, where climate change, lack of financial and administrative resources, and an increase in water demand are reducing the capital's water supply. The historical context of Mexico City is also necessary for understanding the precarious situation the city has found itself in regarding water. Originally built on an island in Lake Texcoco, Mexico City has now grown to occupy the entirety of the ancient lake. This was only achieved through drainage first enacted by the Spanish and has led to severe land subsidence and ecological consequences. Moreover, Martinez et al. (2015) study claims that there is a lack of climate adaptation policies among water agencies operating in Mexico City.

Dupuits et al. (2020) argues that local communities in Latin America have begun to engage in "transnational mobilizations" by creating grassroots movements to advance global knowledge of local commons.<sup>5</sup> In Mexico City, *Cosecha de Lluvia*, a bottom-up initiative with an emphasis on individual participation, has yielded advancements in water security mitigation and has aimed to reduce the negative impact of the water crisis in impoverished districts of the city.<sup>6</sup> As of 2020, this project has installed 20,145 water harvesting systems within 5 districts of Mexico City.<sup>7</sup> Furthermore, out of the total water harvesting systems that have been installed through the project, 65% have directly benefited women.<sup>8</sup>

We arrived at our focus on Latin American water security by identifying gaps in the literature and chose Mexico City as a specific case study due to the water dilemma the city is currently facing. The first gap that we identified in the literature is the climate change adaptation process in Latin America, and specifically how this process is being undertaken in a mega-city like Mexico City. We also found gaps in the role that non-state actors, such as local non-profits or international organizations, play in the climate change mitigation and adaptation processes. Therefore, our interests in Latin America as well as the unique history of Mexico City regarding

<sup>&</sup>lt;sup>4</sup> Al-Zu'bi, M. Jordan's climate change governance framework: from silos to an intersectoral approach. Environ Syst Decis 36, 277–301 (2016). https://doi.org/10.1007/s10669-016-9602-9.

<sup>&</sup>lt;sup>5</sup> Dupuits, et al. (2020). Scaling Up But Losing out? Water Commons' Dilemmas Between Transnational Movements and Grassroots Struggles in Latin America. Ecological Economics, 172. https://doi.org/10.1016/j.ecolecon.2020.106625.

 <sup>&</sup>lt;sup>6</sup> Secretaría del Medio Ambiente, "Cosecha De Lluvia," Secretaría del Medio Ambiente (Secretaría del Medio Ambiente), accessed October 15, 2022, https://www.sedema.cdmx.gob mx/programas/programa/cosecha-de-lluvia.
<sup>7</sup> Ibid.

<sup>&</sup>lt;sup>8</sup> Ibid.

water led us to pursue a case study of the water security situation in the capital. Specifically, we hope to explore the role of cross-sectoral partnerships in water mitigation initiatives within the city.

Our research study questions the role and approach of international, national, and local actors in cross-sectoral collaborations in green infrastructure development in Mexico City. More specifically, we aim to study the attitudes towards multi-sectoral partnerships in water infrastructure initiatives, within local non-profits, international organizations, and government entities. Our conceptual theory, as seen in *Figure 1.2*, claims that cross-sectoral partnerships are necessary for implementing successful green infrastructure transitions in developing countries. This need is especially salient considering the vulnerability of developing countries to adverse climate change effects. This research highlights Mexico City as a case study, where we hypothesize that cross-sectoral partnerships would improve the advancement of effective green infrastructure initiatives, and that current approaches to mitigating climate change and water insecurity are focused on top-to-bottom approaches.

Through the use of pre and post-surveys as well as a focus group, we hope to convene a group of state and non-state stakeholders involved in Mexico's water infrastructure developments to answer a set of directed questions in a mediated setting. Research participants will answer questions geared towards understanding the attitudes and approaches to collaborative cross-sectoral water mitigation projects in Mexico City. We anticipate our study and results will lead to effective group interactions and qualitative data where the strengths, weaknesses, and opportunities for multi-sectoral partnerships on water infrastructure projects will be evaluated. Moreover, we expect our results to show that a bottom-up approach model, with an emphasis on individual participation in local water infrastructure initiatives, is the most effective method for cross-sectoral entities to develop and promote sustainable green infrastructure partnerships to improve water security in Mexico City.

