

CLIMATE RESILIENT COMMUNITIES IN THE CARIBBEAN:

A TRANSDISCIPLINARY STUDENT RESEARCH PROJECT ON DOMINICA



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ABBREVIATIONS

CARICOM	Caribbean Community (an intergovernmental organisation of 15 member states)
CATS	Caribbean Aqua-Terrestrial Solutions Program
GDP	Gross Domestic Product
GIZ	German Agency for International Development
MMA	Marine Managed Areas
MPA	Marine Protected Areas
OECD	Organisation for Economic Co-operation and Development
OECS	Organisation of Eastern Caribbean States
SMF	Sustainable Marine Financing Programme
TD	Transdisciplinary

FOREWORD

VOLKER HAMANN & CAMILLE DAVID

Climate variability and change is a monumental challenge for island nations across the Caribbean given their centralized position in the Mid-Atlantic hurricane belt, concentration of development along their narrow coastal fringes and hillsides owing to limited land mass and topographical constraints as well as limited human capacities and access to resources. Unfortunately, Dominica has suffered the brunt of the climate crisis in recent years with two catastrophic storms impacting the island in 2015 and 2017 respectively.

As a development and technical cooperation agency, GIZ has been laser-focused and instrumental in developing the management capabilities of MPA/MMAs in Dominica with the goal to improving resource management within protected marine spaces to achieve both conservation and livelihood enhancement end goals. Under the CATS II Program we realigned our focus to complement Dominica's National Resilience Development Strategy supporting a number of livelihood recovery programs and restoration efforts to preserve the ecological integrity of the coastal ocean particularly in and around Dominica's MPAs.

Our present focus under the Sustainable Marine Financing Program aims to improve the MPAs access to long secured financing and improve user fee collections systems and the administration of MPAs. The adoption of a regional guidelines document at the highest political level is intended to lay a foundation for a sustainable coastal strategy and harmonize approaches to its management across the OECS and CARICOM countries. Our program is actively building partnerships across the spectrum to enhance the effectiveness of MMA/MPAs as community driven approaches to resource management and combating climate change.

We continue to recognize the value of MPA/MMAs to the islands ecologic and economic systems and the potential to upscale lessons learnt to inform broader integrated coastal zone management planning. Our newly forged partnership with Leuphana University is a significant step in improving our understanding of MMA/MPAs processes, the socio-ecological resilience framework for tackling core MMA/MPA problems and rethinking on how development agencies such as GIZ can improve their effectiveness in assisting small island states better cope with climate change challenges.

The GIZ - SMF team facilitated contacts between the students and governmental and NGO representatives of the different fields covered by the study, and we are very satisfied with the outcome of the research. It was a process of mutual learning for all involved parties. The work broadened our understanding of flood management, biodiversity, small scale agriculture and the effectiveness of foreign aid on community resilience - and will be useful for the design and continued implementation of resilience strategies.

It is our hope that we can formalize this partnership for the upcoming semesters to unlock the full potential of the MMA/MPAs and add greater value to Dominica community resilience programs.

INTRODUCTION

LUISA EVELIN SCHUBERT & STEFFEN FARNY

Climate change will pose unforeseen challenges to humanity in the 21st century. Small island states are among the first to experience climate change effects since they are highly exposed to sea level rise and more extreme weather events. We all have seen pictures of destruction and devastation of extreme weather events in the media. These headlines and portrayals shape a doomsday scenario and forge a discourse on disasters and vulnerability. At the same time, the current discourse largely dismisses people's ability to withstand shocks and locally adapt to changing circumstances. The public discourse is often misleading as island communities are not only vulnerable but have proven point and again their ability to absorb disturbances, bounce back from shocks in the natural environment and over time adapt to the changing conditions. In other terms, they have demonstrated *resilience*.

A much less common term than sustainability, *climate resilience* suggests that communities are able to retain essential functions, structures and their identity in light of changing climatic conditions. The term resilience can be employed to frame ways in which society and nature can exist in harmony. It is generally assumed that building climate resilience is a precondition to be able to cope with the disturbances that natural disasters impose on islanders' livelihoods. However, different scientific disciplines approach the topic of securing and sustaining livelihoods on islands through their specific lens. There are bio-engineering approaches that focus on coral reef restoration (Schmidt-Roach 2020), others emphasize the importance of economic development (Zaheer and Jones 2019), yet others focus on the deconstruction of colonial continuities that still shape life circumstances (Hau'ofa 1994). The adaptation of the resilience concept to climate change remains vague and is likely to be context specific.

In response, in a transdisciplinary research project course, we raise the question: *What characterises climate resilient communities in the Caribbean? And How can communities on Dominica become climate resilient?* In collaboration with the team of the Sustainable Marine Financing Programme (SMF) of the GIZ in Dominica, 17 students of the "Global Environmental and Sustainability Sciences" programme at Leuphana University had the opportunity to design four transdisciplinary research projects to research multiple aspects of resilience in a Caribbean community context. With the governments objective to become the *world's first climate resilient nation*, Dominica provides an excellent context to develop greater resilience thinking and foster sustainability competencies together with local stakeholders.

PROBLEM FRAMING

KYRA HASKINS, MARIE BORRUSCH, MILENA WEBER, RAUSCHAN KLOZ

In recent years climate change has become an increasingly large threat due to its adverse effects. With rising temperatures, more extreme weather events and other threats like pollution, not only biodiversity is under stress, but also communities. It is a commonly known fact that the negative effects of climate change and ecological degradation are unevenly distributed across the globe with poorer and less industrialised states suffering the most. States that aren't as economically stable or have less extensive infrastructure are more vulnerable towards threats like droughts or floods due to lacking resources to stabilise or rebuild any structures necessary to maintain basic functions. What adds to this is the fact that they are usually much more directly dependent on ecosystem services. An example for this is the commonly more pronounced share of the society which depends directly on intact nature for their livelihood, such as fisherpeople or farmers. Moreover, the food production system is often less dominated by highly processed foods and imported goods, displaying a higher dependency on local natural resources. These factors contribute to an extremely high vulnerability in the face of the growing intensity and frequency of natural disasters, especially in small island developing states such as those located in the Caribbean. These are hazard-prone places or sites of limited size that are relatively isolated and yet dependent on international assistance. This, along with the tendency of the population to settle along the coastal zones and of a lacking diversity in the production base, leads to a high vulnerability (Sjösted and Povitkina 2016) which can be counteracted by implementing measures increasing resilience.

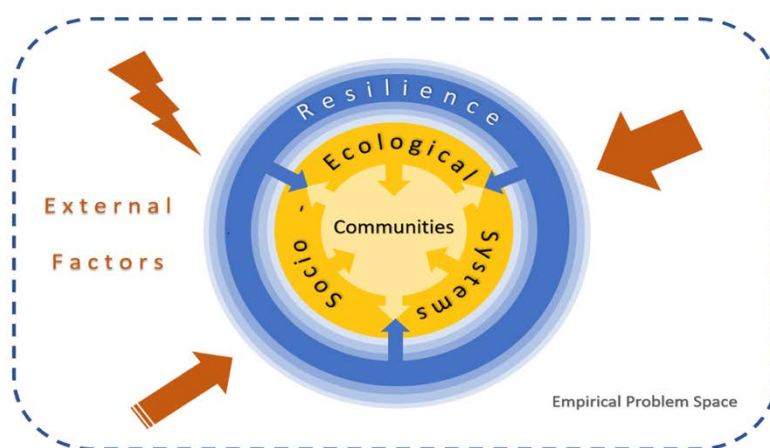


Figure 1 Empirical Problem Framework

All four projects are located within a theoretical problem framework portraying how different interactions and system components influence resilience (Figure 1). Socio-ecological systems and communities are located at the heart of the framework. Socio-ecological systems are defined as

“integrated system(s) where societies and ecosystems coevolve and develop, adapting and interacting together” (Herrera-Franco et al. 2018, p. 303). As the “social, economic, cultural, and political characteristics” (Herrera-Franco et al. 2018, p. 304) of the societal realm of the socio-ecological system are represented within communities, these are embedded within them, and both can influence one another. In our projects’ problem framings the *communities* can encompass local to national scales spatially or certain interest groups. Communities are “autonomous actors with [...] own interests, preferences, resources, and capabilities” which they use to promote the local common good (Patterson et al. 2010, p. 130).

Resilience then surrounds and interacts with the socio-ecological system and communities. There are varying definitions of resilience in the literature, however our problem framework applies the concept of resilience as the “collective ability of a [...] geographically defined area to deal with stressors and efficiently resume the rhythms of daily life through cooperation following shocks” (Aldrich and Meyer 2015, p. 255). This definition is expanded through viewing resilience as “the capacity of linked socio-ecological systems to absorb recurrent disturbances such as hurricanes or floods so as to retain essential structures, processes, and feedbacks” as well as the ability of the system to self-organise, learn, and adapt (Adger et al. 2005, p. 1036). This adds to the aforementioned definition by introducing the aspects of the community actively growing and learning through catastrophes. Some „stressors“ mentioned in the definition by Aldrich and Meyer (2015) are depicted as external factors in the theoretical problem framework. These range from extreme weather events to climate change or foreign aid in our project. Resilience is not represented as a stable state within the framework, but is variable depending on the influences of socio-ecological systems and communities as well as external factors. These can either foster resilience through their actions and thicken the resilience ring or decrease it resulting in a thinner circle. By increasing the resilience, the vulnerability to negative impacts, i.e., hurricanes, can be lowered. For this resilience is not viewed as external, but as involved in the interactions of the community and the socio-ecological system.

