Risk Root Cause Analysis Paper for PEARL (Preparing for Extreme And Rare events in coastal regions project):
St Maarten, Dutch Caribbean

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PEARL Risk and Root Cause Analysis: St Maarten, Dutch Caribbean

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1. Introduction

This paper summarises the findings of the Risk Root Cause Analysis for St Maarten carried out by Work Package 1 researchers at King’s College London in 2015 – 2016. The aim of this brief is to inform Work Package 1 research in the PEARL Project through:

1) Further validation and development of the PEARL Risk Root Cause Analysis Framework
2) Reflection on the application of particular methodologies for Root Cause Analysis

The paper is structured as follows: Section 2. Discusses the application of methods for Root Cause Analysis in St Maarten; Section 3. Provides essential background to the case study; Section 4. Presents the central analytical findings using the PEARL Risk and Root Cause Analysis Framework; Section 5. Presents initial findings about the role of institutional regimes in risk management based on the comparison between St Maarten and St Martin; Section 6. Discusses the broader implications of the study.

2. The application of the Risk Root Cause Analysis Method in St Maarten

The Risk Root Cause Analysis for St Maarten followed the methodological approach laid out in PEARL Deliverable Paper 1.1. The research is based on individual, expert interviews with stakeholders, where the aim was to capture as diverse a set of views about disaster causation as possible through interviews with multiple stakeholder types. 22 interviews were conducted between July and November 2015, the majority face-to-face interviews but also telephone interviews with those whom it was not possible to meet during fieldwork on the island. The researcher ‘snowballed’ out from interviews with initial contacts provided by other PEARL researchers to generate a wider field of interviewees. A list of interviewees is provided in Annex 1, and included independent expert consultants; Ministry of Public Housing, Spatial Planning, Environment and Infrastructure; Ministry of Public Health, Social Development and Labour; Fire Department; Meteorological Office; Ministry of Economic Affairs; Department of Communications; NGOs; Business sector bodies; Insurance companies; Port, Harbour and Marina companies.

A limitation of the study lies in the sectors and stakeholders who were unrepresented in the study sample – for St Maarten this was representatives of the tourist and hotel trade, critical infrastructure facilities, donors, property developers as well as community leaders and affected residents. This reflected the challenges to interview research: accessing busy stakeholders within a tight timeframe, high staff turnover which impeded indepth data collection as well as the ‘snowballing’ process, and the difficulty of ‘snowballing’ out of established stakeholder relationships (especially where these are contested, as is the case between some St Maarten government officials and citizens). Some of the difficulty was overcome through the use of further telephone interviews, but the strong oral and face-to-face culture of the island limited this approach. There
were also limitations to accessing stakeholders on the French side of the island in order to develop the comparison of institutional regimes in risk management. This was related to time limitations on the fieldwork and on stakeholders (as the possibility for interviews opened up on the French side the hurricane season also became manifest and many stakeholders moved into operational mode) and the lack of formal involvement of French stakeholders in the PEARL project. However, initial information from informants on the Dutch side of the island, and from French stakeholders that were interviewed is presented here.

The face-to-face interviews proved critical due to the lack of initial, relevant secondary data related to the island, in part because it has undergone significant political change in the last decade but also because it retains an ‘oral’ culture of information and knowledge-sharing. Face-to-face interviews elicited valuable grey literature, such as unpublished government reports. With a better knowledge of the context and relevant actors and events on the island, a review of secondary sources such as newspaper articles and YouTube videos was undertaken after the face-to-face interviews.

The interviews were in-depth, typically lasting 1-2 hours each. Given that a core objective of the St Maarten study was to generate insights for the development of Agent-Based Models, the interviews centred on actor behaviour pre-, during and post-flooding events as well as eliciting stakeholder opinions about the broader causes of specific disaster events on the island. The interview structure adapted the broad PEARL Risk and Root Cause Analysis Framework – which displays root causes acting on risk across the interacting physical, governance, socio-economic and perceptions, values and beliefs domains – for the context - for example, seeking to understand the impact of changes in governance on the island in 2010 on risk management. Further, a major focus of the interviews was the development of new analytic themes related to the role of governance in root causes, in particular the impacts of global economic shifts and institutional change across levels of government on risk management and risk response activities. Different events affected different stakeholders in different ways, however – the impact of Hurricane Gonzalo in 2014 was mainly felt by a certain section of the marine sector, for example, while subsequent flash flooding events in November 2014 affected households and businesses in Philipsburg and adjacent hillsides. The event discussed therefore varied by stakeholder type where necessary. Further, although more contemporary events were fresh in the minds of many stakeholders, the current disaster risk management system in St Maarten has been strongly influenced by the impact of major hurricanes in the 1990s. To fully explore this history, the researcher sought out interviews with long-standing officials and retirees.

Details about the ethical and consent procedures to be followed were presented in PEARL Deliverable Paper 1.1. The protocol sent to stakeholders prior to interview is included in Annex 2.

Interview notes and all other textual material was loaded in the Atlas.ti programme, and coded using relevant categories based on the Root Cause Analysis Framework and the structure of the PEARL Agent-Based Models.
3. **Background to the case study**

The island of St Maarten is located in the Northern belt of islands of the former Netherlands Antilles (a group of 5 islands spread across 2 geographic regions of the Caribbean), and borders French St Martin. Hurricane conditions are experienced on average once every 4-5 years, with the most recent hurricanes to cause considerable damage Hurricane Gonzalo (2014), Hurricane Omar (2008), Hurricanes Jose and Lenny (1999), Hurricane George (1998) and Hurricanes Luis and Marilyn (1995). Of these hurricane events, Luis and Lenny have been the most major: Luis left over 90% of all structures on the island damaged or destroyed and total indirect and direct costs of around US$1 billion (ECLAC 2011). Hurricane events are not the only source of flooding, however - localised flooding occurs in the rainy season several times a month, making certain locations unreachable and disrupting transport systems. The average recurrence of significant damage to residential and commercial areas is estimated at about every 2 years, and of damage of equivalent scale to events in 2014 (with Hurricane Gonzalo followed by a heavy precipitation event) every 5-10 years (Ministry of Public Health, Spatial Planning, Environment and Infrastructure 2015). While casualties and mortalities are rare, flooding in 2005 caused the loss of two lives. Flood events commonly cause school and business closures, and disrupt health and social services.

