Climate impacts on Aruba

May 2025

Authors:
Timo Kelder (Climate Adaptation Services)
Sophie van der Horst (Climate Adaptation Services)

Workshop organizers:
Timo Kelder (Climate Adaptation Services)
Sophie van der Horst (Climate Adaptation Services)
Ryan R Peterson (NCRC council)
Juliet Carvalhal (Government of Aruba)

Workshop moderators:
Ursell Arends (Minister)
Diego Acevedo (University of Aruba)
Robert-Jan Moons (Moons consulting Engineers)
Marlon Faarup (CBS)
Tony Sevold (Metabolic)

Content

1. Introduction

On January 30, 2025, the workshop "co-designing Aruba's Climate Impact Atlas" was organized in collaboration with Aruba's National Climate Resilience Council (NCRC), the Ministry of Transport, Integrity, Nature and Elderly Affair, the International Panel on Deltas and Coastal Areas (IPDC), and Climate Adaptation Services (CAS) to discuss and prioritize climate impacts on Aruba. This event brought together around 50 stakeholders at Hyatt Place Aruba Airport. During the workshop, stakeholders from the public and private sectors, as well as non-governmental organizations, identified climate change impacts and hazards specific to Aruba. These insights contribute to the development of Aruba's Climate Impact Atlas and its National Climate Adaptation Strategy.

During the interactive workshop session, mind maps showing climate impacts were validated. These mind maps provide an overview of the impacts of climate change for different climate themes, such as heat, drought, and sea level rise. The impacts were categorized into economic, environmental, and socio-cultural impacts. The first versions of the mind maps for Aruba were created by Climate Adaptation Services based on a literature review. The mind maps were validated and prioritized with the participants.

This document presents the results of the workshop. Chapter 2 outlines the climate impacts per climate theme using the mind maps; Chapter 3 provides an overview of the prioritized impacts identified during the workshop; Chapter 4 describes the input collected for the climate stories on Aruba's Climate Impact Atlas; Chapter 5 describes the input for the maps and data that stakeholders valued for on Aruba's Climate Impact Atlas; and Chapter 6 concludes with how this input will be further utilized.

Appendix A lists the literature sources used to create the initial mind maps. Appendix B presents workshop outcomes that informed adjustments to the mind maps based on stakeholder input. Appendix C showcases photos of the modified posters from the workshop.

Figure 1: The workshop started with presentations but mostly focused around interactive exercises. Credits: Ministry of Transport, Integrity, Nature & Senior Affairs, Noel Werleman.

2. Climate impact mind maps per theme

The information in this chapter is based on a literature review and information gathered during the workshop in Aruba on January 30, 2025. During the workshop, participants discussed the climate impacts they experience, categorized into three sectors: economic impacts, environmental impacts, and societal impacts. The mind maps provide a simplified, visual summary of current knowledge on climate effects and are based on the "climate impact diagrams" from the Dutch National Adaptation Strategy (NAS, 2016). These mind maps help to gain a better understanding of the impacts and risks but are simplified representations. Further studies are needed for detailed information. The mind maps are being described into text descriptions per theme (e.g., drought, heat, etc.).

How to read the mind maps?

The mind maps present the climate theme in the center (e.g., "It is getting warmer"), with the relevant hazards (e.g., "More extreme temperatures") linked to it, which in turn are connected to sector-specific impacts. The impacts are divided into three main sectors: socio-cultural, environmental, and economic. In some cases, climate effects do not belong to just one sector. In such cases, the most relevant sector is displayed.

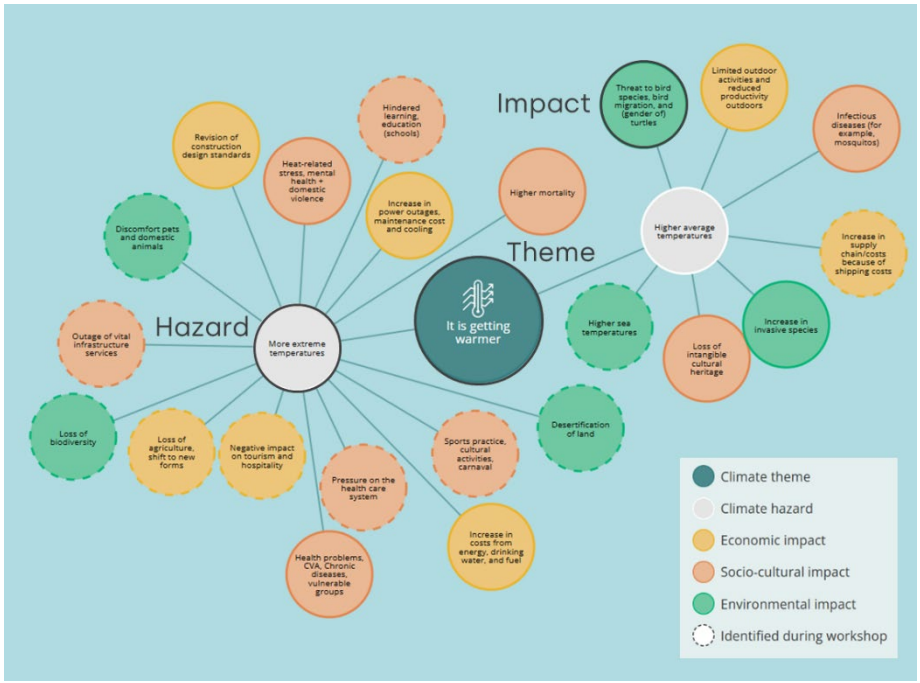


Figure 2: The mind maps include a climate theme, hazards and impacts.

2.1. It is getting warmer

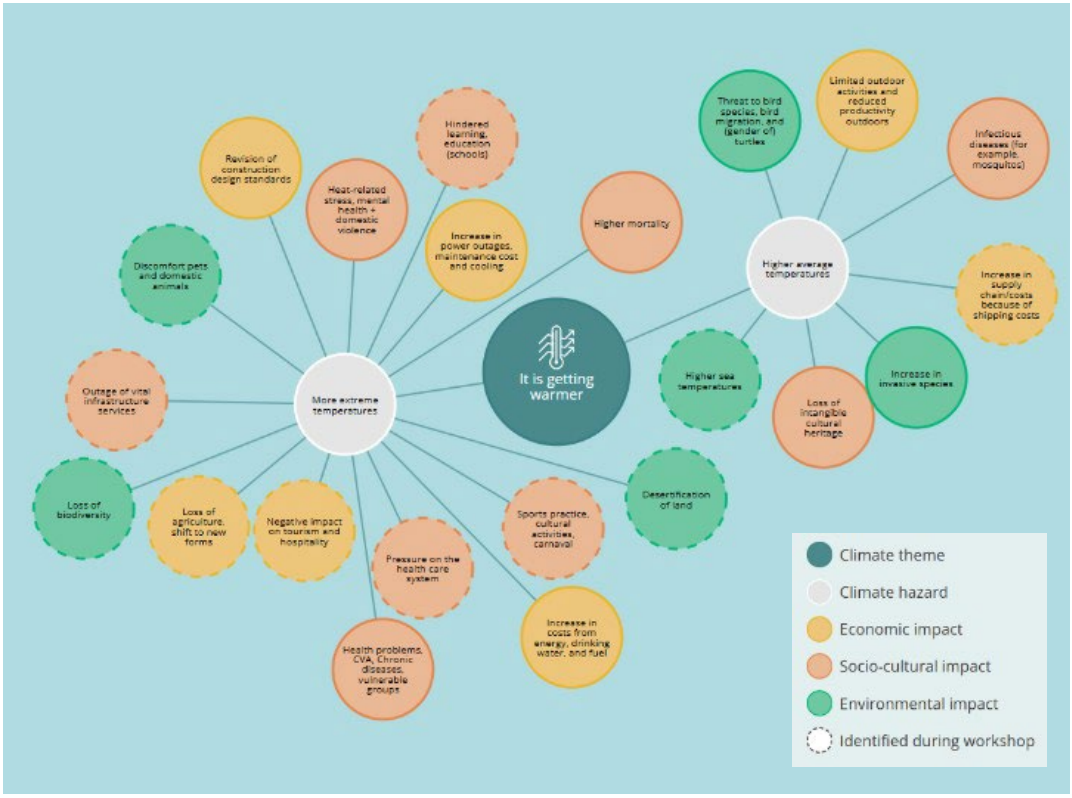


Figure 3: It is getting warmer

Due to climate change, it is getting warmer. This not only means a rise in average temperatures, but also more frequent periods of extreme heat. To guide discussions, initial mind maps based on a literature review were presented and refined based on stakeholder input. Below is an overview of the key climate-related impacts identified through this process.

2.1.1. Environmental impacts

Rising temperatures create favorable conditions for invasive species, which can disrupt local ecosystems and outcompete native flora and fauna. Warmer temperatures affect bird migration routes and timing, while also skewing the gender ratio of sea turtle hatchlings, which is determined by nest temperatures. These disruptions contribute to an overall loss of biodiversity, a concern raised by stakeholders. Additionally, desertification was identified as an impact. This, in turn, negatively impacts agriculture, leading to crop losses and creates challenges for farmers adjusting to

shifting growing conditions. Higher sea temperatures were also identified as impact, which is further described in section 2.4.

Stakeholders also emphasized the growing need for measures to protect pets and domestic animals, as extreme heat increases their vulnerability and the necessity for additional care and cooling strategies.

2.1.2. Socio-cultural impacts

Climate change is threatening intangible cultural heritage, including traditional farming and fishing practices, as well as nature-inspired cultural expressions such as festivals and rituals. Sports practice, cultural activities, and Carnival were identified by stakeholders as being at risk due to extreme heat, which may lead to schedule adjustments or reduced participation. Educational settings were also identified as being particularly vulnerable, as high classroom temperatures can hinder learning, making it difficult for students and teachers to focus.

Stakeholders further refined the understanding of health impacts, emphasizing that extreme heat particularly affects vulnerable groups, including the elderly and those with chronic diseases such as cardiovascular conditions. Rising temperatures contribute to higher mortality rates, particularly among these populations. Additionally, concerns were raised about mental health impacts, with stakeholders mentioning a potential increase in domestic violence incidents. These issues place additional pressure on the healthcare system, as heat-related illnesses lead to more frequent hospital admissions and strain on medical resources. It was mentioned that people living in the urban areas are particularly vulnerable because of the urban heat island effect.

During discussions, the relevance of infectious diseases in Aruba's climate context was debated. While some stakeholders viewed it as a potential impact, others were less certain. However, given that mosquitoes in Aruba can transmit diseases (i.e., there is risk of dengue, chikungunya, and Zika transmission), infectious diseases remain a consideration in the broader climate discussion.

2.1.3. Economic Impacts

Workshop participants identified several economic risks linked to climate change. Higher temperatures increase power demand for cooling, putting pressure on electricity grids, leading to more frequent power outages and higher maintenance costs. In extreme cases, this can result in outages of vital infrastructure services, affecting water supply and transportation networks.

Stakeholders also emphasized the rising costs in supply chains, particularly regarding shipping and fuel expenses that are exacerbated by extreme heat conditions. Additionally, the tourism industry is expected to see shifts in peak seasons, as extreme temperatures affect visitor preferences and potentially reduce revenue.

Furthermore, outdoor work and recreational activities were refined to highlight their decreasing feasibility, leading to reduced productivity in labor-intensive industries and limiting opportunities for outdoor tourism and leisure.

As extreme temperatures become more frequent, construction and urban planning must adapt to ensure buildings and infrastructure can withstand these conditions. Stakeholders emphasized the need for revision of construction design standards, including the use of heat-resistant materials and urban cooling strategies such as green spaces and reflective surfaces.

2.1.4. Disclaimer

This text is primarily based on stakeholder input gathered during the workshop, where local experts and stakeholders provided insights into the climate impacts affecting Aruba. To facilitate discussions, initial mind maps were developed based on a literature review and then validated and refined by participants during the workshop. While literature sources were consulted in drafting these mind maps, this document does not represent a comprehensive literature review. A more in-depth analysis of scientific and technical literature will be conducted as part of the CORVI study. Appendix A provides an overview of the literature sources used to create the initial mind maps. Appendix B contains the adjustments made to the mind maps based

on stakeholder input. Appendix C contains photos of the posters that were modified during the workshop.