#### **Literature Review**

The initial three articles provided broadly address the topic of climate change in developing countries. More specifically they explore the role of vulnerability in the climate change adaptation process. Mertz et al. (2022) argues that "linkages between vulnerability, adaptive capacity, and

adaptation are often circular rather than linear in nature".<sup>9</sup> These linkages ultimately influence the way developing countries are able to plan and implement climate change adaptation programs. The authors further explore how different countries and regions experience the effects of climate change, and how these differing effects impact the integration of climate concerns within the framework of development efforts.

Mertz et al. specifically identify Latin America as a region of concern for unpredictable precipitation rates annually as the global mean temperature rises.<sup>10</sup> The special issue also noted that Latin America's emerging economies are better equipped for adapting to climate change than poorer countries in regions like Africa and Asia. Furthermore, island nations appear to face greater vulnerability which has become clearer in the 11 years since the special issue was published with the increasing regularity of severely damaging hurricanes in countries like Puerto Rico. Mertz et al. do not hone in on non-state entities like cities, nor do they address water security in depth. The biggest challenge is the uncertainty regarding climate change's specific impacts on Latin American countries like Mexico. This uncertainty makes it difficult to properly assess vulnerabilities and plan adaptation strategies with the degree of confidence that most policy-making requires. Our focus group can assist in providing concrete qualitative measures of areas for improvement and can bring together the groups necessary for adapting to these changes.

McArthur et al. (2022) argues that green infrastructure and investment are needed to mitigate climate change, but that developing countries are not currently in a position to finance the initiatives necessary to address climate change.<sup>11</sup> These countries are not only unable to finance these initiatives themselves, but there is also an overarching feeling of mistrust directed towards 'developed' countries. This mistrust exists in part because of international meetings regarding climate change, like the Paris Climate Accords, where developing countries felt little was done to address the difficulty they face to adopt green infrastructure. Thus developing countries feel that

 <sup>&</sup>lt;sup>9</sup> Mertz, O., Halsnæs, K., Olesen, J.E. et al.. Adaptation to Climate Change in Developing Countries. Environmental Management 43, 743–752 (2009). https://doi.org/10.1007/s00267-008-9259-3.
<sup>10</sup> Ibid.

<sup>&</sup>lt;sup>11</sup> McArthur, Amar Bhattacharya, Homi Kharas, and John. "Why Developing Country Voices Will Shape the Global Climate Agenda." Brookings, 27 July 2022, https://www.brookings.edu/research/why-developing-country-voices-will-shape-the-global-climate-agenda.

the onus has been placed on them by developed countries to mitigate climate change but they have few resources to meet these expectations.

McArthur et al. discuss how emerging markets and developing economies (EMDEs) are further strained by the COVID-19 global pandemic. Developed economies have traditionally focused on international efforts to 'build back better'. However, these plans include climate change mitigation efforts that oftentimes do not provide proper investment for EMDEs, do not include sufficient EMDE input, or some combination thereof. McArthur et al. stresses the importance of cooperative and equitable objectives for transforming a global "build back better" policy into a successful "global green transition".<sup>12</sup> McArthur et al. (2022) studies the lack of local specificity that was not present in Mertz et al. In the same way that developed economies are disconnected from the reality of the situation faced by EMDEs regarding global green transitions, state governments are also often disconnected from the implementation and integration of policy in local climate change efforts. We also noted that McArthur et al. do not address water security, but the briefing is centered around global climate change and focuses on greenhouse gas emissions and forest preservation.

Maha Al-Zu'bi seeks to address Jordan's current approach to climate change governance.<sup>13</sup> Al-Zu'bi's core question is if Jordan's governance framework is adequate to respond to climate change's impacts, or if a new framework is needed for future climate change adaptation. He finds that a better and more nuanced understanding of the country's intersectoral approach is needed to develop appropriate mitigation and adaptation strategies that can effectively tackle the problem that climate change presents.

Al-Zu'bi's piece best encompasses the qualitative work we hope to do with our case study. The multidisciplinary participatory approach incorporating an "extensive network of stakeholders with varied and wide experience in climate change from relevant organizations" inspired the cross-sectoral focus group for our research design.<sup>14</sup> Importantly, this article emphasizes the need for a multi-layered and dynamic approach to regional climate security. Al-Zu'bi does not explore the role of intersectoral approaches to climate change mitigation and adaptation policies in Latin

<sup>&</sup>lt;sup>12</sup> Ibid.