Location of St Maarten and the former Netherlands Antilles, *Source: ECLAC 2011*
While the Root Cause Analysis developed in the next section illustrates how the island’s economic, social and political development has influenced the scale, nature and distribution of flood risks, it is worth noting the features of the St Maarten context that set it both alongside and apart from the other PEARL Root Cause Analysis case studies.

St Maarten’s status as a small island and historic marginalisation within the Kingdom of the Netherlands influences its economy, politics and culture. From the 1960s, the island experienced a key turning point with the development of the airport and port, and the return of islanders with money to invest following the oil booms in Aruba and Curacao, which facilitated tourist development and which led to demographic growth and in-migration. Economically, St Maarten is a highly open economy dependent on tourism and related sectors, and the US economy in particular,
although financial services, cruise passenger spending in duty-free outlets and property development also contribute. While relative to other Caribbean islands St Maarten has a high income per capita its income is also highly unequally distributed. Like other case study locations in PEARL such as Rethymno, Crete, St Maarten has faced acute public sector resource constraints. This is partly as a result of the impacts of the global economic downturn from 2008, although St Maarten weathered the downturn better than other Caribbean nations, but partly owing to its small island status and the impact of devolution in 2010 which resulted in St Maarten becoming an autonomous country within the Kingdom of the Netherlands (rather than governed as part of the Netherlands Antilles). The island is societally small-scale, but the structure of the economy has sustained high levels of migration from other Caribbean nations, including a relatively large group of mostly unskilled (and also illegal) immigrants. This population group is highly mobile: within a period of 3-5 years an estimated one-third of the population moves on to North America or Europe (Transparency International 2015). Politically, the case study is distinct as although the scope of the population is that of a small town (such as Rethymno, Crete), political and judicial responsibility is as a country, following a referendum and devolution of power within the Kingdom of the Netherlands in 2010.

Photographs showing development in St Maarten since 1950, courtesy of VROMI

Figure 2. St Maarten: Philipsburg 1950 and 2015
4. Testing the Risk and Root Cause Analysis Framework for St Maarten

The following central section presents the findings from the St Maarten research in the format of the PEARL Risk and Root Cause Analysis Framework table. Three points are worth noting in relation to the use of the Framework table as a way of analysing and expressing the findings of the research:

1. The Framework table does not explicitly capture manifestations of resilience as well as risk and related causes: this is therefore noted in the text.
2. The Framework table does not distinguish between root causes and drivers: this is therefore discussed in the text.
3. It is important to reiterate that risks can be highly localised, spatially, sectorally and socially, even on a small island like St Maarten. Spatially, the highest risk areas were identified by UNESCO studies in 2006 as being the densely populated areas which have developed rapidly up the hillsides (and particularly those closest to the highest terrain), such as the Cul-de-Sac neighbourhood, which is in an enclosed basin and suffers the effects of erosion and flash flooding. The following map shows the main water bodies and stormwater channels as well as stormwater management infrastructure for the island. The areas liable to coastal flooding are low-lying areas between the sea and the inland lagoons, including the densely populated areas of Philipsburg, the capital, and Simpson’s Bay and the sites of most major critical infrastructure for the island, such as the electricity generator and the airport. While the quality of building construction and socio-economic status of neighbourhoods such as Cul-de-Sac was described by interviewees as of reasonable standard, the areas of the highest social vulnerability are settlements of illegal immigrants who stand to be affected more by hurricane winds than pluvial or coastal flooding. Different sectors of the economy too exhibit different forms of resilience – the marine sector, for example, is able to get up and running after storms more quickly than the hotel sector, for instance, as it does not rely on fixed infrastructure. Finally, the risks are both primary and secondary in impact: a major concern for St Maarten is the secondary public health risk from flooding due to the inadequacy of the sewage infrastructure and threats to drinking water supply when pipes get broken or electric pumps fail. Perceptions too, matter: as one respondent reported “when the pond goes into town you know what to do, so you don’t consider it a flood” (Interview SHTA). As far as possible, therefore, the Table aims to draws out generic root causes and drivers whilst noting the influence on these different manifestations of flood risk.
<table>
<thead>
<tr>
<th>Category of root causes</th>
<th>Pathway</th>
<th>Temporal expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Root causes and Drivers of hazard</td>
<td>Physical</td>
<td>Historic</td>
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<tr>
<td>Location in hurricane belt (and among northern Caribbean islands most exposed) as well as susceptibility to heavy precipitation unrelated to tropical storms</td>
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<td>Morphology: low altitude of island’s valleys and coastal areas make them sensitive to risk of flash floods, cyclonic swell and tsunamis (i.e. pluvial and coastal flooding)</td>
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<td>Hurricanes themselves alter morphology, e.g. 1979 Hurricane Frederic destroyed the natural function of the salt pond (an inland pond below sea level) to act as a buffer, triggering in-filling of the pond through human activity</td>
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<tr>
<td>Contemporary</td>
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<tr>
<td>Future</td>
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<tr>
<td>Causes above exacerbated by impacts of climate change: more intense tropical storms, sea level rise, loss of coral reefs</td>
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<tr>
<td>Socio-economic</td>
<td>Historic</td>
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<tr>
<td>Physical landscapes are changed in ways that exacerbate hazard impacts, e.g. the Fresh Pond, which was protected for salt mining by the Dutch West India Company by a series of dykes and open to the sea, acted as a buffer between the land and the coast. In 1960s it was closed off for hotel construction, and land reclaimed through infilling, eroding its natural function.</td>
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<tr>
<td>Dredging of the harbour to allow the passage of larger cruise ships moves the sandbank.</td>
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<tr>
<td>Contemporary</td>
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<tr>
<td>Drivers</td>
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<tr>
<td>Physical landscapes continue to be changed in ways that exacerbate hazard impacts, e.g. Ongoing development in the hillsides, including in natural gutters, lessens the options for upstream water retention while hardened surfaces allow less rainwater to infiltrate, generating more run-off at greater speed and creating negative effects in lower areas. Where vegetation and top soil are removed without control measures and cuttings made into hillsides, severe erosion and landslides result from heavy rainfall. Large-scale removal of vegetation can affect rainfall patterns. Infilling of salt ponds continues, including with material from harbour dredging (Of 19 salt ponds on St Maarten in the 1960s, only 5 now exist (source)).</td>
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Secondary impacts such as public health risks from degraded surface water quality (which also feeds into ecosystem degradation and related economic losses in the fisheries and tourism sector) occur because of illegal and poorly maintained sewage system connections, dumping of waste water as well as sediments and trash from road surfaces ending up in waterways. Insufficient drainage also leads to mosquito breeding in stagnant waters.

