*Landscape series: 2*

# *The history of resource exploitation in Aruba*


***Fragments from an early maritime map from 1684 with reference of 'Isla Oruba' by J. van Keulen (Publisher/Cartographer) and C. J. Vooght (Cartographer) Source: Dutch Maritime Museum Amsterdam In: www.geheugenvannederland.nl***

*The Aruban landscape has undergone many changes in time. This paper reviews aspects of its resource history and is part of the series: "Spatial Developments in the Aruban Landscape: A multidisciplinary GIS-based approach derived from geologic, historic, economic and housing information"*

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*This paper is part of a series on the Aruban landscape. To bring perspective to current environmental threats and developments we review, in this paper, the history of resource utilization in Aruba. Good knowledge of present but also of past processes is vital to understanding the effects of urbanization and economic progress on land- and marine-ecosystems.*

## *The history of resource exploitation*

The architectural, cultural and political history of Aruba is quite well documented. In the context of this paper we like to recall some of the historic events that strongly relate to the utilization of local resources in the region and that indirectly had a lasting effect on the face of the landscape in Aruba. We review information from, amongst others, Hartog (1953), Versteeg and Ruiz (1995), Alofs and Dalhuisen (1997), Ridderstaat (2007) and Bakker and Klooster (2007) and follow a division into periods as used by the National Archaeological Museum Aruba (NAM, 1999).

Over time, the landscape and vegetation in Aruba changed due to fluctuations in geological and climatic conditions as well as due to the impact of human action. In Figure 1 (pp. 7) we present a schematic overview of the events in the Caribbean that help to understand the influences that Aruba faced during the colonial period and thereafter.

### Preceramic Period
*2500 BC – ca.1000*

Over the years, the Archaeological Museum of Aruba has done extensive research on (pre) historic living in Aruba. Based on stone tool findings, mainland inhabitants are thought to have made occasional visits to the island as far back as 4500 BP[1] (2500 BC). Two cave burial sites and a number of remains of small Amerindian settlements have been discovered in the coastal areas on the limestone terraces. A few stone extraction sites windward in the hilly northeast coastal area are thought to date back from Preceramic Amerindians as well. The piles of shells and artifacts indicate that the Preceramic Amerindians had a mainly marine orientation and lived predominantly from fishery. The location of these settlements along the lower coastal regions is associated with the near availability of freshwater and the location of mangrove forests (the typical habitat for shellfish and other easy to catch marine life) (Versteeg & Ruiz, 1995). Shell midden sites may provide further clues to the daily lives of the natives and the biodiversity at the time but no related studies are known to us. Today mangrove forest can only be found in some inlets and the islets along the southwest coast predominantly.

A palynological study suggests that the landscape and vegetation had changed millennia ago. In older sediment layers proof is found that primordial Aruba likely was covered with a dry tropical forest (Nooren, 2008). Pollen records of a sediment core from Frenchman's Pass list fern spores and an abundance of pollen from the tree species Bursera *simaruba that* is recognized as an indicator species for disturbance[2]. What is more, charcoal deposits have been found as well in these layers. The occurrence of charcoal deposits and ferns and tree pollen within the otherwise Mangrove dominated peat layers, points towards disturbance and probably a more open landscape with deforestation near the lagoon during pre-Columbian times, thus long before the arrival of the Spanish colonialists (Nooren, 2008). The findings confirm the descriptions of slash/burn human activities in the preceramic period. New palynological studies may reveal interesting new facts about the vegetation and climatological circumstances in pre-Columbian time. Interesting to note is that at the Boca Prins lagoon in the northwest littoral zone, the occurrence of pollen from typical littoral Mangrove forests from up to the end of precolonial times switches completely towards pollen from more inland species. This suggests a large-scale erosion of soils in early colonial times, suggestive for a deforestation of woods (Nooren, 2008). A large-scale harvest of woods during Spanish and Dutch colonization follows from the details of early WIC journals (Müller, 1637) and is described in Teenstra (1936 and 1937) and in Hartog (1953).

