WAGENINGEN
UNIVERSITY & RESEARCH

ARUBA 2050

A NATURE INCLUSIVE VISION


© GREG PETERSON

ARUBA 2050

A NATURE INCLUSIVE VISION

WAGENINGEN
UNIVERSITY & RESEARCH

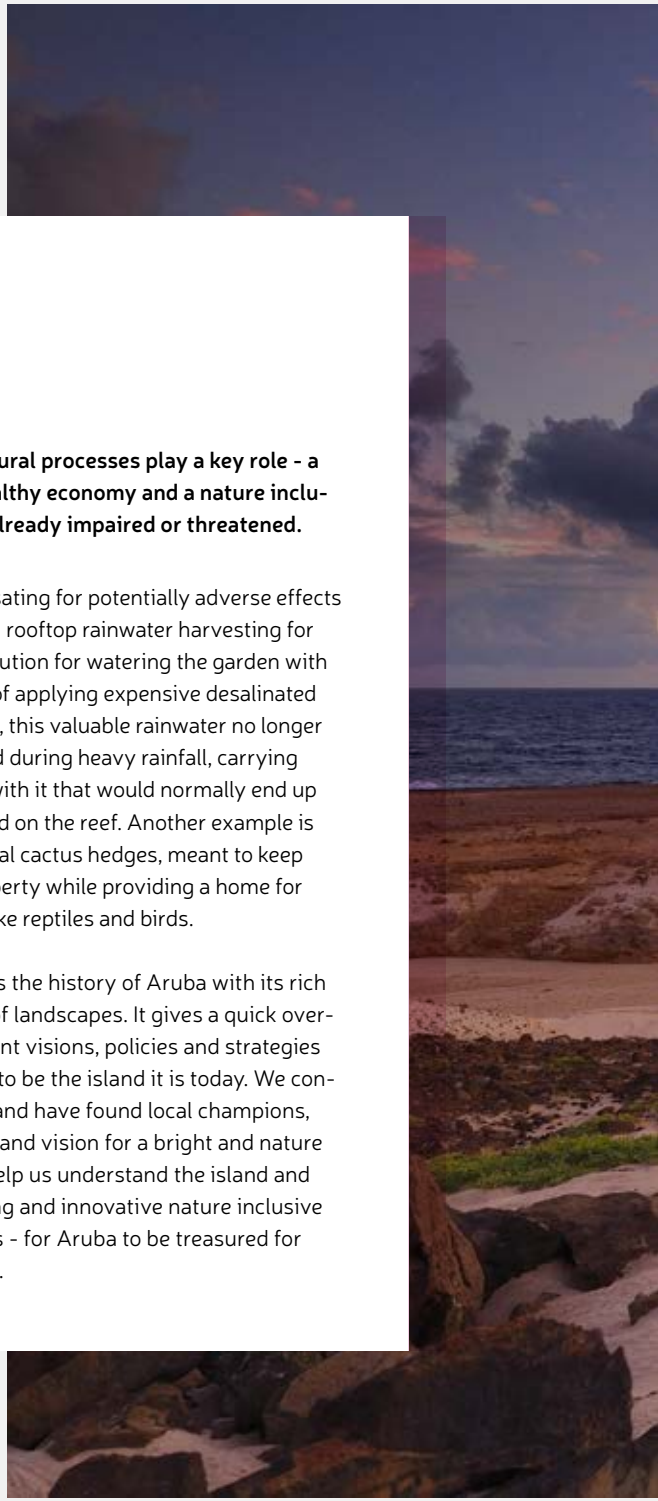
A NEW PERSPECTIVE

This booklet portrays a vision for Aruba 2050. A vision where nature and natural processes play a key role - a 'nature inclusive vision' that inspires action. It outlines a future in which a healthy economy and a nature inclusive society join forces to maintain what is precious, and to improve what is already impaired or threatened.

Nature on small tropical islands is particularly sensitive to pressures, such as climate change and over-exploitation. Aruba also faces major challenges: urban expansion and population growth; managing (mass) tourism; strained infrastructure; halting biodiversity loss; loss of culture; the dependency on food imports; and adaptation to extreme weather events. As a result, Aruba will very likely look completely different within a few decades from now. If current trends continue, pressures will increase and it will be harder to cope with the challenges. Thus, a new way of thinking, planning, and acting is needed.

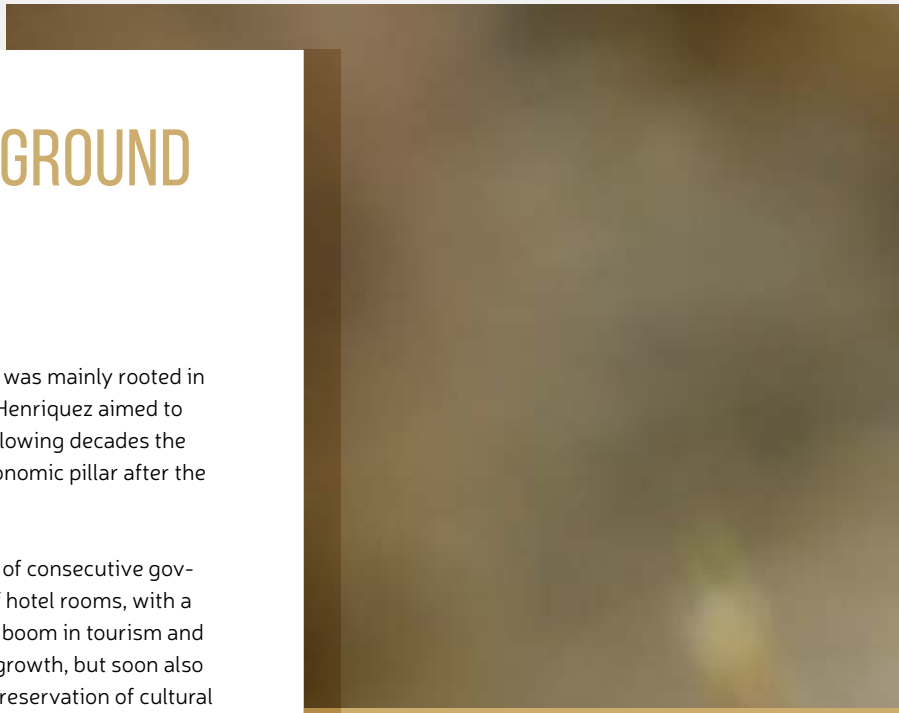
Local government, NGO's, businesses, households and researchers from Wageningen University and Research, have explored ways to strengthen nature by interweaving it into the daily lives of the people in Aruba. This goes beyond nature protection; we sought synergy with sectors such as culture, tourism, construction industry, agriculture and fisheries. We call this nature inclusive. Nature inclusiveness is about taking nature and its benefits for people into account in advance in planning, rather than compensating for potentially adverse effects afterwards. Consider rooftop rainwater harvesting for example; an easy solution for watering the garden with fresh water instead of applying expensive desalinated seawater. In addition, this valuable rainwater no longer washes off the island during heavy rainfall, carrying valuable fertile soil with it that would normally end up in the mangroves and on the reef. Another example is stimulating traditional cactus hedges, meant to keep livestock on the property while providing a home for native biodiversity like reptiles and birds.

This vision considers the history of Aruba with its rich culture and variety of landscapes. It gives a quick overview of all the relevant visions, policies and strategies that have led Aruba to be the island it is today. We consider its challenges and have found local champions, islanders with heart and vision for a bright and nature inclusive future to help us understand the island and come up with exciting and innovative nature inclusive concepts and visuals - for Aruba to be treasured for generations to come.




BY INTEGRATING NATURE INTO DAILY LIFE, ARUBA
CAN OVERCOME CHALLENGES AND BUILD A VIBRANT,
SUSTAINABLE FUTURE FOR GENERATIONS TO COME.

ARUBA'S POLICY BACKGROUND



POLICY DEVELOPMENT THROUGH THE YEARS

Let's go back to the late 1950's when Aruba's economy was mainly rooted in the oil industry. At that time the government of Oscar Henriquez aimed to diversify the economy by promoting tourism. In the following decades the tourism sector grew, until it remained the near only economic pillar after the Lago refinery closed its doors in March 1985.

In 1986 the country of Aruba was established. A series of consecutive governments aimed to double or even triple the number of hotel rooms, with a corresponding increase in the number of tourists. This boom in tourism and the associated construction activities led to economic growth, but soon also called for socio-environmental sustainability and the preservation of cultural identity. Therefore, subsequent policies focused on integral strategies that harmonize economic wellbeing with environmental and social aspects. The National Action Plan 2023-2025 specifically advocates moving away from a business-as-usual economic model to one that is more inclusive, sustainable and future-proof.

POLICY PLANS TIMELINE

1955

CALL TO DIVERSIFY THE ECONOMY

Introduce tourism as alternative to the unilateral dependency on the oil industry

1986

COUNTRY OF ARUBA IS ESTABLISHED

TOURISM DEVELOPMENT

Doubling to tripling amount of hotel rooms

1992

TOURISM POLICY

Plan to increase occupancy of hotel rooms

1996

STRUCTURE MEMORANDUM

(STRUCTUURNOTA NATUUR EN LANDSCHAP)

Call to protect nature

2006

INTEGRAL CULTURAL POLICY PLAN

To make Aruban people more aware of their own identity (nation building)

2010

NATIONAL INTEGRATED STRATEGIC PLAN

Integrate fragmented policy fields

2015

CULTURAL EXCELLENCE "OUR CULTURE, OUR PRIORITY"

Development of culture via education, cultural heritage, entrepeneur-ship and tourism

2019

CIRCULAR ECONOMY VISION 2050

Grow the economy with less waste and incentivize for technology

CARRYING CAPACITY TOURISM

Appeal to limit growth and decrease pressure on infrastructure and nature

2020

NATIONAL STRATEGIC PLAN 2020-2022

Stimulate partnerships, policycoherence, evidence-based policy formulationand SDG based monitoring and evaluation

2021

NATIONAL ACTIONPLAN 2023-2025

Transition towards a sustainable and inclusive economic model for energy, food, water and built-up area.

SPATIAL DEVELOPMENT PLAN

Harmonize eco-nomic growth with environment and social spects

2023

NATURE INCLUSIVE PLANNING

A NEW WAY OF DOING

Humanity is sustained and dependent on nature. In planning, nature should therefore be factored in up front, instead of compensating later for potential detrimental effects.

- Nature inclusive planning has evolved in various sectors, including agriculture, construction and energy.
- Nature inclusive planning is usually best applied at the landscape scale, while measures are taken at the local scale.
- It is about the improvement of nature in sectors other than conservation.
- Nature inclusive actions complement traditional nature conservation actions (e.g. protected areas), and are not a substitute.
- Nature inclusive measures address societal, cultural and economic challenges while providing benefits to nature at the same time.

EXAMPLES OF NATURE INCLUSIVE MEASURES

NO FREE ROAMING

Limiting livestock roaming helps regenerate natural vegetation and restore habitats for wildlife, including pollinators.

RAINWATER RETENTION

Catching rainwater reduces washouts, and supports agriculture and ecosystems during dry periods.

COMPOSTING WASTE

Composting enriches the soil with nutrients while reducing waste and water.

GREEN SCHOOLYARDS

Trees create shade and increase living area for butterflies and birds.

> WITH NATURE INCLUSIVE PLANNING IT'S ALL ABOUT CREATING POSITIVE OUTCOMES FOR BOTH NATURE AND PEOPLE

ARUBA'S CHALLENGES

Aruba boasts a remarkable variety of native species and several globally endangered ecosystems. These ecosystems play a central role in safeguarding the island's attractive coastlines, and provide vital services like erosion control and resilience against the adverse impacts of climate change.

At the same time, Aruba is confronted with a complex web of challenges. The rapidly growing population and tourism industry, coupled with the expansion of grey infrastructure and income insecurity, pose serious threats to the island.

POPULATION GROWTH AND URBAN EXPANSION

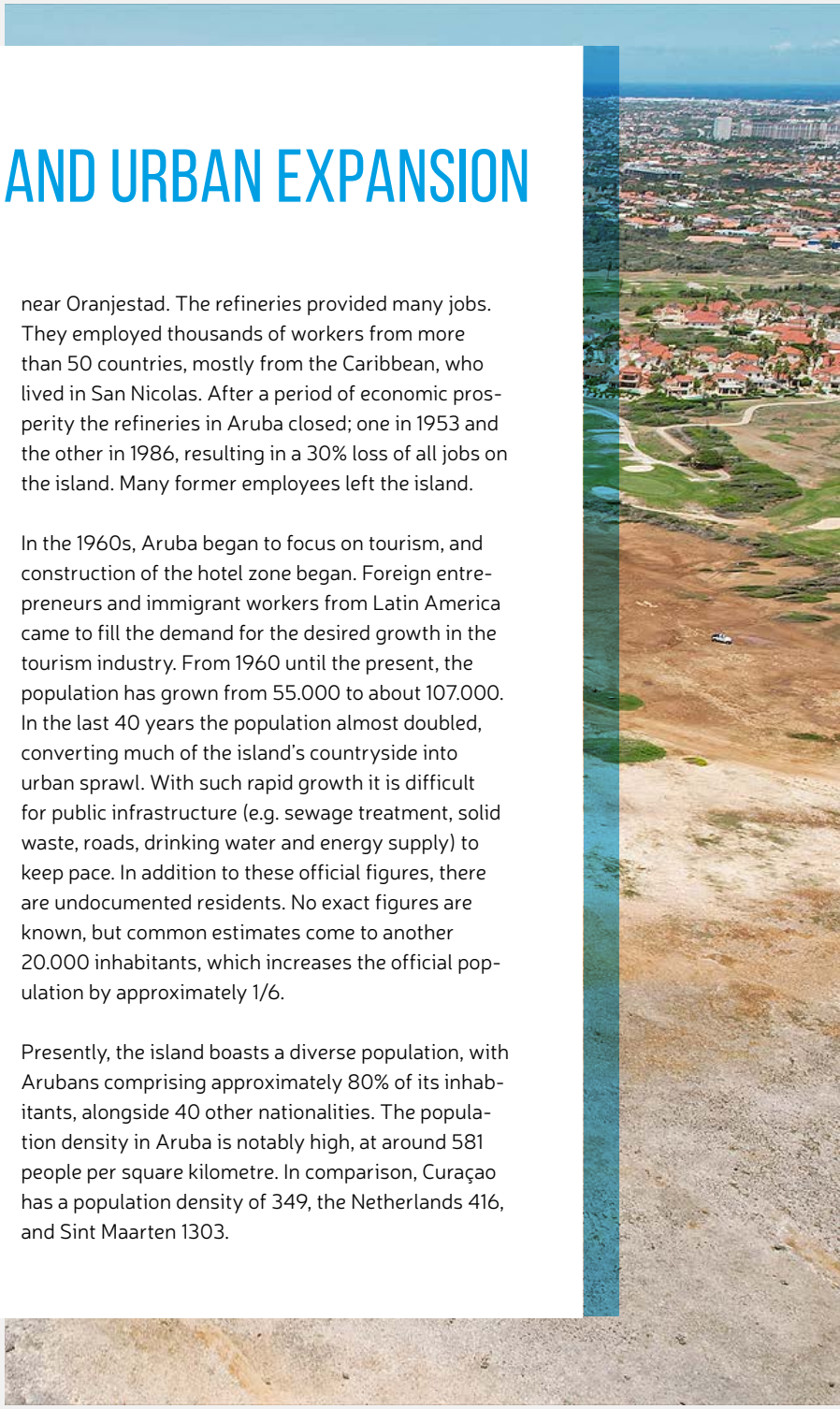
A few thousand years ago, South American Indians had spread across the Caribbean and lived in Aruba. The first groups of Indians lived as semi-nomads from the sea. Later groups had permanent homes and also practised agriculture. Aruba's first inhabitants were the Caquetios Indians from the Arawak tribe. Fragments of the earliest known Indian settlements date back to 1000 A.D. In 1499, the Leeward Islands, including Aruba, were colonised by the Spanish. From then on, Aruba frequently changed hands between the Spanish, French, English, and Dutch. After most of the Indians from Aruba were taken to what is now known as the Dominican Republic to work as slaves in the mines, Aruba was repopulated by order of the Spanish king. In the second half of the seventeenth century, the island was primarily inhabited by Indians who spoke Spanish, along with stationed soldiers of the Dutch West Indian Company. The settlers found it hard to grow crops in the harsh Aruban environment. For export, colorant was harvested from cocheneal insects and some aloe was grown.

Before 1790, Savaneta, founded by the Spanish in the 16th century as the island's main town, served as Aruba's capital. Later, many residents of Aruba settled around Fort Zoutman, in current Oranjestad. Slowly, the hamlet grew into a small village. In fact, more than 25 years after the completion of the fort, almost half of the total island population lived near Fort Zoutman. Around 1860, more than 1,000 people lived there.