*The root cause – unplanned residential and tourist development and the visions and narratives associated with it – is discussed further below in the socio-economic and governance pathways underpinning exposure and vulnerability.*

<table>
<thead>
<tr>
<th>Root causes and Drivers of exposure</th>
<th>Physical</th>
<th>Historic</th>
<th>As above</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Contemporary</td>
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<td></td>
<td>Future</td>
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<tr>
<td><strong>Governance</strong></td>
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<td></td>
<td>Historic</td>
<td>Lack of constraints or guides on development change the physical landscape in ways that exacerbate hazard impacts, e.g. uncontrolled development, inadequate or inexistent drainage (again, discussed in more depth below).</td>
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<td></td>
<td>Contemporary</td>
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<td>Future</td>
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<td><strong>History</strong></td>
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<td><strong>Contemporary</strong></td>
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<td><strong>Socio-economic</strong></td>
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<td></td>
<td>Historic</td>
<td>Development from the 1960s and 70s and associated high demographic pressure pushes urbanisation into the most exposed areas: Dense urban areas are situated in valleys while residential and tourist developments encroach on low-lying coastal areas, all subject to flooding (as well as landslides and hurricane-related winds).</td>
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<td>Contemporary</td>
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<td>Future</td>
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<tr>
<td>Root causes and Drivers of vulnerability</td>
<td>Physical</td>
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<td>Practices of land ownership influence the form of development; because people own narrow strips of land from top to bottom they cut roads straight up the hillsides to avoid lengthy negotiations with neighbours. This exacerbates physical and social vulnerability as it causes heavy erosion and emergency vehicles cannot use the roads.</td>
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<td>Settlements of illegal migrants do not have risk infrastructures such as retaining walls or the infrastructure and services to prevent against health hazards and they are difficult for emergency services to access. While some inhabitants become more established, others live in temporary shacks while they send money back to their home countries to build properties. These areas are often highly vulnerable to hurricane winds (due to poor quality shelter). The root cause lies in the economic structure that depends on immigration (for tourism, e.g. hotel work but also they provide services for the political / economic elite), and the governance decisions that underpin this.</td>
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<th>Socio-economic</th>
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Governance

Historic

Land use and building regulation

Despite a certain amount of regulation on paper in recent decades – such as a Beach and Hillside policy from the 1990s, and a Dutch law from the same era mandating that zoning policies and plans be put in place – there has been a lack of oversight and enforcement. Local and foreign development has not been coordinated (with most development private development), and has continued with inadequate or non-existent drainage structures, and with a lack of outlets to the sea. The impacts of Hurricane Luis did lead to improved public and private sector building construction practices, however.

The root cause was described by one informant: “There has been a lack of political will because politicians have a ‘build it and they will come’ mentality. They believe that they need to build new hotels, new casinos, all sorts of things to get the tourists to come here.” (in Holian 2012) There has also been a conflict of economic and political interests, with landowners including parliamentarians and ministers. This is reflected in the failure of the inspection system, which has been under-funded and reactive, and has often failed at the point at which ministers need to sign off enforcements. In addition, a culture of attachment to land and of ‘people can’t tell me not to build’ has underpinned development. Fragmented land ownership, with families dispersed overseas as well, complicates land management.

Disaster risk management policies and measures

The emergency management system (a policy plan with 10 focus areas, each specifying relevant actors, targets, e.g. the number of fire stations and actions to be taken in an emergency) was developed for all the Antillean islands after Hurricane Luis and has provided a stable structure for disaster management, with much continuity in key personnel (the Ordinance and Plan were approved in 2000). A National Disaster Coordinator was appointed and the Fire Department given a key role in disaster management. Developed as a response to events in a “trial and error” fashion, the organisational system for preparedness and response, including annual awareness-raising campaigns, is well-established among government institutions and has been supported by successive Lieutenant Governors and Prime Ministers (after 2010). It contrasts previous eras in which “different agencies all said different things”. A key underlying difference between this aspect of risk management and the failure to address the land use and building control issues that drive up risks was explained by one respondent as: “Forecasting and warning is safe and people are willing to support it” (Interview Fire Dept.), and by another: “When it comes to hurricanes there is no political play, the concern is
for communication” (Interview DCOMM). This is underpinned by an emergency shelter system and advisories for evacuation, although there is no mandatory evacuation. The effects of Luis are reflected not only in the practices of government ministries, but across many entities: one respondent from the port authority reported that hurricane preparedness was “now much more of a routine in response to events” (Interview Port Authority).