### Ceramic Period
*ca 1000-1515*

Quite a number of archeological sites have been characterized by the absence of the large heaps of shell-remains and instead are surrounded with an abundance of pottery artifacts (Versteeg & Ruiz, 1995). Accordingly, these sites document the Ceramic period in which already a considerable population of Amerindians inhabited Aruba. Three larger and two medium-sized villages have been discovered with permanent settlement. The majority of sites are located on the higher grounds that are more suited to the needs of agricultural activities at the time. According to the authors, there must have already been some influence on the landscape in terms of subsistence agriculture and deforestation by the Amerindians. This happened long before the Spanish arrived.

### Spanish period
*1515–1636*

During the Spanish colonization, after the killing and deportation of the Caquetio Amerindians as slaves to Hispaniola in 1514 from Curacao (Deive, 1995) and later in 1514 from Aruba (Alofs, 2015), settlement in Aruba other than by Indian laborers, arrivers from the mainland, and a few Spanish settlers was not allowed by the Spanish Crown. In fact, there was not so much interest in the island by Spain other than for geostrategic reasons to secure the waters and trades off the mainland near the capital Coro and present-day Venezuela (Alofs & Dalhuisen, Geschiedenis van de Antillen : Aruba, Bonaire, Curaçao, Saba, Sint Eustatius, Sint Maarten, 1997).
Since the arrival of Spanish colonization and into the 17th century, the landscape in Aruba underwent fundamental changes from the cutting of woods and the grazing by free roaming herds that were introduced by the Spanish (NAM, 1999). The introduction of animal husbandry brought a shift in the ecology (and erosion) of the Aruban landscape. The exploitation of the landscape intensified after the Dutch took control in Curacao in 1634, i.e. not too long after the 12 years' Truce (1609-1621) and the recommencement of the Dutch resistance against the Spanish Crown (Teenstra, 1837).

[1] BP indicates Before Present in 1950.
[2] Reference cited in Nooren, 2008.

*Early salt, wood, cattle and other resources*

In 80 years of war, the Dutch had a lasting resistance against the occupation by the Spanish Crown (1568-1648). Despite this ongoing conflict with Spain, the economy of the Dutch Provinces grew. When the 12 years' Truce ended in 1621, the Dutch intensified their international trade and strengthened their presence in the Caribbean with the institutionalization of the *Dutch West Indian Company* (WIC).

The successful Dutch fishery in the late 16th and early 17th century required a steady supply of salt. Salt was crucial to preserve the dried fish, predominantly herring. Because of a Dynastic Union between Spain and Portugal, however, the Dutch had come into conflict with Portugal and lost their access to important salt resources. Even worse, the high quality Caribbean salt from St.Maarten had become a crucial commodity but this WIC stronghold was also soon lost to the Spanish. The Spanish marauding of the Dutch salt trade was part of the larger conflict and directly affected the expanding Dutch economy. At their turn, the Dutch seized an opportunity with the taking of control of Curacao in 1634 and immediately thereafter of Aruba and Bonaire (which conveniently offered high quality salt resources) (Curaçao Maritime Museum, 2016).

**West-Indian period**
*1636–1792*

In addition to salt, these islands offered another highly valued commodity, dyewood (Gehring & Schiltkamp, 2011). In Europe, only the rich could afford brightly colored cloths made with expensive Oriental dyes, but with the dyewood from the West the production of more affordable dyes to color cloth for the common became possible. While the Spanish had a strong harvest of high quality dyewood, referred to as Logwood, in the Campèche region in Mexico *(*Haematoxylon *campechianum),* the Dutch managed to secure their share in the dyewood industry and invade the Pernambuco region in Northern Brasil, where another dyewood (Caesalpina *echinata*) was harvested by the Portuguese. The high quality Pernambuco dyewood became known as Brazilwood[3]. Later, the wider region including Pernambuco got known as Brazil.