2.2. Storms, rainfall and hurricanes are intensifying

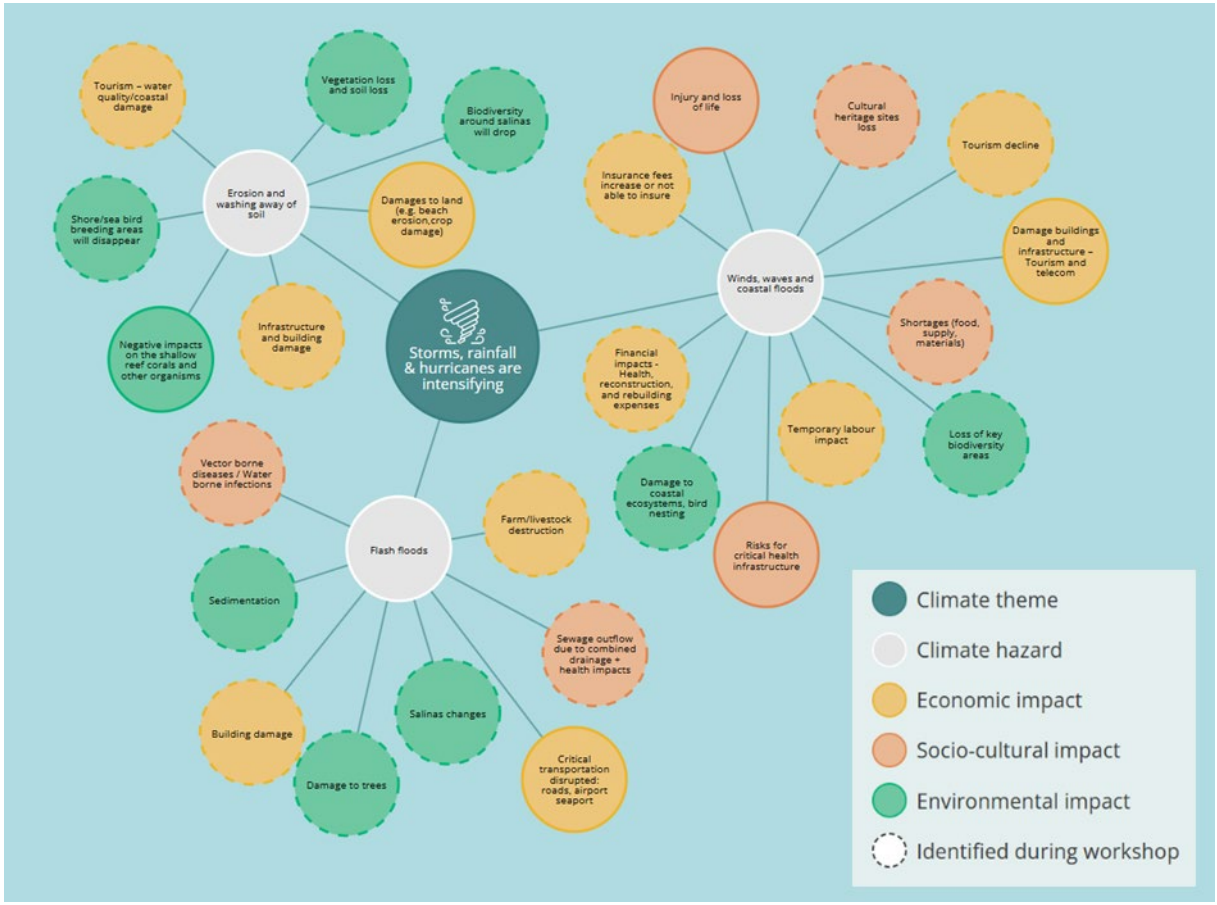


Figure 4: Storms, rainfall & hurricanes are intensifying

The intensity of storms, hurricanes, and rain showers is increasing with climate change. Stakeholders provided insights on how these hazards impact Aruba, refining and expanding the initial understanding of these challenges. Below is an overview of the key impacts identified through this process.

2.2.1. Environmental impacts

Flash floods and strong winds directly damage trees, destroy vegetation, and contribute to overall habitat loss, threatening key biodiversity areas

such as coastal ecosystems where birds nest. Additionally, these events accelerate erosion and soil loss, impacting beaches, mangroves, and vegetation. The resulting sedimentation from soil and debris washing into the ocean disrupts coastal ecosystems and saliñas, altering biodiversity. This influx of murky water further harms shallow reef corals and marine organisms, weakening their resilience.

Stakeholders mentioned that coastal erosion affects popular beaches like Arashi, Eagle, Baby, and Rodgers beaches.

2.2.2. Socio-cultural impacts

Severe storms and flooding disrupt daily life and access to essential services, impacting work, school attendance, and healthcare access. These disruptions can leave communities isolated due to damaged road networks and flooding. Roads and (low-lying) areas prone to (regular) flooding are, for example, ex-Sasaki Weg, Cunucu Abou, Pos Abou, Palm Beach, Pos Chikito, and Savaneta. At Pos Abou, homes were recently flooded and, in 2016, the Gas Station and surrounding buildings at Palm Beach flooded. Additionally, sewage overflow from overwhelmed drainage systems poses health risks, increasing the potential for waterborne infections and vector-borne diseases.

Stakeholders also highlighted concerns about the loss of cultural heritage sites due to storm damage. Housing and community infrastructure face increasing vulnerabilities, and temporary displacement due to severe weather events may affect social stability. Additionally, injury and loss of life remain serious risks during extreme storms, particularly in vulnerable areas.

Another critical concern is the possibility of shortages of food, materials, and essential supplies due to disrupted transportation and supply chains. These shortages can further impact communities, especially those already facing economic challenges.

2.2.3. Economic impacts

Extreme weather events cause severe financial strain, including rising costs for rebuilding following storm damage. Flooded roads and critical

transportation infrastructure, such as airports and seaports, disrupt economic activities, delaying the movement of goods and services. Supply shortages of food, materials, and essential goods may result in price volatility, further affecting economic stability.

Damage to buildings and infrastructure, including hotels, ports, hospitals, and utility systems (such as water and energy supply), significantly impacts key industries like tourism and telecommunications. Additionally, if extreme weather events become more intense, tourism could decline, as visitors may avoid destinations with higher risks of storms, flooding, and infrastructure damage. This could result in reduced visitor numbers, cancellations, and long-term economic downturns for businesses reliant on tourism. Insurance costs may rise as extreme weather events become more frequent, making coverage less accessible for individuals and businesses. The temporary loss of labor due to storm disruptions also poses a challenge to economic productivity.

Additionally, fisheries and marine infrastructure are particularly vulnerable, with storms damaging fishing equipment.

2.2.4. Disclaimer

This text is primarily based on stakeholder input gathered during the workshop, where local experts and stakeholders provided insights into the climate impacts affecting Aruba. To facilitate discussions, initial mind maps were developed based on a literature review and then validated and refined by participants during the workshop. While literature sources were consulted in drafting these mind maps, this document does not represent a comprehensive literature review. A more in-depth analysis of scientific and technical literature will be conducted as part of the CORVI study. Appendix A provides an overview of the literature sources used to create the initial mind maps. Appendix B contains the adjustments made to the mind maps based on stakeholder input. Appendix C contains photos of the posters that were modified during the workshop.

2.3. It is getting drier

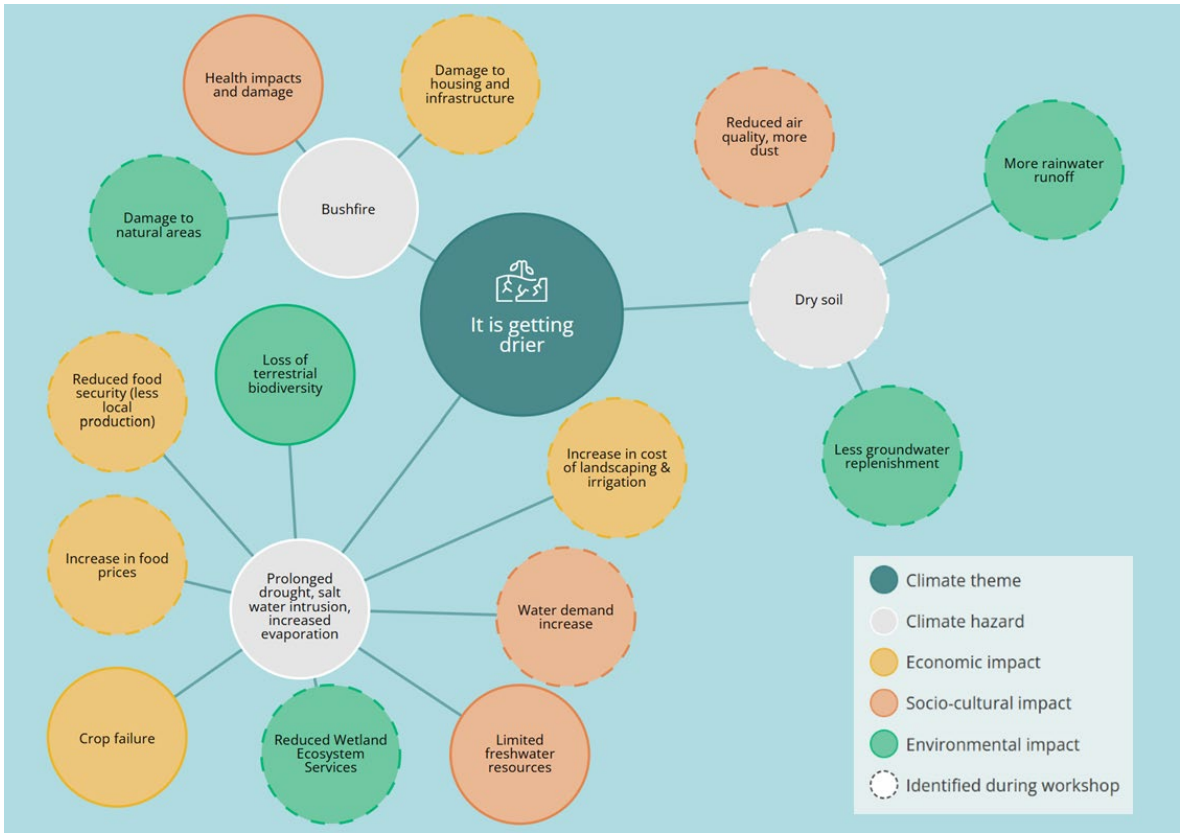


Figure 5: It is getting drier

Due to climate change, it is getting drier. This not only means prolonged drought and increased evaporation but also impacts on water availability, agriculture, ecosystems, and public health. To guide discussions, initial mind maps based on a literature review were presented and refined based on stakeholder input. Below is more information on the key climate-related impacts identified through this process.

2.3.1. Environmental impacts

Prolonged drought contributes to loss of terrestrial biodiversity, as species struggle to adapt to drier conditions. Additionally, dry soil loses its ability to absorb rainwater effectively, leading to less groundwater replenishment and increased rainwater runoff in streets. This affects overall water availability and increases flood risks during heavy rains.

Wetland ecosystems are also impacted, with a decline in ecosystem services such as natural water filtration and habitat stability. Another growing concern is poor air quality due to dust, as drier conditions lead to increased airborne particles, affecting both human health and environmental quality.

2.3.2. Socio-cultural impacts

Drier conditions put additional stress on freshwater resources, making water scarcity a growing issue for communities and businesses. As a result, increased demand for water and electricity places further strain on utilities, leading to higher costs and potential service disruptions.

Stakeholders also highlighted concerns about bushfires (previously termed wildfires), questioning their relevance in the local context but acknowledging the socio-economic and environmental risks, including loss of nature reserves and housing. Furthermore, health impacts from fire damage and air pollution were noted as potential risks associated with drier conditions.