The four research groups within the project focus on different problems. Firstly, one group explores how farmers’ (communities) resilience can be increased by change in the socio-ecological system or influence of external factors. Secondly, a project group links community-based flood management to possible adaptation and mitigation within the socio-ecological system to increase the resilience to extreme weather events (external factors). Thirdly, the interlinkages within the social and ecological system are looked at concerning biodiversity loss through climate change (external factors). The link of participation and stakeholder diversity within communities to effective biodiversity protection implementation fostering resilience is investigated. Lastly, a fourth group researched the effects of foreign aid (external factors) on communities and how it can be applied positively to foster resilience.

CONCEPTS AND LITERATURE

HANNAH LÜBBERT, NEELE PHILIPPSSEN, JULIANE VORIG, CAROLIN ZOFALL

The central aspect of our research project is the resilience of socio-ecological systems. This describes the ability of human-environment systems to absorb external shocks. For that, the system can either absorb the disturbance, learn from it, adapt to it, or rearrange after the shock (Berkes 2007). Resilience does not just focus on ecological resistance and adaptation but takes into account social and community aspects and thereby describes the resilience in coupled socio-ecological systems. To further comprehend these aspects, we will describe the adaptation of systems, influencing factors such as diversity and stakeholder participation and resilience-focused management systems. Finally, we will look at the concept of foreign aid and neo-colonialism to comprehend how resilience is being influenced pre- and post- disaster from external organizations.

An important factor strengthening resilience is the capacity for adaptation. Adaptation is defined as adjusting the structure of a system to changing circumstances and accompanying challenges such as shocks like extreme weather events (Folke et. al. 2010). Adaptation to system shocks can be conceptualized by the adaptive cycle, in which adaptation occurs in four phases (Pisano 2012). After a shock (release), new solutions must be found and there is the chance for reorganization of the system to be better prepared for future shocks (re-organisation). This leads to a growth phase in which the system develops a multitude of new facets (exploitation), while afterwards stabilizing into fewer most successful elements (conservation). Adaptability can be fostered by adaptive governance, which includes effective collaboration between actors, a common learning from non-resilient management and sustaining the intactness of ecosystems (Pisano 2012; Adger et. al. 2005).

For resilience it is important that all spheres of the concept are provided with diversity. High biodiversity will increase ecological resilience (Berkes 2007). Diversity of species increases the variety of responses to disturbance and the likelihood that species can compensate for one another (Bernhardt & Leslie 2013). Connectivity among species, populations, and ecosystems enhances the capacity for recovery (Bernhardt & Leslie 2013). Biodiversity mainly stabilizes ecosystem productivity (Isbell et al. 2015) which then again contributes to a better community resilience as it secures livelihoods and provision of services. Community resilience needs a high economic diversity and diversity of partnerships (Berkes 2007). High diversity of organizations helps economic systems to absorb shocks. Looking at partnerships, a high level of interconnectedness provides for more and better contacts if needed, which can come in helpful in

times of crisis. High interconnectedness across scales can further improve this (Berkes 2007). Different actors react differently to hazards which allows for more possible responses in a community. This is important for disaster management, to avoid putting all hopes on one protection measure. Added to that, a broad range of stakeholders offers many viewpoints on a topic and thereby allows for better understanding of issues and solution options (Berkes 2007). It can be said that high diversity in participating stakeholders contributes to the resilience process by better anticipation, stronger coping, and multi-faceted adaptation (Berkes 2007). However, high levels of participation can also produce conflicts (Sterling et al. 2017) and slow down the process (Brody 2003).

Vulnerability of communities consists of intertwined concepts of exposure, resilience, and resistance (Few 2003). Communities in Dominica are vulnerable to disturbances and natural disasters such as hurricanes, floods, and landslides. Recent floods and landslides have drastically decreased communities' resilience by the destruction of houses, lands, and with-it livelihoods. Flood risk management encompasses all activities that aim at maintaining or improving the capacity of a region to cope better with floods to mitigate and adapt to risk and to increase community resilience. It decreases the disruption caused by flood waves in a way that serves society best and minimizes impact on nature or land scenery (De Bruijn 2005). Flood management takes place in a time pre-crisis, to better prepare the area and the community to deal with the next floods. The concept in a high-risk area such as Dominica, or specifically Colihaut is 'living with floods' rather than attempting to prevent them through large scale engineering interventions. Such actions attempt to reduce negative effects from floodwaters through actions such as livelihood diversification, relocation of belongings, or the community distribution of emergency drug supplies (Few 2003). The aspects of disaster management, specifically Community-based disaster management, include a holistic view of communities and the socio-economic activities of locals. It includes, expresses, and addresses societies' real needs and priorities by defining the problem frame correctly. This way of disaster management creates a bottom-up approach, additionally complementing the top-down approach, to create community resilience by generating social resilience (Holladay and Powell 2013).

One concept that has gained attention for trying to influence community's pre- and post-disaster resilience is foreign aid. The OECD defines foreign aid (or development assistance) as a financial flow that is at least 25% granted and primarily intended for development in the recipient country. Foreign aid can be aimed at improving disaster preparedness, disaster mitigation or disaster response and is thus affecting all stages of the adaptive cycle. As aid is usually granted by wealthier, "more developed" countries to those affected by disasters and a lot of resilience measures are facilitated by financial means, one can argue that foreign aid serves as transmission of resilience capacities. However, foreign aid can foster dependencies between countries and has

thus been criticized for manifesting neo-colonial structures by undermining the self-governing capacity of the dependent state and often impoverishing it (Ziai 2020). In such cases, foreign aid can actually be a means for giving countries to strengthen their geopolitical power, their economy (and thus their own resilience) to the disadvantage of the socio-ecological resilience of the receiving countries. The question whether and how foreign aid can be successful is thus not only highly political but also very interesting from a systems-theory standpoint as it addresses the issue if a system's resilience can be improved from outside the system and if resilience can be transferred from one system to another.

To sum up, the research project examines how resilience can be fostered to reduce the vulnerability of the socio-ecological system of Dominica to climatic weather events. According to the examined literature, resilience can be fostered by adaptation to climatic events, including effective collaboration between stakeholders and a common learning from negative experiences. Another factor fostering resilience is diversity, including, ecological, economical and stakeholder diversity, as it increases the variety of responses to disturbances. A more specific measure for resilience is flood management, which includes precautionary practices that mitigate flood impacts. While the above-mentioned concepts are considered to foster resilience, neo-colonial forms of foreign aid have been criticized to have negative impacts on communities and could thereby reduce their resilience.

TRANSDISCIPLINARY RESEARCH APPROACH

JELKE MEYER, CHARLINE RIEFFEL, LOTTE RÜTH, VIVIENNE WIDAWSKI

The methodology in all research groups includes the typical elements of transdisciplinary research since it aims to combine societal practice with scientific practice to co-produce knowledge. To better understand the complex sustainability problems of today and find transition strategies towards a more desirable future state, novel methods for scientific research have to be implemented. Transdisciplinarity is a research strategy which aims at collaboration between disciplines and actors outside academia to create a holistic approach by co-producing socially-robust knowledge. Lang et al (2012, p.26) define this approach as “[...] a reflexive, integrative, method-driven scientific principle aiming at the solution or transition of societal problems and concurrently of related scientific problems by differentiating and integrating knowledge from various scientific and societal bodies of knowledge”. This solution-oriented approach fosters the development of new conceptual, theoretical, methodological, and translational innovations. Transdisciplinary research has gained increasing popularity in recent years, as it dissolves the traditional borders between disciplines and links concepts and skills through a real-world context. Additionally, it helps to capture complex causes and creates in-depth knowledge.