After one hundred years under Spanish rule, first WIC Commander/director Van Walbeeck intended to strengthen his military presence in the Caribbean and intensified the exploitation of the islands' resources. Local woods, such as *Stockvishout*[4] *and ironwood*[5] were harvested and exported to Europe. Van Walbeeck destined Curacao as the administration and military outpost, while its land was developed for agriculture. Bonaire was particularly suited for salt exploit and, like Curacao, had forests that could be harvested for wood. Aruba was the least promising for suitable resources and destined to raise livestock, such as cattle, goats, pigs, sheep and horses that could be left to roam freely. Interestingly, upon first arrival, Van Walbeeck describes Curacao as covered with forests. He notes that although the Spanish already had logged some quantities of 'Stockvishout', apparently there was easy regrowth and still plenty available (Teenstra, 1836).

Unfortunately, no detailed description of the landscape of Aruba of that time is available. So we have no knowledge how Aruba must have looked like when the Dutch first arrived. We do know that the Spanish had already released some herds in Aruba and that they harvested coppiced wood from present low forests (Versteeg and Ruiz, 1995, pp 60). During those Spanish years, Aruba remained in relative quiet isolation. This situation didn't change much during WIC I.

Later, when the WIC II gained control over the islands, Indians were given protection. Indians could attain a tax-free piece of land that they were allowed to cultivate in return for some services to the WIC (referenced in Hartog, 1953).

The logging of wood, in particular Stockvishout, continued over two hundred years, far into the 19th century, with the peak in export in the late 17th century. It was not before the piracy in the region settled down in the middle of the 18th century, when Aruba again became safe for inhabitation by settlers. Privileged settlers moved from Curacao and were allowed to run trade (with Europe and with the Guajira Peninsula in Northeast Colombia and the Venezuelan mainland) directly from the Aruban territory (Kelly, 2012).

At the end of the 18th century, during the years of the global trade crisis, the WIC II dissolved as it got into financial troubles. When, in 1792, the WIC lost the rights of rule in the region, Aruba came under rule of the '*Republic of the Seven United Netherlands'*. One year later, however, the Republic came into war with France and ten years later into war with England, so there was little means to protect the islands from the occasional raiding by rival ships. Opportunistically, the small and distant Aruba went under control by the flag that happened to anchor in the harbor. In the early 19th century, Aruba came twice under English control, from 1801-1803 and 1806-1816. After that time, Aruba was left in struggle as the English caused severe damage and had taken all the cattle and piles of stocked woods (Hartog, 1953). The new settlers from European

**Colonial period**
*1792–19th*

[3] Antillean dyewood [Haematoxylum *brasiletto*] from Aruba, Bonaire and Curacao was named by early Dutch as 'Stockvishout'. Alternative names such as 'Braziel', 'Brasia', 'Brasil, or 'Brazielhout' are practiced as well and translate to 'Brasilwood' or 'Brazilwood', but refer to a more common naming for red dyewoods based on the Latin name 'brasa' for ember, like the glowing coal or wood in a fireplace, in reference to the reddish color of the wood. Today, the English name 'Brazilwood' is reserved to refer to the famous Pernambuco wood ['Caesalpinia *echinata'*].

[4] Antillean dyewood 'Stockvishout' [Haematoxylon *brasiletto*] is listed in the Amsterdam tax inventory in 1667 (Brugmans, 1898) separate to dyewoods, such as 'Brazilienhout' and 'Campechi'. Also in the WIC journals, Stockvishout and Campeshi are categorized next to each other in a single ship log (Müller, 1637). Thus the names are probably not used alternatively for the same tree species. Interestingly, in an extract of the WIC ship log of the arrival of Van Walbeeck in Curacao, in 1634, already mention is made of the local dyewood named 'Stockvishout' (Teenstra, 1837). The name Stockvishout may be a reference to the common practice to dry fish, typically "kabeljauw" or Atlantic Cod (Gadus *morhua*) on a wooden frame of sticks. In Dutch a wooden stick translates to "stok" and the fish ("vis") thus dried may be named "Stokvis" or translated in older Dutch "Stokvisch" or "Stockvis". The question "Why the wood that was harvested by the Dutch was called 'Stockvishout' in reference to a practice to dry fish and not in reference to its actual use as a dye-wood?" remains yet unanswered, however.