2.3.3. Economic impacts

Agriculture faces major challenges, with crop failure remaining a concern despite Aruba's relatively small agricultural sector. Stakeholders discussed that while agriculture is not a dominant industry, there are still crops grown locally, justifying the inclusion of this impact.

Drier conditions are also driving a shift in agricultural practices, with a move from soil-based farming to hydroponics and indoor farming becoming increasingly necessary. These changes come with added costs but could improve food security and local food production in the long term. Additionally, the cost of landscaping and irrigation is expected to rise, affecting both households and businesses.

Higher food prices are another economic consequence, as local and imported food production costs increase due to water scarcity and extreme weather events. Moreover, increased utility usage—driven by greater demand for water and cooling—leads to rising operational costs for households and industries.

2.3.4. Disclaimer

This text is primarily based on stakeholder input gathered during the workshop, where local experts and stakeholders provided insights into the climate impacts affecting Aruba. To facilitate discussions, initial mind maps were developed based on a literature review and then validated and refined by participants during the workshop. While literature sources were consulted in drafting these mind maps, this document does not represent a comprehensive literature review. A more in-depth analysis of scientific and technical literature will be conducted as part of the CORVI study. Appendix A provides an overview of the literature sources used to create the initial mind maps. Appendix B contains the adjustments made to the mind maps based on stakeholder input. Appendix C contains photos of the posters that were modified during the workshop.

2.4. Caribbean sea is getting warmer and more acid

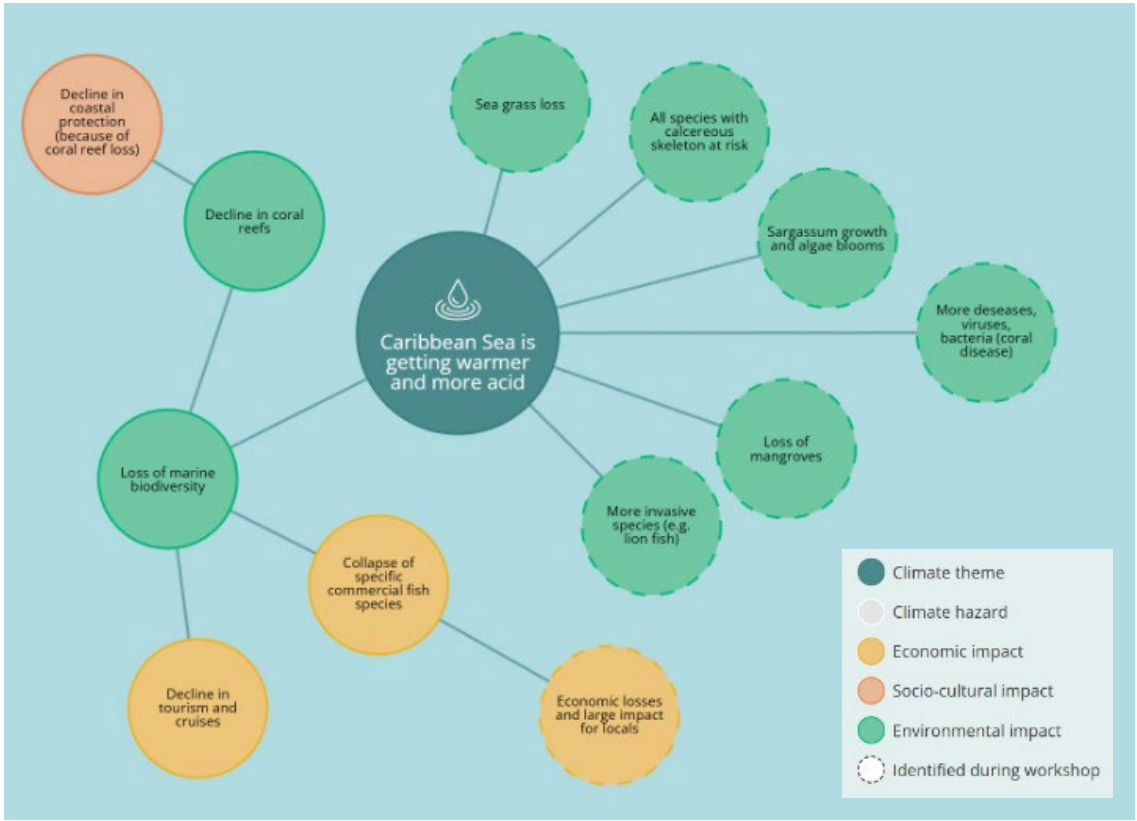


Figure 6: Caribbean sea is getting warmer and more acid

Climate change is having a profound impact on seas and oceans worldwide. Human activities, especially the use of fossil fuels, release large amounts of CO_2 into the atmosphere. While some of this CO_2 remains in the air, a significant portion is absorbed by the ocean, leading to a process known as ocean acidification.

Not only is the air temperature rising, but seawater temperatures are also increasing, while ocean water becomes more acidic. Stakeholders provided insights on how these changes impact biodiversity, fisheries, tourism, and local livelihoods. Below is an overview of the key climate-related impacts identified through this process.

2.4.1. Environmental impacts

Increasing ocean temperatures and acidification pose a significant threat to marine biodiversity, affecting coral reefs, fish populations, and other marine organisms. Coral reefs, which are essential for marine life and coastal protection, are particularly vulnerable. Rising temperatures lead to more frequent and severe coral bleaching, while ocean acidification weakens corals by making it harder for them to build their calcium carbonate skeletons. Additionally, acidification threatens other marine species that rely on calcium carbonate, such as crabs, lobsters, mollusks, sea stars, sea urchins, and certain plankton species. The decline of these species disrupts food chains and weakens marine ecosystems.

Some marine species may struggle to adapt to these rapid environmental changes and face the risk of extinction. Warmer waters also create favorable conditions for the spread of diseases and viruses affecting corals and other marine life, further accelerating biodiversity loss. Additionally, higher sea temperatures may promote the expansion of invasive species such as the lionfish, which outcompetes native fish populations and disrupts the balance of marine ecosystems.

The potential loss of mangroves and seagrass beds further reduces critical habitats for marine species while diminishing natural coastal protection. These ecosystems play a crucial role in absorbing carbon, filtering water, and providing nurseries for fish populations. Mangrove forests, in particular, help shield coastlines from flooding and erosion. However, rising

temperatures combined with sea-level rise may pose a threat to mangroves, potentially leading to their decline in some areas. At the same time, some theories suggest that sea-level rise could temporarily expand mangrove habitats by creating more shallow coastal areas where they can thrive.
In addition to these threats, harmful algae blooms, have become a pressing issue due to warming waters and changing ocean chemistry. In addition, sargassum can form large floating mats that entangle fish, block sunlight from reaching coral reefs and seagrass beds, and contribute to coral bleaching and disease outbreaks. When it washes ashore in large amounts, it negatively impacts coastal environments, tourism, and public health.

2.4.2. Socio-cultural impacts

The degradation of marine ecosystems impacts coastal protection, as coral reef loss makes coastal areas more vulnerable to erosion, storm surges, and flooding. Communities that rely on marine resources for food and livelihoods may face increased hardship due to the decline of fisheries and the loss of key marine biodiversity areas.

2.4.3. Economic impacts

A decline in marine ecosystems has serious economic implications, particularly for fisheries and tourism. The collapse of specific commercial fish species due to ocean warming and acidification threatens local fishing industries and food security. Warmer and more acidic waters lead to a decrease in fish populations, fewer species, and smaller fish sizes. As a result, fishermen must travel farther offshore to find viable catches, leading to higher fuel costs, longer trips, and lower overall yields. This not only reduces income but could also mean that some key fish species disappear entirely, severely impacting the fishing industry.

The tourism sector is also at risk. Rising temperatures make Aruba less attractive to tourists, while damage to coral reefs and marine biodiversity reduces the appeal of activities such as snorkeling and diving. This decline in tourism, including a potential reduction in cruise ship arrivals, leads to economic losses that significantly impact local businesses and livelihoods. This, combined with rising costs associated with environmental management and restoration, places a long-term financial burden on the island's

economy.

2.4.4. Disclaimer

This text is primarily based on stakeholder input gathered during the workshop, where local experts and stakeholders provided insights into the climate impacts affecting Aruba. To facilitate discussions, initial mind maps were developed based on a literature review and then validated and refined by participants during the workshop. While literature sources were consulted in drafting these mind maps, this document does not represent a comprehensive literature review. A more in-depth analysis of scientific and technical literature will be conducted as part of the CORVI study. Appendix A provides an overview of the literature sources used to create the initial mind maps. Appendix B contains the adjustments made to the mind maps based on stakeholder input. Appendix C contains photos of the posters that were modified during the workshop.

2.5. The sea level is rising

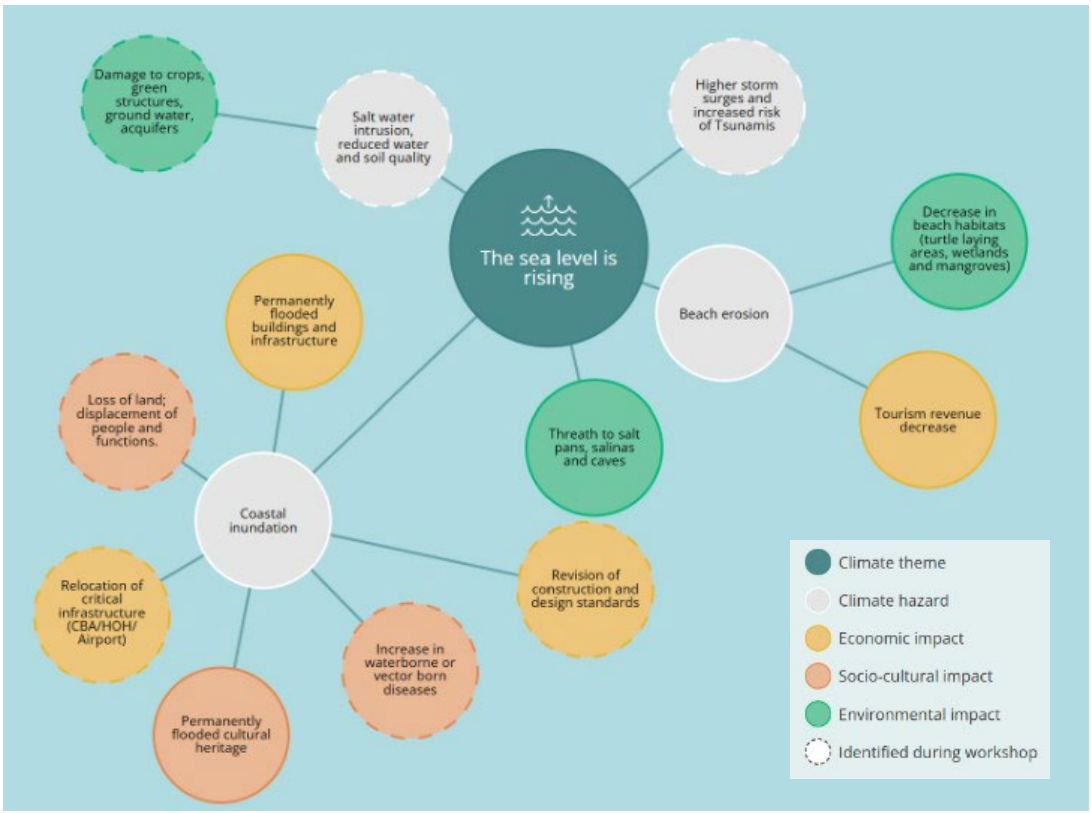


Figure 7: The sea level is rising

Due to climate change, sea levels are rising worldwide. This rising sea level threatens Aruba and the other Caribbean islands in various ways, leading to significant consequences. Below is an overview of the key climate-related impacts identified.

