Dutch Caribbean Nature Alliance
Safeguarding nature in the Dutch Caribbean

Small Islands – Large climate change challenges

Household resilience to climate change vulnerabilities - a case study of Bonaire

POLICY BRIEF - SEPTEMBER 2022

Main findings

- The main climate change vulnerabilities for Bonaire are: an increase in the intensity of hurricanes and tropical storms, an increase in the number and extent of flood events, and an increase in the occurrence of extreme weather
- These impact Bonaire's natural systems (e.g., destruction of coastal and marine ecosystems and terrestrial environments) and socio-economic systems (e.g., health, income, and food availability) – and thus negatively impact households.
- The average score of the household sample indicates that HCR in Bonaire is not particularly low, but also not high.
- Especially the following drivers of household climate resilience seem to be limited in Bonaire: expected damage to homes, amount of savings, insurance covering damage from climate change (vulnerabilities), dependent income sources, incomes, vulnerable neighbourhoods, alternatives to electricity, water, and food, social resilience, community response, government response, awareness of climate change, information and education on climate change impacts and steps to prepare for this, and steps taken to prepare for this.
- The following households are less inclined to be climate resilient: (possibly) bigger households, households with high kid ratios, households with younger household heads, (possibly) households speaking fewer languages, households not fluently speaking English, and households with a higher level of obtained education.

Recommendations

- Create an action plan in which policy directly aimed at increasing (household) climate resilience is formulated. This should at least include policy to:
  - Keep investing in the protection and recovery of Bonaire's nature
  - Create awareness
  - Increase the availability of insurance covering damage from climate change *(vulnerabilities)*
  - Provide financial assistance to help households prepare for climate change *(vulnerabilities)*
  - Provide income generating opportunities and diversify the economy.
- Incorporate climate change (resiliency) in the design of policy on other themes.
- Increase cooperation
- Involve the local community
- Conduct additional research

1 Background

Small Islands (SIs) – like Bonaire and the other Dutch Caribbean islands – are particularly at risk for climate change and climate-related disasters[1] and will likely be the first and most intensely affected by climate change impacts[2]. Ironically, SIs experience 'double inequality'; where regions have barely contributed to the overall cause of climate change while showing a small capacity to resist or recover from its impacts[3]. This is often due to their, generally shared, sustainable development challenges such as limited economies of scale, limited (natural) resources, and isolated nature[4]. Therefore, these islands' households often do not have the resources to prepare for and recover from climate change and related vulnerabilities. Considering the immense impact climate change is expected to have on SIs and their households and the fact that these islands are not prepared for these impacts[5], it is important to increase Household Climate Resilience (HCR) on these islands[6]. HCR refers to 'the capacity of a household to deal with change by maintaining or transforming living standards in the face of climate change vulnerabilities without jeopardizing their long-term prospects'[7]. Although more focus is starting to be directed at building (household) climate resilience, considerably greater action is needed[8]. Also, less action seems to be directed at vulnerable regions and people, such as the SIs and their citizens[9]. To act, knowledge of which drivers weaken resilience is crucial to identify opportunities for increasing household climate resilience[10]. However, such knowledge is limited, especially for SIs and, as far as known, non-existent for Caribbean SIs. Thus, to be able to enhance initiatives aimed at increasing HCR on the (Dutch) Caribbean islands, additional knowledge is required. Therefore, HCR on Caribbean SI – with Bonaire as a case study – has been researched.

2 This research

Climate resilience is context-dependent[11]. Therefore, to study household climate resilience, it is important to first map out the climate context of Bonaire[12]. The main climate change vulnerabilities, their possible impacts and the related drivers of household climate resilience were identified (see p.3, 4 & 5). To do so, 13 Key-informant interviews were conducted – which were complemented with extensive desk research. Based on the results of these, a household survey, attempting to measure the 21 selected indicators of HCR in Bonaire, was created. This survey was spread online and household heads with a sédula (a certificate of registration on Bonaire) were asked to fill in the survey. After checking and processing the collected data, 183 household cases were available for analysis with inferential statistical techniques. An important side note is that the representativeness of this sample cannot be guaranteed; households with a European Dutch ethnic background seem to be overrepresented in the sample. The statistical analysis allowed for the identification of the most pressing barriers of HCR on Bonaire and the households which seem less inclined to be climate resilient (see p.6, 7 & 8).