In the 1920s, the oil refineries were established on the island, one in San Nicolas and another at Eagle bay near Oranjestad. The refineries provided many jobs. They employed thousands of workers from more than 50 countries, mostly from the Caribbean, who lived in San Nicolas. After a period of economic prosperity the refineries in Aruba closed; one in 1953 and the other in 1986, resulting in a 30% loss of all jobs on the island. Many former employees left the island.

In the 1960s, Aruba began to focus on tourism, and construction of the hotel zone began. Foreign entrepreneurs and immigrant workers from Latin America came to fill the demand for the desired growth in the tourism industry. From 1960 until the present, the population has grown from 55.000 to about 107.000. In the last 40 years the population almost doubled, converting much of the island's countryside into urban sprawl. With such rapid growth it is difficult for public infrastructure (e.g. sewage treatment, solid waste, roads, drinking water and energy supply) to keep pace. In addition to these official figures, there are undocumented residents. No exact figures are known, but common estimates come to another 20.000 inhabitants, which increases the official population by approximately 1/6.

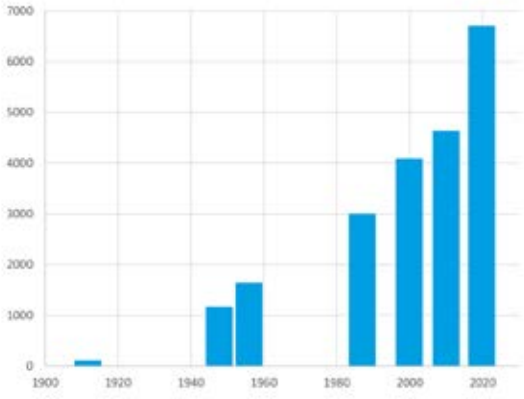
Presently, the island boasts a diverse population, with Arubans comprising approximately 80% of its inhabitants, alongside 40 other nationalities. The population density in Aruba is notably high, at around 581 people per square kilometre. In comparison, Curaçao has a population density of 349, the Netherlands 416, and Sint Maarten 1303.



ARUBA'S POPULATION DEVELOPMENT

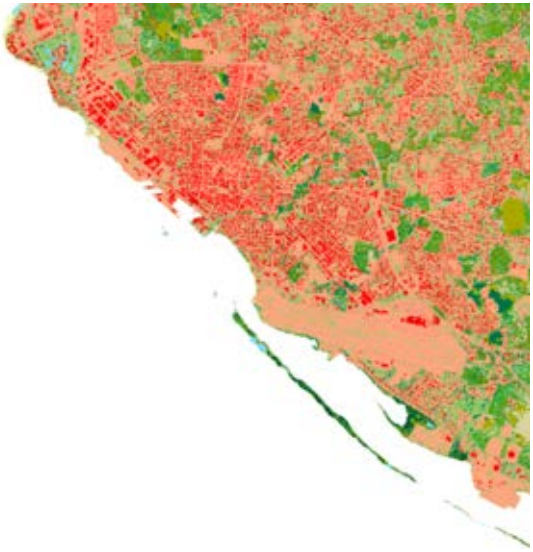
Population

Built-up area in hectares



URBANIZATION IN THE ORANJESTAD REGION

(1912 / 2020) red is built-up



ARUBA'S CHALLENGES

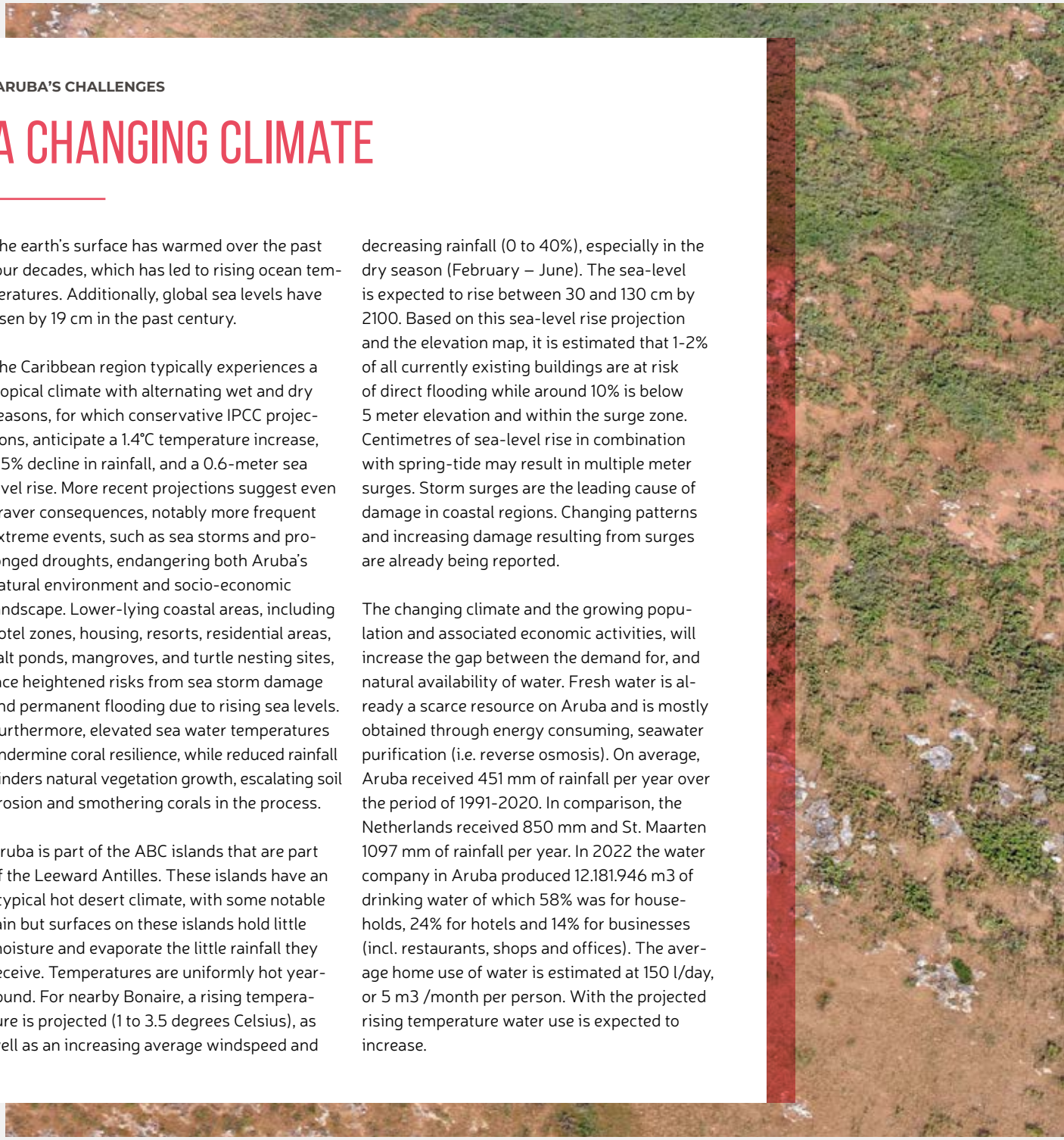
A CHANGING CLIMATE

The earth's surface has warmed over the past four decades, which has led to rising ocean temperatures. Additionally, global sea levels have risen by 19 cm in the past century.

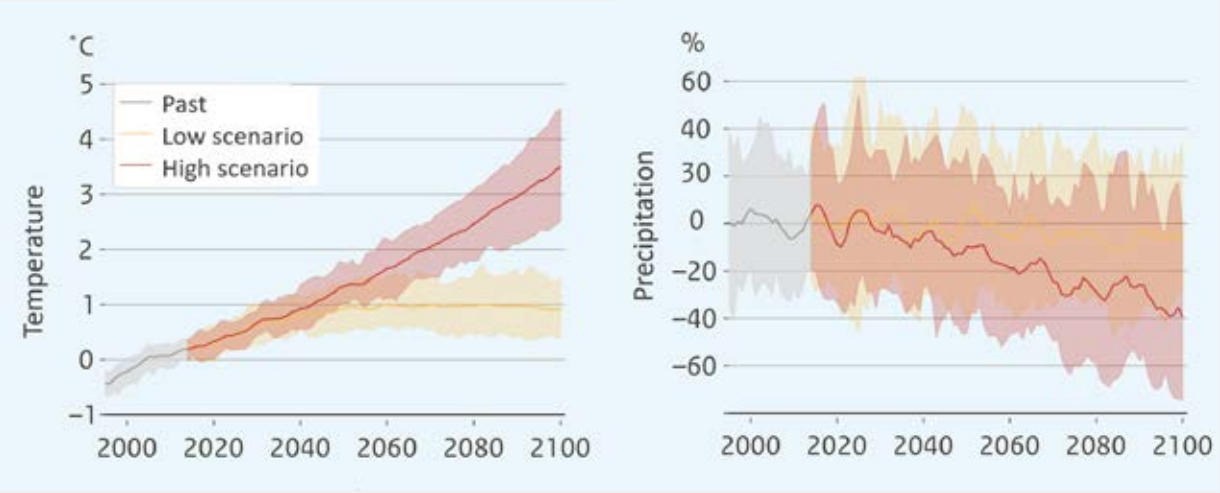
The Caribbean region typically experiences a tropical climate with alternating wet and dry seasons, for which conservative IPCC projections, anticipate a 1.4°C temperature increase, a 5% decline in rainfall, and a 0.6-meter sea level rise. More recent projections suggest even graver consequences, notably more frequent extreme events, such as sea storms and prolonged droughts, endangering both Aruba's natural environment and socio-economic landscape. Lower-lying coastal areas, including hotel zones, housing, resorts, residential areas, salt ponds, mangroves, and turtle nesting sites, face heightened risks from sea storm damage and permanent flooding due to rising sea levels. Furthermore, elevated sea water temperatures undermine coral resilience, while reduced rainfall hinders natural vegetation growth, escalating soil erosion and smothering corals in the process.

Aruba is part of the ABC islands that are part of the Leeward Antilles. These islands have an atypical hot desert climate, with some notable rain but surfaces on these islands hold little moisture and evaporate the little rainfall they receive. Temperatures are uniformly hot year-round. For nearby Bonaire, a rising temperature is projected (1 to 3.5 degrees Celsius), as well as an increasing average windspeed and decreasing rainfall (0 to 40%), especially in the dry season (February – June). The sea-level is expected to rise between 30 and 130 cm by 2100. Based on this sea-level rise projection and the elevation map, it is estimated that 1-2% of all currently existing buildings are at risk of direct flooding while around 10% is below 5 meter elevation and within the surge zone. Centimetres of sea-level rise in combination with spring-tide may result in multiple meter surges. Storm surges are the leading cause of damage in coastal regions. Changing patterns and increasing damage resulting from surges are already being reported.

The changing climate and the growing population and associated economic activities, will increase the gap between the demand for, and natural availability of water. Fresh water is already a scarce resource on Aruba and is mostly obtained through energy consuming, seawater purification (i.e. reverse osmosis). On average, Aruba received 451 mm of rainfall per year over the period of 1991-2020. In comparison, the Netherlands received 850 mm and St. Maarten 1097 mm of rainfall per year. In 2022 the water company in Aruba produced 12.181.946 m3 of drinking water of which 58% was for households, 24% for hotels and 14% for businesses (incl. restaurants, shops and offices). The average home use of water is estimated at 150 l/day, or 5 m3 /month per person. With the projected rising temperature water use is expected to increase.



TEMPERATURE AND PRECIPITATION PROJECTIONS



BUILDINGS ON TOP OF ELEVATION

Buildings (in red) plotted on top of the digital elevation model of Aruba. Elevation is plotted in a colour ramp from dark green (low lying), via yellow to dark brown (highest).

COASTAL RISK

(2100)

Coastal risk (in red) for the land that is projected to be below the tideline in 2100.

ARUBA'S CHALLENGES

MANAGING TOURISM

Annually, Aruba receives more than two million visitors, making it one of the busiest and most crowded Caribbean destinations. Most tourists (83% in 2022) come from North America. Already in the 1960s, the numbers of annual tourists exceeded the resident population size. Currently, the tourism industry is the primary source of income for 25% of households, and when accounting for indirect contributions, it accounts for nearly 90% of the island's GDP. Large transnational corporations are integrated into the Aruban economy, and use subsidiary companies to service much of the tourist's visit. This leads to economic leakage (estimated at 55-80%) to foreign-owned businesses, leaving little opportunity for smaller local enterprises to benefit from tourist expenditure.

In 2019, 43% of all tourists visiting the island annually were cruise tourists. They engage in activities like exploring Oranjestad, visiting beaches, or touring the island via tour buses, mini-vans, taxis, offroad vehicles, and motorcycles. Cruise tourists often opt for all-inclusive packages provided by cruise lines, minimizing their utilization of local hospitality services, besides visits to casinos and shopping malls. Stay-over tourists mainly visit the island to enjoy the sun and the beaches. While tourism has brought economic benefits to Aruba, it has also brought serious pressure on the island's infrastructure, especially in relation to the treatment of solid waste and wastewater, energy provision, and the road network. Also, tourism claims public beach areas at the expense of local beach use.

The north-west coast of Aruba with its beaches made up of coral sand is where most hotels are located. Seagrass meadows thrive here due to nutrient runoff from hotel gardens and sewage plant overflows. At some coastal spots, mud and silt settle at stormwater outlets, smothering the seagrass and creating a foul sludge. The area is regularly dredged to prevent mud and odour that could deter tourists.

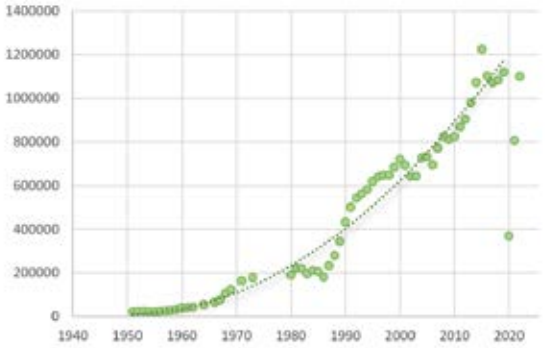
To keep hotels attractive, they are remodelled and refurbished every 7 to 10 years, providing work in the construction industry. This has a knock-on effect on the amount of waste produced, as all discarded and replaced furniture as well as construction waste remains on the island.

There is debate about distributing tourism more evenly throughout the island. Efforts are underway to develop tourism facilities near San Nicolas, which could lead to increased employment in this region but may come at the cost of the region's unique cultural character. Additional proposals include the promotion of leisure activities such as biking along the rugged north side of the island. While this could enhance the tourist experience, it raises concerns about the degradation of natural areas and direct damage to the nests and breeding grounds of rare bird species.

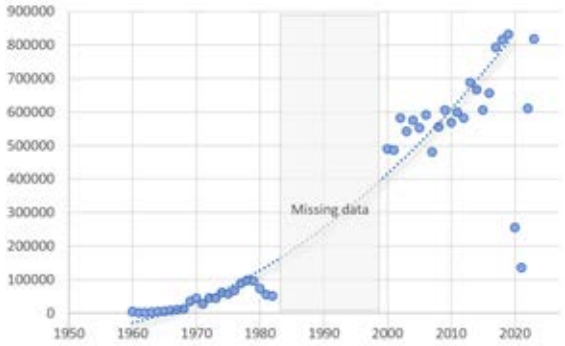
Furthermore, there is a growing trend in the expansion of condominiums with timeshares and a significant increase in Airbnb listings. These developments encroach on residential areas, limiting space and raising prices for local housing.

A survey conducted among locals revealed mixed sentiments regarding the impact of tourism. On average respondents rated tourism's impact as slightly positive. 76% of respondents highlighted that tourism leads to high cost of living. 46% believed that tourism negatively affects nature and the environment. 25% of the surveyed locals stated that they do not benefit from the revenue generated by tourism. Due to its social and environmental impacts, there is controversy on the planned further growth of the tourism sector.