A key source of institutional resilience on the island also lies in the capacities of the non-governmental sector and historic ways of working between government and non-government actors. Due to the historic lack of public resources (as a small island), when the emergency management structure was designed for the island from 1995, it was recognised that the private sector also needed to be involved. Non-government actors are therefore included in the Emergency Support Function task forces alongside government bodies. To give an example of ways of working, in terms of shelter management, the government guarantees the security of emergency shelters, the local branch of the Netherlands Red Cross opens them and does the initial registration and medical checks and then the Community Development Department takes over (but shelters and staff training are not paid for by the government). The level of formalisation in these arrangements varies: VROMI, for instance, has a standing agreement with an NGO called the Nature Foundation for environmental protection and management (a form of agreement relatively common in the Dutch Caribbean), but other NGOs don’t necessarily have mandates with government. There is overlap in key personnel that facilitates the arrangements: the Head of Disaster Management is also the President of the local branch of the Netherlands Red Cross. Some may get basic funding, but others not. The lack of formal agreements was not reported to be a problem, with a strong sense of “The role comes with the responsibility, and comes with the territory” (Interview Ministry Public Health), although a formal agreement with the Red Cross and with shelter owners was being developed by the Ministry of Social Development to manage key aspects of liability. However, although no major problems were reported, it may be hard for NGOs such as the Red Cross to plug the capacity gap, given that they rely on volunteers who are doing other jobs\(^1\). Even the Nature Foundation, which receives a subsidy from government, reported that it could only be reactive in its functions.

\(^1\) The capacity of the Red Cross in large scale emergencies, however, is guaranteed through the regional International Federation of the Red Cross, when the Red Cross can call upon the capacity of the other NLRC Overseas Branches (OSBs) as well as the regional IFRC in case of imminent disasters or in case of disaster response. There are protocols in place for this, and once a year the OSBs train together in a disaster response exercise.
The business sector has also been a key source of capacity and resilience, both autonomously and in conjunction with government. An example of collaboration was the clean-up of sunken boats and debris in the Simpson’s Bay Lagoon after 2014 Hurricane Gonzalo, organised by VROMI in conjunction with local businesses, for whom the debris threatened the upcoming tourist season and safety of maritime operations. Many businesses also have their own preparedness and response plans, including making their properties secure before forecasted storms, but may also be mandated nationally or internationally to do so (e.g. the port is required to have a plan nationally, the airport due to international aviation standards, the insurance company Nagico has its own internal response plan, response preparedness committee and a continuous watch on warnings, in part because of a national requirement on financial institutions). Insurance companies and banks also contribute to citizens’ promotions and preparedness activities for hurricanes – e.g. putting out an emergency list as part of their product marketing and offering discounts for putting up hurricane shutters (which in turn reduces their risks).

Structural measures:
Flooding events in the island’s history have historically prompted the introduction of new structural measures or improvements, e.g. after Hurricane Frederick and the flooding of Philipsburg, the capital, in 1979 a ford was created so that water could overflow into the salt pond. Such measures have often been only partially remedial or partially implemented (the opening of a key outlet to the sea was discouraged because of the construction of the Great Bay Hotel since the 1960s, for example). As one respondent put it “After a while everything fades away…everything goes quiet until something happens again” (Interview Fire Dept.). Informants described a ‘drawn out’ process to get new measures approved, with construction of a new flood gate only completed after another round of flooding, for example. The operation of infrastructure is also hampered by procedure: historic problems with the operation of the flood gate, for example, were attributed to complex protocols and lack of communication (the operation of the new gate remained untested at the time of research). Informants also reported lack of finance for monitoring and maintaining key flood mitigation infrastructure.

Lack of finance has also held back the development of infrastructure. In 2012-2014 a reported 30% of planned drainage projects were completed, but none had been undertaken post-2014, after the government committed the budget to purchase land instead (see below on underlying governance culture).

In terms of stormwater management measures, the narratives and perspectives of different stakeholders has also been divided, and, according to some respondents, contributed to a lack of effective measures. As
the current draft stormwater management strategy reports: “Currently the approach towards storm water runoff on Sint Maarten is rather one sided. Virtually all measures are aimed at reducing the occurrence of flooding with a focus on fast discharge of runoff water and little consideration for infiltration and retention.” (Ministry of Public Health, Spatial Planning, Environment and Infrastructure 2015). Although international best-practice thinking around retention vs the old Dutch ‘concrete and run-off’ model is taking hold in awareness and policy in relevant institutions such as VROMI (in part due to the influence of international expertise through UNESCO), there is still a clash of perspectives among senior figures.

**Response, recovery and reconstruction:**
Although the government ‘gets out there’ to do clean-ups before and after storm events, according to a non-government informant, the response took much longer than expected after Gonzalo, according to government officials. The clean-up after Gonzalo was all done on credit as the operational budget, even though approved, does not cover existing activities, let alone preventative maintenance (Interview VROMI).

There is little public aid for disaster losses, and little by way of humanitarian assistance (although there are some social subsidies) or permanent relocation programmes. The system is predominantly market-based, leading one respondent to say “the safety net for citizens is missing” (Interview x).

The government’s priority is to keep business running after any event, and restore the commercial districts of Philipsburg and Simpson Bay and any hotel areas after disasters because the island’s livelihood depends on it (Daily Herald 2013). “Preparedness was never a priority, the priority was rebuilding and maintaining tourist numbers” (SHTA Interview).

In the absence of public aid for disaster losses, insurance plays an important role (Ministry of Public Health, Spatial Planning, Environment and Infrastructure 2015). Many businesses have business interruption insurance. Households who take out a mortgage are required to have insurance – but it was reported that often insurance coverage is left to expire (especially when there has not been a recent storm), premiums are high for households and businesses, and that there are not enough clauses to cover all events (although insurance providers said they had a certain amount of discretion as to what events were covered: Nagico reported that they will cover named storms, but not regular rainfall, although they made an exception for the November 2014 flooding event). Most claims were reported from coastal and low-lying areas where property values and incomes are higher, and construction of better quality and more likely to be approved by insurers (Interview Nagico Insurance). The requirements to have insurance are long-standing on the
island, and offered some protection after Hurricane Luis, although the risks that such an event posed for insurance companies (with many going out of business) led to the introduction of deductibles for hurricane events.