<sup>&</sup>lt;sup>13</sup> Al-Zu'bi, M.

<sup>14</sup> Ibid.

America, but his case study of Jordan highlights water security as a top priority for developing countries' climate policies.

The first gap in the literature that we identified was how current climate change adaptation processes are occurring in Latin America, and specifically how this process is being undertaken and implemented in a mega-city like Mexico City. Furthermore, we also found gaps in the role non-state actors play in the climate change mitigation and adaptation process, especially in regards to the potential for cross-sectoral cooperation. The identification of both gaps led us to pursue a case study in Latin America, and Mexico City specifically, with a focus on water security. The additional references that we selected address these gaps and provide a foundation for our case study.

Dupuits et al. (2020) assessed the complications of scalability with local, non-state actor interventions regarding climate change.<sup>15</sup> The authors conducted an aggregate analysis of multiple interview sets, prior research, and collected information for four case studies. The author emphasizes the feedback element of transnationalization for grassroots movements, whereby benefits attained by approval in larger commons can incur damages to local communities from which the movement originated. In a way, the process of scaling up a locally-created solution to the impacts of climate change disconnects the methods and resources from the initial community.

Where once there existed shared community expertise and the wisdom of indigeneity, "commoning" can supplant the positives of grassroots movements with more disconnected ideologies. Dupuits et al. noted a degradation of autonomy, risks for exploitation amongst modern legal frameworks, and a "commodification of values, petrification of dynamic norms and water rights," as potential negative effects when scaling grassroots mobilizations transnationally.<sup>16</sup> Ultimately the authors argue that local movements should be aware of these risks when undertaking their own expansion processes. However, Dupuits et al. do not offer concrete solutions to how these groups should "constantly strengthen their local legitimacy" through the transnationalization process.

<sup>&</sup>lt;sup>15</sup> Dupuits et al.

<sup>&</sup>lt;sup>16</sup> Ibid.

Martinez et al's study isolates our chosen case study location and underscores the pressing need for adaptation in the face of water insecurity.<sup>17</sup> Martinez et al. conducted an assessment of Mexico City's water supply to locate factors that could mitigate or exacerbate the impact of water availability in the future. The study blends quantitative and qualitative methods to produce a warning for climate policy-makers about the complexities of the Mexico City water system and the siloed nature of compounding factors for impact. It is useful for emphasizing our choice of critical locality for our case study.

Furthermore, Martinez et al. point out the vulnerability of water shortages, which as Dupuits et al. note, can exacerbate local conflicts when project scaling supersedes the local community. The startling metric of a 10-17% reduction in water availability by 2050, combined with the growing population of Mexico City should be cause for concern. Work completed by Martinez et al. can aid policy-makers by highlighting physical water systems and the human factors that affect water supply and distribution. They stress the value of "holistic analysis in exploring the implications of multiple factors" which we intend to contribute to through our cross-sectoral focus groups.<sup>18</sup>

Our last article comes from the Secretary of the Environment for Mexico City's Internal Evaluation of the Rain Harvesting Program.<sup>19</sup> The internal evaluation was completed in 2021 and includes the initial objectives and methodologies of the program, as well as a thorough quantitative and qualitative analysis of the results of the program. According to the report, 10,015 new rainwater harvesting tanks were installed throughout different districts of Mexico City, bringing the total count of installed rainwater harvesting tanks to 31,239 in three years since the program was first enacted. The overarching goal of the project is to improve the access to clean water for economically impoverished areas of the city and to reduce the current water security problems that many across Mexico City are facing.

This report echoes many of the concepts discussed in Al-Zu'bi's article on intersectoral approaches to climate change mitigation in Jordan, which is particularly relevant for our study.

<sup>&</sup>lt;sup>17</sup> Martinez et al.

<sup>&</sup>lt;sup>18</sup> Ibid.

<sup>&</sup>lt;sup>19</sup> Secretaría del Medio Ambiente, "Cosecha De Lluvia," Secretaría del Medio Ambiente (Secretaría del Medio Ambiente), accessed October 15, 2022, https://www.sedema.cdmx.gob mx/programas/programa/cosecha-de-lluvia.