TOURISTS BY AIR



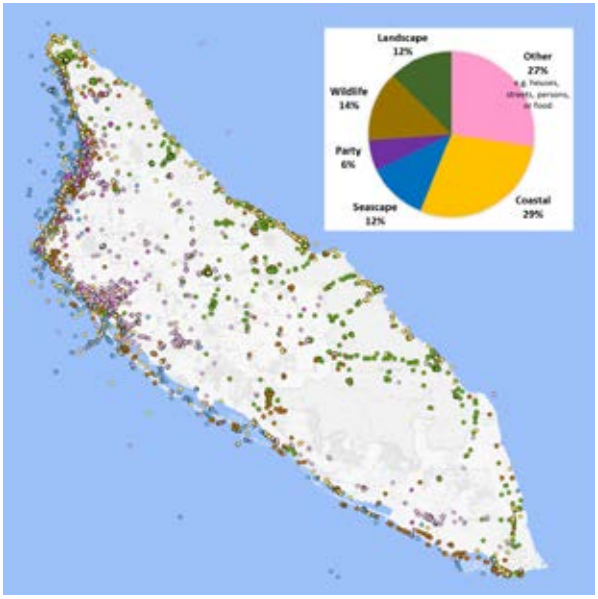
CRUISE PASSENGERS



CURRENT HOTELS AND HOLIDAY RENTALS

(2024)

SOCIAL MEDIA PHOTO POSTS TAKEN BY TOURISTS



ARUBA'S CHALLENGES

LOCAL PRODUCE AND HEALTHY DIETS

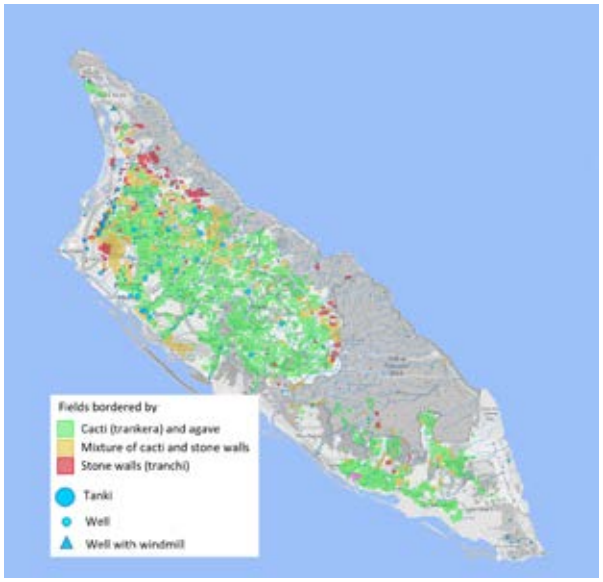
In the past, Aruba's food production was primarily based on subsistence farming, with farms known as 'cunucus'. The island's diet mainly consisted of goat, chicken, fish, and starchy crops like sorghum. Fruits and fresh leafy vegetables were limited in availability. Seasonal cropping took place from September to February and consisted mostly of sorghum, peanuts, cucumber, pumpkin, okra and various legumes. Typical dryland farming practices were used: retaining rainfall on the land (e.g. through a water-capturing network of river beds and storage in dams) and, use of drought tolerant crops that fit the Aruban rainfall patterns. Close to the cunucu houses, mango, dwarf banana, papaya and herbs like basil and siboyin (wild leek) were grown. Cunucu fields were found in relatively good soils, close to (dry) river beds, wells and tanki's (a natural waterhole or pond). Most of the cunucu's were fenced by cacti and agave, although stone walls -or mixtures- were also used on the less fertile borders of the suitable area. In 1911, 11.7% of all lands was used for aloe production (mostly on limestone) and an additional 21.1% of all land was used for food production.

The agricultural landscape on the island shrunk significantly since. Today, there are only 28 commercial farmers. Farming methods involve hydroponics, raised beds, outdoor cultivation, and husbandry. For irrigation, water from rainwater collection points (so-called 'dams') and desalinized seawater are being used. In recent decades, fishing has evolved with larger boats, more technology, and bigger catches. Tourist charter boats have increased, and catch sizes and species have shifted. The larger specimens of inshore species (red snapper and grouper) have been caught. Fish species further out in the ocean (barracuda, kingfish and tuna) face challenges.. Despite these agricultural and fishing activities, Aruba is fully dependent on imports to satisfy its food needs. Seventy percent of food imports come from North and South America, 25% from Europe and 3% from the surrounding Caribbean. This dependence on imports exposes the island to vulnerabilities, for example caused by unrest in exporting countries or a pandemic.

Efforts are underway to promote local food production through various community initiatives such as farmers markets that gain in popularity. Some examples include the cultivation and sale of native fruit trees by garden centres and horticultural enterprises, as well as increased interest in home vegetable gardening. While these initiatives have had a positive impact on reducing household food expenses, they would need to be significantly expanded to decrease the island's reliance on imported food.

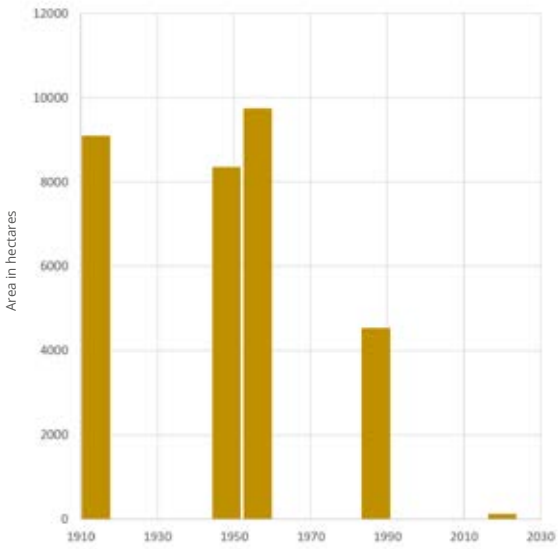
Enhancing local food production not only addresses economic concerns but also has the potential to improve the overall health and nutrition of Aruba's residents. Eight out of ten Arubans are overweight or obese, with many experiencing health issues like high cholesterol and blood pressure, while 35% of households face health and nutrition insecurity. Initiatives have been introduced to educate children at primary schools about healthy eating habits. This may increase demand for local production of nutritious food such as water melon, tomatoes, spinach, lettuce, pumpkin, okra, and pawpaw. Healthier diets can reduce health issues and associated health care costs.

CULTIVATED LANDS
(1912)



CULTIVATED LANDS
(1948)

DOWNWARD TREND OF CULTIVATED LANDS

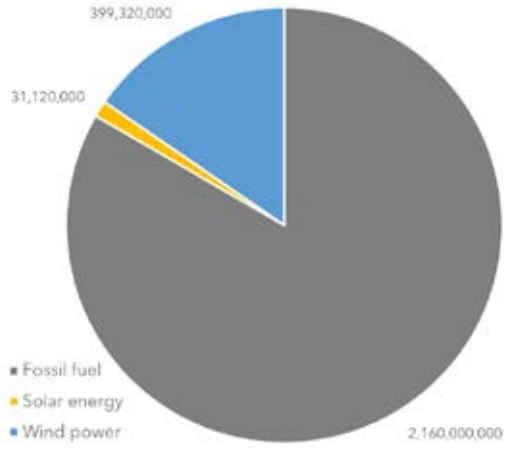


GEOLOGICAL MAP OF ARUBA

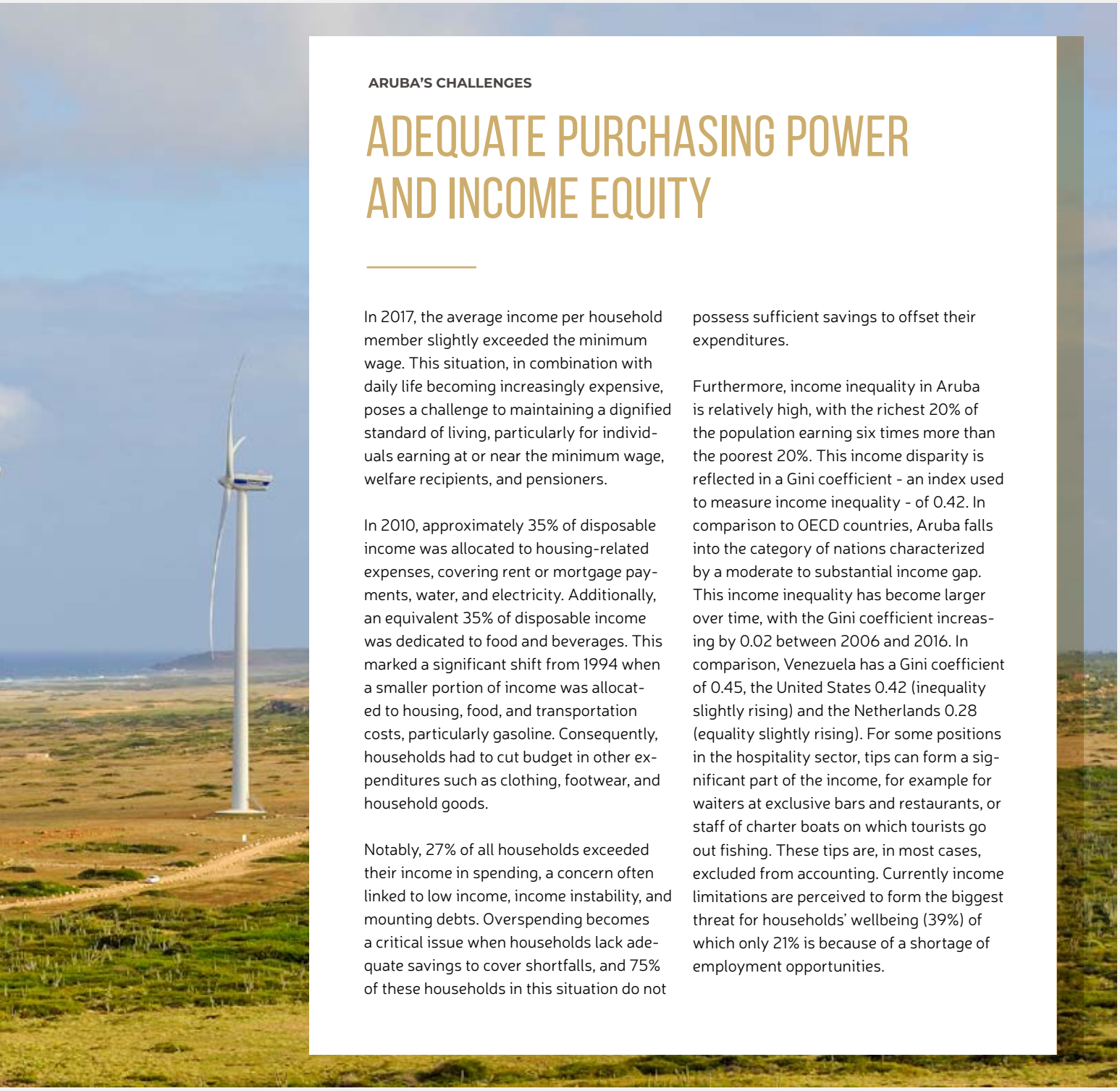
ARUBA'S CHALLENGES

USING RENEWABLE ENERGY

Aruba relies heavily on imported fossil fuels, which account for 84% of its energy supply. Wind turbines contribute to 15% of the energy supply, while solar panels contribute 1%. Electricity costs are consequently high and are affected by fluctuations in oil supply. Although Aruba's environmental conditions are excellent for sustainable wind and solar energy generation, its electricity grid needs improvement. The global commitment to reduce greenhouse gas emissions, as outlined in the 2015 Paris Agreement, presents an opportunity for Aruba to secure funding for investments in renewable energy sources.



Energy production in kWh/year



ARUBA'S CHALLENGES

ADEQUATE PURCHASING POWER AND INCOME EQUITY

In 2017, the average income per household member slightly exceeded the minimum wage. This situation, in combination with daily life becoming increasingly expensive, poses a challenge to maintaining a dignified standard of living, particularly for individuals earning at or near the minimum wage, welfare recipients, and pensioners.

In 2010, approximately 35% of disposable income was allocated to housing-related expenses, covering rent or mortgage payments, water, and electricity. Additionally, an equivalent 35% of disposable income was dedicated to food and beverages. This marked a significant shift from 1994 when a smaller portion of income was allocated to housing, food, and transportation costs, particularly gasoline. Consequently, households had to cut budget in other expenditures such as clothing, footwear, and household goods.

Notably, 27% of all households exceeded their income in spending, a concern often linked to low income, income instability, and mounting debts. Overspending becomes a critical issue when households lack adequate savings to cover shortfalls, and 75% of these households in this situation do not possess sufficient savings to offset their expenditures.

Furthermore, income inequality in Aruba is relatively high, with the richest 20% of the population earning six times more than the poorest 20%. This income disparity is reflected in a Gini coefficient - an index used to measure income inequality - of 0.42. In comparison to OECD countries, Aruba falls into the category of nations characterized by a moderate to substantial income gap. This income inequality has become larger over time, with the Gini coefficient increasing by 0.02 between 2006 and 2016. In comparison, Venezuela has a Gini coefficient of 0.45, the United States 0.42 (inequality slightly rising) and the Netherlands 0.28 (equality slightly rising). For some positions in the hospitality sector, tips can form a significant part of the income, for example for waiters at exclusive bars and restaurants, or staff of charter boats on which tourists go out fishing. These tips are, in most cases, excluded from accounting. Currently income limitations are perceived to form the biggest threat for households' wellbeing (39%) of which only 21% is because of a shortage of employment opportunities.

MAINTAINING, ENHANCING AND RESTORING NATURE

Despite its size, Aruba has a varied landscape. It is located at the boundary between the South American and Caribbean tectonic plates. Throughout its geological history, Aruba has undergone tectonic displacement, uplifting, sea level rises, and geological deformation. The core of volcanic formations is surrounded by limestone rocks. Fringing reefs line the south and southwestern coast. Aruba's proximity to the South American mainland, connected via the continental shelf, has a stronger influence on its flora and fauna compared to the neighbouring islands of Bonaire and Curaçao. The groundwater of Aruba is brackish.

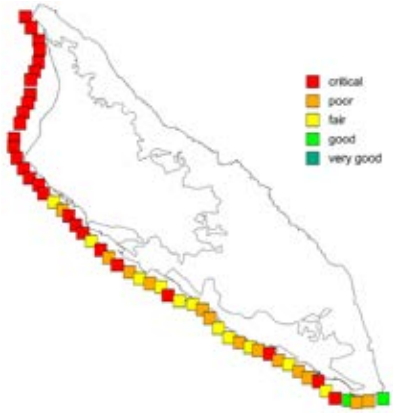
Aruba's biodiversity - with 2.439 known species of flora and fauna - remains surprisingly rich despite the semi-arid environment and enduring centuries of extensive agriculture, grazing, mineral extraction and habitat loss from land conversion. As one of the world's most densely populated countries, the island's natural values, ecosystems, and biodiversity face significant pressures. Aruba hosts 34 known endemic species, with an additional 28 endemic to the ABC islands and 37 more to the ABC islands, northern Venezuela, and Colombia. Iconic landscapes feature windswept Buttonwood or Fofoti trees, Watapana trees and several cacti species.

The island supports diverse wildlife including hermit crabs, land crabs, butterflies, dragonflies, lizards, and bats. Some species, such as the Arubian cottontail, Hummelinck's vesper mouse and Crested bobwhite, have become rare sightings in recent years. Others like the Aruba burrowing owl and Aruba brown-throated parakeet are also declining. Aruba hosts 282 bird species, including migratory birds.

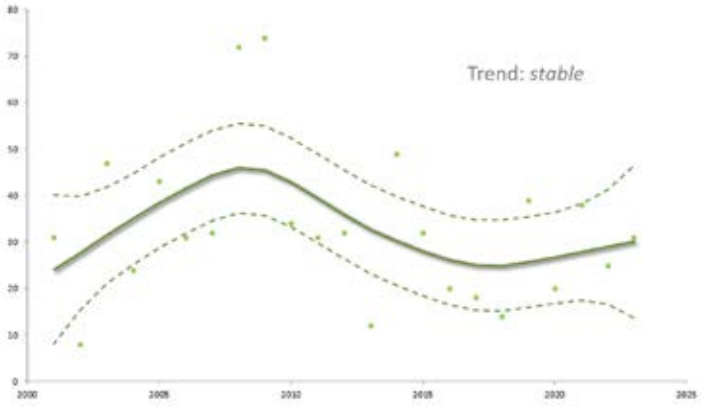
Aruba's coastal area of San Nicolas serves as crucial breeding grounds for 25% of the global Cayenne tern population, 90% of the Caribbean Common tern population, and 25% of the Caribbean Black noddy population. The island also hosts six bat species and four species of sea turtles that nest on its beaches.

Nature in Aruba is vulnerable due to its small area and inherently small populations of species, making them particularly vulnerable to habitat loss, fragmentation and degradation. Like all islands in the Caribbean region, Aruba also suffers from invasive alien species and climate change.

In early 2024, a survey of 800 households found that 81% experience stress reduction and improved well-being from time spent in nature. Most feel connected to nature (78%) and visit natural areas weekly, with beaches and the underwater world (41%) being the most visited. Overdevelopment, tourism pressure, and pollution are seen as major threats, while climate change is considered a long-term danger.



Coral abundance



Leatherback sea turtle nests at west coast

ARUBA'S CHALLENGES

FLOURISHING CULTURAL MELTING POT

Aruba's population reflects a rich historical tapestry, originating from a blend of sources: the original Caquetios Indian inhabitants, Europeans (mainly Dutch and Spanish) and, to a lesser extent, Sephardic Jews and Africans. Slavery played a major role in the Caribbean, however, due to the lack of plantations in Aruba, relatively few slaves (still several hundreds) were put to work on the island.