**Related policies: sewage treatment**

A historic lack of municipal infrastructure and investment for sewage treatment (reported to be at 15% capacity in 2012) means a reliance on private septic systems. Despite a requirement to have a tank in order to receive a building permit half may not function. People look for the cheapest way to dispose of sewage. Legislation to implement a sewage treatment fee has not been implemented. However there has been EU assistance to improve part of the main network. Although VROMI officials are trying to improve connections, it has not been a high priority in spending (losing out to government development projects).

**Underlying nature of governance and institutions**

The underlying nature of governance and institutions on the island was described in great depth in a Transparency International report in 2015 which highlights the influence on politics of being a small-scale society built on close and informal relationships, but also starkly divided between the elites and poor populations. In relation to disaster risk management, government informants described how their work was impacted by the resource constraints due to low tax compliance and a large civil service and the culture of the political elites, who can leave the island at times of difficulty and adopt short-term perspectives. Government departments often lack expertise, with salaries half that of the private sector. Although a long-standing resource constraint hampers disaster preparedness and response, informants were keen to stress that this also reflected political priorities; according to one “Cost is not our biggest friend, but it is a question of political choices” (Interview VROMI). Since 10.2010 the political outlook has been unstable: governments (and politicians) have changed rapidly (with 5 different governing coalitions since 2010), in contrast to the previous system where a lieutenant governor would be appointed for 6 years. Government respondents described how a minister would be brought on board with a new plan, only to change. With Ministers highly interventionist in policy and budgeting – every expenditure above 5 thousand guilders has to be approved by a Minister – this also creates slow and inefficient procedures as the price of goods may have gone up by the time it is approved. Non-government actors report having to lobby each time there is a new cabinet. Political parties are not bound by ideology but more by patronage, leading to a situation in which the same party could be calling for protection of the lagoon and in-filling of the Pond at the same time! This prevents a political platform for risk reduction and environmental protection. Interviewees described a reactive and
short-termist political culture – “Why are you doing that? Nothing’s happened!” – built on verbal agreements, ‘I know you so I’m going to help you’, and a culture of ‘hoping for the best’. While bribery in construction was mentioned in one interview, the pre-dominant blockage to tackling risks were perceived as the personal and political interests in land and development.

In terms of government-community relationships, these were described as highly politicised, affecting efforts to improve public awareness of garbage disposal and at times leading to dependence on government emergency response services and the lack of development of strong community response. This has been underpinned by a historic culture of citizen dependence on government and politicians, fostered through patronage-style relationships in a small and personalised society. Efforts by government to set up stronger community organisations – which could play a role in disaster preparedness and response among other functions – were undermined by this politics, as well as the transience of communities. However, community groups such as church groups were reported to play a strong, independent role in supporting community rebuilding efforts. It is also the case that people do take autonomous actions, building small flood walls to protect their properties, often in collaboration with their neighbours. The public function of civil society groups has been historically weak, given symbiotic relationships with government and government wariness of activist organisations, who are seen as critique-ing or “just making a noise” (Interview Nature Foundation), rather than playing a vital role in enhancing transparency and accountability.

However, long-standing resource constraints and informal governance procedures has also led to the emergence of informal practices as a source of resilience when disasters occur. When they do, informants reported that budget amendments were quickly made, money re-allocated between ministries and within ministries staff reported shifting money between different pillars (as one Ministry of Health employee expressed: “you look for the one closes to whom you can negotiate with”).

It is also worth noting the impacts of devolution reforms in 2010 which gave St Maarten independent status from the former Netherlands Antilles and self-governing powers in all areas except defence, some aspects of judicial function and foreign affairs. The financial impacts are described below in contemporary governance issues. One respondent noted a move away from a collective mentality to one where powerful individuals now controlled budgets. However, respondents also highlighted positive changes since 2010: previously there were more levels of government to go through to access people and programmes, including the island government and Netherlands Antilles government. 2010 has also led to development of more appropriate
knowledge base with the move of the meteorological office from Curacao to St Maarten, although the capacity constraints on the St Maarten office are discussed below.

**Lack of co-operation between Dutch St Maarten and French St Martin**
Given the island’s small size and limited resources, the historic lack of co-operation between the French and Dutch sides of the island (due to lengthy procedures and differences in language) has limited further the capacities of each government, and the ability to control population movement and the passage of unregistered boats to the island. However, interviewees were keen to stress that historically in emergency situations there has been a will to co-operate. Since 2010, however, changes in political status on both sides of the island have brought about a new context in which co-operation has been strengthened. With regards to co-operation between non-government actors, the local branches of the French and the Netherlands Red Cross have also been exploring opportunities for closer co-operation.

**Contemporary**

**Land use and building regulation**
- The most comprehensive effort to date at zoning and land use regulation is underway. However, as one informant described, the process is still heavily influenced by the context described above: “It is politically sensitive and at a standstill; the last few decades have been a free for all” (Interview VROMI). According to another, “Development continues and so does run-off from the concrete” (Interview Fire Dept.).

**Disaster risk management policies and measures**
Against the backdrop described above, informants listed the following challenges to Disaster Risk Management as ongoing:
- The contrast between Hurricane preparedness and response and other disaster types, including flash flooding. According to one interviewee: “we are experts at hurricanes, everyone can tell you how to prepare...but we think that because we are aware of hurricanes we are aware of everything else” (Interview SHTA). A key challenge is the contrast between the usual warning onset period for hurricanes of 2-3 days and that of a flash flood of 20-30 minutes. Some moves to greater overall flood preparedness have been made: a flooding disaster response plan has been drafted and advisories are issued. One respondent reported that since the 2005 flash floods, in which a woman died after getting out of her car, there is greater awareness of staying off the road and a preparedness ‘kit’ is sold for cars (as well as homes, which has long been part of hurricane preparedness measures). Even for hurricane events, however, there was uncertainty at how St Maarten would cope today with events of the magnitude of Hurricane Luis (i.e. above a category 3-
4 hurricane). As one respondent commented: “It is basically clean up as fast as possible, get to higher ground and see what is left” (Interview Port Authority). There is also a lack of preparation for possible tsunami events.