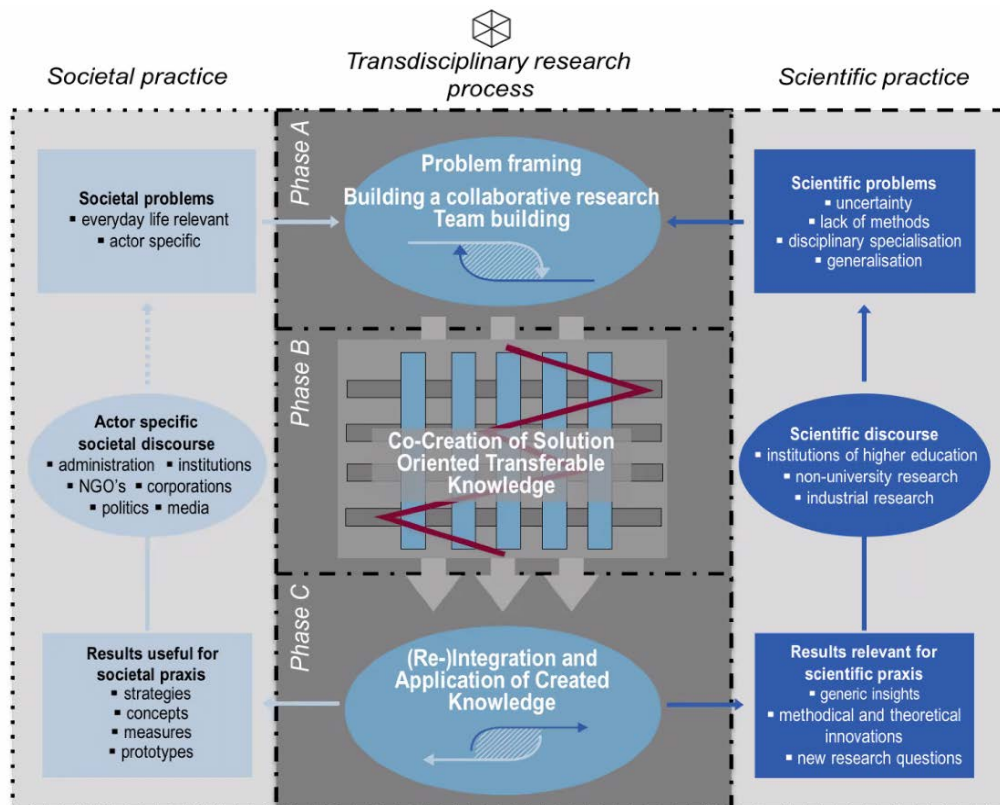


Figure 2 Transdisciplinary research framework following (Lang et al. 2012)

Following the transdisciplinary research framework (Lang et al. 2012), the first step was the analysis of the complex problem situation. Therefore, firstly the groups did a broad literature review, to know the state of the research, using primarily journal articles, theoretical publications, and governmental reports. One group focused on stakeholder analysis and used the approach of stakeholder mapping (Alexander 2003) for identifying and analysing the stakeholders. Based on previous research, a rough map of the stakeholders and their relations was sketched. For the outcome and for presenting the collected data of the research project, the concept of visualizing the desired state of a stakeholder network was used. Via questionnaires, a few quantitative but mainly qualitative questions were asked, this way different values and perspectives were collected. Here the concept of map-based questionnaires was used to get a deeper insight into locations and value-related sites. Therefore, data analysis, mainly qualitative data analysis, was one of the main methodological concepts in this group.

The other groups focused on interviews to collect the data, mostly interview questions for a semi-structured and therefore qualitative interview. This allowed them to gain insights into societal practice and answer questions that are Dominica specific and not included in the literature. Group one designed the questions aimed at adaptation strategies since the concept of the adaptive cycle (Sundstrom & Allen 2019) is the scientific background on which these are based.

Furthermore, all groups included elements of the methods of scenario development and visioning into their question guide. By this the groups could identify plausible and simplified future states, based on stakeholder information. However, the groups also invited the interview partners to be able to envision a possible future state they desire, which is also realistically achievable. However, these last two mentioned methods were only touched upon, because of time reasons. One group also used GIS data sets as an additional source of knowledge, to understand physical conditions of Dominica. Finally, all groups aimed to analyse the given information and connect it to scientific theory to identify possible future states and visualizations that were developed.

In retrospect, the research was conducted in a transdisciplinary way for the most part. Nonetheless, the research teams deviated from the principles of transdisciplinary research as there was a strong focus on the scientific part and less on the societal part in phase A (Figure 2; Lang et al. 2012). The knowledge co-creation in phase B brought some challenges as well, as there was only one joint reflection meeting with local partners due to time limits and the geographical distance. The knowledge co-creation predominantly happened in academic spaces. The knowledge integration and application in phase C follows transdisciplinary principles as there is scientific output as well as creative output, both of which are accessible to the public.

We, as a transdisciplinary research team, are aware that research must include ethical considerations. All research should have findings and outcomes that benefit society by assisting in solving complex problems. Transdisciplinary research in specific, has to be conducted in a way that is advantageous both to science and society as a whole. Achieving this needs to be one of the priorities in transdisciplinary research projects as they thrive from these interlinkages of different kinds of knowledge. This mutual benefit can be hindered when power dynamics are involved and not being acknowledged. In this research project for example, one important power dynamic to recognize is that most of us are white researchers in the European academic field. Most often, we are taught that our view of the world and how things ought to be is the ideal (and only) way, especially in the field of environmental science. This resulted for example in power dynamics within the interviews and a tendency from our side to rely on academic knowledge rather than live experiences of the interviewees in phase B (Figure 2). However, we do have to unlearn this when trying to provide knowledge that is helpful to our research partners in Dominica. By acknowledging that we might be overstepping our area of expertise when proposing actual strategies for places and dynamics that we are only starting to understand, we are attempting to conduct this research project in a respectful and self-critical way.

EMPIRICAL CONTEXT

GAIA BRABELER, FIEKE GRUNWALDT, RACHEL LA, MAIKE TRÜMPLER, PIA WELLMANN

The Caribbean as a region of Small Island States is especially vulnerable to the effects of climate change due to its location in the Atlantic hurricane belt, low-lying coastal areas and a large share of the economy is based on coastal ecosystems and/or located close to the shoreline (FAO 2019). Flooding and hurricanes occur annually with tropical climate and heavy rainfalls being the main cause. As a result of climate change, the frequency and intensity of these natural disasters will only be increasing. The Dominican terrain is rich in river streams and steep hills, during hurricanes and rainy seasons, flash floods and landslides are common (Jetten 2016).

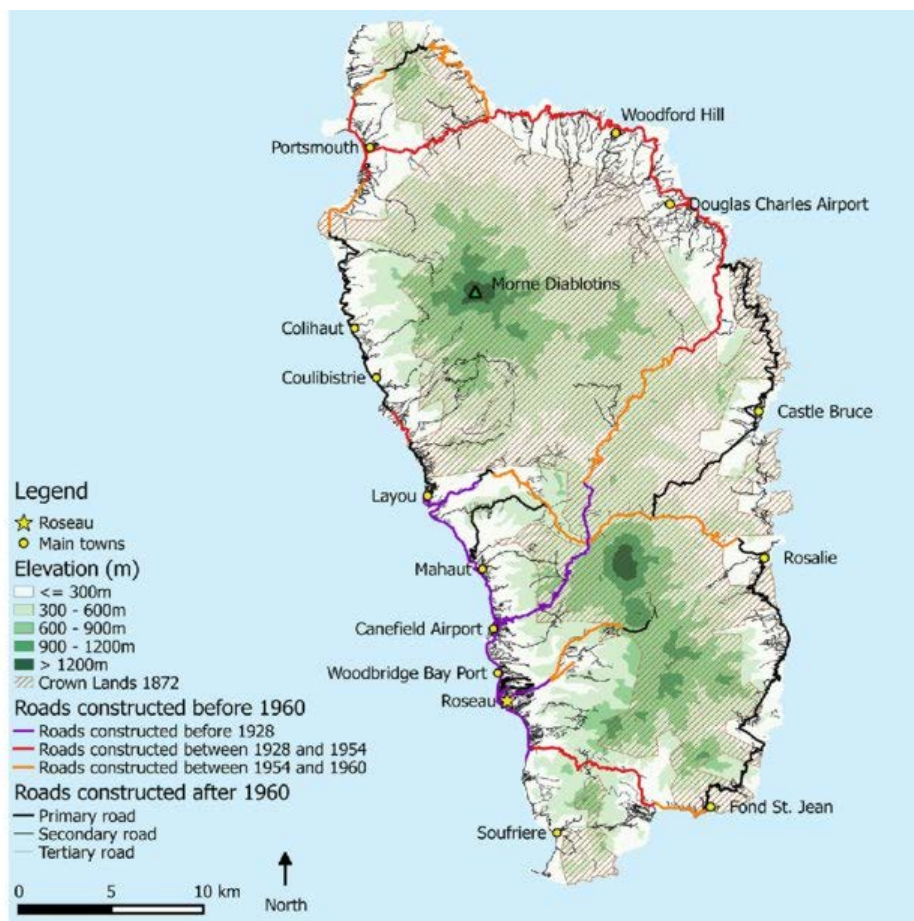


Figure 3 Topographic map of Dominica showing the capital city Roseau and other selected settlements, ports and airports, and main roads (Caribbean Handbook on Risk Information Management 2016).

The aftermaths of these events are human casualties, destruction of infrastructures and houses, loss of food crops and pollution of drinking water. Hurricane Maria in 2017 alone brought calamitous damage to Dominica. 80% of the population was distressed, 31 lives were lost and 37 people were missing as well as more than 90% of buildings and entire crops were damaged or

destroyed (ACAPS 2018). Continuously fighting against the effects of extreme weather events is a major setback to the economic development of Dominica and other developing Island nations. In the case of Dominica, Hurricane Dean 2007 imposed damage equivalent to 58% of GDP; Tropical Storm Erika caused damage equivalent to 90% of GDP; worst of all, Hurricane Maria led to total loss and damage estimated to be 224% of GDP (Government of the Commonwealth of Dominica 2015; ACAPS 2018). Apart from the devastating economic and social impact, the increased prominence of natural disasters affects Dominica's biodiversity both directly and indirectly. Direct influences include the damage of habitats and ecosystems as well as the improper disposal of dangerous waste in the environment (CBD 2019; Climate Resilience and Recovery Plan 2030 2018). An indirect influence of natural disasters on biodiversity is the direction of attention and resources away from conservation projects and towards reconstruction and immediate relief (CBD 2019).