A true gold rush developed in Aruba after a shepherd boy found gold at Rooi Fluit and Rooi Daimari on the north coast in 1824. This brought an onrush of miners, seeking their fortune. Since the opening of the oil refinery in San Nicolas in 1924 and the rapid tourism development since the 1980's, waves of immigration followed. Thousands of workers from elsewhere were contracted. These immigrants - the workers and their families - from different cultural backgrounds went to live and work in Aruba and became part of Aruban society. Many traditions and customs in Aruba can be traced back to the large labour immigration. Aruba's variety of cultures merged to produce a richness in oral history, poetic language, architecture, local dishes, music and folkloric dancing. This forms the basis of Aruba's norms, values, traditions and lifestyles.

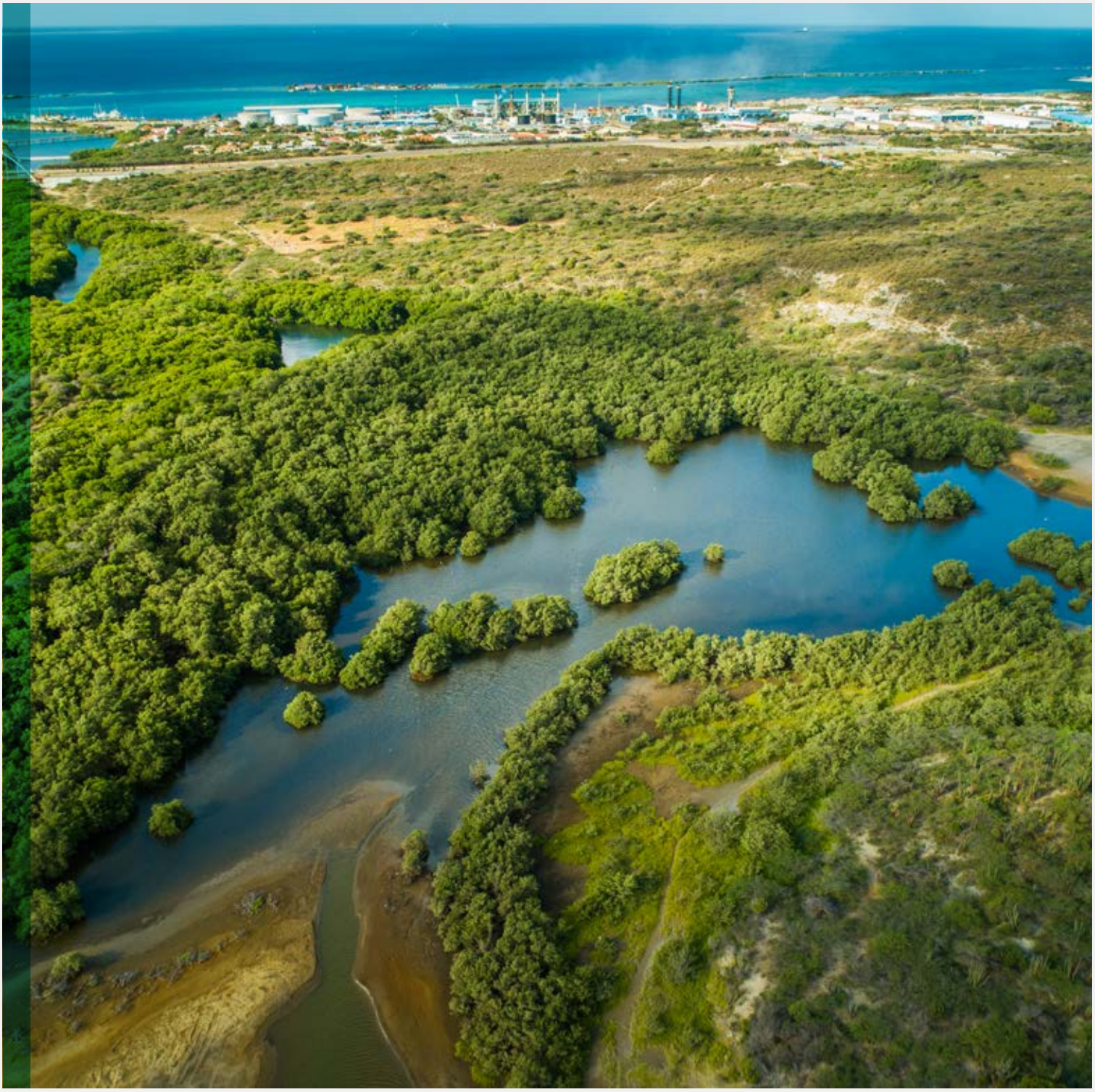
Despite the enriching effects of such a cultural melting pot, there are also downsides. In recent decades many fast-food chains have established themselves up all over Aruba. This influx of globalized culture, with its vigorous branding styles, uniformity, commercialisation and money-oriented mindset (often referred to as 'Americanisation'), is not always appreciated by the local population. It is often perceived as a denial of local culture, a sentiment widely expressed.

ARUBA'S CHALLENGES

ECONOMIC DIVERSIFICATION

Aruba's economy is heavily reliant on tourism, with around 2.1 million cruise and stay-over tourists visiting each year, despite the island's population of only 107,000. Tourism accounts directly for ~30% of the island's GDP. When indirect contributions are included this value increases to ~90%, although another source reports that tourism accounts for roughly 60% of the Gross National Product (GNP) of approximately $2 billion in 2019. This sector provides employment opportunities in various fields, including hotels and restaurants (17%), partly real-estate, renting, business activities (13.2%), construction (13%), and wholesale and retail (14%). However, this dependence on tourism exposes the economy to risks such as market fluctuations, extreme weather events, and global health crises, as evidenced by the impact of the COVID-19 pandemic, which brought tourism to a standstill.

To mitigate this vulnerability, diversification of the economy is essential to supplement the income generated by tourism. This would require the further development of economic activities with a lower, or even net-positive impact on nature on the island, and could involve fostering the growth of sectors such as digital nomadism, financial intermediation (requiring stable and high-speed internet infrastructure), hydrogen production and export (from wind and solar energy), processing of (organic) waste streams into valuable products, biopharmaceutical industries (utilizing resources like algae and aloe), increased local production of vegetables and fruits, the small-scale export of sheep- and goat meat, and a knowledge-economy. This diversification requires jobs that demand knowledge that is currently limited available on the island. This is partly due to the brain drain in which talented Aruban youth go abroad to study and do not return to apply their knowledge in the Aruban labour market.



ARUBA'S FUTURE OUTLOOKS

Aruba will look different in the future. In part, this depends on external influences such as geo-politics, markets and climate change, but in large part it depends on the choices made on Aruba, by its people, the businesses and government.

Two of such possible futures, in which external influences are assumed relatively stable, are described on the following pages.

Origin of food

80 ha local produce

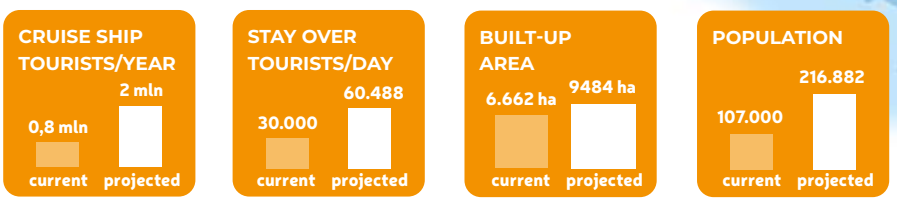
Site impression

Site impression

Tourist accommodation development

Number of stay-over tourists

2.740.000 per year



OUTLOOK

BUSINESS AS USUAL ON ARUBA

What would happen to Aruba when tourism will continue to increase at the same rate as now? What would it look like when Aruba continues to build at the current speeds. This section provides a snapshot of Aruba in 2050 when such historical trends continue at the same rates as in the recent past in terms of island policies and practices, and urban and tourism expansion.

In 2050, global climate change is more urgent as flood and storm damage risks increase. Droughts and average temperature also increase, lowering the amount of water seeping into the soil. This causes stress on the natural vegetation and thereby increases soil erosion and salinization.

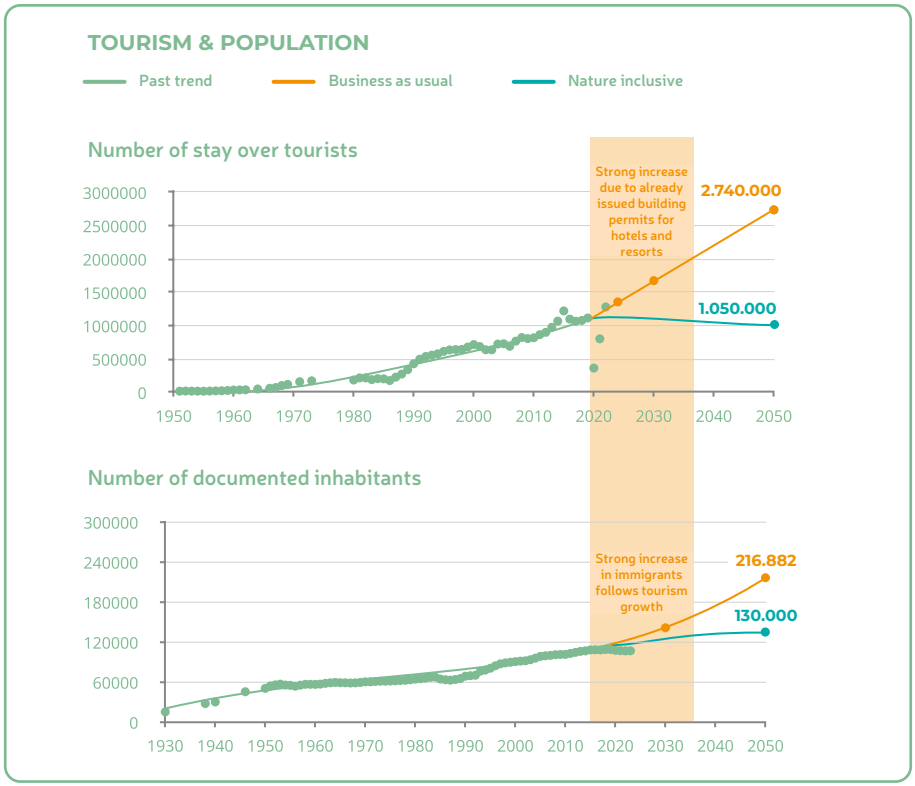
The main economic pillar is tourism, with an increase in stay-over and cruise ship tourists. Construction of accommodations for tourists continues nonstop. The numbers of both stay-over and cruise ship tourists have more than doubled. The port and airport capacity have been adapted to accommodate for the growing flows of goods (such as construction material and clothing) and people. The population on the island is double that of 2024, as it is coupled to (mostly stay-over) tourism growth through the influx of foreign workers and investors.

Consequently, the built-up area, road network and sewage system are expanded. Urban expansion occurs from the edges of the towns or through densification. In addition, new built-up areas arise, scattered across the island.

The energy and water demand have tripled. A warmer climate boosts energy use for air-conditioning and water use to service the growing numbers of tourists and inhabitants, and to water gardens. Meanwhile access to fresh-water is increasingly difficult and costly with the drier climate. A few individuals invest in rooftop water harvesting, mainly for watering their own gardens, or growing vegetables on their own private properties.

A handful of small-scale entrepreneurs are growing fresh (leafy) vegetables and fruits, or produce eggs, that are sold to restaurants, hotels and local supermarkets. Technological innovation and private investments increase local energy production from solar and wind, in addition to traditional, fossil fuel based production.

Ongoing urban expansion and thus removal of vegetation, makes it increasingly vulnerable to flooding and soil run-off. Due to erosion and a warmer and dryer climate, the land becomes less and less fit for growing food and the dependency on off-island imports continues. This dependency makes the island exposed to fluctuations in world trade and market prices.



NATURE INCLUSIVE ARUBA

Imagine a future where people and nature live in harmony. Let's take a look at a snapshot of Aruba in 2050, when island policies and cultural changes have encouraged such a harmonious relationship between people and nature.

Similar to the Business as Usual future, global climate change will continue along current trends. Flood and storm damage risks increase. Droughts and average temperature increase. This lowers the amount of water seeping into the soil which causes stress on the natural vegetation. Soil erosion and salinization will also increase.

In contrast to the Business as Usual future, the natural vegetation is stimulated through reforestation, revegetation and mangrove restoration. Natural vegetation can grow and fully develop, including a well-developed rooting system that holds the soil and leaves less bare soil. Coral reefs are being restored and regrowth is boosted as pressures such as pollution and sedimentation have been improved.

Tourism will continue to be the main economic driver. The number of cruise ship stop-overs has reduced, the numbers of flight passengers has stabilized and tourism-related net immigration has phased out. There is a clear shift to high-end (eco)tourism, with primarily expansion in family inns and boutique hotels. The population stabilizes, following the trend of tourism stabilization. With the degrowth in tourism, fewer additional labourers are needed in this sector. Urban expansion is restricted to current designated development areas. In the pathway towards this scenario, urbanization is steered towards more people per square km, with smaller, multiple-story houses on smaller lots, thereby reducing urban sprawl and prohibiting urban encroachment into nature and other land uses. Better public transport takes pressure off the road network. Capacities of the airport and ports remain at current size and do not expand further.

Most energy is produced by both wind and sun. Households and business buildings are equipped to collect rainwater and solar energy from the rooftops. All energy collected is used over the urban electricity grid, and rural areas store energy on site with batteries. This strengthens the island's energy self-sufficiency, and reduces dependence on fuel imports. Water collected from rooftops and into cisterns is used for watering gardens. Where needed, governmental retention basins store cistern surplus water. It therefore reduces the energy needed to desalinize seawater for production of freshwater. Natural waterways are well-managed and drain into dams. All these water capturing measures reduce freshwater- and soil run-off, reducing excessive nutrient enrichment of mangroves, seagrass fields and corals. Natural watercourses are free from man-made obstructions and the zones around them are revegetated to decrease erosion and increase water absorption into the soil.

New construction is limited by first renovating abandoned buildings while preserving their original character. When new construction takes place, these buildings are well-insulated and make optimal use of prevailing wind direction, window blinds and shading by vegetation to create a comfortable indoor climate and limit the need for air-conditioning. For new construction projects the natural vegetation is kept mostly intact; no full clearances take place before construction works begin. Private households invest in rooftop water harvesting, mainly for watering their decorative native plants, but also for growing vegetables on their private properties.

Within urban zones, green pockets are abundant and connected to each other along roads and dry riverbeds. A mix of (fruit-bearing) native trees along roads provide shade for pedestrians and cyclists. Landscaping uses native species that attract insects, amphibians, reptiles and birds. Cut vegetation and pruning are collected and used as compost in farming and gardening. Green pockets are used to grow fruits, nuts and vegetables and are maintained by local residents. They serve as a shaded meeting place for neighbourhood activities.

Vegetable and fruit tree production has become more common with local entrepreneurs, using substrate, aquaponics and hydroponics. Dozens of small-scale entrepreneurs form cooperatives that sell their produce to restaurants, hotels, supermarkets and at weekly fresh markets in the neighbourhoods.

Vegetable waste is used as fodder for goats, pigs and chickens that are kept in fenced ranches. Traditional cunucus produce a mixture of plant and livestock products. Several syntropic farms have been developed, that are maintained by the local communities and serve social cohesion, educational, eco-tourism and food production purposes. Communities and schools also grow food together in local gardens, stimulating the interest in own food production and farming. Such initiatives enhance the awareness of the interchange with nature and contribute to nature-conscious behaviour. Rainwater and grey-water is used for irrigating crops and gardens. Fish is sustainably caught and sold for the Aruban market. This expansion of local food production catalyses a healthier nutrient management system in which fewer nutrients are imported and helps to diversify the economy.

Origin of food

2.000 ha local produce

Site impression

Site impression

Empty cliffs and coast with some beach houses

Number of stay-over tourists

1.050.000 per year

CRUISE SHIP TOURISTS/YEAR

0,8 mln current

0,7 mln projected

STAY OVER TOURISTS/DAY

30.000 current

25.000 projected

BUILT-UP AREA

6.662 ha current

7300 ha projected

POPULATION

107.000 current

130.000 projected

INTERWEAVING NATURE IN ARUBA'S LANDSCAPES – A VISION TOWARDS THE FUTURE

In a nature-inclusive society, the challenges faced by communities are addressed in ways that also benefit nature. To this end, nature inclusive measures are implemented to address these challenges while at the same time expanding natural areas, improving their quality or preventing damage. The types of measures implemented depend on unique landscape characteristics, such as its biophysical, cultural, and aesthetic features. Aruba's landscapes are diverse; they feature arid cacti forests, traditional cunucus, white sandy beaches, rock formations, the high-rise tourist area, traditional villages and many more. Island experts located nature inclusive measures on a map. These measures formed coherent clusters that, when combined with maps of geology, soils, topography, vegetation, spatial plan and historical use, resulted in the landscape map shown on the next page.