- The withdrawal of Dutch development aid with devolution, reduced EU funding through the European Development Fund (as St Maarten is now only an Associate Member of the EU) and constraints on international borrowing with a debt relief settlement agreed with the Dutch from 2010 (although they may borrow from the Dutch as a last resort). The nature of the settlement also means there is a tight fiscal ceiling. This adds to the financial pressures of being a small state, without economies of scale and with high debt ratios that can make it difficult to borrow internationally. This was cited as a more pressing constraint on government than the impacts of the global economic downturn, which were by and large withstood across ministries and sectors (although there was undoubtedly contraction (which also affected private construction and possibly exposure) informants said levels of disaster preparedness were maintained, possibly with the exception of small companies and household expenditures on preparedness including emergency kits and insurance). In fact, development aid (alongside the structure of St Maarten’s economy) may have cushioned the effects of the global economic downturn (Economic Outlook St Maarten 2012-2013; Interview VROMI). However, major planned infrastructure works had been delayed to keep the deficit down (ibid.). Development aid financed many infrastructure and social development projects that were not seen locally as an investment priority, such as roads and water and sewage infrastructure, in areas that were not a political priority (such as Middle Region, outside Philipsburg and the main tourist areas), but also projects were pre-financed, whereas now liquidity constraints means delays (although one respondent also reported that the island lacked the capacity to manage previous inflows of foreign aid). Each ministry has its own risk-related budget (there is no National Disaster Fund at present), which is often the first to be cut and is ultimately fungible. Ministry of Public Health officials reported that dedicated funds would be necessary if they were to have dedicated staff for preparedness, more appropriate equipment and better planning and structures in place. A former government official reported that expertise in planning projects and getting money from external sources such as the EU was currently lacking. “Now we have to be self-reliant and it is a huge challenge” (Interview VROMI). Ultimately, in a major disaster, respondents said they expected to be reliant quickly on the Dutch and on international humanitarian assistance (with a contingent of Dutch marines already present in St Maarten during the hurricane season who assist with reconnaissance and clean-up). In 2014, the Finance Minister warned that the island might be able to finance one catastrophe, but not successive disasters (Today St Maarten 2014).
**Forecasting:**
- Lack of small weather stations as well as functioning radar. The lack of functioning small weather stations in part relates to weaknesses in government co-ordination, e.g. between VROMI and the Met Office.
- Ongoing capacity building at the Met Office following the devolution of functions to the island from 10.10. The development of the Met Office has been supported by international expertise. The current operating capacity of the Met Office is estimated at around 60% of planned operations (Interview Met Office).

**Warning and awareness:**
- Official communications are least likely to reach illegal / immigrant groups due to language barriers and mistrust in government. Other challenges to communication included: the transience of communities, the lack of capacity to translate communications into other relevant languages in an emergency that people forget the information, that needs are different in the high and low seasons.
- Communications infrastructure relies on radio, with sirens discontinued due to technical issues, but more radio and TV presence and cell phone broadcasts still needed. With more and more private channels, the challenges of co-operating with the private sector increase, and the public are not aware what is government information, e.g. people call the national hurricane centre when they should call local met services.
- There is training by the Fire Dept., e.g. at the airport, although some agencies are not yet fully on board (such as the police). Likewise, exercises take place in schools but less so in businesses and government agencies.

**Sewage treatment:**
- VROMI is trying to connect sewage lines.

**Future**
- A revision of the Emergency Support Function structure is underway to better reflect recent changes in institutions.
- The National Disaster Co-ordinator is working more with the British and French Caribbean territories, which could facilitate faster international assistance in an emergency.
- Flood models are being entered into a GIS system, which will allow the definition of at risk areas and better evacuation planning. The Belle Plaine project financed by the EDF is expected to influence development guidelines.
A joint project with French St Martin is underway to install a new radar system (with EDF funding, which can be accessed by the French administration).

In terms of the overall governance environment, officials report that devolution since 10.10 (and the advent of digital media) is also bringing increased public scrutiny, with politicians being held to greater account by the public, who are more aware that public entities are responsible and accountable and because there are more structures for accountability (such as an ombudsman). In addition, capacity and professionalism in government is said to be improving.

The culture of citizen dependence on government and patronage relationships was also said to be changing.

The Root Cause Analysis Table highlights, although it does not make explicit, many of the inter-connections across the physical, socio-economic and governance domains and pathways that give rise to risk. Information from the Root Cause Analysis presented above was also presented for the Agent-Based Modelling work in a format that highlighted the actors, actor-relationships and underlying institutions conforming the current flood ‘system’. In conjunction, this report also provides a more detailed timeline of policy measures and the underlying motivation for relevant policies, as reported in interviews:

<table>
<thead>
<tr>
<th>Known trigger / motivation</th>
<th>Policy action</th>
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</thead>
<tbody>
<tr>
<td>Hurricane Frederic in 1979 exposes weaknesses of pump and waterworks</td>
<td>Several measures taken such as lowering of ford to allow water to flow into Salt Pond</td>
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<tr>
<td>Controversy about certain building developments highlighted in the media</td>
<td>Beach Policy 1994, first attempt to regulate development</td>
</tr>
<tr>
<td>First planning permit request made it clear that guidelines were needed – guidelines were supposed to bridge phase until Global Land Use Plan could be developed</td>
<td>Hillside Policy 1998 (these are guidelines, not laws)</td>
</tr>
<tr>
<td>Socio-Economic conference of 1995 also emphasized that natural resources were being destroyed</td>
<td></td>
</tr>
<tr>
<td>1990s Hurricane events</td>
<td>Leads to better building and infrastructure construction by public and private sector (e.g. almost all cables now run underground); strengthened building codes and enforcement; disaster management and co-ordination structures, plans and training exercises put in place; curfew system put in place; improvement of Government communications and annual hurricane awareness campaign introduced</td>
</tr>
</tbody>
</table>
The destruction of Great Bay in 1995 and the washing away of the beach in 1999 led to the building of the Philipsburg boardwalk from 2003, which was built to protect against storm surge. It was financed by the government and the Harbour (it also included an aesthetic aspect to attract tourists to Philipsburg).