Dominica has a large marine biodiversity with many coral reefs. Two Marine Protected Areas on the shores of the island have a long partnership with the GIZ since in 2013 when the Caribbean Aqua-Terrestrial Solutions Program (CATS) started. The GIZ focus was to link biodiversity protection to economic gain (David 2015). Corals are very important to maintain or increase fish stocks, protect the coastlines, and draw tourists. However, the abundance is threatened by changes in salinity and sea temperature (Climate Resilience and Recovery Plan 2030 2018). Therefore, their protection and increase are one of Dominica's 20 climate resilience targets (Climate Resilience and Recovery Plan 2030 2018). A healthy ecosystem is more resilient, due to a higher number of regulating ecosystem services that can decrease the impact a natural disaster has on a place. It can also attract more tourists which generates income for Dominica (Climate Resilience and Recovery Plan 2030 2018). As a small island, Dominica is largely dependent on import goods. A healthy ecosystem can provide several ecosystem services that can reduce its dependency. Corals for example provide a habitat for fish and thereby benefit the local fishing industry (Climate Resilience and Recovery Plan 2030 2018).

Historically, fishing and crop agriculture have been one of the key economic sectors for Caribbean nations. This is still true for Dominica today as the agricultural sector contributes about 16% of its GDP with 40% of the population dependent on agriculture (FAO 2019; World Factbook). First and foremost, agriculture in all Small Island States is defined by a limited availability of land mass and population (FAO 2017). Partly because of this, most Small Island States are highly dependent on food imports, which becomes an issue especially when the islands cannot be accessed from the outside, e.g., due to an extreme weather event. Small Island States are particularly vulnerable to external (economic) shocks and natural disasters because of their topography and their usually fragile natural environments (FAO 2017). In Dominica a lot of agriculture is done on the steep slopes of the mountainous island, a difficult environment prone to landslides and wind damage

(Barker 2012). Most farms are small, no bigger than two acres and monocultures are still the most common form of cultivation, a remnant of colonial times on the island (Mohan 2016; FAO 2008). The main crops grown in Dominica for both the internal market and export include bananas, plantain, coconut, citrus fruits, cocoa, other tree crops and root crops (FAO 2008). Open-field agriculture is especially vulnerable to climate change and extreme weather events. Dominican farmers face challenges of more intense tropical storms destroying crops, soils, and infrastructure as well as droughts and volcanic activity (FAO 2019).

Due to their vulnerability, Small Island Developing States like the Caribbean Islands tend to have received more development aid in relation to their size over the past decades than other developing countries. This is due to their high vulnerability as island states to crisis such as natural disasters (e.g., hurricanes) and changing climatic conditions in general which brings those islands in the need for foreign aid to overcome disasters (Bah & Ward 2011). Foreign aid can increase the growth of a country but may also bring dependencies and/or neo-colonial tendencies to small island developing states. The context of this is the history of 500 years of colonial influence in the Caribbean which brought Western power hierarchies to the island states. The Caribbean was the first territory of the Western overseas expansion (Girvan 2012). Due to the colonial history, foreign aid and funding may induce neo-colonial tendencies in Small Island Caribbean States when a financial dependency on foreign actors occurs in conjunction with an overall control of economy from external powers. Therefore, foreign aid can be categorized as conditional and unconditional and thus can have different outcomes and impacts on the affected island states (Girvan 2012; Ziai 2020). As a Small Island State in the Caribbean, Dominica is dependent on foreign aid for recovery after for example tropical storms like Hurricane Maria in 2017.

Every year in June Dominica enters the hurricane season and each year it poses an existential threat to land and livelihoods in the Caribbean's Small Island States. Besides the more intense storms and other effects of climate change, the management of marine ecosystems in Dominica is additionally challenged by the legislation concerning its governance being split between many different laws and ministries. This leads to both jurisdiction gaps and management overlaps and prevents a way of holistic management (David 2015). Holistic management for building resilience to extreme weather or other natural events and adapting to a changing climate are necessary key priorities for the future of Dominica. For terrestrial and marine biodiversity conservation and ecosystem management as well as all its small-scale farmers and infrastructure sectors. Having good measures of flood management and land use planning are vital to reduce risks and impacts of disasters as well as the cost of reconstruction while increasing food security. An important factor to consider for Small Island States, like Dominica, is that the whole state is affected by a natural disaster and there are very little or no resources to be mobilised afterwards (Hewitt 2017). Therefore, foreign aid is needed in a way that builds resilience and fosters independency.

TD PROJECT: FLOOD MANAGEMENT

CAROLIN ZOFALL, CHARLINE RIEFFEL, HIU LAM RACHEL LA, KYRA HASKINS

Floods are no stranger to Dominica, especially during the hurricane, rainy seasons. Due to its hilly topography that is filled with river streams, flash floods and subsequent landslides are very common. Colihaut was one of the most seriously impacted areas during the last Hurricane Maria with an ageing community with limited resources. It is crucial to find implementable mitigation measures for Dominica, especially for this particularly vulnerable area to become more climate-resilient. In this project, four scenarios – relocation, community-based disaster management, floodproofing infrastructure and balance – to enhance resilience were developed based on literature review and expert interviews, as a general overview of possible future pathways to construct Colihaut into a more resilient community less exposed to flooding. A Multi-Attribute Utility Theory Analysis and consistency analysis were conducted to assess how applicable and internally consistent the four scenarios are.

Flooding is a relevant issue in Dominica in connection to extreme weather events. The small town of Colihaut is particularly heavily affected and was thus recommended for our research project. The proximity of the buildings and infrastructure to the river and the higher risk for landslides due to an upstream mining operation increase the damage of the flash floods, which occur due to the steep topography during hurricanes. The Colihaut community is facing a lack of economic opportunity, which results in only limited personal financial resources to function as a safety net during disasters. Additionally, the government does not possess the funds to build the region back better to increase resilience. The ageing community and lack of education on hurricane preparedness further increase the town's vulnerability. The current mitigation measures of stone walls and dredging are insufficient to counteract this trend. As climate change is expected to worsen the flooding on Dominica, an increase in Colihaut's community resilience is desirable for dealing with the increasing vulnerability and risks.

To explore possibilities for achieving an increase in community resilience for Colihaut, we developed four scenarios of future pathways. Firstly, a literature review of sources on the context of Dominica and the Small Island States, case studies on flooding, landslides, and mitigation measures as well as theoretical concepts of adaptation, mitigation, resilience, and community participation were reviewed. This was complemented by expert interviews with employees of the

Dominican physical planning division as well as a US organization conducting participatory flood management projects.

Based on this information the following scenarios were developed:

Relocation: As Colihaut's proximity to the river is one of the main risk factors, a relocation of the residents living closest to the river to an area further uphill and less prone to flooding would decrease their vulnerability. This relocation should be supported by government incentives to gain the community's support. As people naturally are attached to their homes, a relocation would have to be accompanied by targeted community education and risk communication on the issue. Additionally, it should be a jointly developed process with those to be relocated to ensure that their needs are met. To also reduce the flood risk for houses slightly further away from the river, the then-vacant riverside area should be covered by vegetation for water retention and flood control and bring further value to the community by offering a recreational space. By facing less destruction due to flooding, the Colihaut community could experience more stability and increased economic opportunities.

Community-based disaster management: The core principle of this scenario is the involvement of the local community in the river basin management. This way the locals can express their needs set their priorities and define and target problems more concretely than from an external perspective. For achieving the implementation of effective measures of sustainable flood management, capacity development of local institutions as well as hard and soft planning and management measures, restoring the natural functions of the floodplains and river should be utilized. A lack of community participation, which is essential for shaping this approach as the local people play a central part in solving the challenges faced by their community, could become an issue. For overcoming this, the local context and possible incentives should be considered to increase participation. The desired outcome of this scenario is a strengthened community support network and community resilience.

Floodproofing infrastructure: This approach aims for a combination of measures to reduce the exposure and vulnerability to flooding. This expert-led approach would implement various technical planning measures in Colihaut such as a decentralized power system, rain infiltration facilities, permeable pavements, floodplains, etc. The realization of these measures should be based on the development of a disaster database to assess a location's specific vulnerability and design possible site- and data-based improvements. Government engineers and practitioners should be trained in the construction and maintenance of flood risk reduction measures. Additionally, raising the public's and

government’s awareness of disaster risk and how to reduce it will improve this scenario’s outcome.