3 Main Findings – Climate Context

Main climate change vulnerabilities

Tropical storms and hurricanes

- Hurricanes are expected to increase in strength by 20% in the Caribbean region[13].
- Rainfall within 100 km of the eye of hurricanes is expected to increase by 20% by 2100[14].
- Expectations of changes in frequencies differ between models. The occurrence of tropical storms is expected to further increase in the future[10].

Inundation

- Levels of the sea around Bonaire rise with an average of 3.3mm/ year – which is more than the global average[15].
- By 2100 a maximum Sea Level Rise (SLR) of 1.6 metres can be expected[16].
- SLR, together with storm surges, caused by tropical storms and hurricanes, causes inundation[17].
- Bonaire is also at risk of being hit by a hurricane[18], [19] and chances of this happening increases[20].
- Bonaire is especially vulnerable to (increased) inundation[13].

Extreme weather

- Changes in drought and precipitation patterns are observable for Bonaire and an increase in the frequency, magnitude, durations, and extent of droughts is expected for Caribbean SIs[21].
- Impacts of draughts become more drastic in combination with other extreme weather events like storms and hurricanes[22].
- Long periods of droughts followed by sudden extreme rainfall can have disastrous effects like landslides[23].

Photos: © Casper Douma Photography

Impact of climate change vulnerabilities

Natural systems

- Negative impacts on **freshwater resources**, due to droughts and salination caused by inundations – while these provide very important resources and (nesting) habitats for many plant and animal species[21].

- Destruction of **coastal and marine ecosystems** (e.g., coral reefs, mangroves, and sea grass meadows) due to, amongst others, warming of the ocean, soil run-off, storms, hurricanes, and floods[24, 25] – while these provide crucial habitats for many marine species and provide protection from physical damage to Bonaire[26].

- Imposing threats to **terrestrial environments**, like beach erosion (due to floods and increased wave action), terrestrial erosion and surface run-offs (due to droughts, storms, and hurricanes), and negative effects on vegetation (due to increases in temperature and droughts)[27] – thus putting extra pressure on Bonairean species[16].

Socio-economic systems

Impacts of climate change and related vulnerabilities on Bonaire's socio-economic systems (households) include negative impacts on:

- **Citizens' health**, like casualties and injuries[28], psychological distress[29], and sickness from infectious diseases, foodborne infections, animal infections, and respiratory and cardiovascular diseases[30] – which are all expected to increase due to climate change.

- **Economy and household incomes** – especially those in the tourism, fishery, and agriculture sectors[30, 31, 32, 33], because, amongst others, these sectors highly depend on the natural systems that are negatively impacted by climate change.