According to Al-Zu'bi, Jordan's current climate change governance framework "lacks the multilayer institutional arrangements that extend beyond traditional government players to include the private sector, NGOs, and civil society."<sup>20</sup> We found that this was also the case with Mexico City's Rain Harvesting System. Many governmental actors are partnering with the project, but there seems to be little to no participation from the private sector, NGOs, or civil society. With this in mind, we hope to explore how more effective cross-sectoral collaborations will impact the current water security issues in Mexico City.



**Figure 1.1 – Current Cross-Sectoral Collaboration Structure in Mexico City** 

## **Theoretical Framework**

Our conceptual framework is found in *Figure 1.2*. The first theory states that green infrastructure development is needed in developing countries. This theory was derived from the Mertz et al. (2009) and McArthur et al. (2002) studies, where the results showed the vulnerability,

<sup>&</sup>lt;sup>20</sup> Al-Zu'bi, M. Pg. 299

lack of adaptive capability, and financial limitations hamper the ability of developing countries to adequately and effectively address adverse climate change effects. Upon reviewing the study conducted by Al-Zu'bi (2016), we concluded that cross-sectoral collaborations are crucial for better green infrastructure transitions. This second theory was bolstered by Al-Zu'bi's (2016) assertion that Jordan's lack of an effective multi-sectoral approach to climate change initiatives has affected the country's ability to mitigate the negative effects of climate change. Our third theory is grounded in an exploration of Mexico City as a Latin American case study, where climate change has exacerbated water insecurity in the capital. Therefore, our third theory is developed from Martinez et al. (2015) and Dupuits et al. (2020), which shows the vulnerabilities of Mexico's aged water systems and more broadly, Latin America, as a region where grassroots movements have advanced global knowledge on local commons, including water.

Our first conclusion states that non-state involvement would lead to more effective green transitions. We believe that the presence of non-state actors, alongside a cohesive cross-institutional collaborative framework, in water mitigation efforts, would reduce the vulnerability of developing countries to the negative effects of climate change. This theory is strengthened by the literature, which demonstrates the lack of effective cross-sectoral partnerships and institutional arrangements involving non-state actors, such as international organizations or local non-profits in the water security and climate change mitigation process. The second conclusion that we identified is that current approaches to building green infrastructure are top-down. This theory was derived from our literature, especially by Al-Zu'bi (2016), which shows that green initiatives are generally headed by government entities without an emphasis on individual participation nor non-state involvement. Ultimately, we argue that emphasizing a bottom-up approach and allowing for more participation from the private sector, NGOs, and civil society, can serve to strengthen the effectiveness of climate change mitigation and green infrastructure transitions.

We will focus on Mexico City as a case study and examine its water crisis and the role that cross-sectoral collaborations, non-state actors, and top-down approaches play in mitigating the adverse effects of climate change on water resources. We will study our framework by measuring attitudes towards cross-sectoral partnerships on water mitigation initiatives. Affiliated stakeholders from the international, national, and local levels will participate in a pre-survey and a focus group study. We expect the results to yield a positive correlation between effective water mitigation efforts and cross-sectoral approaches, involving international organizations, government entities, and local non-profits. In addition, we anticipate our participant responses to include favorable consensus on bottom-up approach measures, approving of initiatives centered on individual participation.



**Figure 1.2 – Conceptual Framework** 

#### **Research Design**

By identifying an interesting potential of cross-sectoral relations in the creation of better green infrastructure initiatives, we decided to conduct a case study focusing on the case of Mexico City. Inspired by the literature on *Jordan's Climate Change Governance Framework*<sup>21</sup>, we seek to understand how the lack of effective intersectoral partnerships contributes to the perpetuation of the water crisis in the city. This case study will help make the case for why it is important to implement partnerships among actors at the international, national, and local levels to accelerate

<sup>&</sup>lt;sup>21</sup> Al-Zu'bi, M.

existing green infrastructure initiatives and to inspire the creation of new partnerships that will provide benefits for communities around the world.