2.5.1. Environmental impacts

The continued rise of sea levels contributes to beach erosion. Coastal habitats, including beach ecosystems, mangroves, and reef islands, are particularly vulnerable. Stakeholders highlighted the impact on wetlands at Druif, Malmok, and Schia Sere, which are critical for maintaining biodiversity and supporting local ecosystems. Vulnerable areas include:

- Loss of breeding areas for migratory terns (approximately 25,000 per year) in the San Nicolas Bay Area (Rodgers Beach Reef Islands);
- North coast impact on breeding areas, affecting species such as the

least tern, common tern, and roseate tern;
- Spanish Lagoon, a critical bird breeding area, facing severe disruptions due to habitat degradation.

Mangrove ecosystems face a disbalance in species composition, with potential changes in root structures (luchtwortels) due to prolonged saltwater exposure. Additionally, the decline of turtle and bird nesting areas due to coastal erosion threatens key reproductive grounds for marine species. Saltwater intrusion into freshwater sources further complicates agricultural practices and changes ecosystems.

2.5.2. Socio-cultural impacts

Sea level rise and coastal flooding lead to the displacement of communities as habitable land decreases. Critical cultural sites and heritage locations are also at risk of permanent flooding, threatening Aruba's historical and cultural identity.

Additionally, stagnant floodwaters from coastal flooding could increase waterborne and vector-borne diseases, posing serious public health risks. Loss of coastal land also affects access to recreational spaces and traditional uses of the coastline, impacting cultural and social activities.

2.5.3. Economic impacts

Sea level rise threatens major infrastructure in Aruba, including key facilities such as the airport, Centrale Bank van Aruba, and Horacio Oduber Hospital, necessitating relocation and adaptation measures. Increased flooding and storm surges put critical infrastructure, ports, and roadways at risk, requiring a revision of building codes, construction standards, and urban planning strategies to enhance resilience. Some of the most vulnerable areas include:

- Flood-prone buildings and infrastructure:
    - WEB (Water- en Energiebedrijf Aruba)
    - Horacio Oduber Hospital
    - Queen Beatrix International Airport
    - Seaport areas
    - Infrastructure in the South, including electrical grids, hospitals,

and drinking water facilities

- Beach erosion hotspots:
    - Surfside Beach
    - Arashi Beach
    - Divi Beach
    - Hyatt Beachfront
    - Ritz-Carlton Beachfront
    - Boardwalk Boutique Hotel area

The economic impacts of sea level rise are particularly concerning for tourism, which relies heavily on beachfront attractions and coastal resorts. Declining beach habitats and worsening coastal conditions could make Aruba less appealing to visitors, leading to significant tourism losses that would directly affect local livelihoods and businesses. Additionally, flooding and saltwater intrusion will increase maintenance and reconstruction costs, placing an ever-growing financial burden on both the public and private sectors.

2.5.4. Disclaimer

This text is primarily based on stakeholder input gathered during the workshop, where local experts and stakeholders provided insights into the climate impacts affecting Aruba. To facilitate discussions, initial mind maps were developed based on a literature review and then validated and refined by participants during the workshop. While literature sources were consulted in drafting these mind maps, this document does not represent a comprehensive literature review. A more in-depth analysis of scientific and technical literature will be conducted as part of the CORVI study. Appendix A provides an overview of the literature sources used to create the initial mind maps. Appendix B contains the adjustments made to the mind maps based on stakeholder input. Appendix C contains photos of the posters that were modified during the workshop.

2.6. Changing wind

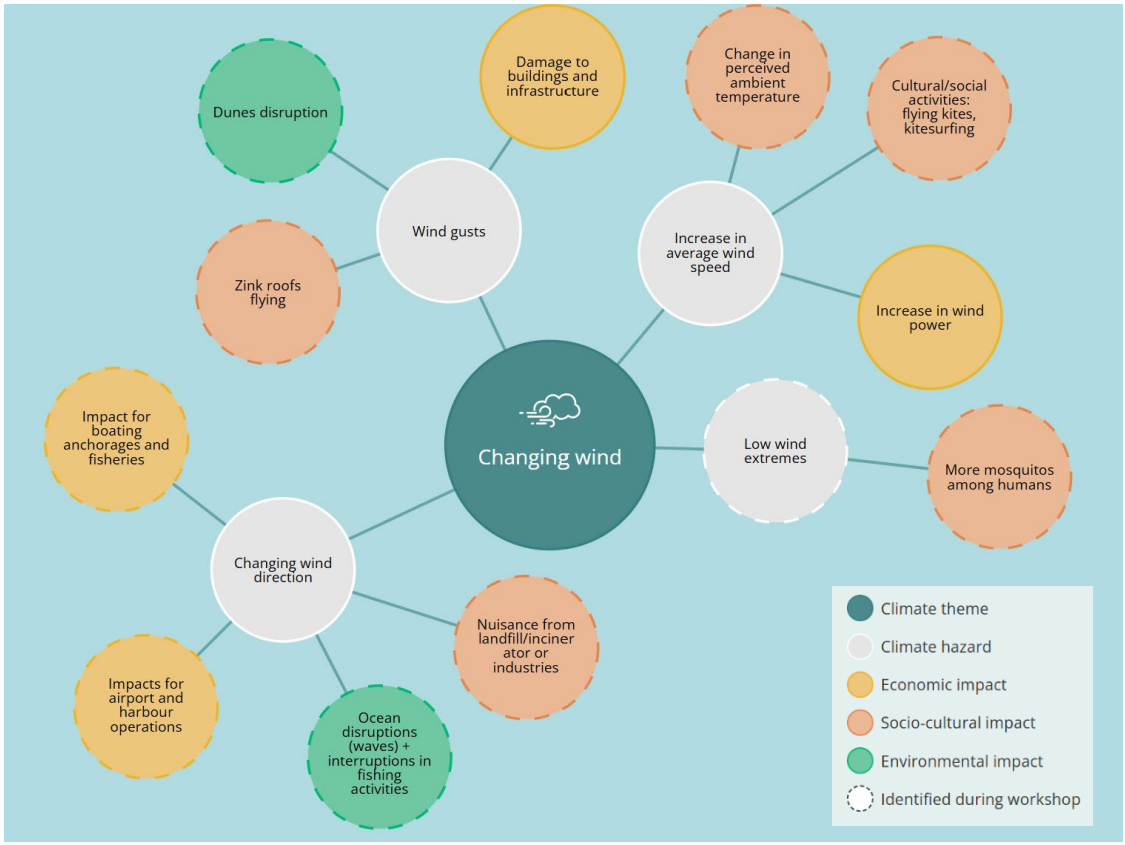


Figure 8: Changing wind

Due to climate change, the wind patterns in the Caribbean islands may shift compared to the past. For example, the average wind speed could increase. Additionally, the wind direction may change, resulting in less frequent easterly winds. There is also a possibility of periods with very little wind. On this page, you can read about the potential consequences for Aruba.

2.6.1. Environmental impacts

Changes in wind patterns influence ocean currents and wave activity, which can lead to increased beach erosion and disruptions to marine ecosystems. Stronger or shifting winds may also alter upwelling patterns, potentially cooling sea surface temperatures, although this could be offset by broader climate change effects.

Stakeholders highlighted concerns about dunes disruption and the potential

for more Sargassum accumulation due to changes in wind-driven currents. Additionally, a decrease in wind speeds could result in drier conditions and less rainfall, affecting local water availability. Cloud streak formation may also change, altering weather patterns over the island.

2.6.2. Socio-cultural impacts

Wind shifts can impact cultural and social activities, such as kite flying, kitesurfing, windsurfing, and sailing, which depend on predictable wind conditions. Changes in high-wind seasons and extreme gusts may affect traditional competitions and tourism experiences related to wind sports.

Additionally, stagnant winds can lead to higher perceived temperature and increased mosquito activity near humans, potentially increasing vector-borne diseases among humans. Furthermore, shifts in wind direction could cause increased nuisance from landfill sites, incinerators, or industrial areas, affecting local communities.

2.6.3. Economic impacts

Wind changes pose challenges for aviation and maritime industries, particularly due to crosswinds affecting airport and harbor operations. Stronger or unpredictable winds may disrupt flight schedules, impact landings, and make docking for boats and cruise ships more difficult.

For boating and fishing industries, changing wind patterns may require adjustments in anchorage practices, as boat owners currently base their anchor lines on prevailing winds. Ocean disruptions and waves could also interrupt fishing activities and port operations, leading to economic losses.

Stronger wind gusts increase risks to energy infrastructure, buildings, and trees, potentially leading to roof damage (e.g., zinc roofs flying off), fallen branches, and localized power disruptions. However, an increase in wind power could benefit renewable energy generation, improving Aruba's wind energy potential.

2.6.4. Disclaimer

This text is primarily based on stakeholder input gathered during the workshop, where local experts and stakeholders provided insights into the climate impacts affecting Aruba. To facilitate discussions, initial mind maps were developed based on a literature review and then validated and refined by participants during the workshop. While literature sources were consulted in drafting these mind maps, this document does not represent a comprehensive literature review. A more in-depth analysis of scientific and technical literature will be conducted as part of the CORVI study. Appendix A provides an overview of the literature sources used to create the initial mind maps. Appendix B contains the adjustments made to the mind maps based on stakeholder input. Appendix C contains photos of the posters that were modified during the workshop.

3. Priorities

The prioritized impacts were determined using stickers, with each participant receiving four stickers. They were asked the question: "What are the most important impacts?" See also the small stickers on the photos of the posters in Annex C.

This exercise highlighted the issues perceived as most urgent or impactful for Aruba. Below is an overview of the highest-priority climate impacts as identified through this process.

3.1. It is getting warmer

Stakeholders identified rising utility costs and power outages as the most pressing concerns related to increasing temperatures.

- Increase in utility costs (water, energy) – (10 votes)
- Increase in outages of vital infrastructure – (10 votes)

3.2. Storms, rainfall and hurricanes are intensifying

Stakeholders prioritized the impacts of extreme weather events, particularly their effects on infrastructure and mobility:

- Flooded roads – (11 votes)
- Damaged buildings and infrastructure – (9 votes)

3.3. It is getting drier

Loss of terrestrial biodiversity received strong stakeholder attention, reflecting concerns over cascading ecological impacts:

- Loss of terrestrial biodiversity – (8 votes).
  This includes reduced wildlife (animals), declining flora and fauna, loss of home garden plants and trees, and reduced agricultural crop yields.

3.4. Sea level rise & warmer and more acid sea

Stakeholders placed high priority on the decline of coral reefs and the loss of marine biodiversity, both of which play crucial roles in coastal protection and ecosystem health. The permanent impact on built infrastructure was also seen as a significant concern:

- Coral reefs (coastal protection + reef decline) – (8 + 8 votes, for two related impacts)
- Loss of marine biodiversity – (11 votes)
- Permanently flooded buildings and infrastructure – (8 votes)

3.5. Changing wind

This category received less stickers overall, with no impacts seen as priorities compared to other climate hazards.

4. Climate stories

In the second phase of each workshop round, participants contributed their ideas for climate stories to be featured in the Climate Impact Atlas. These narratives offer a deeply local and personal perspective on the tangible effects of climate change in Aruba. They not only highlight the island's vulnerabilities but also showcase the resilience of its people, culture, and environment.

These stories will be integrated into the Climate Atlas as an educational and awareness-raising resource. By sharing these firsthand experiences, we aim to enhance public understanding of climate change's impacts and inspire collective action toward resilience and adaptation.

The following key story ideas emerged from the discussions:

4.1. It is getting hotter

- Urban Heat Islands: Rising temperatures are intensifying the urban heat island effect in densely populated areas such as Oranjestad and Palm Beach, making these locations significantly warmer than rural areas.
- Heat's Impact on Outdoor Activities: Participants noted that extreme heat is limiting outdoor training for both recreational and professional athletes, disrupting sporting events and local active lifestyles.
- Health Impacts:
    - Increased risks of dehydration and heat-related illnesses, particularly in elderly care facilities that lack air conditioning.
    - Public transportation drivers enduring extreme heat in vehicles without adequate cooling, leading to health risks and reduced efficiency.

4.2. Storms, rainfall and hurricanes are intensifying

- Testimonies from Residents: People from Pos Abou and other flood-prone areas shared experiences of homes being inundated during extreme rainfall events.