For each landscape, local experts have collaboratively crafted an English and Papiamento name, a description and an aspirational vision for the future. These visions show where specific nature-inclusive measures are envisioned to address the unique challenges confronting Aruba. These landscape visions are detailed in the following subsections.

LANDSCAPE MAP OF ARUBA

Each type delineates an area with coherent biophysical, cultural and aesthetic characteristics

SECLUDED COASTAL LAGOON

Mangrove forests have been present for over 7000 years in Aruba. Through time, these mangroves were displaced by more terrestrial tree species due to natural changes in climate, human impacts, or extreme weather events.

At the beginning of the 19th century, many mangrove forests were logged to construct houses and to fuel stoves and lime kilns. Mangroves are now mostly found along parts of the southern coast, in some inlets, lagoons and on reef islands along the southwest shore where they provide coastal protection against waves and currents. Together with seagrass beds and coral reefs, mangroves provide nursery grounds for a range of sea life, positively contributing to fish and crayfish stocks for fishing. These three ecosystems contribute to pollution absorption, nutrient cycling, primary production and carbon storage. Increased sedimentation from upstream erosion chokes the mangroves, hampers the water flow and circulation, and increases the salinity to near toxic levels.

2050 VISION

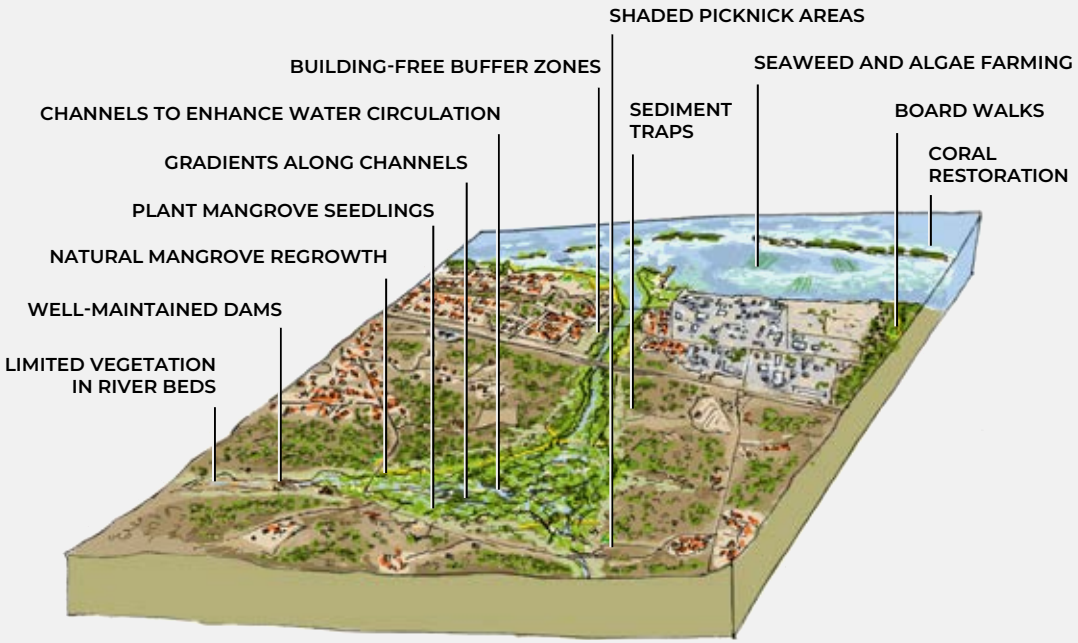
By 2050, it is envisioned that sediment traps have been constructed. Sediment traps prevent soil and dirt to run-off into the mangroves and on to the corals. Natural waterways (such as 'rooi') have been deepened and dams have been constructed to prevent surface runoff and allow the fresh water to drain slowly. Dams have been constructed (or restored) at several locations along each waterway. These dams slow down the throughflow and allow for the infiltration of the water into the soil. In the mangroves, channels have been dug to increase water circulation. The circulation is nowhere blocked by infrastructures. On each side of the channel shallow sloping sides have been excavated at a gradient that allows birds to feed and new mangrove to establish. The tide moves up and down the shallow sides of the excavation providing good conditions for the new mangrove to grow. In places where mangroves were removed over time, seedlings are actively planted to boost regrowth. Within this new forest, shaded picnic areas, boardwalks and bird watching spots have been located.

Coral restoration is established by placing artificial elements, mimicking the structure of natural reefs, boosted by the placement of coral fragments on these artificial structures. The preconditions that can be managed by the island (like pollution and sedimentation, not seawater temperature) have been improved, allowing corals to re-grow. Coral reefs, together with extensive seagrass beds and mangrove forests, protect the land against storms.

Seaweed and algae farming equipment has been installed in low densities in the calm waters between the islets and the coast. Seaweed and algae are grown for the human consumption and the pharmaceutical industry. On the seaward side of the islets, reefs have been restored.

SECLUDED COASTAL LAGOON
CURRENT SITUATION

SECLUDED COASTAL LAGOON
ENVISIONED SITUATION



SAN NICOLAS CULTURAL MELTING POT

In the 19th century, guano was found near Sero Colorado on the south-east coast of Aruba. Guano consists of fossilized accumulated bird droppings from, in this case, sea gulls and terns. Much of this phosphate-containing natural fertilizer was mined, exported from Aruba and traded around the world.

The centre of exportation was San Nicolas, which only consisted of a few fishermen's huts. The exploitation of phosphate led to the development of the settlement of San Nicolas, where a wooden pier was built in the harbour. The exportation continued until 1914. In the course of the years, phosphate exploitation became less profitable. As the phosphate had to be extracted from deeper underground, the quality became poorer.

At the beginning of the twentieth century, after the end of gold and phosphate exploitation, Aruba fell back on agriculture and fishery. Poverty and regularly recurring famine were the order of the day. In 1924, matters changed drastically with the arrival of the island's first oil refinery, near San Nicolas. The refineries provided many jobs and the standard of living increased quickly. In 1986, the outdated and obsolete refinery closed down. It is now a less expensive area of the island to live, where the historical character has been preserved. This can be seen in the typical buildings, nowadays alongside street art (including the murals in San Nicolas) and rum shops. Contrary to what the name suggests, rum shops are not only bars but also meeting places for local residents, where small everyday shopping errands can also be done.

Following the example of the western part of the island, the tourism industry is now developing west from Sero Colorado and south of San Nicolas, close to Baby Beach and Rodgers Beach. This development is however highly contested within Aruban society.

2050 VISION

In 2050, the unique character is prominent in the unique building style and diversity of cultures. Life in San Nicolas is affordable. New construction (and accompanying land clearing) is limited by first renovating abandoned buildings while preserving their original character. Households and neighbourhoods grow their own fruits and vegetables. Schools have green gardens, where pupils learn at an early age to grow and prepare their own food. A small amount of family-owned boutique hotels is scattered in the coastal region.

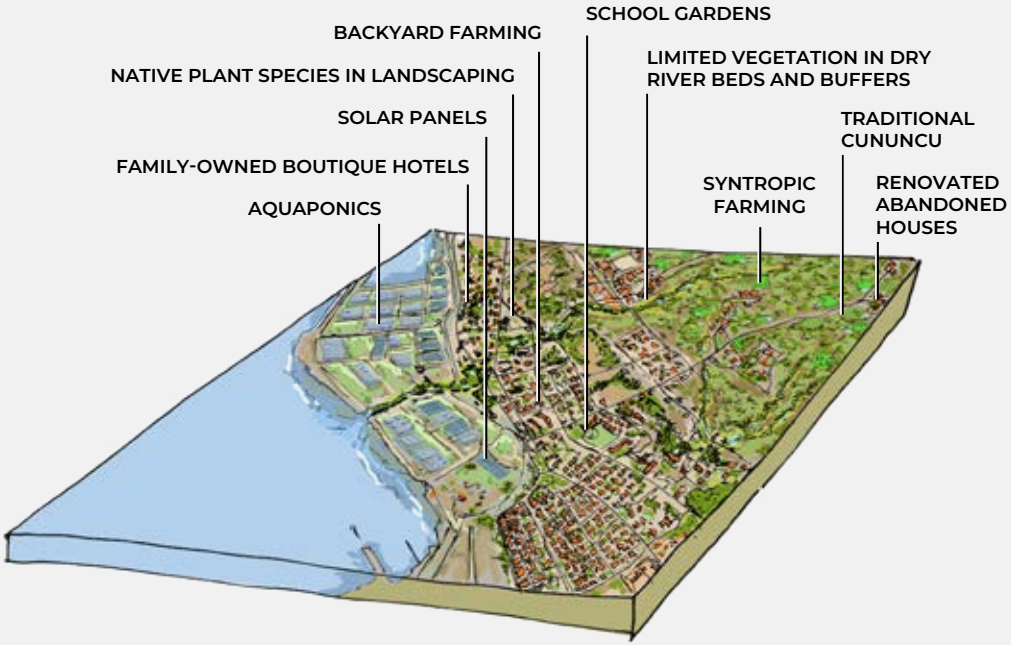
In the hinterland, up against the hills and in the valleys, traditional cunucu can be found where fruits and vegetables are grown, goats are raised and families stay-over for the weekend. Next to the cunucus, there is room for syntropic farming.

After decontamination, parts of the old oil refinery site are in use for food and energy production. Energy is generated through fields of solar panels. Food is grown through aquaponics, which are on tanks above the ground. Aquaponics is a food production system that links raising fish, shrimps or prawns (aquaculture) with cultivating plants in water (hydroponics), by using the excretion of the aquatic animals as fertilizer for the plants.

Native plant species are used for shading and yard fences, and as municipal ornamental landscaping, integrated into urban areas.

SAN NICOLAS CULTURAL MELTING POT
CURRENT SITUATION

SAN NICOLAS CULTURAL MELTING POT
ENVISIONED SITUATION



TRADITIONAL COASTAL TOWNS

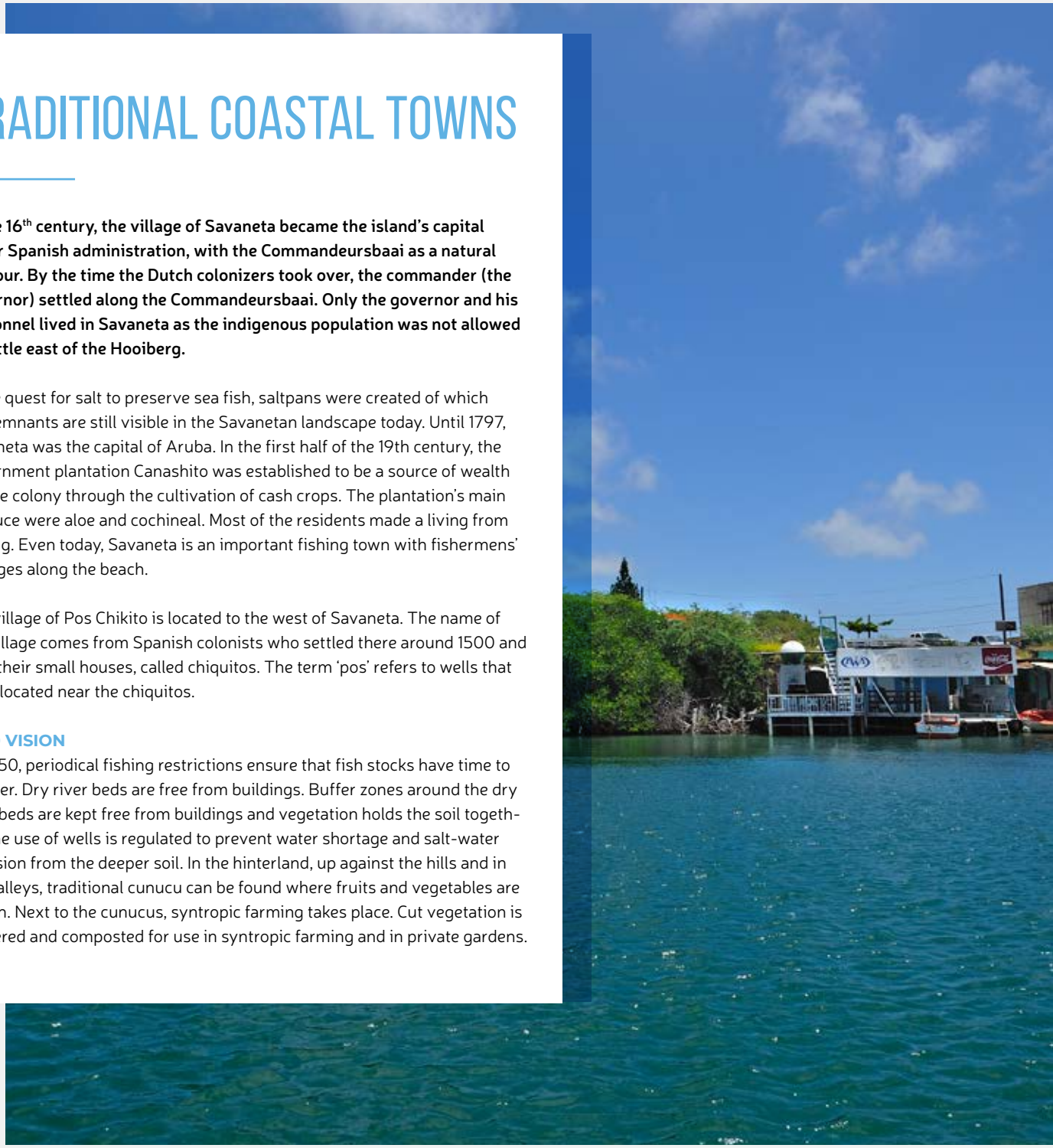
In the 16th century, the village of Savaneta became the island's capital under Spanish administration, with the Commandeursbaai as a natural harbour. By the time the Dutch colonizers took over, the commander (the governor) settled along the Commandeursbaai. Only the governor and his personnel lived in Savaneta as the indigenous population was not allowed to settle east of the Hooiberg.

In the quest for salt to preserve sea fish, saltpans were created of which the remnants are still visible in the Savanetan landscape today. Until 1797, Savaneta was the capital of Aruba. In the first half of the 19th century, the government plantation Canashito was established to be a source of wealth for the colony through the cultivation of cash crops. The plantation's main produce were aloe and cochineal. Most of the residents made a living from fishing. Even today, Savaneta is an important fishing town with fishermens' cottages along the beach.

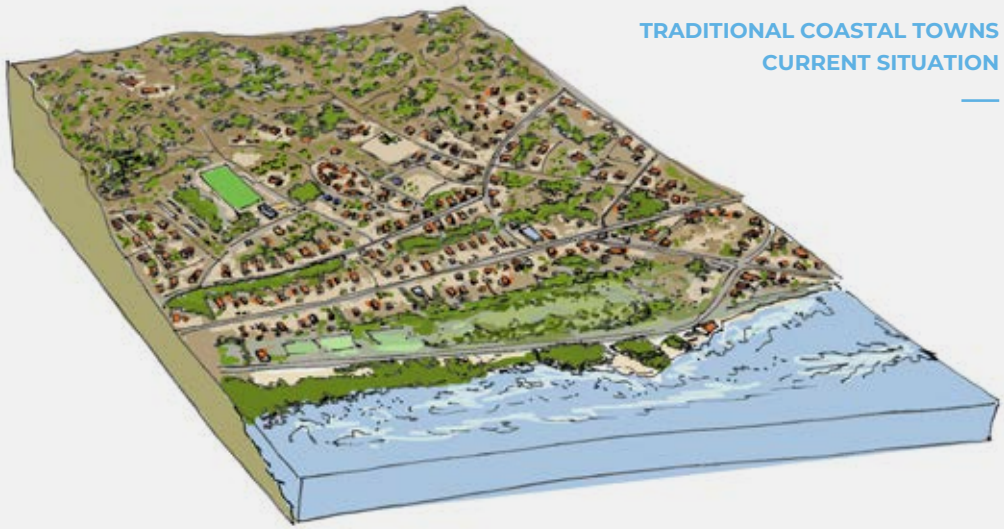
The village of Pos Chikito is located to the west of Savaneta. The name of the village comes from Spanish colonists who settled there around 1500 and built their small houses, called chiquitos. The term 'pos' refers to wells that were located near the chiquitos.