Balance brings resilience: This scenario combines the measures and strengths of the previous three scenarios. These complement each other quite well and overall lead to a more significant decrease in risk and increase in community resilience. Relocation would create a safer and more stable environment for the residents living closest to the river, thus significantly reducing risk exposure and vulnerability. Technical measures of the “Flood-proofing infrastructure” scenario would further decrease the disasters’ intensity for the entire community. Lastly, by basing the measures on “Community-based disaster management” the community support is secured as the locals would be involved in flood management. By including the local perspective, the site-specific implementability and thus effectiveness could increase.

For assessing how useful and suitable the four scenarios are, a Multi-Attribute Utility Theory Analysis was conducted. The following attributes were defined and weighted, which shows our assessment of how important they are to the overall desired outcome of the scenarios.

Attribute	Definition	Weighting
Implementability	Possibility of realization in physical setting. Economic setting was also considered, but not focused on as the scenarios were designed as a collection of the best possible solution pathways and thus were not restricted by realistic economic implementability.	0,2
Community Support	The community’s acceptance of scenario is key to sustainable and long-term changes. Community involvement enhances the support of plans.	0,15
Remaining Risk	Decreased physical vulnerability of community. It should be considered that this attribute has to be coded negatively.	0,3
Community Resilience	As defined in previous chapters. In our project specifically, a decrease in vulnerability to flooding and an improved recovery and coping after disasters constitutes resilience.	0,3
Uncertainty	Lack of certainty in outcomes of scenarios and possible issues occurring before, during and after implementation. Especially for the “Balance brings resilience” scenario the interactions of the approaches create uncertainty.	0,05

In this analysis the “Flood proofing infrastructure” scenario scored lowest (0.515), followed by “Relocation” (0.64) and Community-based disaster management (0.685), while “Balance brings resilience” scored highest (0.7525). This shows that the combination of scenarios most effectively reaches the desired outcomes. To assess if the scenarios were internally logical, a consistency analysis was conducted. The five MAUT attributes as well as “effectiveness” were used as criteria. “Effectiveness” was added as it was considered a prerequisite for a utility analysis, but useful to

Flood Management in Colihaut

Flooding is a relevant issue in Dominica in connection to extreme weather events. The small town of Colihaut is particularly heavily affected and was thus recommended for our

research project. The proximity of the buildings and infrastructure to the river and the higher risk for landslides due to an upstream mining operation increase the damage of the flash floods, which occur due to the steep topography during hurricanes. The Colihaut community is facing a lack of economic opportunity, which results in only limited personal financial resources to function as a safety net during disasters. Additionally, the government does not possess the funds to build the region back better to increase resilience. The aging community and lack of education on hurricane preparedness further increase the town's vulnerability. The current mitigation measures of stone walls and dredging are insufficient to counteract this trend. As climate change is expected to worsen the flooding on Dominica, an increase in Colihaut's community resilience is desirable for dealing with the increasing vulnerability and risks. To explore possibilities for achieving an increase in community resilience for Colihaut, we developed four scenarios of future pathways.

Scenario 1: Relocation

After disaster: rebuilding whole village in different location

- Relocation uphill → higher distance to river
- Need for Incentive to gain community support

- Need for education about necessity
- Good risk communication
- Lower risk
- Possibly more economic opportunity and stability
- Possibly relocating the mine?



Scenario 2: Community based Disaster Management

- Considering of economic and cultural issues
- Improve coping response through planning and management practices
- Involving the local communities in the river basin management
- Capacity development of the local institutions for effective measures of sustainable flood management

- Possible problems:
- Lack of participation

Scenario 3: Flood proofing Infrastructure

- Developing database on disasters
- Decentralized power system
- Multifunctional facilities in river basin (sport facility, ponds, rainfall infiltration facilities, permeable pavement)



- Training for government engineers and practitioners for construction and maintenance of the flood risk reduction measures
 - Raising awareness of the public and the government on disaster risk reduction
- Less exposure and vulnerability

Scenario 4: Balance brings Resilience

- Combination of all 3 scenarios:
- Relocation
 - Community-based disaster management
 - Flood-proofing infrastructure
- Combining strengths of each scenario
- Safer environment + community support + technical measures = risk reduction + community resilience



Conclusion

For assessing how useful and suitable the four scenarios are, a Multi-Attribute Utility Theory Analysis was conducted (attributes: implementability, community support, amount of reduced risk, community resilience, certainty). In this analysis, the "Floodproofing infrastructure" scenario scored lowest (0.515), while "Balance brings resilience" scored highest (0.7525). This shows that the combination of scenarios most effectively reaches the desired outcomes. To assess if the scenarios were internally logical, a consistency analysis was conducted. The five MAUT attributes as well as "effectiveness" were used as criteria. The analysis showed that all scenarios were consistent, with "Floodproofing Infrastructure" scoring the highest (0.6). We hypothesize that the other three scenarios scored lower as the community's perspectives were not considered sufficiently leading to inconsistency. For the "Balance brings resilience" scenario a lack of adaptation of the three distinct scenarios to each other, could lead to a larger inconsistency. In conclusion, no scenario is perfect, but they can serve as inspiration.

Figure 4 Four Scenarios to improve Flood Management in Colihaut

assess its interaction with other scenario characteristics. The analysis showed that all scenarios were consistent as they all scored above zero on a scale from minus two (very inconsistent) to two (very consistent). "Floodproofing infrastructure" scored highest (0.6) probably as there are a lot of case studies for how to create consistent technical approaches and the local community

showed a preference for current measures similar to those proposed in our scenario. We hypothesize that the other three scenarios scored lower as the community's perspectives were not considered sufficiently leading to some discrepancies. For the "Balance brings resilience" scenario a lack of adaptation of the three distinct scenarios to each other, could lead to a larger inconsistency.

We are aware that we did not consider all aspects of our scenarios as deeply as necessary. Our project shows a lack of community involvement due to limitations in time and obstacles regarding implementation. Thus, parts of the local context might not have been considered sufficiently. Additionally, our project does not include an economic component of the scenarios and thus lacks realistic feasibility. Lastly, as students of environmental studies, we lack the knowledge on and did not analyse the technical suitability to the site and feasibility of the measures we proposed.

Nevertheless, our results are valuable as inspiration for the application to the flood management of Colihaut or other communities in Dominica. Additionally, our findings can be adapted to other locations with similar geographical or socio-economic conditions as we also developed our scenarios based on a combination of case studies from all over the world.

TD PROJECT: BIODIVERSITY

MARIE BORRUSCH, GAIA BRABELER, JELKE MEYER, JULIANE VORIG

The area where we conducted our research was the Scott's Head Marine reserve, which is located on the southwestern tip of the island of Dominica and was established to reduce user conflicts, preserve traditional fishing practices, and ensure conservation of resources as well as preserve the Soufrière underwater crater. Gathering information about the region was the first important part of our literature review. We identified a variety of different stakeholders, including, but not limited to, the Government, fisher people, scientists, and the educational system. Lastly, we did research on action plans in place to preserve biodiversity and found several plans on a national level, as well as different organizations on the local scale.

The second important take-away from our key literature are definitions of key terms. We started looking at ecological, social and community resilience and how they are connected and then at the individual concepts. Our literature showed that stakeholder diversity increases social resilience, because of more diverse possible responses and mutual learning processes. However, even when there is high stakeholder diversity, stakeholder need to be included to be able to contribute to problem-solving. Sufficient participation is therefore necessary in addition to stakeholder diversity to increase social resilience. A key requirement for ecological resilience is biodiversity, because it leads to a higher variety of possible responses and increases the chances that species compensate for one another (Bernhardt & Leslie 2013). Community resilience is a result of both ecological and social resilience. Another factor is economic resilience, however for our project, we decided to focus on connections between the former two concepts.

We designed a questionnaire to gather data on how people who live in the Scott's Head area perceive the local biodiversity conservation. The first cluster of questions were scale questions concerning their perception of the current management of biodiversity, as well as the importance of participation and their own influence, were included. There were also questions to find out to what extent they value biodiversity and whether they are personally attached to it. Participation as well as Stakeholder diversity are perceived as very important by all participants. But not all participants agreed that participation is sufficiently implemented in the area. An interesting correlation was that those participants with high self-perceived influence were more content with the current management, including participation processes. Several participants indicated that they would like to participate more and felt like their skills could be a useful contribution.

Another type of questions that we included in the questionnaire were the map-based questions, aiming at understanding how the participants perceive the area. For example, which regions

appear to be most healthy and diverse, and which seem to be the most vulnerable. We analysed the data by giving each participant a different colour and trying to find similar or controversial perceptions and connections to other characteristics of the participants. We were able to observe that the government official sees a significantly larger part of the area as very healthy than any other participant. Another interesting observation was that the government official and the scientist almost never agreed (see Figure below – colours indicate different stakeholder groups). Most commonly pointed out as vulnerable areas were those, where most infrastructure is present, however the Scott's Head Bay and forest areas were seen as the areas that have been harmed the most in the past years. Furthermore, an interesting insight was that the perception of vulnerability was more homogenous than the perception of diversity. This suggests that vulnerability of biodiversity might be more clearly noticeable than health.