- Disrupted Daily Life: Roads frequently flood, making transportation difficult and impacting businesses and schools.
- Memories of Sudden Flash Floods: A participant recounted a childhood memory from 40 years ago when a sudden flash flood filled their home while they and their siblings slept on mattresses and rugs on the floor of their cunucu house.
- Erosion at Tourist Hotspots: Increased coastal erosion is visibly affecting popular beaches like Arashi, Eagle, Baby, and Rodgers beaches, threatening both natural beauty and economic activity.
- Loss of Homes: Stories from individuals, particularly coastal fishermen, describe the devastating reality of losing homes to flooding and encroaching sea levels.

4.3. It is getting drier

- Loss of Shoco Breeding Grounds: The critically endangered Aruban burrowing owl (shoco) is losing its breeding habitats due to prolonged drought and changing land use patterns.
- Cascading Effects in Food Production: Drought has triggered a chain reaction across the local food supply, affecting agriculture, livestock, and fisheries. Participants shared concerns about reduced crop yields, declining fish stocks, and increasing dependence on imported food.

4.4. Sea level rise & warmer and more acid sea

- Stories from Fishermen: Interviews with local fishermen, including Roly Bisslik, provide insights into the dramatic changes in sea conditions, fish species availability, and fishing practices over the decades.
- Coastal Erosion: Key beaches, including Divi Divi Tamarijn, Manchebo, and others, are facing erosion due to rising sea levels, impacting tourism and local livelihoods.
- Coral Reef Degradation: Scuba divers share firsthand accounts of changes in coral reef health, illustrating the impact of warming and acidifying oceans on marine biodiversity.
- Disappearing Mangroves: Community members recount the loss of mangrove forests and highlight local restoration efforts to preserve

these critical coastal ecosystems.

4.5. Changing wind

- Sailing Stories: Featuring sailors such as Anthony Hagendoorn, emphasizing the traditional and competitive aspects of sailing in Aruba.
- Windsurfing and Kite Surfing: Highlighting world-class champions like Sarah-Quita Offringa and local kite surfers who thrive in Aruba's steady trade winds.
- Divi Divi Tree and Wind Changes: The iconic Divi Divi tree has evolved to grow in the direction of the northeast wind. A shift in wind patterns could confuse its natural growth, leaving it vulnerable to falling, especially in the rainy season when wet soil weakens its roots.
- Resilience of Traditional Architecture: The traditional Aruban cunucu house has a roof designed to break or divert airflow, making it more resilient to extreme winds compared to modern flat-roof structures.
- Wind as a Catalyst for Leisure Sports: Aruba's ideal wind conditions foster a thriving culture of wind-related sports, attracting world championships and boosting the island's reputation as a premier destination for windsurfing, kite surfing, and sailing regattas.

5. Data & Maps

We invited stakeholders to share their input on the types of data and maps they would like to see in the Climate Impact Atlas. This discussion helped identify gaps and set priorities for future updates.

Stakeholders highlighted the need for more data on climate change, water resources, biodiversity, urban heat, extreme weather, infrastructure resilience, and socio-economic impacts. They also stressed the value of real-time monitoring and predictive modeling for better decision-making.

Many of these maps are already part of the Atlas, but new ideas were also shared. These suggestions may help guide future map development to improve climate adaptation and mitigation efforts.

5.1. It is getting hotter

- Sea surface temperature maps (✓ Already Developed)
- Surface temperature map (✓ Already Developed)
- Airport-specific heat map for aircraft performance
- Location-specific heat maps (neighbourhoods)
- Traffic congestion maps
- Radioactivity maps
- Seismic activity maps
- Infectious diseases map
- Health-heat report
- Global and regional temperature maps

5.2. Storms, rainfall and hurricanes are intensifying

- Reefs, mangroves, and coral maps (✓Already Developed)
- Flooding during heavy rains map (✓ Already Developed)

- Sandy beaches and erosion maps (✓ Sandy beaches Already Developed)
- Historical hurricane tracking map (✓ Already Developed)
- High resolution land cover maps
- Lowland maps (where water collects & roads flood)
- Health institutions map
- Schools map
- Elderly homes map
- Flash flood risk maps
- Erosion risk maps (beaches and coastal changes)
- Dynamic flooding navigation maps
- Maps of emergency locations, bunkers, evacuation routes
- Historical buildings map
- Flow of water and sedimentation map
- Fisheries inventory
-

5.3. It is getting drier

- Agricultural and drought maps (✓ Drought Map Already Developed)
- Map of freshwater and groundwater wells (public & private)
- Land degradation map
- Rainfall maps
- Map of dams, saliñas, and wetlands
- Native vegetation map
- Sedimentation map
- Humidity & evaporation maps

5.4. Sea level rise & warmer and more acid sea

- Future coastal maps (including airport and city areas) (✓ Future Coastlines Already Developed)
- Seagrass, mangrove, and reef maps (✓ Seagrass, Mangroves, and Coral Reef Already Developed)
- Waterways map (✓ Rooienstelsel Already Developed)
- Bathymetric and temperature maps (daily/monthly temperatures)
- Baseline sea level map
- Nutrient loading and biological mapping
- Wave and current mapping
- Economic activities at sea map
- Biodiversity mapping
- Turtle nesting site
- Hydrology map
- Coral reef status & prognosis maps
- Future ocean acidity projections
- Weather monitoring maps (real-time updates)
- Map of agricultural grounds
- Ocean acidification and marine ecosystem maps

5.5. Changing wind

- Sea current map
- Odor radial map
- Wind change maps
- Localized wind data for Aruba: wind intensity & stability maps

6. What's next?

The results from the workshop, including the added and stakeholder-validated impacts, will be incorporated as a tool in the Climate Impact Atlas for Aruba. This tool will provide an overview of climate-related impacts and is a valuable resource for further climate policy development and adaptation planning.

Additionally, the input gathered on stories will be used to develop narrative-driven content within the Climate Impact Atlas, bringing personal experiences and local knowledge to the forefront. The suggestions regarding valuable maps will guide future developments to ensure they align with stakeholder needs.

Beyond serving as an informational tool, the Climate Impact Atlas will help identify key concerns that can contribute to the development of Aruba's National Adaptation Strategy. The prioritization exercise revealed critical areas of focus, including essential services, ecosystem health, and infrastructure resilience, with the highest-ranked issues—utility costs, biodiversity loss, flooding, and coral reef decline—highlighting the need for targeted adaptation measures to safeguard Aruba's nature, people, and economy.

This process is part of a broader effort to strengthen climate resilience in Aruba. CORVI (the Climate and Ocean Risk Vulnerability Index) will also provide insights and analysis, which the results from this workshop complement, ensuring that adaptation strategies are based on both scientific assessments and local stakeholder input.

Annex A. Literature sources used to create the initial mind maps

Climate theme	Hazard or impact	Impact	Impact description	Source	Impact categories
Select the overarching climate theme	*Write down the relevant hazards, categorized per relevant climate theme*	*Write down the relevant impacts*	*Describe the impact*	*Source of the impact description*	*Select the relevant impact category for this impact*
It is getting drier	Prolonged drought, seawater intrusion, increased evaporation (or temperature)	**Limited freshwater resources**	Resources become limited due to decreased rainfall, seawater intrusion, increased temperature, increased reach of tides, waves and storm surges	DCNA, 2020	Social impacts
It is getting drier	Prolonged drought, seawater intrusion, increased evaporation (or temperature)	**Crop failure**	Sea level rise, heat waves, droughts storms have indirect impacts on health through vector-borne diseases, NCDs (like Respiratory, cardiovascular, circulatory, and kidney problems), heat-related stress, malnutrition and food insecurity, water-borne diseases, skin diseases, and mental health.	IVM, 2022	Economic impacts
It is getting drier	Wildfire	**Health impacts and damage**	Droughts and heat can lead to increasing number of wildfires impacting chronic diseases	IVM, 2022	Social impacts
It is getting drier	Prolonged drought, seawater intrusion, increased evaporation (or temperature)	**Loss of terrestrial biodiversity**	Increased temperatures will drive forests of Saba and St. Eustatius further uphill, which increases their exposure to extreme weather such as droughts and hurricanes. Furthermore, the drier lower regions will then become more susceptible to fires, further threatening these areas.	DCNA, 2022	Natural impacts
It is getting warmer	More extreme temperatures	**Revision of construction design standards**	It is good to stress test construction design to future extremes > 40 degrees.		Economic impacts

It is getting warmer	Higher average temperatures, more extreme temperatures	**Limited ability to work outdoors (or shift in working hours)**	Both direct impacts due to e.g. unbearable working conditions or health impacts, as well as indirect impacts through e.g., impact on family or deprived sleep from hot nights.	Izaguirre, 2020	Economic impacts
It is getting warmer	Higher average temperatures, more extreme temperatures	**Increase in costs from energy, drinking water, and fuel due to high demand**	With hotter temperatures there is more demand for air conditioning, fuel, and drinking water. This increases the costs. An example of the increase in electricity costs is that in September, the warmest month of the year, the cost is highest due to higher usage.	Monioudi, 2018	Economic impacts
It is getting warmer	Higher average temperatures, more extreme temperatures	**Increase in power outages related to engine overheating**			Economic impacts
It is getting warmer	more extreme temperatures	**Health problems**	Heat increases cardiovascular and respiratory diseases, especially within the elderly. These increased temperatures can raise the level of ozone and other pollutants, as well as pollen and other aeroallergens, further threatening individuals with weakened cardiovascular or respiratory systems. Experts predict that there will be an increase in water- and foodborne infectious diseases caused by global warming.	DCNA, 2024	Social impacts
It is getting warmer	more extreme temperatures	**Mortality**		IVM, 2022	Social impacts
It is getting warmer	Higher average temperatures, more extreme temperatures	**Infectious diseases (more mosquitos)**		IVM, 2022	Social impacts

It is getting warmer	Higher average temperatures, more extreme temperatures	**heat-related stress**		IVM, 2022	Social impacts
It is getting warmer		**Increase in invasive species**	Increase in mosquitoes poses a threat to human health. Other invasive species include the lion fish or snails (unsure about the link with climate change)	DCNA, 2023	Natural impacts
Caribbean Sea is getting warmer and more acidic	Rising sea temperatures	**Decline in coral reefs**	Due to Coral Bleaching as well as Ocean Acidification	IPCC, WGII, factsheet	Natural impacts
Caribbean Sea is getting warmer and more acidic	Decline in coral reefs, Higher average temperatures, more extreme temperatures	**Decline in tourism and cruises**	With rising sea temperatures corals in the Caribbean are already being impacted, affecting diving tourism. Furthermore, hotter temperatures may make it less appealing for tourists to come to Curacao.	Spencer, 2022	Economic impacts
Caribbean Sea is getting warmer and more acidic	decline in coral reefs	**Decline in coastal protection**	With the decline in coral cover on shallow reefs there is less structure to attenuate waves from storm surges	IPCC, WGII, factsheet	Social impacts
Caribbean Sea is getting warmer and more acidic		**Loss of marine biodiversity**	Ocean acidification threatens calcified organisms and coral reefs, climate change threatens seagrass beds and mangroves (also serving as coastal protection), increase algal blooms, and alter ocean currents impacting fish and mammal migration	DCNA, 2023	Natural impacts
Caribbean Sea is getting warmer and more acidic	decline in coral reefs	**Collapse of specific commercial fish species**	Deterioration of coral reefs shifts in migration patterns and the worsening of water quality conditions can also negatively affect fisheries, and could lead to a total collapse of specific commercial fish species [3]. This is not only an issue for food availability, but will also have economic impact as there are a number of fishermen on these islands which depend on fisheries to make a living	DCNA, 2023	Economic impacts
Storms, rains & cyclones are intensifying	Erosion and washing away of soil	**Damages to land (e.g. trees falling**	Damages to land (e.g. trees falling down, exposed pipelines & cables, roads washing away)		Economic impacts