2050 VISION

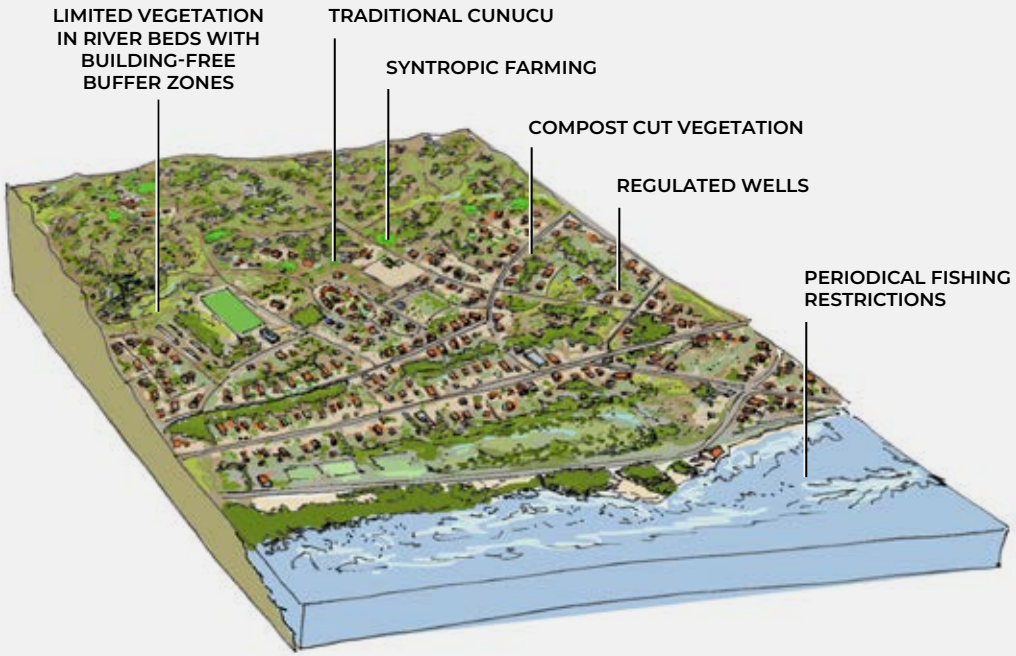
In 2050, periodical fishing restrictions ensure that fish stocks have time to recover. Dry river beds are free from buildings. Buffer zones around the dry river beds are kept free from buildings and vegetation holds the soil together. The use of wells is regulated to prevent water shortage and salt-water intrusion from the deeper soil. In the hinterland, up against the hills and in the valleys, traditional cunucu can be found where fruits and vegetables are grown. Next to the cunucus, syntropic farming takes place. Cut vegetation is gathered and composted for use in syntropic farming and in private gardens.



TRADITIONAL COASTAL TOWNS
CURRENT SITUATION



TRADITIONAL COASTAL TOWNS
ENVISIONED SITUATION



ORANJESTAD URBAN FABRIC

Over the past few centuries, Oranjestad has transformed from a modest trading outpost into a dynamic urban centre. This can be attributed to a combination of factors, particularly its strategic geographical location.

Located on the west coast of Aruba, Oranjestad has a natural harbour, which made Oranjestad a strategic hub for shipping and trade in the region. In the 18th century, the city grew into an important trading post for the Dutch West India Company. Trade in commodities such as aloe and horses brought prosperity to the city and attracted traders and entrepreneurs. As Oranjestad grew, small settlements like the fisherman's village of Rancho became annexed by the city. In the vicinity of Oranjestad the Eagle oil-refinery was developed. A new port was built for the oil industry, and later further expanded for tourism, for which the foreshore was reclaimed from the sea. As a result Rancho no longer had direct access to the beach. Many local fisherman got employment in the refinery and changed their way of life.

From the 1920's till the 1980's, Aruba developed into a hub for the oil refining and petrochemical industries. This led to economic growth and employment opportunities in Oranjestad and the surrounding region. In addition, the city developed a thriving service sector, with banks, business services and trade.

In the 20th century, tourism began to play an important role in the growth of Oranjestad. Aruba's climate and beaches, attracted tourists from all over the world. Oranjestad became a hub for tourism activities and services, with hotels, restaurants, stores and other facilities developed to meet the needs of the growing tourism industry.

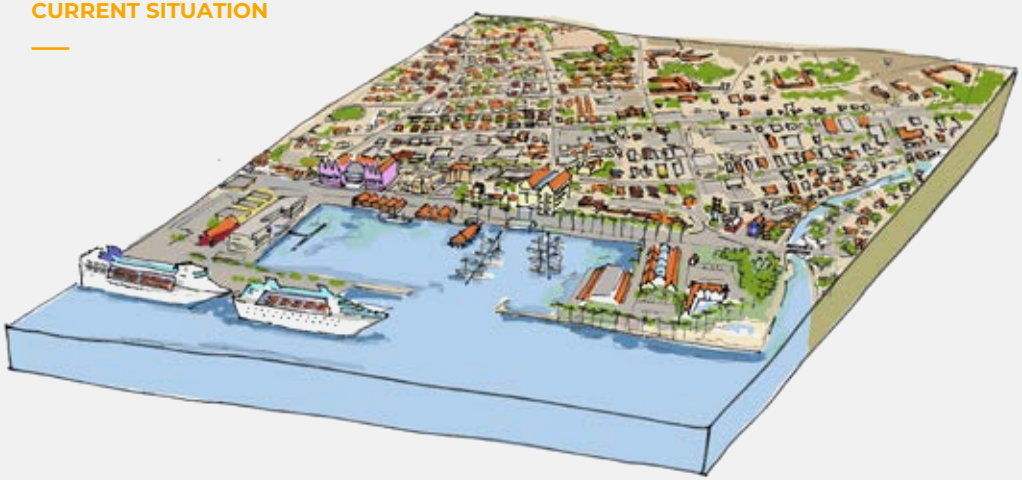
2050 VISION

In 2050, green pockets in Oranjestad that counteract the heat island effect are embraced by Aruban residents and connected to each other along roads and dry riverbeds. A mix of (fruit-bearing) native trees along roads provide shade for pedestrians and cyclists. Landscaping uses native species that support native wildlife, including birds. Cut vegetation is collected and used as compost. Green pockets are used to grow fruits, nuts and vegetables. Some of these are set up as syntropic farms, where they produce food and have an educational function. The green pockets are maintained by local residents. They serve as a shaded meeting place for neighbourhood activities.

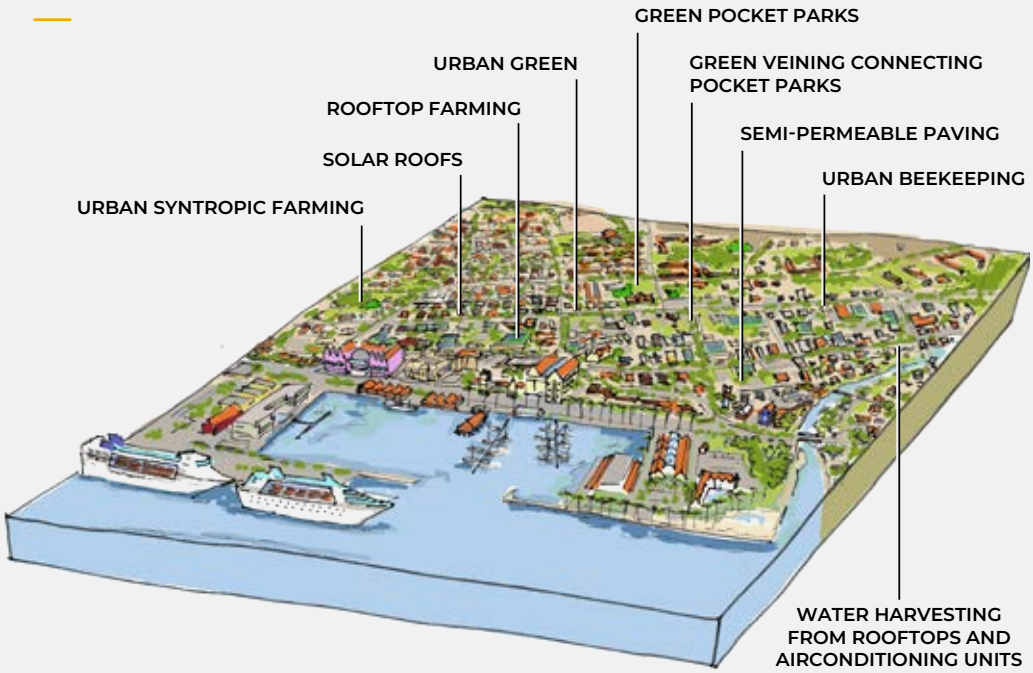
Scattered throughout the city, beekeepers have beehives. The domestic honey bees find their food in the many green landscape elements and do not outcompete the native, wild bees.

Water is collected from roofs and from air conditioners. This water is used to irrigate gardens, parks and green, flourishing road verges. Solar panels are placed on roofs to produce energy. On flat roofs solar panels are placed on poles enabling shaded production of vegetables grown underneath them. Roads and (solar panel-covered) parking lots are constructed from permeable material for the water to infiltrate into the soil.

ORANJESTAD URBAN FABRIC
CURRENT SITUATION



ORANJESTAD URBAN FABRIC
ENVISIONED SITUATION



BOULDER-SCATTERED RURAL MOSAIC

Before the Europeans arrived in Aruba, the Caquetio Indians built small dams to retain the rainwater for growing mainly sweet potato as they did in their South American country of origin. These water fed areas were called 'Conuco'. This was the beginning of what we now know as the cunucu landscape: a mosaic of agricultural fields, pockets of wild nature ('mondi') and hamlets.

2050 VISION

In 2050, stone walls, called 'transhi', that traditionally served as yard boundaries, have been restored. The holes and gaps between the walls' locally quarried diorite stones provide habitat for various invertebrates, reptiles and plants. During heavy rains, the permeable walls slow the passage of water, preventing flooding of farmyards and fields. Living stems of columnar cacti ('trankera') and agave are also used as yard fencing.

To collect water during heavy rains, traditional dams have been repaired. Water quality in the drainage systems is strictly controlled to ensure that water can be used for irrigation of agricultural and horticultural crops.

Higher up the slopes of the hills forests have been planted to promote infiltration of water into the soil. The trees hold the soil together with their roots so that it is not washed away during heavy rains. Native trees were planted that can withstand the dry and hot climate. The forests provide habitat for many local species. In some of these forests, crops are grown in the underbrush, as is common in syntropic farming.

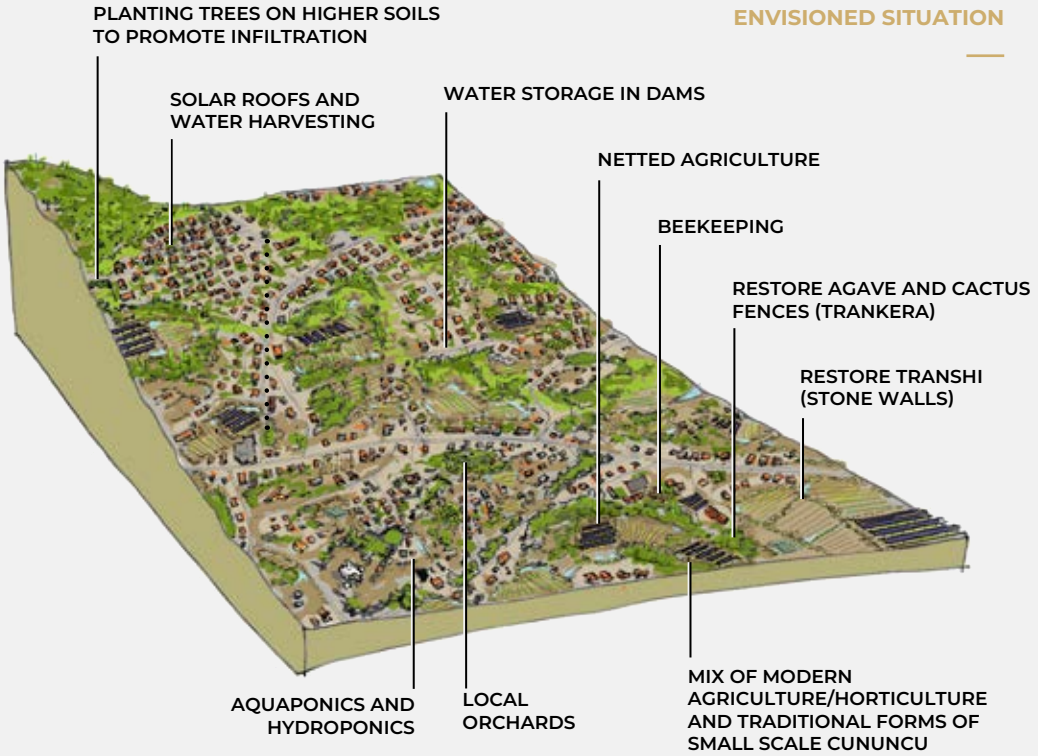
In the rural areas, the best soils are kept free for agriculture. Here we find a mix of modern agriculture and horticulture, cash oil crops (e.g. karpata for castor oil and argan) and small-scale cunucus. The modern farms use water collected from dams and subsidized desalinized seawater. Harm by pests and diseases is reduced by using organic crop protection agents that are without risk for the natural environment. These farms produce leafy vegetables such as beans, fruit, squash and okra, for local households and restaurants. Several of these closed farming systems are placed in unused mining pits. Various forms of agriculture are combined on the traditional cunucu. Local fruit trees such as the kenepa, maca pruim, shimarucu and mispel are used to produce popular juices and jams and provide shade. In this shade, tomatoes, peanut, cucumber and spinach can grow. In addition, goats, pigs, sheep and chickens also roam freely. A lively trade of food and goods between the ABC-islands and Latin American mainland harbours has been re-established. Bees are kept in many places in rural areas for honey, wax and as pollinators. Beekeepers provide regular tours of hives, which are scattered in the wild nature pockets.

Solar panels on the roofs of houses and barns are used to generate energy and to collect rainwater that is used to irrigate crops and gardens.

Marked, unpaved routes for cars, mountain bikers and hikers guide tourists through the cunucu landscape and point out interesting natural and cultural sites for photo safaris.

BOULDER-SCATTERED RURAL MOSAIC
CURRENT SITUATION

BOULDER-SCATTERED RURAL MOSAIC
ENVISIONED SITUATION



SUBURBAN AGGLOMERATE

Since the 1960's, landowners subdivided and sold their once-cultivated lands. Large land parcels were subdivided into smaller residential areas near main roads and economic centers, creating a ribbon-like pattern that marked the first phase of suburbanization.

Initially, pockets of land were left open, but they eventually succumbed to parcelling of previously untouched wild pockets of land. Consequently, the once wild and untamed landscapes, known as 'Mondi,' gradually disappeared, replaced by new construction projects. The former agricultural landscape, or cunucu, underwent a profound transformation into its current suburban state.

While most regions surrounding Oranjestad experienced this metamorphosis, remnants of the wild landscape persist in the island interior. These small, wild patches are recognized for their crucial role as habitat corridors in preserving biodiversity amidst the island's suburban agglomerate.

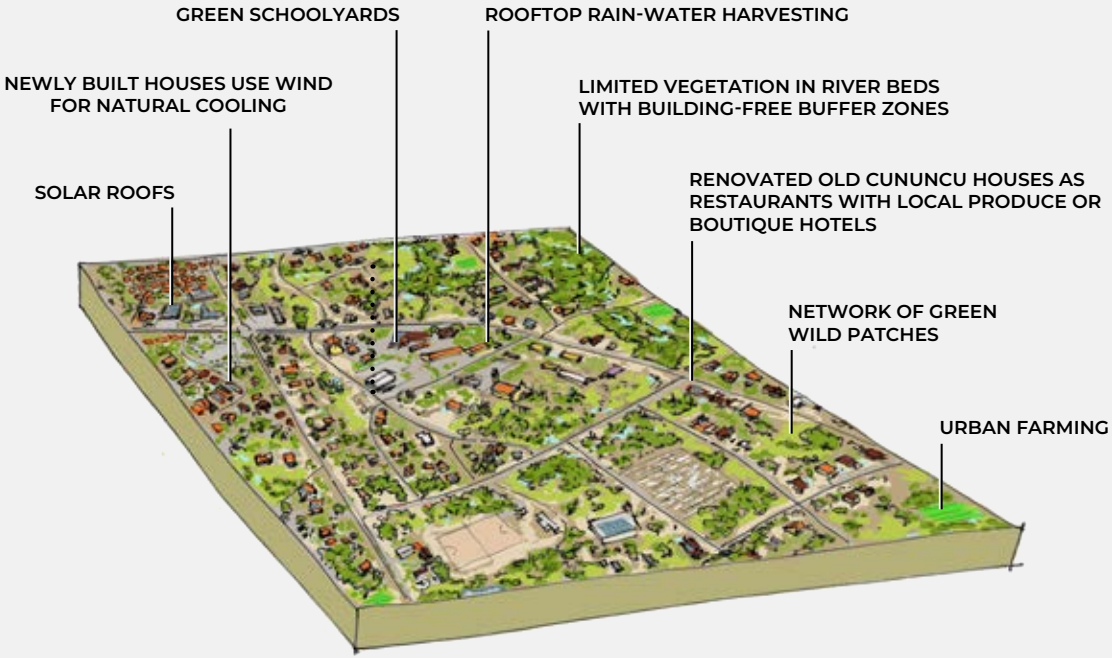
2050 VISION

In 2050, the green pockets are still the core of the green network in the suburban area around Oranjestad. These green pockets provide space for rainwater retention and storage after heavy rainfall. This water is used in this area for urban agriculture. The green pockets are mainly located around the dry riverbeds, which are completely free of buildings. Some previously abandoned cunucu are again in use, for example for syntropic farming. Various old cunucu houses are renovated and converted into family-owned boutique hotels or small-scale restaurants, that serve traditional, home-style dishes made with local produce. Along public roads, native grasses, herbaceous plants and (fruit) trees provide habitat for native wildlife, including pollinators. Every schoolyard has space for growing fruits and vegetables, and raising chickens, which is part of the standard curriculum for primary and secondary school students. Pupils put their acquired knowledge into practice at home, together with their parents. Businesses and individuals have solar panels on their roofs and collect rainwater for their own use. Condensation from air conditioning is also collected.