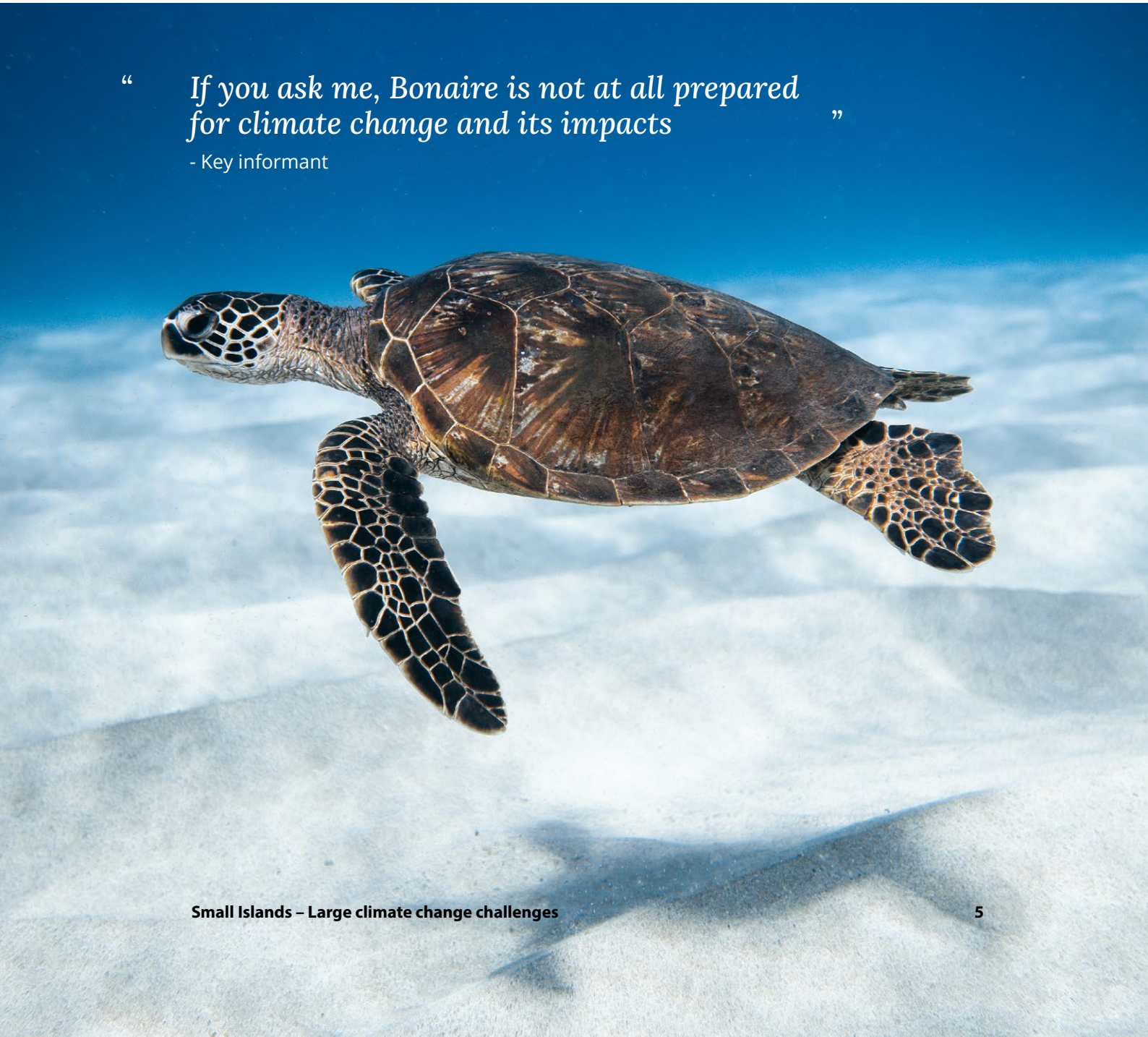
- **Food and water availability** [10, 28 35].

- **Important buildings** – like the hospital, police station, schools, houses, and resorts[36, 37] – and **vital infrastructure** – like roads, electricity grids, telecommunication, water supply networks, sewers, and the (air)port[28, 38].

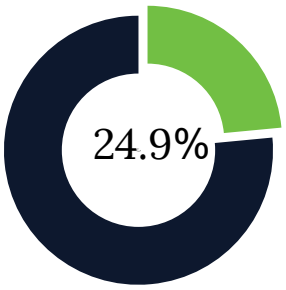
Current state of climate change preparedness

- Bonaire does not seem to be prepared for the above-described climate change vulnerabilities.
- As far as known, none of the government policy documents for Bonaire mention specific action towards climate or climate resilience and initiatives on increasing climate resilience on Bonaire are non-existent. The same goes for education or information campaigns aimed at the topic are non-existent.
- Reasons that are mentioned for this are: low awareness about climate change, the belief that climate change is a problem of the future, the perception that other challenges are more pressing.