To ensure methodological rigor, our analysis contemplates the nature of the research (applied), the research objectives (descriptive and explanatory), and the procedures that will be used (case study, surveys, and focus groups).<sup>22</sup> See *Figure 1.3* to understand how this design is interconnected. The nature of our research is applied, as it involves local interests. In this case, it promotes green infrastructure in Mexico City through discussions that seek to offer alternatives to what is the norm. Our research objectives are both descriptive and explanatory. The objectives are descriptive in that we will collect data through surveys and focus groups to observe and interpret facts without interfering with the behavior of the observed individuals and/or groups. They are explanatory because we seek to deepen our knowledge of this specific Latin American case, offering possibilities for understanding the phenomenon in other locations.<sup>23</sup>



**Figure 1.3 – Research Design**<sup>24,25</sup>

<sup>&</sup>lt;sup>22</sup> Prodanov, Cleber Cristiano, and Ernani Cesar de Freitas. Metodologia Do Trabalho Científico: Métodos e Técnicas Da Pesquisa e Do Trabalho Acadêmico. 2nd ed. Novo Hamburgo: Feevale, 2013.

<sup>&</sup>lt;sup>23</sup> Gil, Antonio Carlos. Métodos e técnicas de pesquisa social. 6th ed. São Paulo: Atlas, 2008.

<sup>&</sup>lt;sup>24</sup> Silva, Cassandra. Ribeiro. Oliveira. Metodologia do trabalho científico. Fortaleza: Centro Federal de Educação Tecnológica do Ceará, 2004.

<sup>&</sup>lt;sup>25</sup> Prodanov, Cleber Cristiano, and Ernani Cesar de Freitas.
The case study approach is the most adequate for this case, as it allows us to recognize implicit variables that are not clear in an initial observation.<sup>26</sup> In the case of Mexico City, there are multiple initiatives created to address the water crisis, but none of them seems to be sufficient to solve this issue. Observing this case offers us the possibility to recognize where the gaps are located, promoting alternatives to existing execution strategies in these initiatives. As for the limitations of this design, despite the purpose of the research being replication, the results may be very restricted to the focus of our study on account of the specificity of historical, geographic, and cultural factors.<sup>27</sup>

Along with the case study, we will use surveys and focus groups in order to gather the data that is missing from the governmental reports on initiatives such as the *Cosecha de Lluvia*. We will have two surveys (pre and post-focus groups) in order to validate the information gathered throughout the research, identifying similarities and discrepancies amongst the responses of individuals from different sectors. Although we want to demonstrate that cross-sectoral relations are crucial for the advancement of effective green infrastructures, our intention in carrying out the surveys and focus groups is not to change the participant's opinions but to examine them, a central aspect of performing descriptive procedures.<sup>28</sup> Even if this is a variable of interest, what we will observe when conducting these is whether the change in behavior or opinion occurs autonomously.

#### **Data Collection and Instruments**

In order to adequately understand approaches to cross-sectoral partnerships in Mexico City, we chose to conduct a focus group composed of relevant stakeholders of the city's water infrastructure. As opposed to individual interviews, a focus group presents a better method to evaluate existing partnerships (or lack thereof) and their functionality. Since the key focus of the study is cross-sector collaboration, our research method needed to have a collaborative aspect. By conducting a focus group, we will be able to identify the challenges and lessons learned from a variety of perspectives, including state and non-state actors. In doing this, we expect that focus group participants will be able to develop a consensus on the benefits and weaknesses of current approaches toward partnership for the city's water infrastructure.

<sup>&</sup>lt;sup>26</sup> Yin, Robert K. Case Study Research and Applications: Design and Methods. Los Angeles: Sage, 2018.

<sup>&</sup>lt;sup>27</sup> Ibid.

<sup>&</sup>lt;sup>28</sup> Prodanov, Cleber Cristiano, and Ernani Cesar de Freitas.

To select interview participants, we conducted a comprehensive analysis of existing partnerships working on Mexico City's water infrastructure and the key actors within each. From this research, three prominent themes of actors emerged: those at the international level (such as UN agencies and international organizations), those at the national level (such as departments within the Mexican government), and those at the local level (including local nonprofits and community leaders). From here, we selected the most prominent partnerships and identified individual positions within each group who would be ideal focus group participants. Given the current distribution of international, national, and local actors of the state and non-state variety, each focus group will consist of six members with one representative from the international level, three from national governmental efforts, and two from local level/community efforts.