		down, roads washing away)			
Storms, rains & cyclones are intensifying	Erosion and washing away of soil	**Negative impacts on the shallow reef corals and other organisms**	Increase of sedimentation and nutrients on the reef can have negative impacts on the shallow reef corals and other benthic organisms	DNM, 2019	Natural impacts
Storms, rains & cyclones are intensifying	Flash floods	**Flooded roads / disrupted road network**			Economic impacts
Storms, rains & cyclones are intensifying	Winds, waves and coastal floods	**Injury and loss of life**	On average, once every four years a tropical cyclone occurs within a radius of 150 kilometers, but mostly passing to the north of the islands without causing severe weather. Even the immediate effects of major hurricane Hazel, of which the center passed approximately 90 kilometers to the north on October 7, 1954, with maximum sustained winds near the center of 190 km/h, were confined to observed maximum winds of 50 km/h with gusts to 90 km/h, and the damage, an estimated US$ 350.000,-, resulted mainly from flash floods due to heavy rainfall (48 hours averages: Aruba approx. 250 mm, Bonaire and Curaçao approx. 125 mm).	Meteorological Department Curaçao, 2018	Social impacts
Storms, rains & cyclones are intensifying	Winds, waves and coastal floods	**Damaged buildings and infrastructure**	Extremely dangerous hurricane Ivan on September 7, 2004, became a serious threat for the ABC Islands and a Hurricane Warning was issued on that day. Its eye passed during the late evening of September 8 and the early morning of September 9 at a distance of approximately 130 km north of these islands. Although the destructive winds failed to impact the ABC Islands, the swells it generated were large enough to batter several constructions on its coasts. The greatest damage, however, was caused in Aruba during the early morning of September 10. A developing spiral band of the hurricane caused very heavy rain over this island which resulted in significant flooding in several	Meteorological Department Curaçao, 2018	Economic impacts

			locations and material damage at a cost of at least two million florins.		
Storms, rains & cyclones are intensifying	Winds, waves and coastal floods	**Risks for critical health infrastructure**	Critical infrastructure is vulnerable to sea-level rise and extreme weather events in times of which much-needed "health service delivery and healthcare access" may be jeopardized due to damages to the infrastructure and to essential equipment. Extreme weather events can cause power shortages or situations where the medical services cannot function. Critical infrastructure can suffer from the effects of accompanying storm surges and stronger winds.	IVM, 2022	Social impacts
Changing wind	Increase in average wind speed	**Increase in wind power**			Economic impacts
The sea-level is rising	Beach erosion, coastal inundation	**Tourism revenue decrease**	Sandy beaches are threatened by climate-change-induced sea level rise. Loss of sandy beaches results in hotel room loss and thus tourism revenue decrease. Curacao: ~0.7% loss towards 2015 (RCP45/RCP85), ~29.2% - 32.2% loss towards 2100 (RCP45/RCP85). A sea level rise of one meter would cause more than 29% of major resort properties in the Caribbean to be partially or fully inundated by water, while 49% would be damaged or destroyed by a combination of sea level rise and storm surge.	Spencer, 2022 and DCNA (2020)	Economic impacts
The sea-level is rising	Coastal inundation	**Permanently flooded buildings and infrastructure**		IPCC, WGII, factsheet	Economic impacts
The sea-level is rising	Coastal inundation	**Permanently flooded cultural heritage**		IPCC, WGII, factsheet	Social impacts

The sea-level is rising	Rising sea level	**Threath to salt pans, saliñas and caves**	Changes in rainfall affect the salt pans and saliñas which also serve as freshwater collection points during rainy seasons. Saliñas are important areas for many different species.	DCNA, 2021, IVM 2022	Natural impacts
The sea-level is rising	Beach erosion	**Decrease in beach habitats**	Sea level rise, waves, storm surges, larger tidal differences exacerbate beach erosion. With sand being a limited resource, beach erosion often leaves behind hard fossilized substrate unsuitable for beach habitat which many species depend on, especially nesting sea turtles.	DCNA, 2021	Natural impacts

Annex B. Stakeholder feedback on mind maps

Climate Impact Atlas workshop results

Theme: Heat

Would you like to omit, reword, or add impacts? (drawn on the mind map)
- Omit: Increase in car accidents - Omit: Infectious diseases – maybe not applicable in Aruba? - Reword: Mortality → *Higher* mortality - Reword: Health problems, *CVA, Chronic diseases, Vulnerable groups* - Mentioned but not included: Health effect on health insurance costs (AZV) - Reword: heat-related stress, mental health + *Domestic violence* - Reword: Threat to bird species, migration process and patterns of birds, and (gender of) turtles - Reword: Increase in power outages *maintenance cost and cooling* - Reword: Limited ability *for outdoor activities and reduced productivity outdoors* - Reword: Revision of construction design standards + *Housing Infrastructure (color/roofs/foundation)* - Add: Outage of vital infrastructure services - Add: Loss of biodiversity - Add: Pets and Domestic Animals - Add: Tourism change - Add: Desertification of land - Add: Agriculture and crop loss - Add: Pressure on the Health care system - Add: Increase in supply chain/costs because of shipping costs - Add: Sports practice, cultural activities, carnaval - Add: hindered learning, education (schools) - Heat related stress – links also to higher average temperatures in addition to more extreme temperatures

Which maps do you need for your work, and how would you use them? (color 1)
- Airport specific heat map for aircraft performance - Location-specific heat map (neighbourhoods) - Traffic congestion maps - Radio activity maps - Seismic activity map - Infectious diseases map - Health-heat report - Sea surface temperature maps - Global and regional temperature maps - Ocean acidification and Marine Ecosystem Maps - Agricultural and drought maps - More data and analysis

Do you have suggestions for the stories? (color 2) Where are the impacts the strongest?

Hotter in Oranjestad and Palm beach
Urban Areas
Heat Island Effect

Sports training activity limitation
Increase in skin cancer??
Chauffeurs of public transportation (without airco) can suffer a lot

Elderly homes have no aircos/cooling
This can cause dehydration and health problems even leading to mortality

Additional comments

Some initial solutions mentioned:

- Reforestation
- Nature restoration
- Grid capacity enhancement
- Revision of construction design standards + *Housing Infrastructure (color/roofs/foundation)* → LEED requirements
- Keeping water in dams -> reduced heat and higher groundwater level
- Climate mitigation

Prioritized maps/impacts

Mind map 1:

Loss of intangible cultural heritage (2)
Increase in power outages (2) + Solution of dams (2)
Increase in costs from energy (1)
Limited ability to work outdoors (2)
Infectious dis (1)
Heat-related stress (1)
Mortality (1)
Health Problems (2)
Sports practice (1)
Decreasing Labor Force (1)
More extreme temperatures (1)

Mind map 2:

1. Increase in costs utilities (water, energy) 9
2. Increase in vital infra outages 6
3. Health problems 3
4. Revision of construction design standards 3
5. Threat to birds, turtles, coral, biodiversity 2
6. Limited ability to work (outside), recreation, sports 2
7. Infectious diseases

Merged:

1. Increase in costs utilities (water, energy) 9 + 1
2. Increase in vital infra outages 6 +4

Climate Impact Atlas workshop results

Theme: It is getting drier

Would you like to omit, reword, or add impacts? (drawn on the mind map)

• Added impacts:
  ○ Increased utility usage (i.e. increased demand for water & electricity).
  ○ Socio-economic-environmental impacts from wildfire risk (loss of nature reserves and housing)
  ○ Dry soil will not absorb rainwater was good anymore as before. Consequently, there will be less groundwater replenishment and more rainwater runoff in streets.
  ○ Change of agricultural methods and mindset (shift from soil-based agriculture to hydroponics and indoor farming.
  ○ Impacts on Wetland Ecosystem Services
  ○ Poor air quality (dust)
  ○ Increase in cost of landscaping & irrigation
  ○ High food prices (landbouw)
  ○ Food security + local food production
 	
Additional:
 	
• Wildfire relevance was questioned for local context → change to bushfire
• Crop failure (one group felt this might be less important seeing Aruba is not an agriculture island → there are still crops, so it was decided to leave this in.

Which maps do you need for your work, and how would you use them? (color 1)
• Map of ground water wells (both public and privately owned). *Note: it was suggested to develop a ground water monitoring program (level & salinity), as done in Curacao.* • Map of land degradation • Map of surface temperature (already in CIA) • Map of rainfall • Map of dams, salinja and wetlands • Native vegetation map • Sedimentation map • Humidity & evaporation maps

Do you have suggestions for the stories? (color 2) Where are the impacts the strongest?
• Story on impacted availability of shoco breeding grounds • Cascading Effects in Food Production: A story on how drought triggers a chain reaction (“ketenreactie”) in the local food supply, affecting agriculture, livestock, and fisheries. • Cunukeronan (landbouw uitdagingen vermindering)

Additional comments

Prioritized maps/impacts
Map of ground water wells & ground water levels (hydrology map) Prioritised impact: ○ Loss of terrestrial biodiversity (7 votes). Further, participants identified cascaded effects hereof in terms of reduced wildlife (animals), reduced flora & fauna, loss in home garden plants & trees, loss of agriculture crop. Juliet: **Food Security + Local Food Production *It is getting drier / drought maps

Climate Impact Atlas workshop results

Theme: Changing wind

Would you like to omit, reword, or add impacts? (drawn on the mind map)
• Added impacts: ○ Change in perceived ambient temperature (“gevoelstemperatuur”) due to increased wind speeds. ○ Nuisance from landfill/incinerator or industries due to wind shifts. ○ Impacts for airport and harbour operations due to wind shifts (‘cross winds’). ○ Impact for boating anchorages and fisheries (boat owners now usually set their anchor lines based on current wind direction). ○ Impact of wind on marine environment: changes in sea currents, increased beach erosion and possibly more sargassum. ○ Ocean disruptions (waves) + interruptions in fishing activities ○ Poor air quality (health related): less wind = more mosquitos among humans, and more mosquitos = increase in vector-borne infections ○ Drier/less rain ○ Cloud streak formation ○ No wind (wind dies), hazard ○ Cultural/social activities: flying kites, kitesurfing, high-winds competition/season, windsurfing, sailing) ○ Increase in average wind speed or wind power: zinc roofs flying / less sandy winds hitting you at the beach (latter likely an experience rather than impact) ○ Dunes disruption (change) Adjustments/clarifications: • Increase in average wind speed (more upwelling: colder sea surface temp although could be offset by climate change)

- Wind gusts: Localized changes in wind in relation to energy generation and trees or branches falling
- Damage to infrastructure: planes at airport (disruptions) / boats or ships (cruise/imports) unable to dock in ports

Which maps do you need for your work, and how would you use them? (color 1)

- Sea current map
- Odor radial map
- Map of changings winds
- Sea current map
- Changing wind: more data for Aruba specifically (wind maps / intensity & consistency / stability = days a year where wind speed dies)

Do you have suggestions for the stories? (color 2) Where are the impacts the strongest?

- Sailing Stories: Featuring sailors like Anthony Hagendoorn.
- Windsurfing and Kite Surfing: Highlighting champions such as Sarah-Quita Offringa and local kite surfers.
- The Divi Divi tree naturally grows in the direction of the northeast wind. A shift in wind patterns could confuse its growth direction, making it vulnerable during the rainy season when wet soil weakens its roots, increasing the risk of falling. (as sad story).
- Story of the traditional Aruban cunucu house: the roof of the cununcu house is very resilient to extreme winds since it breaks or diverts air flow. It is more resilient to wind than flat roofs.
- Story of wind leisure sports: excellent conditions for wind surfing, kite surfing, sailing (regatta). More world championships.

- Prioritised locations:
    - Aruba's west coast (Eagle Beach & Palm Beach) will be very vulnerable to wind direction changes.