Repurposing abandoned buildings precedes and limits new construction. New buildings typically feature additional floors and smaller homes, surrounded by green gardens and parks. Houses are well insulated and built to make the best use of the prevailing wind for cooling and ventilation. All houses are connected to the sewage system. The presence of safe biking lanes and affordable public transport reduces residents' use of cars.

SUBURBAN AGGLOMERATE
CURRENT SITUATION

SUBURBAN AGGLOMERATE
ENVISIONED SITUATION



VIBRANT BEACH LIFE AND SALIÑA LACED HINTERLAND

The island's first luxury hotel, the Aruba Caribbean Hotel at Palm Beach was built in 1959. This paved the way for tourism development in Aruba. In a relatively short period, the north-western part of Aruba became a hotspot for tourism and associated businesses.

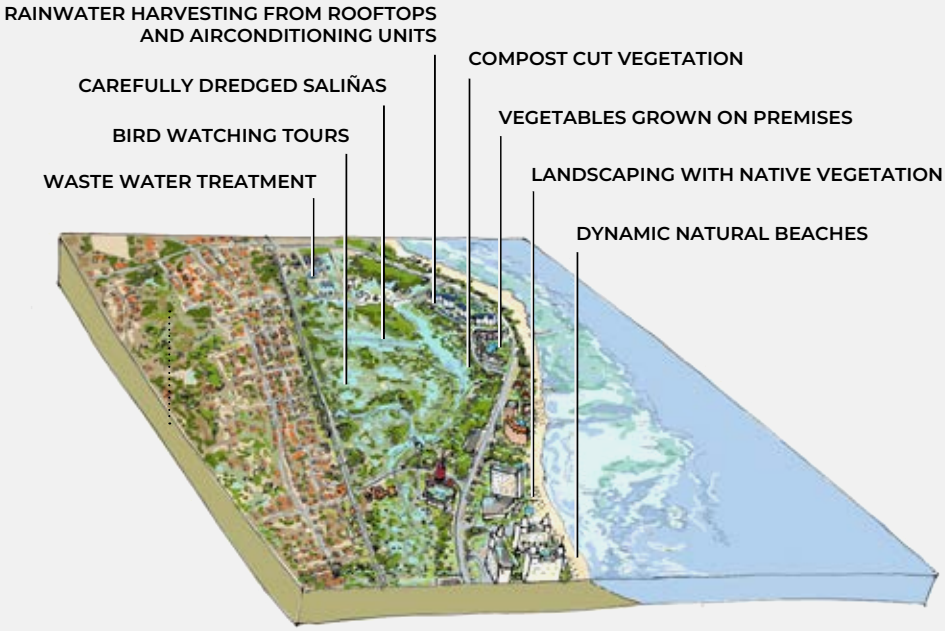
The intensity of tourism in Aruba, measured as hotel rooms per surface area, is among the highest in the Caribbean. Hotel development has primarily focused on the northwest coast, due to its prevailing wind and current, white beaches, blue sea and south westerly aspect where the sun sets in the evening. The hotels are right on the beach. On the landward side of the hotels are four saliñas, Bubali, Palm beach, Cerca and Malmok. Together with salina Druif on the north coast they form the Western Wetlands RAMSAR site (a protected area). As well as being fed by rainwater, Bubali and, to a lesser extent, Palm beach and Druif receive fresh water from a waste water treatment facility and have turned into a man-made semi-permanent fresh or brackish water wetland. Malmok and Cerca are still relatively natural Salinas where the salinity changes from brackish to hypersaline, depending on the season. They are closed off from the sea by remnants of dead corals, and modern infrastructure (roads, buildings) and capture and filter rainwater preventing nutrients and soil from polluting and smothering the coral reefs.

2050 VISION

In 2050, all beaches are dynamic natural sediment deposits with pioneer vegetation. Crabs, seabirds and sea turtles are regular visitors, the latter laying eggs. All wastewater is treated. Clean water is discharged into the saliñas, where it contributes to a rich habitat of healthy mangroves and water birds, and provides a refuge for migratory birds. The saliñas have been regenerated by careful dredging and by management of fringing vegetation to favour mangroves and other native plant species that provide feeding and breeding habitats for a range of insect and bird species. Birdwatching tours through these saliñas are popular tourist activities. Several hotels grow their own leafy vegetables on dedicated floors within the hotel. Hotel gardens are landscaped with native plants, that attract butterflies and birds, which are appreciated by hotel visitors. These gardens are watered by rainwater captured from roofs and by collecting condensation from air conditioners. Cut vegetation is composted and used in farms and gardens elsewhere on the island. In the shallow zone on the northwest coast, seafood is produced in the form of water-purifying mussel aquaculture.

VIBRANT BEACH LIFE AND SALIÑA LACED HINTERLAND
CURRENT SITUATION

VIBRANT BEACH LIFE AND SALIÑA LACED HINTERLAND
ENVISIONED SITUATION



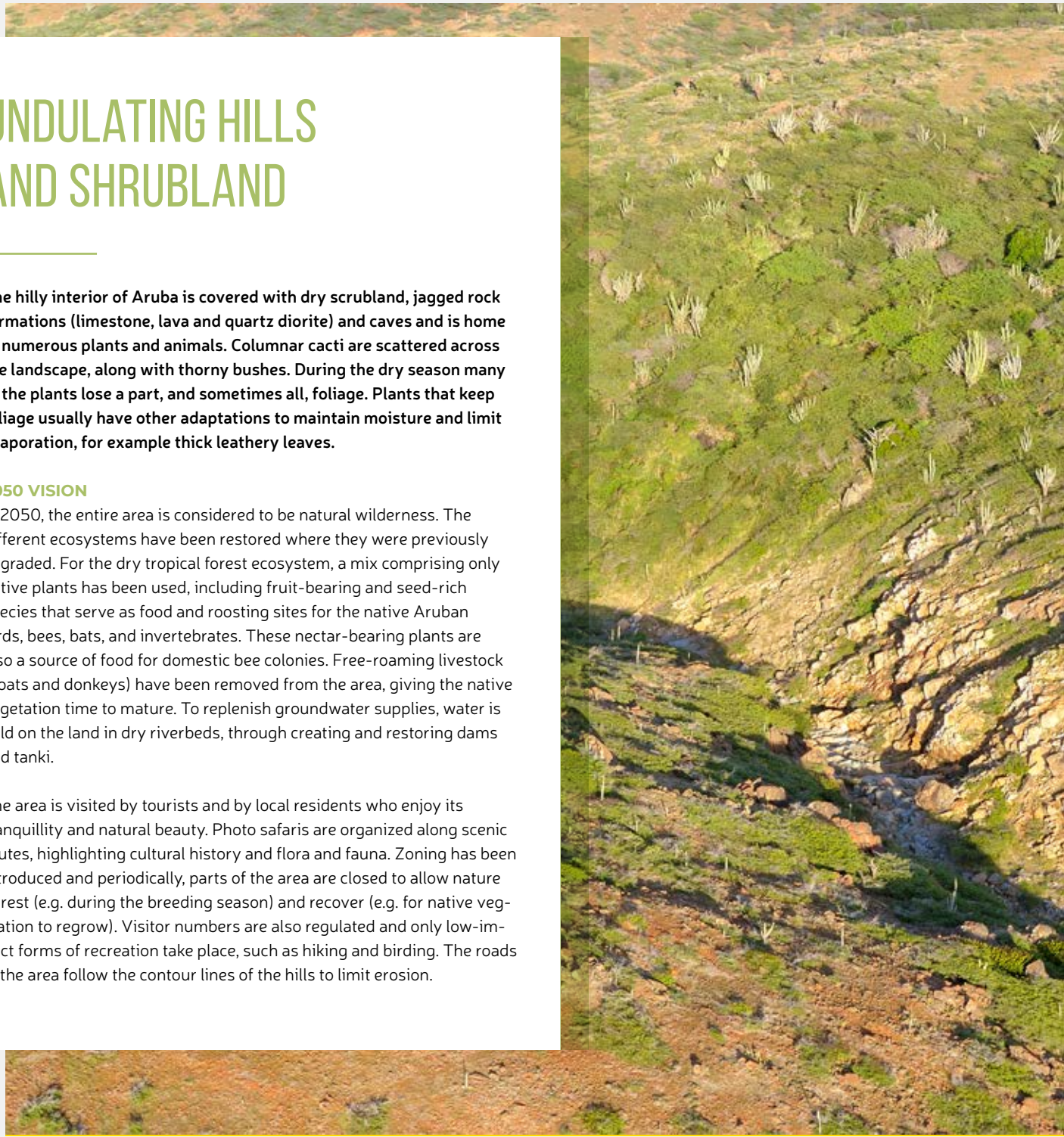
UNDULATING HILLS AND SHRUBLAND

The hilly interior of Aruba is covered with dry scrubland, jagged rock formations (limestone, lava and quartz diorite) and caves and is home to numerous plants and animals. Columnar cacti are scattered across the landscape, along with thorny bushes. During the dry season many of the plants lose a part, and sometimes all, foliage. Plants that keep foliage usually have other adaptations to maintain moisture and limit evaporation, for example thick leathery leaves.

2050 VISION

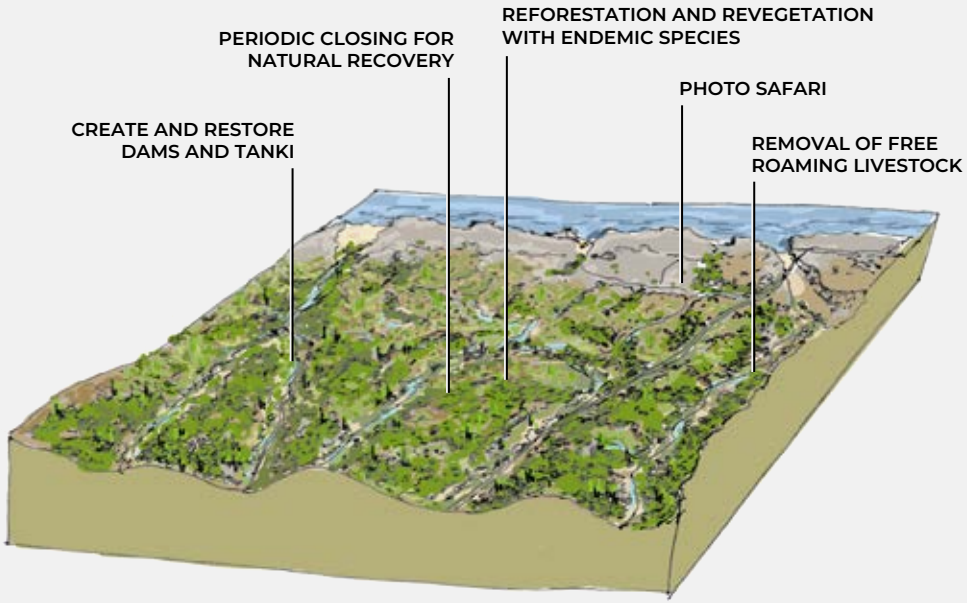
In 2050, the entire area is considered to be natural wilderness. The different ecosystems have been restored where they were previously degraded. For the dry tropical forest ecosystem, a mix comprising only native plants has been used, including fruit-bearing and seed-rich species that serve as food and roosting sites for the native Aruban birds, bees, bats, and invertebrates. These nectar-bearing plants are also a source of food for domestic bee colonies. Free-roaming livestock (goats and donkeys) have been removed from the area, giving the native vegetation time to mature. To replenish groundwater supplies, water is held on the land in dry riverbeds, through creating and restoring dams and tanki.

The area is visited by tourists and by local residents who enjoy its tranquillity and natural beauty. Photo safaris are organized along scenic routes, highlighting cultural history and flora and fauna. Zoning has been introduced and periodically, parts of the area are closed to allow nature to rest (e.g. during the breeding season) and recover (e.g. for native vegetation to regrow). Visitor numbers are also regulated and only low-impact forms of recreation take place, such as hiking and birding. The roads in the area follow the contour lines of the hills to limit erosion.



UNDULATING HILLS AND SHRUBLAND
CURRENT SITUATION

UNDULATING HILLS AND SHRUBLAND
ENVISIONED SITUATION



THE RUGGED SALT SPRAYED COAST

The area running from the north-western tip of Aruba (Sasarawichi) to the south-eastern tip near Sero Colorado, bring up images of a desolate and salt sprayed wasteland. For the Caquetio Indians, the first inhabitants of Aruba, the area housed sacred places, that can still be recognized from pictographs. Bats (both migratory and sedentary) roost and breed in these caves. The coast is characterised by several 'bocas' or small bays, in which dry riverbeds discharge during the rainy season. A storm berm of sand dunes and boulders is located at some distance behind the intertidal splash zone.

At Sasarawichi, very finely eroded coral remains are deposited and formed into rolling sand dunes by the ever-blowing wind. The dunes have a unique vegetation, different from any other place in Aruba. This delicate vegetation holds the fine sand. The dunes are an important habitat for rare species such as the Aruba burrowing owl and the loggerhead sea-turtle. Until recently off-road driving in the north-eastern dunes was a popular leisure activity that resulted in extreme degradation of the dunes. Off-road driving in the dunes and on beaches has been prohibited by law since 1987, and has now been enforced.

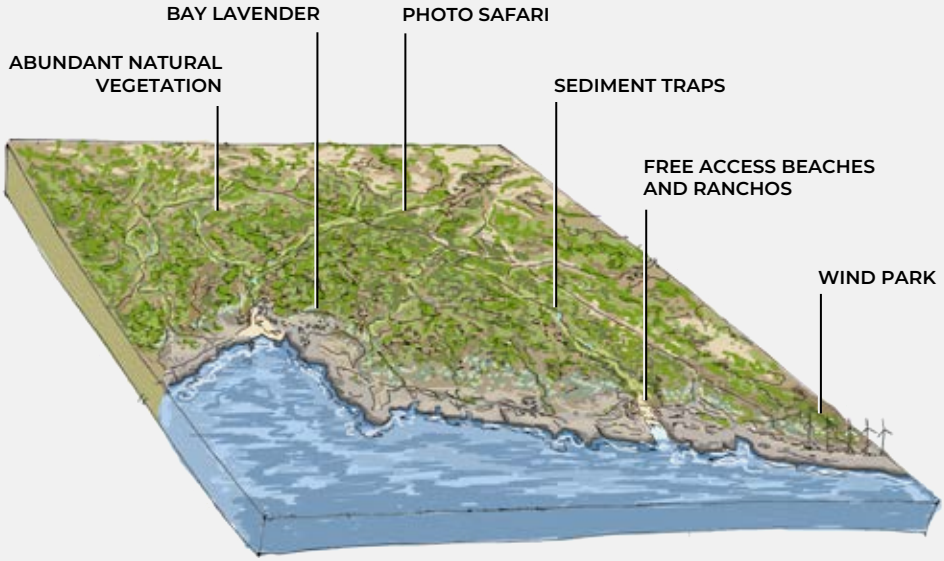
The area around Sero Colorado, crowned by its namesake lighthouse, features a series of beaches and crescent-shaped bays. North of Sero Colorado there are several limestone terraces that run parallel to the coast. The bays are located where dry riverbeds flow from the terraces down into the sea. These places are relatively moist and are often surrounded by dense sea grape vegetation. In one area, of about half a kilometre, there are beach houses (ranchos), where local residents stay with their families on weekends. Typical activities are fishing, barbequing, cooling off and playing in the waves.

2050 VISION

By 2050, much of the natural vegetation has regrown, including the characteristic Bay Lavender. The Crested Bobwhite bird and the Aruba cottontail rabbit are common inhabitants of the dunes, attracting nature lovers that are guided by specially trained guides during photo safaris. Sediment traps capture eroded soil to protect the reef in front of the coast. Wind and solar parks generate a large part of the island's energy. The wind turbines are placed further inland to prevent salt spray damaging the constructions and are located in such a way that they do not hinder migratory bats and birds. The remote character of this coastal area is conserved, and the daily number of tourists visiting the area is limited by law. Beach house owners have free access (as they always had). The tranquility provides an opportunity for seabirds (e.g. terns) and sea turtles to nest and crabs to migrate.