1990s Dutch Ordinance legally obliges zoning and later Dutch development funding

Triggers attempted zoning policies, but none approved into law

2005 Floods

UNESCO flood mapping studies (recently put into GIS so flood risk areas can be defined and evacuation procedures improved)
Prompted measures, but ‘faded away’

2010 flooding

New pump installed in 2011 / 2012, although recommended in 2003

2014 Hurricane Gonzalo

Renewed political calls for drainage improvement lead to drafting of Stormwater strategy (but not approved) (prior to this budget claims for the work never executed)
Change of policy to open shelter in the event of any forecast hurricane, rather than event of a Category 3 magnitude hurricane
Also change in response by non-government actors: Port will now move to full preparedness for any named storm, rather than wait on warnings
Reported that there was political will after Gonzalo to make real changes

Extension of trenches and expansion of flood gate following IHE-UNESCO requirements for South Pond and Fresh Pond

Ongoing revision of Disaster Ordinance and Plans, including Emergency Support Functions as institutional structure increasingly out-moded and need to improve working of some Emergency Support Function groups

Ongoing revision of Disaster Ordinance and Plans, including Emergency Support Functions

Address to Parliament by known local NGO activist, as legislature wanted to approve new developments up the hillsides

2015 prolongation of the Hillside Policy by the legislature

5. **Initial findings from comparison with French St Martin**
Although a full investigation of the institutional differences between the disaster management regime in French St Martin and Dutch St Maarten was not realised, initial findings from this study point to some interesting differences. While these merit further investigation, the main points made by informants were:

- That the Dutch system relies on government functions but struggles to attract top professionals, whereas the French system is a private sector one driven by insurers.
- The French system of building control (a private system whereby independent firms are licensed by the state) has operated more effectively than the Dutch system (although construction has improved since Luis on the Dutch side). Contractor liability is well defined by law whereas Dutch laws are very open in this regard (there is no obligation to have professional insurance, for example, whereas there is in French St Martin).
- While there is very little influence of Dutch or EU law in St Maarten, St Martin follows EU directives, and has a Risk Prevention Plan with spatial mapping of risks including flooding (whereas the Dutch mapping is only partial).
- The French model of development has differed: they have encouraged 2-3 storey apartments and less sprawl, whereas Dutch land was given out in parcels and sub-divided.
- On the other hand, on the French side everything is still relatively centralised and officials work on rotation from France, while there are still more levels of government to go through. As one Dutch St Maarten interviewee described “Before when the Dutch were in the Netherlands Antilles we used just used to do the legwork, the French are in that mentality now” (Interview Ministry Public Health). The weather service is run by Météo France from Guadeloupe rather than locally.
- Post-disaster assistance is higher on the French side, but the assessment process is slower as assessors are not local. There is an emergency fund for those who are not insured. Insurance premiums are lower due to government aid and part of the premium payment goes to a catastrophe fund.

However, informants were divided as to whether the French side could really be known for better disasters management, or whether the differences were over-stated. Interviewees reported “We wonder if the French side had the same storm, its cafes are open the next day” and described the historic difference in response as “After Luis, the French government gave out materials, whereas on the Dutch side it was every man to himself.” However, others reported that the French side was suffering from many of the same problems of poor settlements and lack of development control (with provisions of the Coastal Law not applied and an increasing number of constructions carried out without a building permit), while the experience of the Dutch in preparedness was said to be more advanced. The local government (Collectivité) in French St Martin cannot put out an alert, this has to be done by the Préfêt, or representative of the French State on the island, making the procedures more complicated than on the Dutch side.
In a key paper on the root causes of risk in French St Martin (although the paper pre-dates the effects of devolution and the Risk Prevention Plan now in force in French St Martin), the author attributes the root cause of vulnerability on the French side to political and judicial weakness on the island (Duvat 2013). The causal pathways mapping the relationship between hazard and social vulnerability in French St Martin are reproduced below: they show underlying dynamics that echo those in Dutch St Maarten, although with a different historic profile: economic boom (with the de-fiscalisation of French St Martin from the 1980s) and immigration bringing increased construction and with it exposure, as well as a weakening of social solidarities, increased social marginalisation and enduring weakness of the political administration and regulation. However, it is also worth noting that the two sides of the island, as well as exhibiting differences in institutional regime, have had different economic bases and experienced global economic shifts differently, both because of their respective currencies (euro and dollar) and historic development trajectories. These socio-economic differences are described further in technopolis 2013, although un-related in the paper to risk dynamics and policies.

The following figures re-produce the root cause analysis diagrams produced for French St Martin in Duvat 2013.
Figure 5 - Croissance économique et vulnérabilité : la situation originale de Saint-Martin.
Figure 4 - Les facteurs du risque à Saint-Martin.
6. Research and policy implications

As noted above, the implications of the St Maarten work for risk assessment (through the development of agent-based models), for methodologies for Root Cause Analysis and for analytic approaches to understanding disaster causation are discussed in other PEARL documents. A key implication for further engagement on the island is to understand the under-lying root causes of risk, namely:

- Small island size, limited resources and colonial marginalisation
- The under-lying model of development driving up exposure and compounding physical and social vulnerability
- The unique social structure which underpins the political process in ways that politicise land use, and a political culture that discourages long-term risk reduction in the interests of immediate economic and political gain
- This should not mask key sources of resilience: since 1995 there has been the political and administrative will to address hurricane preparedness and response, which is slowly having a spill-over effect on other types of flood disaster and their management. The small island culture and personal connections also facilitates unique collaborations across the government and non-government sectors which taps into the capacities of the non-government sector.