The participant from the international level will be a representative from Isla Urbana, a US-based international nonprofit that partners with the local community in Mexico City to mitigate flooding and pollution. At the national level, we will invite representatives from three different initiatives: SACMEX: Sistema de Agua de La Ciudad de México (the Water System of Mexico City), SIAPEM: Secretaría del Medio Ambiente (the Secretary of the Environment), and SINACC: Sistema Nacional de Cambio Climático (The National Climate Change System). Each of these have department-specific initiatives related to water infrastructure. As for the local level, we will have representatives from COMDA: Coalición de Organizaciones Mexicanas Por el Derecho al Agua, a nonprofit that promotes transparency and access to information about Mexico City's water system, and ELAC: Estrategia Local de Acción Climática de la Ciudad de México, a city-level climate action program in accordance with the 2030 goals established at the Paris Climate Agreement (See *Figure 1.1*). Participants are selected based on their position in these organizations, or experience with these initiatives if applicable.

Since we are evaluating approaches to cross-sectoral strategies, our data collection follows the structure of a pre-survey, focus group, and post-survey. This is designed to measure how the focus group itself impacts participants' approach to cross-sector collaboration and green infrastructure, one of the key causal connections in our conceptual framework. By asking the same questions before and after, we aim to collect a more specific measure of how views change given the discussion from the focus group. In the focus group, we use three sections to surface participants' attitudes regarding partnerships and water infrastructure in Mexico City. The first section considers open-ended questions regarding challenges to collaboration, the second focuses on potential lessons and their applicability to green infrastructure in general, and the third centers on identifying future opportunities for collaboration, and what this might look like. In asking these questions, we hope to surface underlying approaches and attitudes to cross-sector partnership, as well as gain a better understanding of the current layout. Our hypothesis is that the current level of partnerships is not entirely functional nor sustainable - it relies too heavily on national-level projects and partnerships that do not demonstrate a sense of continuity or a long-term strategy for improving Mexico City's water infrastructure. Additionally, it does not utilize local-level non-state actors such as nonprofits that could significantly improve the city's water management. By dividing the focus group into these three sections, we can better assess the various connections between current approaches, non-state involvement, and how these relate to both water infrastructure and green transitions at a larger level.

Given the nature of the focus group, we will need to obtain IRB approval in order to conduct the study and recruit participants. We will submit our study proposal document, informed consent forms for our participants, recruiting materials, and our data collection instruments, including our pre and post-survey questions, as well as the focus group questions themselves (*See Appendix*). Since the focus group will not ask for any sensitive information, there is minimal risk to the participants. Therefore, the study qualifies for expedited review. For recruitment, we plan to reach out via email to contact individuals who meet the criteria for participation. Based on these responses, we will continue forward with our focus group.

In the following section, we discuss the details of data analysis, including plans for ensuring quality and methodological rigor.

#### **Data Analysis**

The coding scheme used for this study will be based on three first-cycle coding methods: affective, elemental, and exploratory.<sup>29</sup> For our purposes, a singular coding strategy would be superficial, making it difficult to observe satisfactory insights from the research. Effective methods are focused on the values and individual characteristics of participants, elemental methods process

<sup>&</sup>lt;sup>29</sup> Saldaña, J. The coding manual for qualitative researchers. 3rd ed. London, England: Sage, 2016.

qualitative data to categorize them through metrics, and exploratory methods use preliminary codes to identify critical elements from the dataset.<sup>30</sup>

Each of these methods contemplates a multitude of coding strategies, but the ones that will be used to analyze our survey answers and the dialogues within the focus groups will be evaluation coding (effective method), process coding (elemental method), and provisional coding (exploratory methods). The following table outlines how each of these codes will be implemented in the analysis.

Coding Strategy	Principles	Operationalization				
Evaluation Coding	Uses non-quantitative codes to evaluate metrics and the quality of policies.	Used to assess the responses in the pre and post-surveys, allowing us to compare if the participant's opinions changed after the interaction with the focus group. For instance, observing the level of cross-sector partnerships from "no partnerships" to "many partnerships".				
Process Coding With <i>-ing</i> ) to observe the actions in the data.		Applied to the responses in our focus groups to identify participants' activities in response to collaboration initiatives in Mexico City. Some examples are "participating", "creating", and "implementing".				
Provisional Coding	Uses an initial list with keywords based on the researchers' investigation and checks if they appear throughout the study.	Detects if the words from our list will appear in the participant's answers in one of the sections of the focus groups.				

Table	1 –	Coding	Strategies	and	Operat	ionaliz	ation	in t	he (	Case	Study	731
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<sup>&</sup>lt;sup>30</sup> Saldaña, J.