To further understand the area around Scott's Head Marine Reserve, we incorporated open questions into our survey. We wanted to assess the perception of the area's biodiversity and the perception of institutional relations and their benefits. The answers showed that a large part of the benefits from biodiversity are business opportunities. Apart from that biodiversity was considered important for health and the quality of life. To find out where and how interventions could be

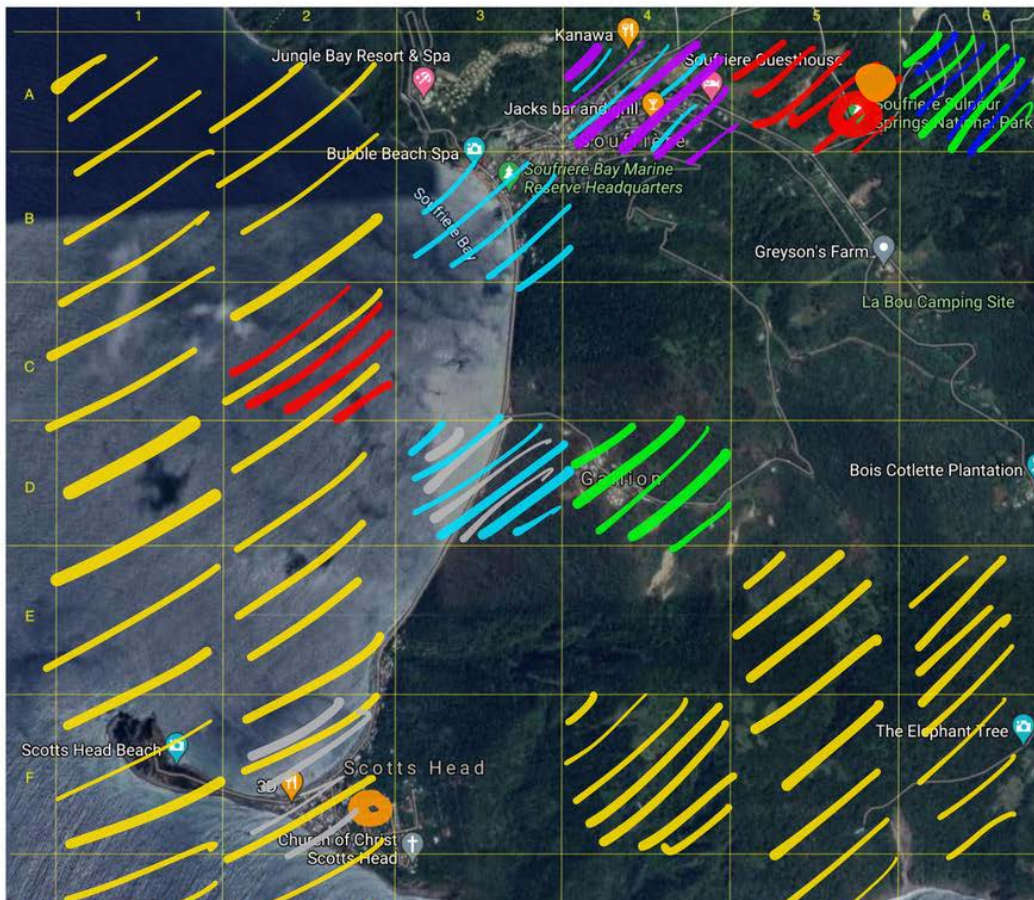


Figure 5 Different Stakeholder Perceptions of Healthiest and most Diverse Places

placed, we asked about the use of exchange between institutions and organizations. Skill, knowledge, and experience sharing was the main benefit from organizational exchange. But also, the coordination of goals and working together for biodiversity protection were mentioned several times. For decision-makers in biodiversity conservation the respondents named knowledge and experience but also passion and respect for nature as crucial attributes. When asked about who influences the biodiversity decision-making the most, many respondents answered that the central government and the public and community have the most influence.

To further assess the interconnections between groups, we provided a list of organizations and asked several questions. A large group of respondents said that they would be especially interested to be in contact with the Physical Planning Division, but also Resilience Dominica and schools. Organizations that seem to be not sufficiently included are The Forestry Wildlife and Parks Division and the LAMA. When asked about who shows the greatest interest in diversity and participation, Resilience Dominica and Nature Island Dive were mentioned.

Regarding our research question “How do the diversity of stakeholders and characteristics of actors influence biodiversity conservation?”, our research suggests that participation and organizational exchange are important for stakeholder diversity to have an impact on biodiversity conservation. Our survey found that organizational exchange and participation are often lacking in Scott’s Head Marine Reserve as many stakeholders that wish to be more included currently aren’t and there is a lack of transfer between scientists and governance. Based on this we suggest three intervention points: increasing awareness for biodiversity, participatory regional planning, and events for organizational exchange. Awareness for biodiversity and actor’s knowledge could be increased by facilitating workshops and similar events. These could be facilitated by the LAMA, and/or Nature Island Dive and they could be held in cooperation with schools. Participatory regional planning for future development could be facilitated by the physical planning division with support from GIZ, which many people want to be more in contact with anyway. Events for organisational peer to peer exchange among the MPAs in the region will be organized by the LAMA and GIZ, they could include the central and local government, scientists, and other organizations.

TD PROJECT: SMALL-SCALE AGRICULTURE

FIEKE GRUNWALDT, RAUSCHAN KLOZ, NELE PHILIPPSEN, LOTTE RÜTH, MAIKE TRÜMPLER

The agricultural sector employs over a third of Dominicans and contributes about 20% to the GDP of Dominica (World Fact Book 2021). Due to its characteristics as an island nation and its unique geography, Dominica is highly vulnerable to the effects of climate change. Especially the agricultural sector will face severe challenges as the dry spells increase and extreme weather events become more common. Adaptation to these changes and an increase in resilience are indispensable. For this reason, the research question that this project dealt with was chosen as follows: How can Dominica's small scale farming system adapt to climate change to be more resilient to extreme weather events? The first step in the project was to conduct a thorough literature review to gain some preliminary insights into the topics of resilience, adaptation, and agriculture in general and in Dominica specifically. With the help of this research, a semi-structured interview guide was designed and interviewees were found using the snowballing method. The interviews were conducted via video chat with multiple practitioners based in Dominica: farmers, processors, traders, ministry employees and members of international organizations. Following the data collection, the interviews were transcribed and coded into themes based on reoccurring topics. The grouped data was then used to create a poster in grassroots comic style, portraying the perceived most challenging issues and a vision for a more resilient small-scale agriculture in Dominica based on the practitioners most common answers.

The interviewees described Dominica's setting in terms of soil and climate as perfect for agriculture. Fertile volcanic soils and tropical climate would let many crops thrive well. However, Dominica is extremely mountainous. The slopes are challenging to work on, they limit possibilities for mechanization and the fertile soils are prone to erosion. In terms of extreme weather events, the major threats to farmers' crops mentioned were heavy rainfall causing landslides and floods followed by strong winds destroying entire harvests. Droughts and dry spells were seen as less of an issue, yet some interviewees emphasized not to neglect them. Volcanic activity is also of concern, but in most interviews, it was only mentioned in passing. Planting monocultures is still common practice across the island; however, they are much less resilient to threats than diversified farming systems (Mohan 2016). Monocultures are especially prone to pests and diseases. Along with invasive species they place another burden on destabilised farm and forestry ecosystems weakened by storms or drought (Mohan 2016).

Market access, competition and oversaturation were highlighted by most interviewees as the key economic challenges. Overproduction of certain crops often means farmers can't sell their produce, harvest going to waste is a major economic loss. Tropical storms and hurricanes leave homes and livelihoods destroyed; small-scale farmers often lack the resources to rebuild better. Often, crops which did not do well in storms are planted again. This is partially because knowledge is not shared enough among agricultural practitioners. Furthermore, interviewees criticized an overall lack of collaboration of all actors involved with the agricultural sector.

Major social challenges mentioned are an aging farmer population, the lack of interest in the sector among Dominica's youth and limited participation of women. Considering all these challenges, one interviewee highlighted the major importance of successfully adapting and moving forward as opposed to getting stuck in a loop of 'mere' recovery processes from disasters.

Based on our interviews and the literature review, adaptation strategies that foster the resilience of Dominica's small-scale farmers were identified. They were categorized into ecological, economic, and social resilience strategies. In terms of ecological resilience, it has been found that a diversified farming system, with different kinds of crops growing together, fosters ecological resilience. Different crops are more or less likely to get destroyed by an extreme weather event depending on the particular circumstances of that weather event. Consequently, in a diversified farming system, it is more likely that not all crops will be damaged. This has been stated by several interviewees as well as in case studies on other Caribbean islands (Mohan 2016). Further, the importance of agroforestry elements like strips of trees and shrubs as buffer zones and windbreaks on and around the fields has been highlighted by the interviewees as well as in the literature (Wiener 2020). To conquer erosion and droughts, interviewees stressed building and maintaining healthy soils and good water management. Another important factor to consider is the use and dissemination of local ecological knowledge. This knowledge has evolved over a long period of time in which farmers had to manage the local circumstances and can thus help to foster resilience and long-term sustainability (Sumane 2016).