There is certainly a need for further technical support to ongoing processes of risk management on the island, such as the UNESCO mapping studies of 2006, to which PEARL partners are uniquely placed to contribute. WP1 work has now opened the opportunity for this to involve a wider range of actors across government ministries and businesses / experts (such as the insurance sector and engineering and construction firms). While the political and social dynamics are difficult to address through external interventions – further involvement by PEARL partners could a) use the understandings gained through root cause analysis to highlight the need to address risks with influential actors (such as politicians and the Prime Minister) as well as through the island’s media (identified by informants as a key source of political change on the island) and b) support access to international knowledge and finance by government and non-governmental actors on the island, through cross-case learning processes in PEARL, for example.

Acknowledgements

The author would like to thank all those in St Maarten and St Martin who gave their time to be interviewed and assisted with the research process. In particular, the author thanks Paul Martens, Head of the Office of Disaster Management, and Thijs Sommers, Policy Advisor VROMI, for their time and support.

Any errors in this document remain the responsibility of the author.
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https://www.youtube.com/watch?v=3mFC5lZnH0Y
## Annexes

### Annex 1: Table of Interviewees

<table>
<thead>
<tr>
<th>Name and contact details</th>
<th>Date of interview</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Tony Gibbs, Disaster Risk Consultant for Eastern Caribbean (author of report on St Maarten and St Martin loss and damage)</td>
<td>27/07/2015</td>
</tr>
<tr>
<td>2. Thijs Sommers, Policy Advisor, VROMI (Ministry of Public Housing, Spatial Planning, Environment and Infrastructure)</td>
<td>28/07/15</td>
</tr>
<tr>
<td>3. Mark Williams, Policy Advisor, VROMI</td>
<td>28/07/15 &amp; 03/08/15</td>
</tr>
<tr>
<td>4. Claudius Buncamper, Department Head of Infrastructure, VROMI</td>
<td>31/07/15</td>
</tr>
<tr>
<td>5. Kurt A. Ruan, Department Head of New Projects Development and Planning, VROMI</td>
<td>31/07/15</td>
</tr>
<tr>
<td>6. Jan Vanden Eynde, Vice President, Independent Consulting Engineers (ICE)</td>
<td>03/08/15</td>
</tr>
<tr>
<td>7. Tadzio Bervoets, Manager, Nature Foundation St Maarten</td>
<td>06/08/15</td>
</tr>
<tr>
<td>8. Paul Martens (Head Office of Disaster Management) and Clive Richardson (Chief Fire Dept)</td>
<td>06/08/15 &amp; 19/08/15 &amp; talk given by Paul at King’s on 16/11/2015</td>
</tr>
</tbody>
</table>
Annex 2: Background information for interviewees, in particular initial contacts

PEARL RESEARCH ST MAARTEN JULY-AUGUST 2015

INTRODUCTION TO THE RESEARCH

The research forms part of the PEARL project, or Preparing for Extreme and Rare Events in Coastal Regions. This is an EC funded project taking place from 2014-2018. It is co-ordinated by the UNESCO-IHE Institute for Water Education, The Netherlands, who have already been involved in a project to support the study of flood-related hazards, vulnerabilities and risk on the Dutch side of St Maarten (Regional Risk Reduction Initiative R3I, 2009-2012). The aim of the current PEARL project is to develop holistic strategies for coastal flood management incorporating structural and non-structural measures. Findings from the project will inform a guidebook for flood management practitioners in the EU and beyond. More information about PEARL can be found at http://www.pearl-fp7.eu/about-pearl/

PEARL researchers at King’s College London are carrying out a study of the causes of flood risk and disasters in a number of EU and international case studies. The aim is to understand the social, economic and political causes of small scale but high local impact disaster events in coastal regions at a greater depth than current research. The findings will inform the development of holistic risk assessment models within PEARL, out of which policy-makers can understand the possible impacts of different flood risk reduction measures, and their effectiveness.

POTENTIAL INTERVIEWEES

The aim is to conduct in-depth, semi-structured interviews with a representative sample of stakeholders. In St Maarten, this would include the Fire and Disasters Department, Ministry Officials responsible for spatial planning (VROMI), the Meteorological Office, the Red Cross, relevant donor organisations, affected business groups (tourism association, property developers, the marine industry), insurance companies, the electricity generation company, Independent Consulting Engineers and affected households. These interviewees would also be asked to suggest other relevant people or organisations to interview. We are also interested in generating a similar list of contacts for the St Martin French side of the island.
FORMAT AND CONTENT OF PROPOSED INTERVIEWS

Interviews will be undertaken at a time and in a place convenient to the interviewee. We anticipate the interviews will last around one hour. The interviewer will discuss with the respondent in each interview how they wish the data from the interview to be recorded and used, and ask the respondent to sign a consent form on this basis.

Interviewees will be asked about their experience of and responses to significant historic disaster events in the case study area. In St Maarten / St Martin this will include events from Hurricane Luis in 1995 up to Hurricane Gonzalo in 2014, depending on the interviewee’s age and knowledge. The questions will be 1) What actions were taken in preparation, in response to, and to recover from the disaster event 2) What motivated those actions 3) What constrained their adoption, implementation or effectiveness 4) Who they were taken in conjunction with 5) What effects the actions had 6) What has changed and persisted since the historic event into the present.

FURTHER CONTACT AND INFORMATION

Please contact Arabella Fraser at King’s College London: arabella.fraser@kcl.ac.uk