[5] Ironwood (Guaiacum *officinales*) was mainly used for construction and was named after its hard and dense properties. The wood is locally called Wayaca and '*Pokhout'* in Dutch or 'Lignum *vitae'* in English, in reference to its medicinal qualities for the treatment of the *Great Pox disease* (in Dutch called '*Pokken'*).

origin depended on *small-scale agriculture, fishery* and the *herding* of *cattle,* like the Amerindians had done under Spanish and first WIC rule. The logging of wood continued while the trade with the South American mainland offered some additional economic income (Teenstra, 1837).

We mention some exploitations of resource in 19th century and onwards that had a substantial bearing on the landscape in more detail.

1820 *Lime*

In Aruba, similar to in Curacao, Mangrove forests along the coast were logged to construct commoners' houses and to fuel stoves and lime kilns (Versteeg & Ruiz, 1995). In the early 19th century, lime was a modest export commodity and locally used in construction, until well into the 20th century. *Limestone* is a sedimentary rock composed of *calcium carbonate* skeletal from marine coral that after burning (calcination) turns into a reactive product calcium oxide (*quicklime*) and carbon dioxide. When neutralized with water it becomes *slaked lime*. Lime has many usages.

1824 *Gold*

Gold was incidentally found in 1824. Local farmers and fisherman all went to search for the alluvial gold, but the actual digging in the quartz veins of diorite rocks became a prominent economic activity only some years later. Several consecutive attempts have been undertaken under different concession ownerships to make gold exploitation profitable but most failed (Ridderstaat, 2007).
Initially, gold was extracted with little invasive techniques but at the turn of the century a new technique was introduced to distract the gold from the quartz. The process of suspending the crushed ore in a cyanide solution eased the extraction whereas the load to the environment was then yet little understood (Morin & Hutt, 1998).
Quartz was transported with donkeys to Balashi and along a small tramline from the Miralamar mine. Between the gold factory in Bushiribana and Oranjestad a road was constructed with the intention to ease transportation of the heavy machinery that was required for the gold extraction. Also for this purpose, a new pier was built in Oranjestad (Ridderstaat, 2007). The exploitation of gold lasted about a century, into World War I.

1840 *Aloe*

Initiatives to stimulate settlement and agricultural production inland started in about 1830 in the area of Canashito and in 1852 in what is now called St. Cruz and Savaneta. Crop farming and fruit- and seed bearing trees were successful on terrains that were about 2 ha in size.
In the meantime, Aloe (Aloe *barbadensis* or Aloe *vera*) was introduced (1840) on the terrains of former cochineal breeding (Ridderstaat, 2007) and soon became the main product of export in the late 19th century. *Aloe cultivation was* situated predominantly in the southwest coastal areas, and in particular, on the limestone terraces[6]. The map that was made by Werbata–Jonckheer in the period 1909-1911 provides a detailed account of the topography and extent of the Aloe fields in the Aruban countryside (Werbata, 1913).
It is worth to mention that in the first half of 19th century and onwards a number of efforts had been made to improve subsistence level and gain extra income from the export or the exploitation or alternative more drought-resistant cultivars.

The breeding of *Cochineal mites* (Dactylopius *coccus*) on Opuntia specs in Aruba in 1831 was such a government initiative. The successful production of a carmine-red dye, from the contents of the dried and crushed mites, had existed for thousands of years already in other parts of the world. But the production was discontinued in Aruba in 1869 as the export suffered from direct competition and the production of artificial colors elsewhere (Ridderstaat, 2007).
Ridderstaat (2007) also recollects the initiative to export *seedpods from Divi-Divi trees* (Caesalpinia *coriaria*) for the European tanning industry that lasted for almost a century (1840-1935). The harvest of these pods was mostly a family undertaking and meant some extra income. But the export has never been substantial.