Additional comments

Prioritized maps/impacts

- Prioritised impact:
    - Damage to buildings and infrastructure (2 votes)

**Changing Wind (see data + maps)

*Mosquitos/vector-borne infections

Climate Impact Atlas workshop results

Theme: Storms, rains & cyclones are intensifying

Would you like to omit, reword, or add impacts? (drawn on the mind map)
Isolations, interruptions, disconnections (impact, socio) Loss of key biodiversity areas (impact, nature) Shortages (food, supply, materials) (socio) Financial impacts - Health, reconstruction, and rebuilding expenses (economic) Reword: Damage buildings and infrastructure – Tourism and telecom Add: Vegetation loss and soil loss (Environmental) Add: vector borne diseases/ Water borne infections (socio) Reword: Sorms, rainfall, Reword: cyclones into strong hurricanes Add: Temporary labour impact (economic) Add: Cultural heritage sites loss (socio) Erosion and washing away of soil +beach erosion (env) +tourism – water quality/coastal damage (ec) +crops (ec) +building infrastructure damage (sc/ec) +biodiversity around salinas will drop (env) +shore/sea bird breeding areas will disappear (env) +added “mangroves” to negative reef impacts Flash Floods +farm/livestock destruction (ec) +building damage (ec) +add damage, airport/seaport, critical transportation infrastructure to flooded roads impact +connect secondary economic impact to flooded roads – work, school, home access, healthcare, emergency services, logistics (ec) +damage to trees (env) +salina changes (env) +recovery and drainage time period / delay (sc/ec) +sewage outflow due to combined drainage + health impacts (sc) +sedimentation (env) Wind, waves and coastal floods +secondary economic effects due to injury/loss of life and critical health infrastructure damages +insurance (ec) +added hospital to critical health infrastructure impact

+bird nesting areas on reef islands and north coast
+environmental/coastal ecosystems (env)
+material scarcity & price increases (ec)
+added hotels, and critical infrastructure i.e. web, port, warehouses holding food, airport, hospital to damaged buildings impact
+fisheries disrupted / infrastructure damaged (ec)

Added “drought” effect with insect and bird population decline impacts

Which maps do you need for your work, and how would you use them? (color 1)

- High-res land cover maps
- Low-land maps (waar water verzameld en buurten / roads onder water komen)
- Reefs mangroves corals
- Health departments/ institutions
- Schools
- Bejaardentehuizen
- Flash flood maps

Suggestion: more data collection points (in het algemeen maar ook hoeveel regen er valt)

Erosion

- beaches and changes
- level rise and coastal flooding maps
- climate risk and hazard maps

Flash floods

- risk
- flooded roads:
- emergency routes/supplies
- dynamic navigation
- flooding map of Aruba – most affected areas, housing of vulnerable persons
- design of architecture of residences that do not take water access into account (not a map)
- flooding maps + solution maps i.e. what to do where to go if it floods

Winds waves and coastal floods

- flow of water and sedimentation map
- fisheries inventory
- damage
- map emergency locations, bunkers, evacuation routes
- reefs and reef changes
- historical buildings

Overall

- localized wind, ocean currents, temperature, rainfall, weather systems / radar, better forecasting

Do you have suggestions for the stories? (color 2) Where are the impacts the strongest?

Stories:

- Testimonies from residents in Pos Abou affected by recent floods.
- Roads frequently submerged during heavy rains, disrupting daily life.
- When I was a kid (40 years back) we were sleeping in living room at the cunucu house a sudden flash flood and me and my brothers and sister were all caught by the rainwater that came in the house (we were sleeping on mattresses and rugs on the floor)
- Erosion at Tourist Hotspots: Coastal erosion affecting popular beaches like Bubali, Arashi, Eagle, Baby, and Rodgers beaches.
- Loss of Homes: Stories from individuals living near the coast, such as fishermen who have lost their homes due to flooding.

Locations:

- gas station at palm beach flooded 2016
- flooded road locations: ex-Sasakiweg, Cunucu Abou, Pos Abou, Palm Beach, Pos Chikito, Savaneta, Amalia van solus (sp?)
- Pos Abou mensen huizen onder water
- Hospitality and hospital
- Other vulnerable areas and people
- Erosion: tourism locations Bubali, Arashi, Eagle beach, Baby beach, rodger's beache
- Erosion at Tourist Hotspots: Coastal erosion affecting popular beaches like Bubali, Arashi, Eagle, Baby, and Rodgers beaches.

Wind waves coastal floods

- someone living close to the shore/coast, a fisherman who has lost its home to floods
- locations: druif beach, punta brabo, arashi, reef islands

Additional comments

Lots of discussion about emergency response procedures and knowledge dissemination, e.g. alternate routes in case of floods and use of public broadcast system

Prioritized maps/impacts

Poster 1:

Theme Storms : 3
Internally displaced people: 2
Cultural heritage sites: 2
Waterborne infections: 1
Flooded roads: 5
Shortages: 4

Damaged buildings and infrastructure: 5
Risks for critical health infrastructure: 4

Poster 2:
Erosion and washing away of soil
***damages to land
*building infrastructure damage
*negative impacts on coral reefs and mangroves

Flash floods
******flooded roads

Wind, waves and coastal floods
*risk for critical health infrastructure
****damaged buildings and infrastructure

Merged:
flooded roads: 11
Damaged buildings and infrastructure: 9

Climate Impact Atlas workshop results

Theme: The sea level is rising, Caribbean sea is getting warmer and more acid (purple for both)

Would you like to omit, reword, or add impacts? (drawn on the mind map)

1. **To be added:**
   - Mangroves loss
   - Seagrass loss
   - Decline in tourism and cruises → economic losses and large impact for locals
   - Algae Blooms (Sargassum)
     - Not only corals but also other organism that make their own shells affected (calco, crabs, etc)
   - More coral disease
   - From coastal flooding there could be increase in waterborne or vector borne diseases
   - Decrease in available land leading to displacement
   - SLR →Intrusion of salt water → problematic for agriculture
   - Decrease in available land leading to displacement
   - Critical infrastructure will need to move (CBA/ HOH/Airport etc)
   - Revision of construction and design standards, building codes.
   - Increased risk of Tsunamis, higher storm surges
   - Decrease in beach habitats → also reef island + mangroves
   - Higher cost for clean water (because of acidity?)
   - "Gutido"/Drain waterways impacted
   - Loss of marine biodiversity:
     - Impact on wetlands: druif, malmok, schia sere
     - Decrease of turtle egg laying areas
     - Disbalance of different species of mangroves (luchtwortels)

2. **Other ideas/alterations:**
    - Fringe idea: check seismological projections on tectonic movement (island is rising at the same time out of the sea)
    - Swap decline in coral reefs with threat to marine biodiversity

Which maps do you need for your work, and how would you use them? (color 1)

Green shows maps already being produced

- Bathymetric and temperature maps (daily/monthly temperatures)
- Baseline sea level
- Sea level rise map for Aruba, coastal flooding map
- (future) scenarios of coastal maps, airport
- Future coastline of Aruba
- Nutrient loading, and biologic mapping
- Wave and current mapping
- Seagrass, mangroves, reefs
- Economic activities at sea (shipping, fishing, entertainment, diving, etc)
- Historic storm mapping
- Biodiversity mapping
- Link to Turtle nesting site Atlas (existing)
- Broedplaatsen schildpadden
- Hydrology map
- Map of freshwater, groundwater or wells
- Waterways map
- Coral reef status & prognose
- Toekomstige prognose water “acid” level
- Acidity of the sea
- Weather monitoring up to date + accurate
- Map of agricultural grounds

Do you have suggestions for the stories? (color 2) Where are the impacts the strongest?

Stories:

- Roly Bisslik?
- Local Voices: Interviews with Roly Bisslik and local fishermen to compare past and present sea conditions.
- Coastal Erosion: Assessing sea-level rise impacts at key beaches such as Divi Divi Tamarijn, Manchebo, and others.
- Coral Reef Degradation: Scuba divers’ firsthand accounts of changes in coral reef health due to warming, acidifying oceans.
- Interview fishermen for stories about species of fish
- Disappearing Mangroves: Stories on mangrove loss and community-led restoration efforts.

Locations:

1. Strongest impact flooded buildings:
    a. Web (Water-En Energiebedrijf Aruba?)
    b. Horacio Oduber Hospital
    c. Airport
    d. Seaport areas
    e. In the South: electra, hospital, drinkwater
    f. Beach erosion: Surfside, Arashi, Divi, Hyatt, Ritze Carlton, Boardwalk boutique hotel

2. Loss of biodiversity:
    a. Loss of breading areas of migrating terms (25.000/year), San Nicolas Bay Area (Rodger'ss beach reef Islands)
    b. North coast impact on breeding areas: least tern, common, tern, roseeth tern.
    c. Impact on Spanish lagoon, birds breeding area impact

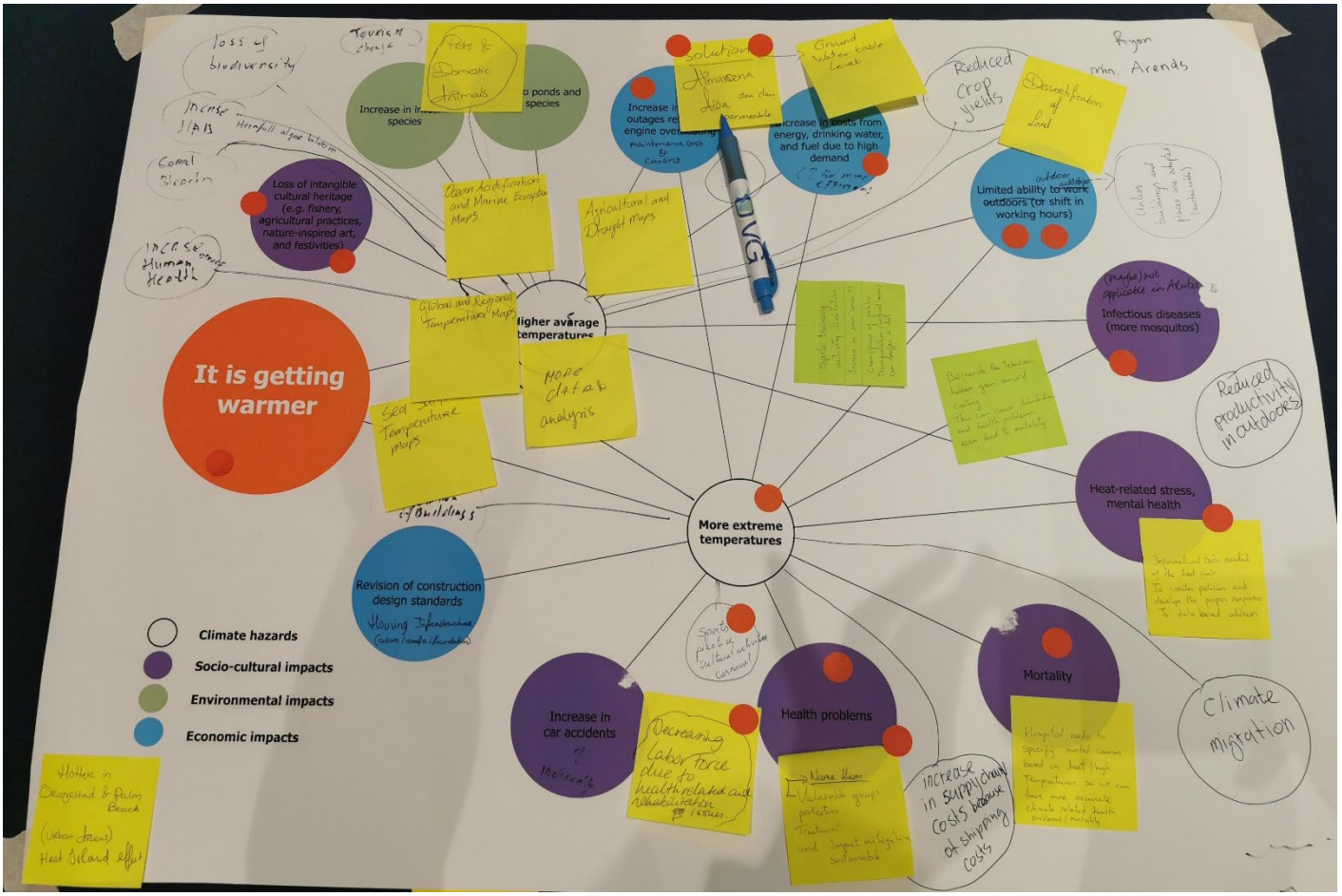
Additional comments

- There were comments on whether or not there would be a decline in tourism if coral decline (argument says people come for safety not biodiversity)
- Talk about not only cultural heritage but also 'intangible' heritage.
- Schildpaddden: Richard v/d Wal
- Source voor maps: Ventusky.com