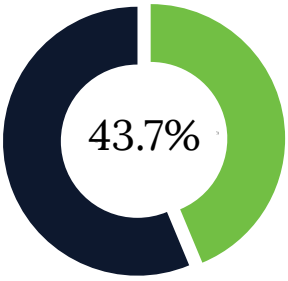
> *"If you ask me, Bonaire is not at all prepared for climate change and its impacts"*
>
> - Key informant



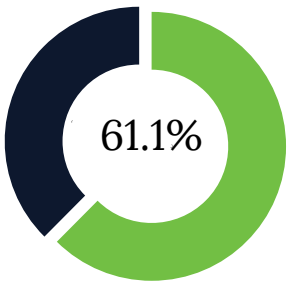
4 Main Findings – Household Climate Resilience



of the households expected their houses to be **totally or severely damaged** by natural hazards.

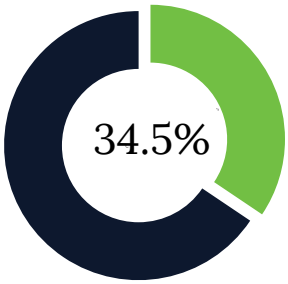


of the households state their **savings** would insufficiently help the household recover from a climate change vulnerability.

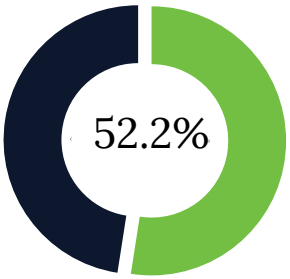


of the households were **not insured** for damage caused by climate change (vulnerabilities).

The fact that more than a quarter of the households expected their homes to be totally or severely damaged by climate change vulnerabilities – especially in combination with the barriers to recovering from such damage through savings or insurance – indicates a barrier to Bonairean. Also, 93.8% of the households were located in a neighbourhood that is highly or medium susceptible to climate change vulnerabilities.



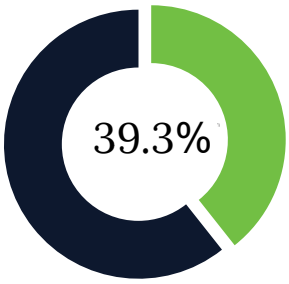
of the households fell in the **'low' or 'very low' income** category.



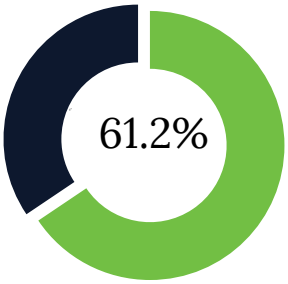
of the households had at least one **income source** that is dependent on a sector vulnerable for climate change.

Since poverty is seen as a threat multiplier when households are faced with climate change-driven phenomena[39] and more than a third of the households fall in the 'low' or 'very low' income category, household income levels seem to be a barrier. Furthermore, sectors (like tourism, fishery, and agriculture) collapsing due to climate change (vulnerabilities) in combination with an absence of economic alternatives, may further decline household incomes and may increase unemployment, poverty, criminality, uncontrolled migration, and social unrest[40].

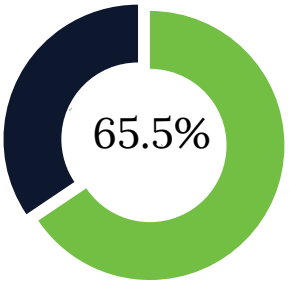
Main Findings – Household Climate Resilience: continued



of the households expected expected **no or little support** from people near their household in case of need.

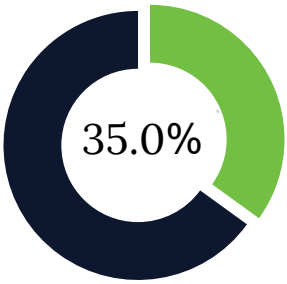


of the households think their **community response** to natural hazards is not at all or only little effective,

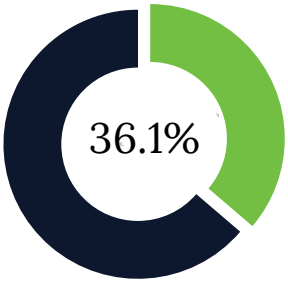


of the households **had no or little trust in the government's preparations** for natural hazards.