Concerning economic resilience of farmers, the findings from the interviews showed that it is considered important that farmers see their farm as a business rather than a subsistence economy. Earning money beyond ensuring their subsistence helps them to have savings for times in which their farm is endangered due to extreme weather events. To be able to invest in their farm, farmers should get financial support from the government. Strengthening and expanding the local agro-processing sector and the development of certification systems are two ways to add value to Dominica's farming products and creating more income for people in the agricultural sector. Value addition has been pointed out as a crucial strategy by both the interviewees and case studies on other Caribbean islands (Mohan 2016; Isaac 2020).

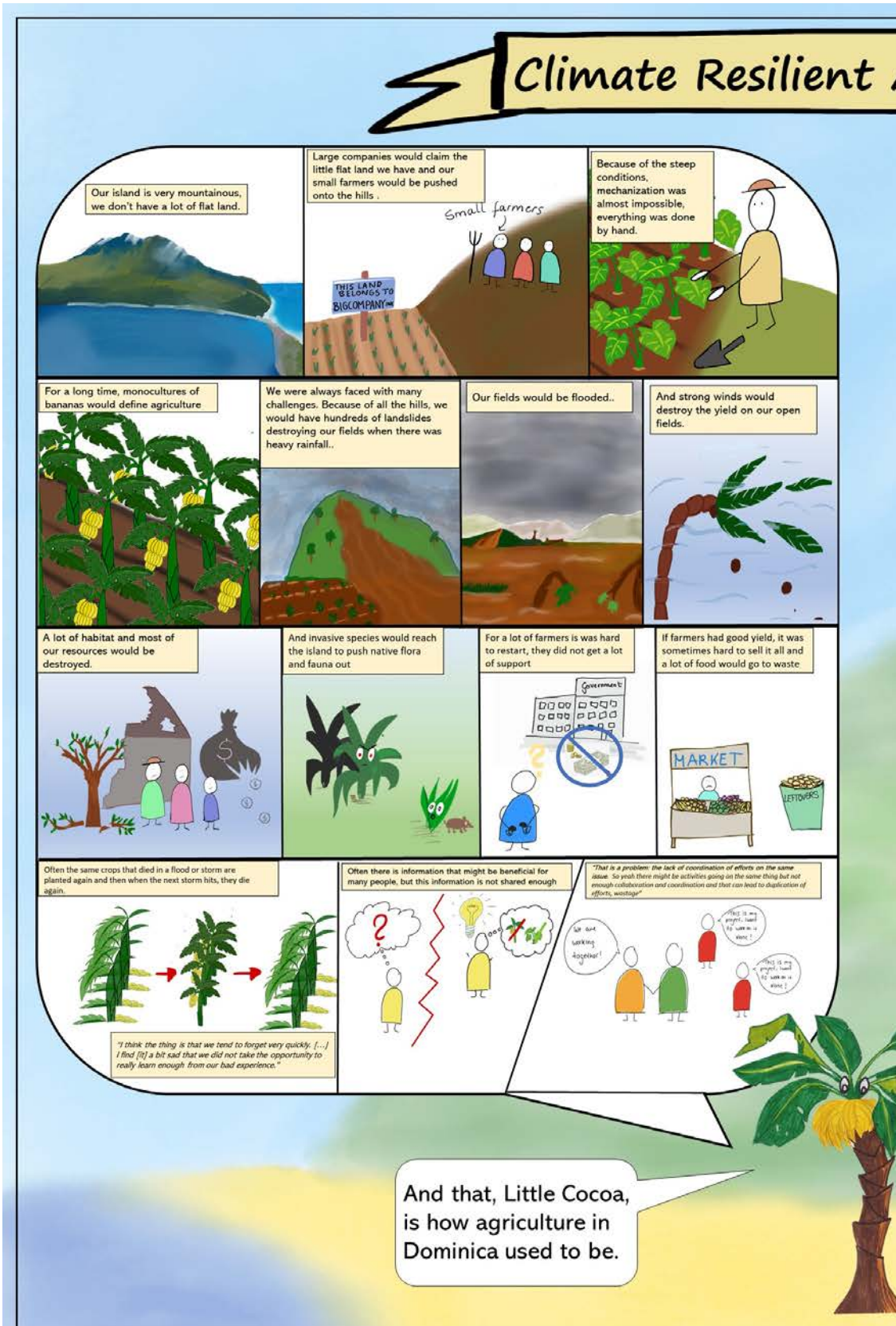


Figure 6 Poster: Climate Resilient Agriculture in Dominica

Agriculture in Dominica

Strips of fruit and timber trees are planted around the farm as wind-breaks. Along riverbanks they form a buffer preventing erosion and siltation.

Our farmers plant a very diverse set of crops. Rows of trees and shrubs altered with lower crops form a vibrant agroforestry system in which all plants mutually profit.

The trees are pruned regularly. Leaves and branches are used for mulching and making compost.

Waste from livestock and crops is used to produce organic fertilizer, e.g. through composting. Bees help with pollination and give the farmers honey.

We collect rainwater to water the communities' fields during dry spells.

Drainage ditches catch excess water.

Pumps and tubes assist with irrigation.

Vetiver hedges trap soil preventing erosion and forming terraces.

Farmers combine new and traditional knowledge. Many farm based on moon phases, process medicinal plants and seed banks keep the crops diverse with old and new varieties.

Financial support (state subsidies, special insurances & monetary support) have made a big difference. It allows the farmers to look beyond solely living off the farm, but seeing it as a business with entrepreneurial opportunities!

Agro-processing adds value allowing farmers to feed back into their livelihoods. More women are included in this process and with a certification system the agricultural sector can compete in external markets.

Early warning systems help us detect dangers and prepare.

Farmers organisations help to represent Farmers' interests. Their interests and knowledge are considered by the projects of local organisations.

We monitor which crops failed during a hurricane and which survived. This information is stored in a database and is communicated to local farmers so they can adjust their crops.

Every time we experience a storm we get together and share our learnings. This way we can improve our farming systems.

"Together we are stronger!"

"The issue of farming cooperatives going forward is an area that we really need to explore (-) cooperatives can bring a lot of time and resources together"

"We need to try to encourage collaboration so that we have little overlap and little waste (of efforts) as well"

"You need all hands on deck to be able to advance the development of the country"

"Together we are more efficient!"

"I'm using drones to monitor my crops. I can see which plants are struggling and which are healthy. This helps me to adjust my irrigation and fertilization plans in real time."

World Bank, CREAO, Ministry, UMPD

Grandpalm, this is how climate-resilient agriculture looks like now.

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Figure 7 (continued) Poster: Climate Resilient Agriculture in Dominica

Finally, social resilience strategies have been identified. First, the importance of social learning has been highlighted by the interviewees as well as the literature. Farmers as well as organisations and political bodies need to learn from their experiences with extreme weather events and share their learnings. This so-called social memory can help to improve the resilience of the socio-ecological system (Adger et al. 2005; Pisano 2012). For a more successful learning process individual experiences should be combined with scientific monitoring, e.g., understanding which crops have failed during an extreme weather event is crucial to improve farming systems (Fedele et al. 2019). Further, this information needs to be communicated in an understandable way among the actors to minimize information asymmetry and ensure that the information is used. Generally, it has been found from the interviews that farmers as well as organisations and political bodies need to work together more efficiently to increase resilience, reduce duplication of efforts and benefit from each other's work. This is underlined by findings in the literature on adaption in socio-ecological systems, which show the importance of collaboration and social networks for achieving resilience (Adger et al. 2005; Barnes et al. 2017; Fedele et al. 2019; Pisano 2012). Lastly, it has been found to be crucial that organizations and political bodies actively collaborate with farmers, inviting them to participate in the development of programs, policies etc. that will affect them. This helps to ensure that the strategies fit to the local circumstances, and it increases the likelihood of implementation by the farmers (Barnes et al. 2017). One important instrument for organizing the voices of the farmers and improving their access to knowledge, (financial) resources and services has been found to be farmer organisations.

TD PROJECT: FOREIGN AID

HANNAH LÜBBERT, MILENA WEBER, PIA WELLMANN, VIVIENNE WIDAWSKI

There is a strong disconnect between the causes and effects of climate change. Whilst the large majority of CO₂ emissions, for example, can be traced back to early industrialised countries, the increasing frequency and severity of climate catastrophes is most damaging to countries with weak infrastructure and unstable political systems. Because of this disconnect industrialised countries have a responsibility to help those regions affected most to recover, adapt, and build their resilience, for example through the transfer of aid. This aid, however, bears certain risks. Because of the power imbalances between providers and receivers of foreign aid its provision can become a covert form of neo-colonial exploitation with hidden benefactors and an attempt to increase dependencies for the economic gain of the providers of the aid. One question that arises here, for example, is whether aid should be conditional. On the one hand, these conditions may be necessary to ensure that the aid reaches its destination and doesn't fall to corruption. On the other hand, conditions are always connected to certain values which may include liberalism and capitalism, thereby forcing the country to adapt to values that it may not necessarily wish to represent. The overall research question that is to be answered here is: How can foreign aid be used to enhance climate resilience of small island states?