1874 *Phosphate*

During the last half of the gold digging era, the profits from gold were surpassed by the much more profitable *phosphate* production (1879-1914). Phosphatized limestone layers from guano droppings had been found at the southern coastal strip in Aruba. The deposits were from large colonies of seafowl that foraged in the surrounding rich waters during late Pleistocene some 1.8 Mio years ago (Stienstra, 1985). A pier in the bay of San Nicolas was constructed to import the machinery for its exploitation. Also a small rail track was built to transport the phosphate from the mine in Seroe Colorado to the harbor (Ridderstaat, 2007). Similar to the decline of gold extraction and Aloe production at about the start of World War I (1915) the production of Aruban phosphate was outcompeted by more profitable production elsewhere in the world (i.e. an easier supply of raw materials during the war) and the competition from the higher wages in the oil industry (Ridderstaat, 2007).

At the 1883 World Trade exhibition in Amsterdam (Eeden, 1884), hardwoods like *Pokhout* [Guaiacum *officinales*], *Kibrahacha* [Bignonia *stans*] and *Divi-Divi* [Caesalpinia *coriaria*] were slightly represented and no account was made of *Stockvishout* [Haematoxylum *brasiletto*] at all. The logging of dyewood had already been slow since the mid-1800 and probably had ceased completely in 1883. There was a display of Aruban handcrafting and twining basketry for which *Mangrove twines and roots* were used.
After over three hundred years of grazing the landscape and harvest of dyewood and other local hardwoods, the landscape in Aruba will have changed dramatically at the turn of the 19th into the 20th century. The landscape was ready for the next phase in resource exploitation.

1911 *Agriculture*

In the early 20th century, agricultural activities already covered nearly the whole central part in Aruba, i.e. most of the quartz-diorite based Batholith landscape (De Busonjé, 1974). In another paper of this series on the Aruban Landscape (Derix, 2016d) we describe the very detailed

[6] Based on a preference for calcareous soils it is quite probable that the dye-woods [Haematoxylum *brasiletto*] that had been harvested in the decennia before may have covered the limestone terraces in particular.

topological map from that time, the Werbata map[7], in more detail (Werbata, 1913). 'Forests', however, could not be discerned on the map. It is obvious that after the continuing harvest of woods for export, construction and to fuel the furnaces of the lime kilns and phosphate ovens, most of the local trees had gone with only sparse patches beside the agriculturally developed land (locally called *Cunucu*).
Already in 19th century descriptions (Teenstra, 1837), the Aruban countryside, in particular along the West coast, was characterized by its large open panoramas. The topological map of Werbata in early 20th century shows a predominantly agricultural land with fencings from locally available materials such as small rocks of diorite stone (locally called *tranchi*) or from the stems of columnar cacti (locally called *trankera*). Wireframe was used as well. Today, only few tranchi and trankera fences still exist and mostly only for their ornamental or cultural value in memorization of the former *Cunucu* landscape.

1924

### *Fuel oil*

After World War I there was an increase in the demand for fuel, worldwide. With the discovery of new oil fields in nearby Venezuela, refining facilities were also built in Curacao and in Aruba. A spread of supply of oil refining products in the region was desirable for strategic and geopolitical reasons. The development of the oil refining industry undeniable launched the economy and welfare in Aruba. The establishment of the first *Oil refinery* was in 1924 in San Nicolas. It was run by the Canadian *Lago Petroleum Corporation* (Later: Lago Oil and Transport Company). At about the same time, in 1928, the *Arend* Oil refinery became operational by Dutch Shell and was situated at the Eagle Beach near Oranjestad. Both refineries processed crude oil from Venezuela and sold the refined products to the United States, respectively, the Netherlands. The industry boomed, in particular during WWI, and attracted many foreign workers as well as propelled local financial and facilitating business activities (Ridderstaat, 2007). The refinery had become Aruba's main economic pillar but fierce competition at the world market for fuel forced the Arend oil company to close its gates in 1953. At about the same time, the Lago Oil and Transport Company introduced new automated systems and technologies to lower for instance the costs in labor and personnel. At the end, in 1984, the Lago was equally forced to close its gates, causing an economic slowdown in Aruba. After years of uncertainty, the close downed refinery was sold in 1991 to Coastal Oil and reopened. In just over one decennium later, in 2004, the refinery was sold again. The new owner, Valero Oil Company, however, closed its gates in 2009.