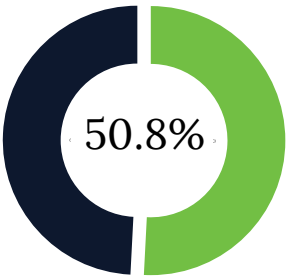
Since households' support system and community response are important drivers for HCR[41, 42], the high number of households not (sufficiently) having access to these drivers seems to be a barrier. Lastly, the households' perceptions of the quality of local government support have proven to be indicative of household resilience in the case of crisis[43]. The fact that there seems to be low trust in government support, indicates another barrier to HCR.



of the households were not well **aware** of what climate change means and how it can impact them.

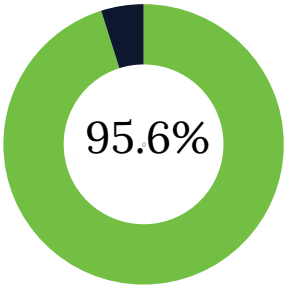


of the households did not know where to find **information** about climate change, its impacts, and how to prepare for them.

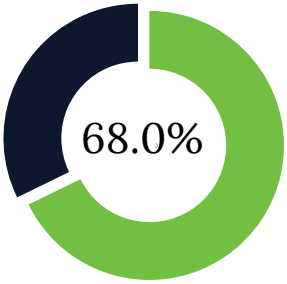


of the households received **no or little education** contributing to HCR – like first aid training or basic disaster-management training

Being aware is a crucial first step to assessing and understanding the risk of one's household and into taking steps to prepare, adapt and transform[44]. Therefore, a third of the households not being aware of this, indicates a barrier to HCR. The same applies to knowing where to find information to inform oneself about these risks[45] and to education that can contribute to HCR[46].



of the households **did not have alternatives to electricity, water, and electricity** in case of need.



of the households had taken **non or little steps to prepare** for climate change (vulnerabilities).

Of all households, 19.4% had alternatives to electricity, 18.3% to water, and 41.8% to food in case of need, while these are crucial in protecting life and property (in the case of electricity) after the occurrence of climate change shocks[47, 48] and in responding, absorbing, and recovering more easily from climate change shocks and stresses[49]. Furthermore, two-thirds of the households had taken no or only a few steps to prepare for climate change (vulnerabilities). Therefore, these two aspects seem to be barriers to HCR.

Differences between households

Although additional research is necessary for a deep understanding, the following households are less inclined to be climate resilient:

- Households with high kid ratios
- Households with young household heads – *meaning younger than 30 years*
- Big households – *households with five or more members*
- Households without a member that speaks English fluently
  (an explanation for this relation can not be provided without further research)
- Households with higher levels of obtained education
- Possibly households speaking less languages

5 Recommendations

Create an action plan in which policy directly aimed at increasing (household) climate resilience is formulated. Increase financial and human capacity to implement this policy. It is recommended to, at least, include the following aspects:

- **Keep investing in the protection and recovery Bonaire's nature**, if only for its protective and resource-providing properties for socio-economic systems.
- **Increase the availability of insurance** covering damage from climate change (vulnerabilities).
- **Provide financial assistance** to help households prepare for climate change (vulnerabilities), such as using hazard-resistant material in construction or realizing off-grid electricity supply, could be considered.
- **Create awareness** around climate change (impacts) and the ways to increase resiliency, both among citizens and governors. Information campaigns should be provided in multiple languages.
- **Provide income generating opportunities and diversify the economy.** This can be combined with other policy recommendations, for example, by providing jobs in awareness campaigns or in nature conservation.

Incorporate climate change (resiliency) in the design of policy on other themes.

Increase cooperation - between the local and Dutch government and between (Dutch) Caribbean SIs. Create stakeholder meetings or a working group between the government, **(nature) organizations, and local (educational) institutions.**

Involve the local community in the creation and implementation of climate resiliency policy. Also include local and traditional. Keep the household that are less inclined to be climate resilient in mind and mobilize targeted support for these households.

Conduct additional research. The availability and quality of data on climate change (vulnerabilities) and its impacts should be increased. Furthermore, possible differences in HCR between 'local' and 'migrant' household should be researched. Lastly, HCR should be researched for other Dutch Caribbean Islands.

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