In a search for factors that ensure that foreign aid fulfils its purpose and doesn't increase neo-colonial interdependencies, we examined the literature body on this topic and found that the results were scarce, polarised, highly contested and context dependent. Due to a lack of investigations into empirical cases we concluded that what was necessary to move this research forward were interviews resulting in a detailed perspective on the reality of foreign aid in order to find out what makes foreign aid "good" and thereby help researchers and aid providers ensure its implementation.

Beginning with an in-depth literature review in order to create an overview of the current status of research into foreign aid, we conducted semi-structured interviews with organisations which implement or guide the transfer of foreign aid. These interviews were then coded, and our findings incorporated into a short informational video designed to help providers and receivers of foreign aid inform themselves on possible risks and how to avoid them.

For the interviews, we prepared a guideline, consisting of some predefined questions that are important to ask for getting information about foreign aid and its local impact. As we conducted semi-structured interviews, there was also space for adjusting to the interviewee and flexibility to

ask additional productive questions. In total, we conducted five interviews with the following interview partners: UNDP Dominica (Mr. Luis Francisco Thais, Head of Office); GIZ Dominica (Brendan Dafoe, National Project Officer of the Sustainable Marine Financing Project); Complete Caribbean (Taletha Laudat, Cocoa Cluster Manager); World University Service of Canada (WUSC) Caribbean (Dr. Nadia Pacquette-Anselm, Country Coordinator OECS – Sustainable Agriculture in the Caribbean (SAC) Project) and Rosanna Gernert (former intern at Climate Action Network Tanzania). As for the coding process of the interviews, we used an inductive approach to get from our collected qualitative data to main themes (second-order codes) to answer our research question mentioned above. To achieve this, we used the coding questions: *What are characteristics of (good) foreign aid partnerships / projects?* It is important to mention that we included both: determinants for “good/successful” respectively “bad/unsuccessful” projects. At first during the open coding, fracturing the data into lines or sentences led to developing labels. Followed by the axial coding, those labels were compared and grouped into themes, our first-order codes. A well-arranged table was created with the matching interview sequences sorted to the corresponding first-order codes. As a result, we found the following first-order codes: stakeholder involvement, evaluation methods, imposing agenda, sustainability/enhancing resilience, building trust, transparency, capacity building, communication and understanding and being involved in the local structure.

Those key factors have been mentioned frequently or with much emphasis showing they are important for answering our research question. From there we gradually moved from our first-order codes to second-order themes.

In the second order coding step we identified four key codes which subsume all of the most frequently mentioned codes. These are (in no specific order) *doing no harm, reflexivity and monitoring, community basis and inclusivity and (in)dependence*. While we do realize that including *doing no harm* as a code might seem like stating the obvious, we concluded that it must be included. For it became obvious in the interviews that one of the biggest problems in foreign aid is actors forgetting that their influence is not positive by default and thus not considering possible negative effects of their work. Therefore, this category includes, among others, *environmental protection, sustainable projects and fostering gender equality*. *Reflexivity and monitoring* means considering stakeholder’s opinions in a continuous process of reflection and self-critique and leaving opportunities to correct the project’s trajectory if things go wrong. *Community basis and inclusivity* describes all aspects of working with local partners, understanding the local context, and including every subgroup of a community into decisions in order to not leave anyone behind. The last code *(in)dependence* stands for whether or not the project’s aims and implementation are influenced by interests stemming from outside of the receiving communities.

As a result, a project which is fully independent, has a community basis and an inclusive approach, monitors and reflects its impact continuously and does no harm can be considered a successful project. Also, it is important to consider that all these characteristics are tightly connected and can only work when implemented simultaneously as they strongly depend on each other. For example, you can only avoid doing harm when you include everybody and only through reflection and monitoring it is possible to ensure the other criteria's implementation.

One last important part of our research process was making our findings available to people who can benefit from them. As we have created a sort of guideline on what needs to be considered when developing foreign aid partnerships while not harming local communities, both receivers of foreign aid and donors as well as mediating organizations can potentially benefit from accessing the newly created knowledge. Givers of foreign aid can benefit from this guideline as they know how their projects ought to be structured while receivers of foreign aid gain power to demand and ensure that the projects are conducted to their benefit. We decided to incorporate our findings into a short informational video because this appeared to be a suitable form of media to convey the results of our transdisciplinary research project in a way that is beneficial to societal actors.

At the end of our research process, we did find key characteristics of “good” foreign aid which promise a successful foreign aid partnership if implemented correctly. Nevertheless, our research project has certain limitations. One, we were conducting research on a country and situation that was not familiar to us before the research process started. Also, we were not able to interview receivers of foreign aid, meaning we only interviewed people who give foreign aid, and who are in relatively high-power positions. Therefore, we need to acknowledge that we cannot say with certainty that what we found as good characteristics of foreign aid is also shared by the most vulnerable actors in foreign aid partnerships. Along with the circumstances that we are no interview experts, had to conduct the interviews via online tools and there was a strict time limit on the research project, our findings need to be considered with care. They are the result of a thoroughly conducted research project, yet there is a very specific context to them.

Keeping all of this in mind, our research project provides an important contribution to the understanding of foreign aid and its effects, especially regarding how successful foreign aid projects can be developed. We believe that our findings are a base for further research projects and can be developed further in regard to power dynamics that come with foreign aid partnerships, more specific and detailed guidelines on successful foreign aid projects and other aspects of foreign aid.

LESSONS LEARNT: HOW TO ENHANCE COMMUNITY RESILIENCE ON DOMINICA

STEFFEN FARNY

This TD student research project with the GIZ team in Dominica was a first attempt to address one of the pressing issues of our time: how can communities resile in face of threatening climate change for their livelihoods. In this quest, the concept of *climate resilient communities* seems central. For one, the government of Dominica had declared to become the world's first climate resilient country (practical relevance) and, at the same time, discussions in various disciplines have called for greater community resilience (academic relevance), e.g. in psychology, sociology, ecology and disaster research (cf. Aldrich & Meyer 2014). They all share the view that people are never helpless in confronting adversities and stressors as they have resilience, that is “the collective ability of a neighbourhood or geographically defined area to deal with stressors and efficiently resume the rhythms of daily life through cooperation following shocks” (Aldrich & Meyer 2014, p. 255). In short, the greater the resilience the better people can cope with and overcome hazardous events, such as a Hurricane.

In order to emphasize novel and practically insightful approaches, four student teams each selected their own thematic focus, geographic scope and practice partner to implement a transdisciplinary research project. Even though the teams were unable to physically visit the island and meet their partners in person, principles of TD research were applied to some extent. In particular the interactions with the local GIZ team served to develop a joint problem framing and co-developing potential solution ideas. As this was the first student batch to design and implement such a research project in this context the implementation phase (compare Figure 2) could not have been reached. Nevertheless, the teams developed valuable learning lessons that can be applied in practice as well as serving other research projects on the topic.

A principal finding across all projects was that climate adaption requires an adjustment of the *material dimension* of community resilience to climate change – i.e., resources, social capital, emergency plans, etc. It became clear that current investments and infrastructures are not sufficient to allow for a smooth recovery on Dominica from a Hurricane. The project on ‘Flood Management’ that developed four scenarios for Colihaut shows a need to combine physical and digital infrastructure developments, anticipatory actions initiatives as well as climate change adaptation needs (the balanced scenario), highlighting the multi-level nature and multi-

dimensional aspects of community resilience. Community resilience is irreducible to a single measure or single agency, it requires broader, yet coordinated, local and regional stakeholder engagement to ascertain role clarity and anticipated action plans. In other words, a resilient disaster response is *demand-driven* and *people-oriented* (IFRC 2014) instead of being standardized and fully pre-planned.

Another central finding is the *identity dimension* of community resilience. It matters how individuals perceive ‘who we are’ and how they relate to nature. This became evident in the project on ‘Biodiversity’ revealing striking differences in stakeholder groups’ perception of vulnerable places. The project also showed that happier individuals had a stronger identification with biodiversity conservation processes. They simply felt more able to influence local change because of their higher individual resilience. In a similar vein, yet working on a different topic, the project on ‘Foreign Aid’ highlighted that inclusivity and reflexivity about resource distribution are as, or even more, important than the amount of financial support. This is additional evidence of an identity dimension in community resilience as people simply want to have a say and feel being part of local decision-making processes. In short, a resilient disaster response is sensitive to social identity processes (Schaubroeck et al. 2021) as people living in a geographically bound communities need to work together, regardless of different beliefs, political ideas, and ideologies.

Last, this TD student research project shows that *social memory* is an inherent element of community resilience. In particular the project on ‘Small-scale Agriculture’ revealed that recovery from Hurricane Maria was grounded in the local community memory of previous disasters. This shows that the way in which a community responds to a disaster is strongly driven by memory-making processes and not only by formal plans, training of official directives. Therefore, it is advisable to see disaster recovery as a much longer learning process of memory-making that will effectively determine the community’s ability to respond to future disasters. This suggest that the creation of sacred spaces, memorials and a people’s engagement in learning from – that is deciding what to remember and what to forget (Moulton, 2015) – is an important disaster mitigation process to enhance community resilience.

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