The development of an oil refinery and transshipment station and the many storage tanks had brought devastating changes to the environment and coastal landscape that was until then still barely touched (besides by the gold and phosphate shipping activities). The impact from the oil refinery on the environment is poorly documented, partly because environmental awareness was not commonplace during the first half of 20th century. Contamination near the coast, however, had severe consequences for the marine environment (Bak, 1987). We will review some of the direct and indirect pollutive actions in and above ground. The information listed below is from a book on the oil refinery activities of the Lago Company (Ridderstaat, 2007) as well as from a study report to exploit natural water resources in Aruba (Finkel & Finkel, 1975).

A direct impact from the oil industry on the surrounding landscape is from leakage and dump sites above as well as below ground (Ridderstaat, 2007). During the transshipment activities in WWII, millions of barrels of oil leaked into the soil. Pits that had been originally dug for the exploitation of caliche[8] were used as easy dump sites for rubble and oily waste, heavy metals, sulphur and all other kinds of toxic waste. At a time during the war when fuel production was at its peak, pitches in the area along the southern coastline (Grapefield) were used to temporarily store tar residual. After the war, the tar was used for the production of briquettes but some open air tar pitches remained for years in the limestone landscape. Similarly, giant heaps of sulfur residual were stored in the open, near the coast, and were continuously taken by the wind and blown into the sea. The pollution of coastal waters lasted decennia.

The environment was affected in other ways as well. There was destruction of the coral reefs of the San Nicolaas Bay to gain better access for the large tankers to the oil terminals, and, there was a more intense exploitation of fresh water from local wells to meet the water requirements for the upcoming oil industry. Initial over-pumping had caused a drastic increase in salinity levels in many dug wells[9] (Finkel & Finkel, 1975). Closest to the coast, at the limestone rocks, the pumping of natural water from the wells was done with care, to prevent an up-welling of sea water. Already, it was practice to skim the water in between periods of rest, such that the well had time to recover, but the demand for freshwater was growing. To meet the requirements, a long skimming tunnel[10] was constructed. The tunnel still exists today.

In his book on the flora and fauna Freylinck described the countryside in the middle of last century as barren and almost without vegetation (Freylinck, 1950). At the time, much of the former agricultural land had already wildered and eroded. There had been periods of drought. Moreover, many farmers had gone to work in the oil refinery and had left their land abandoned. Goats were free to roam and graze the remaining vegetation. It is hard to say whether the salinization of the groundwater may also have had part in the change in the landscape. Causes and effects are hard to disentangle afterwards.

[7] Werbata (in Aruba represented by his student W. A. Jonckheer) had produced for the first time in history, an accurate topography of the landscape in Aruba over the period from 1909-1911 (Krogt, 2006)

[8] Caliche is an accumulation and deposition of minerals and carbonates that have leached from the upper into deeper soil layers.

[9] Wells in the island interior, at some distance from the coast, derived their water from aquifers in the crystalline rock and were less susceptible to salinization by over-pumping. The salinity freshwater levels of most of these wells' were however considered too high for long-term irrigation and agricultural use.

[10] www.lago-colony.com. Keyword: "Mangel Cora wells"