RUGGED SALT SPRAYED COAST
CURRENT SITUATION

RUGGED SALT SPRAYED COAST
ENVISIONED SITUATION



NEXT STEPS

This booklet is meant to inspire and to inform. The two contrasting futures illustrate what is likely to happen if current trends continue, and what might happen if society and nature are in harmony per the wishes of the people of Aruba.

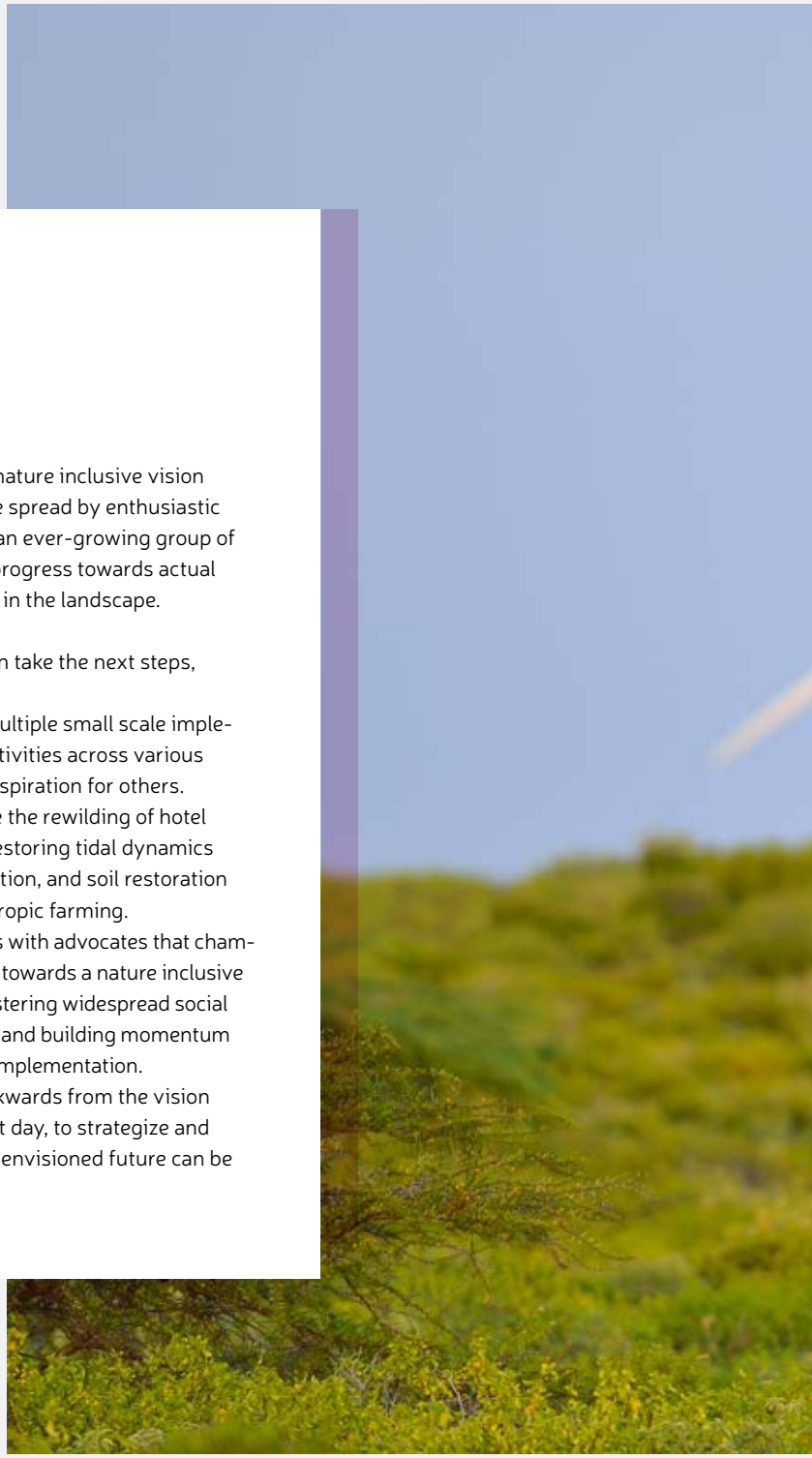
This process revealed a growing community of supporters eager to integrate 'nature inclusiveness' into their activities and initiatives. From concerned citizens, farmers, and academia to politicians; Arubans are greatly engaged with the future of their island. Rightfully so, the island harbors unique ecosystems and species and with the right strategies they can be treasured for generations to come.

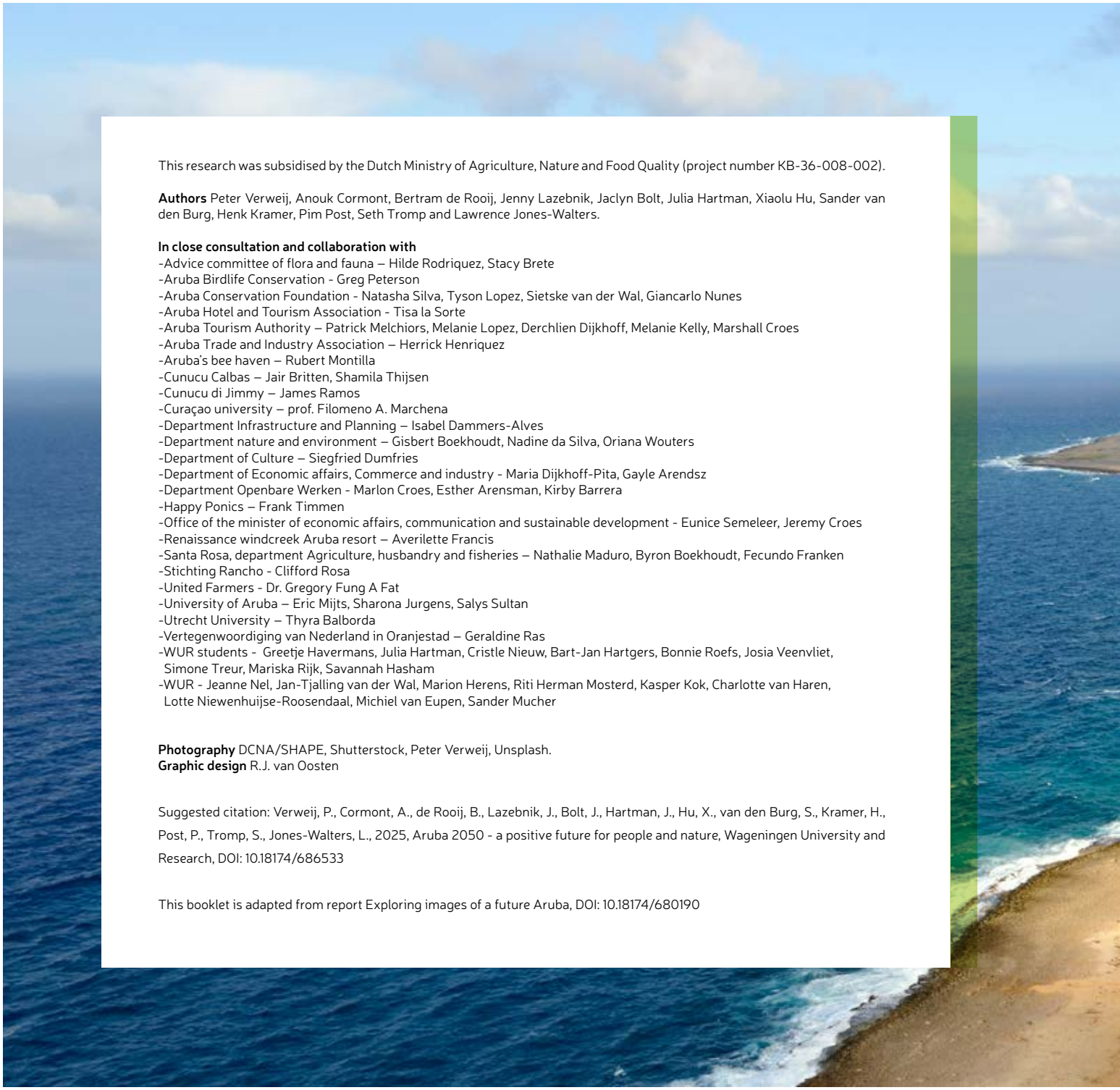
This booklet is designed to help navigate challenges. Together, we have begun a process of foresight that can provoke and motivate the imagination needed to create a profoundly different future, essential for initiating social and political change.

Hopefully, this nature inclusive vision for 2050 will be spread by enthusiastic participants to an ever-growing group of supporters, to progress towards actual visible changes in the landscape.

Together we can take the next steps, starting with:

- Promoting multiple small scale implementation activities across various themes, as inspiration for others. Examples are the rewilding of hotel gardens by restoring tidal dynamics and reforestation, and soil restoration through syntropic farming.
- Joining forces with advocates that champion the shift towards a nature inclusive society by fostering widespread social engagement, and building momentum for effective implementation.
- Working backwards from the vision to the present day, to strategize and plan how the envisioned future can be achieved.





This research was subsidised by the Dutch Ministry of Agriculture, Nature and Food Quality (project number KB-36-008-002).

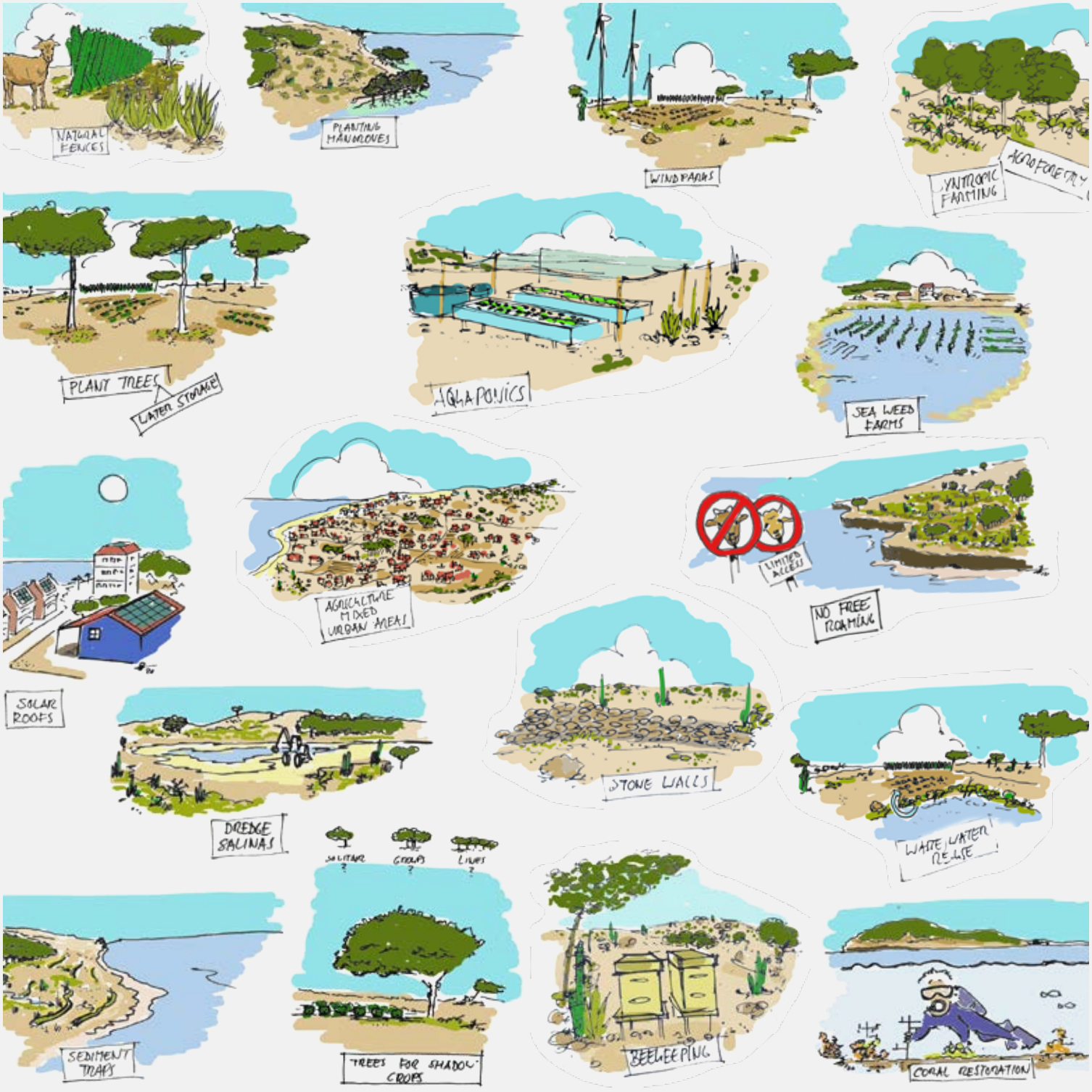
Authors Peter Verweij, Anouk Cormont, Bertram de Rooij, Jenny Lazebnik, Jaclyn Bolt, Julia Hartman, Xiaolu Hu, Sander van den Burg, Henk Kramer, Pim Post, Seth Tromp and Lawrence Jones-Walters.

In close consultation and collaboration with
-Advice committee of flora and fauna – Hilde Rodriquez, Stacy Brete
-Aruba Birdlife Conservation - Greg Peterson
-Aruba Conservation Foundation - Natasha Silva, Tyson Lopez, Sietske van der Wal, Giancarlo Nunes
-Aruba Hotel and Tourism Association - Tisa la Sorte
-Aruba Tourism Authority – Patrick Melchiors, Melanie Lopez, Derchlien Dijkhoff, Melanie Kelly, Marshall Croes
-Aruba Trade and Industry Association – Herrick Henriquez
-Aruba's bee haven – Rubert Montilla
-Cunucu Calbas – Jair Britten, Shamila Thijsen
-Cunucu di Jimmy – James Ramos
-Curaçao university – prof. Filomeno A. Marchena
-Department Infrastructure and Planning – Isabel Dammers-Alves
-Department nature and environment – Gisbert Boekhoudt, Nadine da Silva, Oriana Wouters
-Department of Culture – Siegfried Dumfries
-Department of Economic affairs, Commerce and industry - Maria Dijkhoff-Pita, Gayle Arendsz
-Department Openbare Werken - Marlon Croes, Esther Arensman, Kirby Barrera
-Happy Ponics – Frank Timmen
-Office of the minister of economic affairs, communication and sustainable development - Eunice Semeleer, Jeremy Croes
-Renaissance windcreek Aruba resort – Averilette Francis
-Santa Rosa, department Agriculture, husbandry and fisheries – Nathalie Maduro, Byron Boekhoudt, Fecundo Franken
-Stichting Rancho - Clifford Rosa
-United Farmers - Dr. Gregory Fung A Fat
-University of Aruba – Eric Mijts, Sharona Jurgens, Salys Sultan
-Utrecht University – Thyra Balborda
-Vertegenwoordiging van Nederland in Oranjestad – Geraldine Ras
-WUR students - Greetje Havermans, Julia Hartman, Cristle Nieuw, Bart-Jan Hartgers, Bonnie Roefs, Josia Veenvliet, Simone Treur, Mariska Rijk, Savannah Hasham
-WUR - Jeanne Nel, Jan-Tjalling van der Wal, Marion Herens, Riti Herman Mosterd, Kasper Kok, Charlotte van Haren, Lotte Niewenhuijse-Roosendaal, Michiel van Eupen, Sander Mucher

Photography DCNA/SHAPE, Shutterstock, Peter Verweij, Unsplash.
Graphic design R.J. van Oosten

Suggested citation: Verweij, P., Cormont, A., de Rooij, B., Lazebnik, J., Bolt, J., Hartman, J., Hu, X., van den Burg, S., Kramer, H., Post, P., Tromp, S., Jones-Walters, L., 2025, Aruba 2050 - a positive future for people and nature, Wageningen University and Research, DOI: 10.18174/686533

This booklet is adapted from report Exploring images of a future Aruba, DOI: 10.18174/680190


NATURAL FENCES
PLANTING MANGROVES
WIND FARMS
AGRO FORESTRY
SYNTROPIC FARMING
PLANT TREES
WATER STORAGE
AQUAPONICS
SEA WEED FARMS
SOLAR ROOFS
AGRICULTURE MIXED URBAN AREAS
LIMITED ACCESS
NO FREE ROAMING
DREDGE SALINAS
STONE WALLS
WATER RETENTION
SEDIMENT TRAPS
SOLITAIR
CROPS
LIVES
TREES FOR SHADOW CROPS
BEEKEEPING
CORAL RESTORATION