<sup>&</sup>lt;sup>31</sup> Note – Adapted from Saldaña (2016)

For the provisional coding, the keyword list was created based on the literature review, anticipating responses from the representatives of the local, national, and international groups participating in the focus groups.<sup>32</sup> Our list of codes has 15 words that will be run in the analysis of each participant during the three phases of our focus groups. As one of the cautions of using this strategy is that it may favor preconceived ideas,<sup>33</sup> our provisional coding will have two lists. The first one is the provisional coding list (*see Table 2*) and the second one will be a *code landscaping*<sup>34</sup> of words mentioned over three times that were not contemplated in the initial listing.

# Table 2 – Provisional Coding Keywords

# **Provisional Coding: List for Focus Group**

Partner, local, community, cooperation, collaboration, consensus, dialogue, agreement, individual, challenge, approach, program, management, sector, administration.

Being attentive to the biases and variances that may come through these different coding strategies, the analysis of our data will be implemented from a collaborative approach enabling varied interpretations of the data analysis process and offering a more consistent final report.<sup>35</sup> In other words, the three methods and coding strategies chosen for this research will be applied by at least two coders that are familiar with the literature, case study, and technical processes from the surveys and focus groups. This will ensure an objective and impartial analysis of the results, guaranteeing the quality of the research and providing a justification for the need (or not) for greater cooperation between the different levels of actors involved in the case of Mexico City.

<sup>&</sup>lt;sup>32</sup> Layder, Dereck. Sociological practice: Linking theory and research. London: Sage, 1998.

<sup>&</sup>lt;sup>33</sup> Dey, Ian. Qualitative data analysis: A user-friendly guide for social scientists. London: Routledge, 1993.

<sup>&</sup>lt;sup>34</sup> Saldaña, J.

<sup>&</sup>lt;sup>35</sup> Ibid.

## Appendix

Focus Group Script and Question Guide

Qual Mexico City: Pre-Survey

Start of Block: Informed Consent

intro\_consent

Welcome to the research study!

Hello, my name is [] and I am part of a team of researchers at LBJ studying green infrastructure and transitions in developing countries. We are interested specifically in understanding approaches toward cross-sectoral collaboration concerning the water infrastructure in Mexico City. The study will be conducted in three parts. First, you will be presented with a pre-focus group survey that surveys your current approach to collaboration. Then, you will participate in the focus group, where you will be asked questions about your involvement with different partnerships and initiatives related to Mexico City's water infrastructure, as well as the challenges and lessons learned from such partnerships. Then, you will be given the post-survey, where you will be asked the same question from the pre-survey. Please be assured that your responses will be kept completely confidential.

The focus group should take around 45 minutes to complete. Your participation in this research is voluntary. You have the right to withdraw at any point during the study, for any reason, and without any prejudice. If you would like to contact the Principal Investigator in the study to discuss this research, please e-mail cdmxwaterstudy@utexas.edu.

By clicking the button below, you acknowledge that your participation in the study is voluntary, you are 18 years of age, and that you are aware that you may choose to terminate your participation in the study at any time and for any reason. Additionally, you are aware that your responses to the focus group questions will be recorded and kept confidential.

Please note that this survey will be best displayed on a laptop or desktop computer. Some features may be less compatible for use on a mobile device.

• I consent, begin the study (1)

• I do not consent, I do not wish to participate (2)

End of Block: Informed Consent

Start of Block: Pre-Survey Question

rate\_partnership What do you think is the current level of cross-sector partnerships in Mexico City related to water infrastructure?

- No partnerships (1)
- A few partnerships (2)
- Some partnerships (3)
- Many partnerships (4)

rate\_importance How important do you think cross-sectoral collaboration is to green transitions for developing countries?

- Not at all important (1)
- Slightly important (2)
- Moderately important (3)
- Very important (4)
- Extremely important (5)

End of Block: Pre-Survey Question

Start of Block: Focus Group

## Script\_intro

**Introduction Script** Good afternoon and welcome to our session. Thank you for taking the time to join us to talk about the water infrastructure in Mexico City. My name is [] and assisting me is []. We are both with the LBJ School of Public Affairs at the University of Texas at Austin.