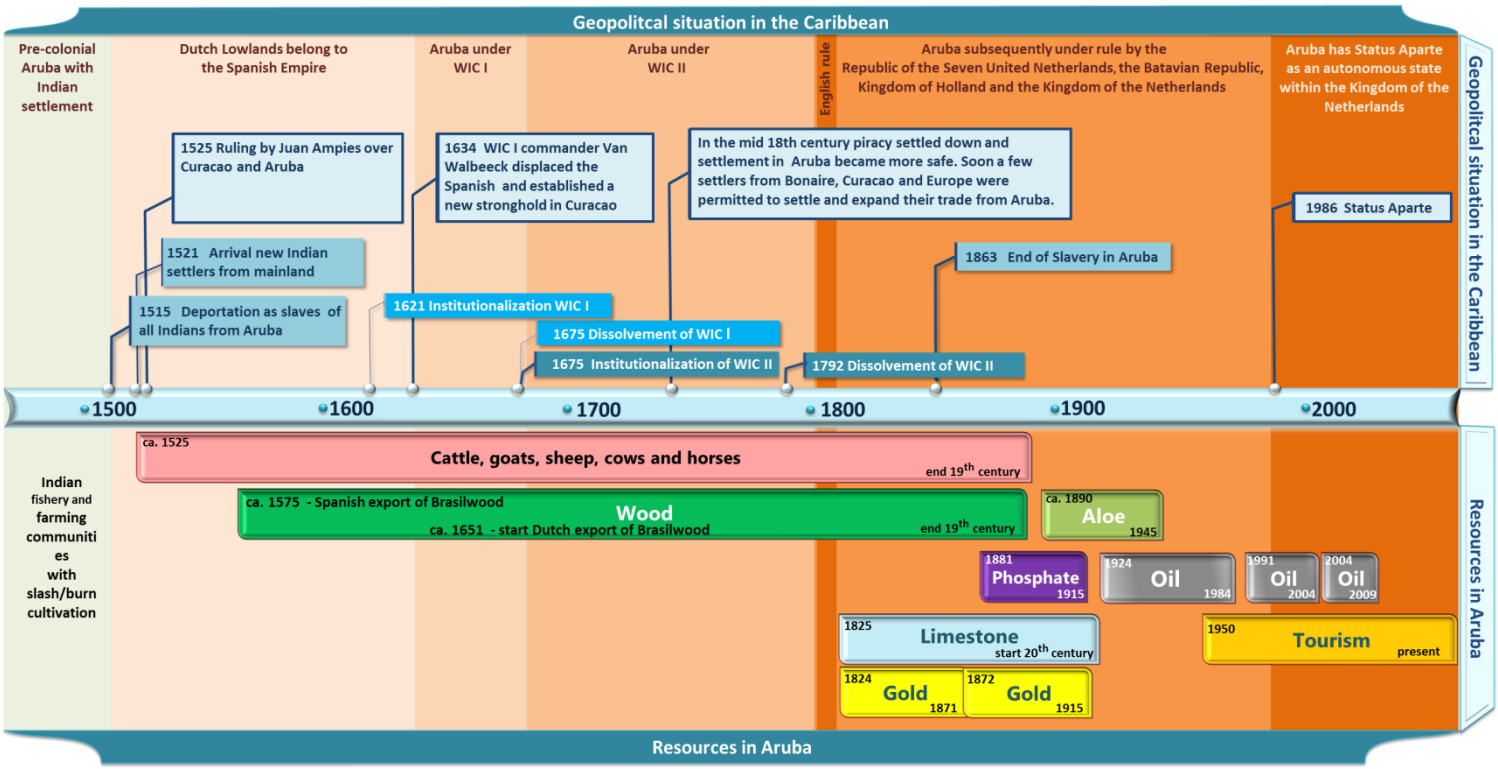
1960

*Tourism*

Not too long after WW II, in the early 1960s the *tourism* industry and alongside with it a strong financial sector offered the opportunity for a next impetus in the growth of the economy. The clear coastal waters, sandy beaches and the pristine natural scenery in the coastal region in the Northwest in particular, shaped a sound basis for continued attraction by tourists. Even so, the development of the tourism industry also brought major changes in the same the landscape.

In particular in the region Noord, housing and land development increased drastically. The hotels at the coast did not only provide work but also propelled the establishment of commercial and recreational centers. Like the refinery had played an important economic role in leveraging the labor market, the tourism and facilitation industry similarly proved to be a strong economic pillar for the years to come. Today, the island economy depends almost exclusively on visiting tourists, which in turn, puts high responsibility to maintain a healthy coastal ecosystem.

*Figure 1 Time line representation to show the history of natural resource utilization in Aruba in perspective with relevant geopolitical events*



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