Prioritized maps/impacts

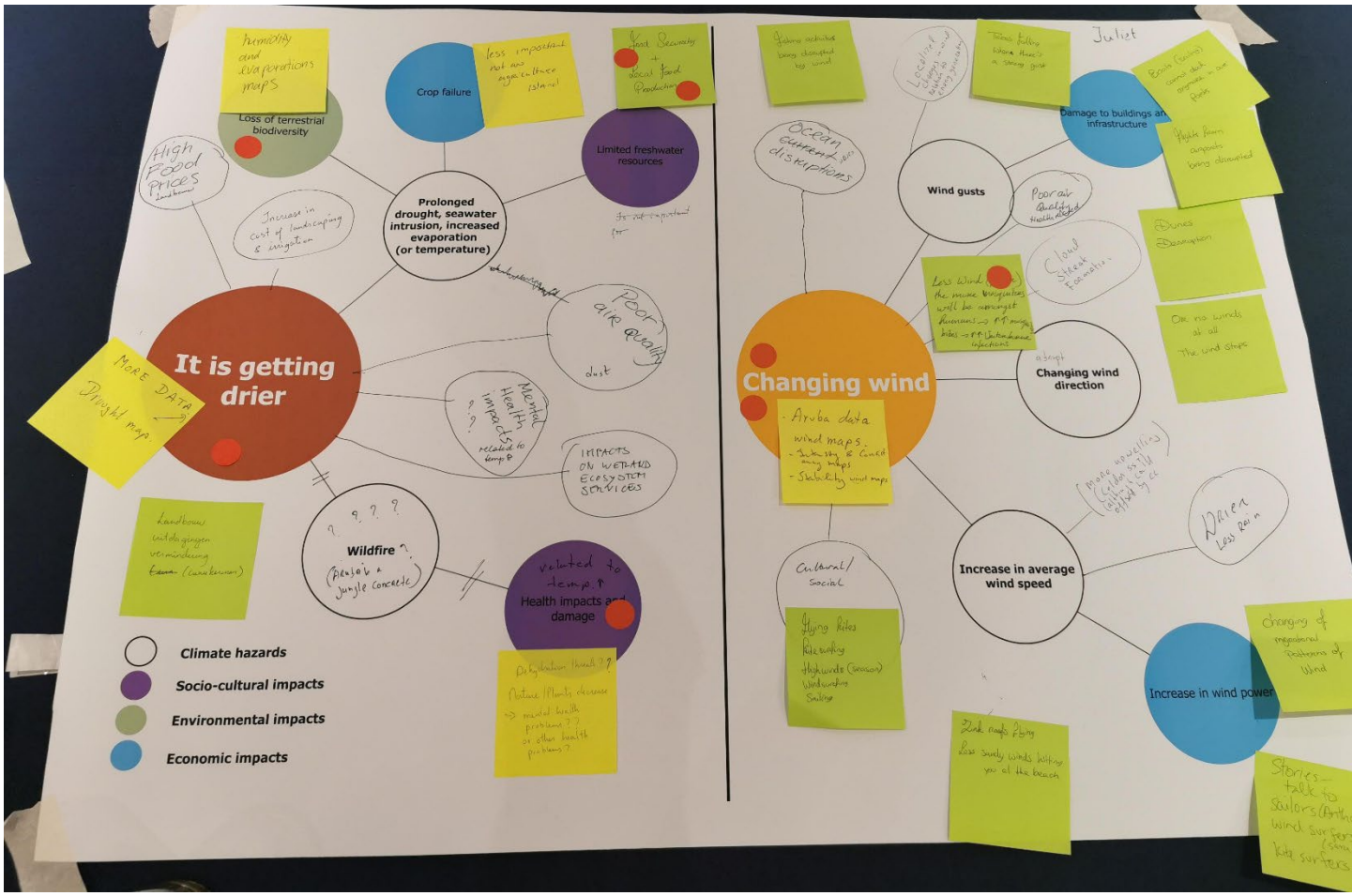
- Priority is coral reefs (coastal protection and overall decline in coral reefs) (8 + 8 – two impacts on poster)
- Loss of marine biodiversity (11)
- Permanently flooded buildings and infrastructure (8)

Annex C. Workshop outputs




Coral bleaching
Impact Migratory processes
Impact on Biodiversity
Increase in invasive species
Threath to pon birds species
Increase(in power) outages related to engine overheating related to multiple factors
Increase in costs from energy, drinking water, and fuel due to high demand
tourism impact
Limited ability to work outdoors (or shift in working hours)
Limited Recreational/sports activities for young/ old
Loss of intangible cultural heritage (e.g. fishery, agricultural practices, nature-inspired art, and festivities)
Report on impact of ouboy due to overheat
Infectious diseases (more mosquitos)
Higher avarage temperatures
It is getting warmer
More extreme temperatures
Heat-related stress, mental health
Revision of construction design standards
Increase in car accidents
Health problems
Higher Mortality
Climate hazards
Socio-cultural impacts
Environmental impact
Economic impacts

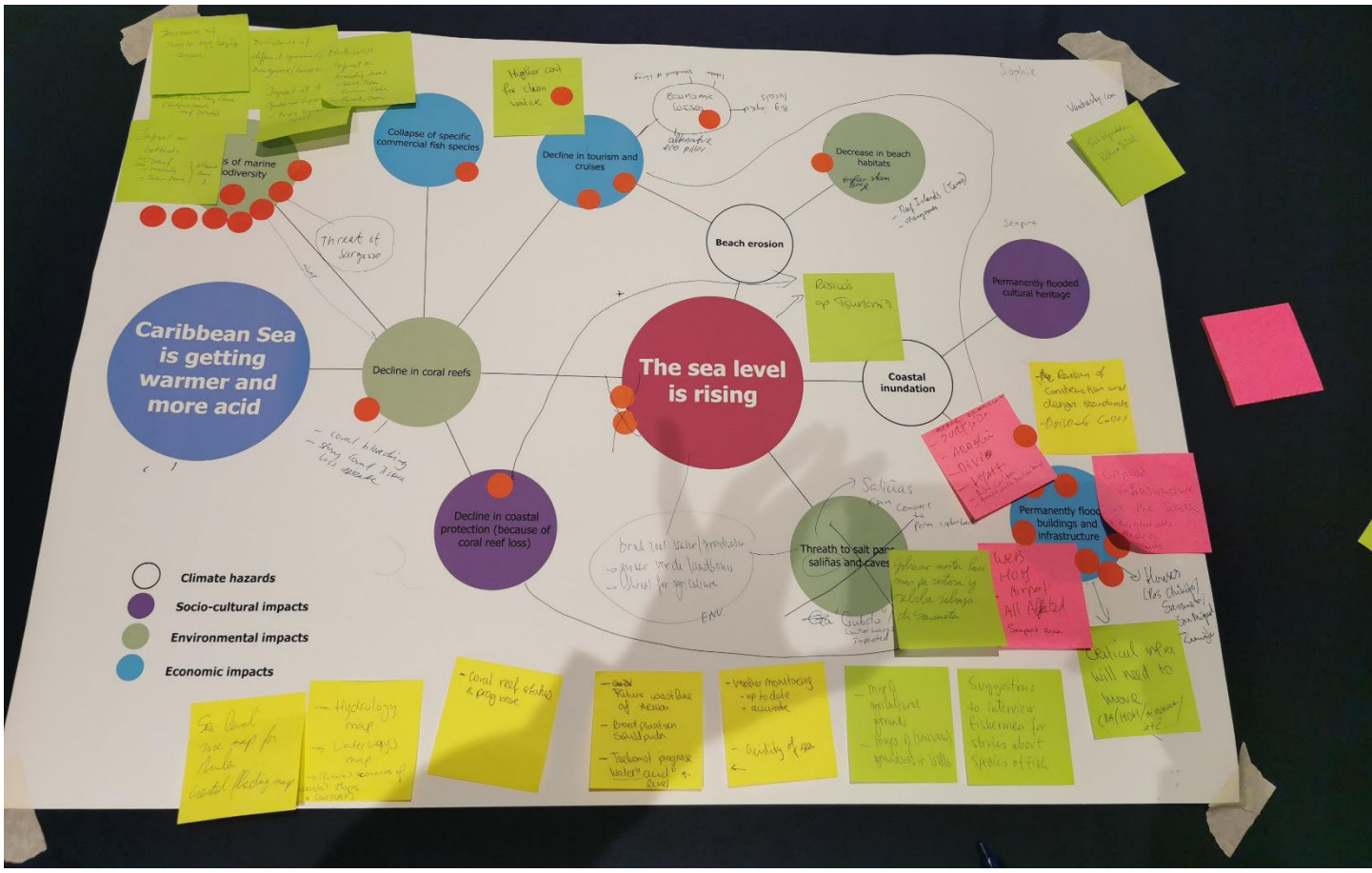

Robert - Jan
Crop failure
Limited freshwater resources
Damage to buildings and infrastructure
Wind gusts
Changing wind direction
Increase in average wind speed
Increase in wind power
Wildfire
Health impacts and damage
It is getting drier
Changing wind
Climate hazards
Socio-cultural impacts
Environmental impact
Economic impacts


It is getting drier
Changing wind
Prolonged drought, seawater intrusion, increased evaporation (or temperature)
Crop failure
Loss of terrestrial biodiversity
Limited freshwater resources
Wildfire
Health impacts and damage
Poor air quality
Wind gusts
Damage to buildings an infrastructure
Changing wind direction
Increase in average wind speed
Increase in wind power
Climate hazards
Socio-cultural impacts
Environmental impacts
Economic impacts


Crops
Negative impacts on the shallow reef corals and other organisms
Damages to land (e.g. trees falling down, roads washing away)
Erosion and washing away of soil
Flash floods
Storms, rains & cyclones are intensifying
Winds, waves and coastal floods
Injury and loss of life
Risks for critical health infrastructure
Damaged buildings and infrastructure
Flooded roads / disrupted road network
Climate hazards
Socio-cultural impacts
Environmental impacts
Economic impacts
emergency routes/ supplies
dynamic navigation
Design of Architecture of Residences that do not take Water accesses into account
flooding maps
reef changes
historical buildings


Damages to land (e.g. trees falling down, roads washing away)
Negative impacts on the shallow reef corals and other organisms
Shortages (food, irrigation, ...)
Erosion and washing away of soil
cultural Heritage Sites
Flooded roads / disrupted road network
Storms, rains & cyclones are intensifying
Flash floods
Waterborne infections
Vector borne diseases
Injury and loss of life
Internally Displaced people
Winds, waves and coastal floods
Damaged buildings and infrastructure
Risks for critical health infrastructure
-Vegetation loss
- soil loss
Climate hazards
Socio-cultural impacts
Environmental impacts
Economic impacts
Marlon
low lands maps
rif mangroves coral
MORE data collection points


Loss of marine biodiversity
Collapse of specific commercial fish species
Decline in tourism and cruises
Decrease in beach habitats
Beach erosion
Caribbean Sea is getting warmer and more acid
Decline in coral reefs
The sea level is rising
Coastal inundation
Permanently flooded cultural heritage
Permanently flooded buildings and infrastructure
Threath to salt pans, saliñas and caves
Decline in coastal protection (because of coral reef loss)
Mangroves loss
Seagrass
Climate hazards
Socio-cultural impacts
Environmental impacts
Economic impacts


Caribbean Sea is getting warmer and more acid
Decline in coral reefs
The sea level is rising
Beach erosion
Coastal inundation
Collapse of specific commercial fish species
Decline in tourism and cruises
Decrease in beach habitats
Permanently flooded cultural heritage
Permanently flooded buildings and infrastructure
Decline in coastal protection (because of coral reef loss)
Threath to salt pans saliñas and caves
Threat of Sargasso
Climate hazards
Socio-cultural impacts
Environmental impacts
Economic impacts