You were invited because you are involved in some level of water infrastructure management or activism, whether that be at the international, national, or local level. You should also have a level of familiarity with some of the current cross-sectoral partnerships that exist related to water. We are interested in gaining your perspective on the utility of these collaborations, and if there is ample opportunity for increased collaboration. There are no wrong answers but rather differing points of view. Please feel free to share your point of view even if it differs from what others have said. Keep in mind that we're just as interested in negative comments as positive comments, and at times the negative comments are the most helpful.

Let's begin. We've placed name cards on the table in front of you to help us remember each other's names. Let's find out some more about each other by going around the table.

End of Block: Focus Group

Start of Block: Challenges

Q1 What is your position, and what projects do you work on regarding water infrastructure? [short answers]

Q2 Are you currently a part of any cross-sector collaborations, and if so, which?

Q3 What are the current challenges you're facing concerning Mexico City's water infrastructure? Has working cross-sectorally helped or made these problems worse?

End of Block: Challenges

Start of Block: Lessons Learned

Q4 What have been some key takeaways from partnering with actors at different levels?

Q5 Do you think these lessons apply to the development of green infrastructure in general?

End of Block: Lessons Learned

Start of Block: Looking Forward

Q6 What opportunities, if any, do you see going forward for collaboration with state and non-state actors at various levels? [For example, do they want to focus more on local involvement vs international, do they want to specify with nonprofit vs more city-level, etc.]

End of Block: Looking Forward

Start of Block: Post-Survey Question

final\_partnership What do you think is the current level of cross-sector partnerships in Mexico City related to water infrastructure?

- No partnerships (1)
- A few partnerships (2)
- Some partnerships (3)
- Many partnerships (4)

final\_importance How important do you think cross-sectoral collaboration is to green transitions for developing countries?

- Not at all important (1)
- Slightly important (2)
- Moderately important (3)
- Very important (4)
- Extremely important (5)

End of Block: Post-Survey Questions

### References

- Al-Zu'bi, M. Jordan's climate change governance framework: from silos to an intersectoral approach. *Environ Syst Decis* 36, 277–301 (2016). <u>https://doi.org/10.1007/s10669-016-</u> 9602-9
- Dey, Ian. *Qualitative data analysis: A user-friendly guide for social scientists*. London: Routledge, 1993.
- Dupuits, et al. Scaling Up But Losing out? Water Commons' Dilemmas Between Transnational Movements and Grassroots Struggles in Latin America. *Ecological Economics*, 172 (2020).https://doi.org/10.1016/j.ecolecon.2020.106625.
- Gil, Antonio Carlos. Métodos e técnicas de pesquisa social. 6th. ed. São Paulo: Atlas, 2008.

Layder, Dereck. Sociological practice: Linking theory and research. London: Sage, 1998.

- Martinez, S., Kralisch, S., Escolero, O., & Perevochtchikova, M. (2015). Vulnerability of Mexico City's Water Supply Sources in the Context of Climate Change. *Journal of Water* and Climate Change, 6(3), 518-533.
- McArthur, Amar Bhattacharya, Homi Kharas, and John. "Why Developing Country Voices Will Shape the Global Climate Agenda." Brookings, 27 July 2022, <u>https://www.brookings.edu/research/why-developing-country-voices-will-shape-the-global-climate-agenda/</u>.
- Mertz, O., Halsnæs, K., Olesen, J.E. et al. Adaptation to Climate Change in Developing Countries. *Environmental Management* 43, 743–752 (2009). https://doi.org/10.1007/s00267-008-9259-3
- Prodanov, Cleber Cristiano, and Ernani Cesar de Freitas. Metodologia Do Trabalho Científico: Métodos e Técnicas Da Pesquisa e Do Trabalho Acadêmico. 2nd ed. Novo Hamburgo: Feevale, 2013.
- Saldaña, J. The coding manual for qualitative researchers. 3rd ed. London, England: Sage, 2016.

- Secretaría del Medio Ambiente. "*Cosecha De Lluvia*." Secretaría del Medio Ambiente. Secretaría del Medio Ambiente. Accessed October 15, 2022. <u>https://www.sedema.Mexico City.gob.mx/programa/cosecha-de-lluvia</u>.
- Silva, Cassandra. Ribeiro. Oliveira. *Metodologia do trabalho científico*. Fortaleza: Centro Federal de Educação Tecnológica do Ceará, 2004.
- Yin, Robert K. Case Study Research and Applications: Design and Methods. Los Angeles: Sage, 2018.