

# JOURNAL OF INTERDISCIPLINARY HISTORY OF IDEAS



2022

Volume 11 Issue 22

Item 14

– Section 2: Articles –

## Transformation and Persistence of the Basin-Valley of Mexico in the 16<sup>th</sup> and 17<sup>th</sup> Centuries

by

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## JJHI 2022

Volume 11 Issue 22

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# Transformation and Persistence of the Basin-Valley of Mexico in the 16<sup>th</sup> and 17<sup>th</sup> Centuries

Omar Rodríguez Camarena \*

*In order to contribute to the debate on the origins of Anthropocene, this paper analyzes the transformations of the Basin-Valley of Mexico during the 16<sup>th</sup> and 17<sup>th</sup> centuries as an early instance of the changes produced in the Anthropocene period. More specifically, this case is studied as an example of the impact of the Iberian colonization of the Americas on local environments by focusing on the geo-hydrological alterations caused by natural and cultural innovations introduced by the Europeans into the basin. It shows how the confrontation between different ways of living and understanding the city, the lakes, and their relationship originated different proposals for water management. Transforming the basin into a valley was close to geological process rather than a mere outcome of political decisions; therefore, this occurred much slowly than the urban elites intended. While this was a problem for the city, it allowed the indigenous way of life, linked to the lakes, to persist and continue for a longer period of time.*

In those ships were all the seeds of herbs, plants and animals that we use the most, so that in that strange land they could multiply... Columbus then, with many other men of authority—who followed him eager to see the great novelties that he in Spain had told—, left Spain the year after the first navigation to mix the world and give those strange lands the shape of ours.  
Fernán Pérez de Oliva, *Historia de la Invención de las Indias*.

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## 1. The Anthropocene and the colonization of the Basin-Valley of Mexico

The starting date of the Anthropocene remains a controversial issue. Initially it was seen as a process initiated by the industrial revolution. However, recent studies have placed its origin earlier. For instance, some scholars have claimed that the emergence of humans as geological agents dates back to early modernity (Asmussen and Omodeo 2020, 364); while others have argued that the European colonization of the Americas shall be seen as the starting point of the Anthropocene era.

Clearly, the European expansion bore major consequences not only for societies, but also for natural environments. The ‘Old’ and the ‘New World’ had not only different cultures but also, so to say, different natures; so, the interchange of plants, animals, and viruses, also known as the ‘Columbian exchange’, had a great impact on their respective ecosystems. Crosby affirms that the introduction of European biota in the Americas “was probably the greatest biological revolution (...) since the end of the Pleistocene” (Crosby 2003, 66). The rapid proliferation of animals of European origin in the American islands and later in the Continent is well documented (Fernandez de Oviedo 1851, 399-400). Mainly commenting on the case of 17<sup>th</sup> century New England, Merchant (1987, 265) speaks of a “colonial ecological revolution”.

The most dramatic impact on the native population was due to the introduction of foreign pathogens. Lewis and Maslin have also linked the catastrophic decline of about 9/10 of the population of the American continent (which was mainly due to epidemics, but also to wars, exploitation, and famines) with the recovery of forests and vegetation; this increased the capture of CO<sub>2</sub> and led to a drop in temperature. They propose the low point of p.p.m of CO<sub>2</sub> in the atmosphere in 1610 as an appropriate Global Stratotype Section and Point marker to

define the beginning of the Anthropocene (Lewis and Maslin 2015). Following Lewis and Maslin, Davis and Todd suggest that the Anthropocene originated in the course of the process of colonization of the Americas. They attempt to decolonize the concept by highlighting the context of violence and power relations it entailed (Davis and Todd 2017). Similarly, taking up the point of view of North American indigenous peoples, Whyte defines Colonialism “as a system of domination that concerns how one society inflicts burdensome anthropogenic environmental change on another society” (Whyte 2016, 91). Endeavoring to see beyond the “usual perspectives from England, France, Germany and the United States”, Wendt (2016, 298) connects the Anthropocene with Ibero-American colonialism and with the beginning of the world system in early modernity.

In addition to the dramatic mortality due to epidemics, some studies have shown the lasting environmental impact of the introduction of European biota and land exploitation in the Americas. Melville (1990) has shown how the introduction and proliferation of sheep in the Mezquital Valley—to the north of the Basin of Mexico—in the 16<sup>th</sup> century had already degraded the endemic vegetation, transforming the land and the traditional resources employed by indigenous people. Melville sees this case as an instance of what Crosby (2004) called ‘ecological imperialism’ and Merchant ‘ecological revolution’. Another example of the environmental impact of Ibero-American expansion is the deforestation caused by the extensive use of wood to refine silver around mines and smelting sites in New Spain and Peru (Moore 2003, 337-338). In the Peruvian case, scholars have showed that the establishment of colonial mining, smelting, and refinement of silver coincide with an increase in the traces of toxic elements discovered in the ice core records of the Quelccaya glacier, located near Potosí (Uglietti et al. 2015).

The transformations of the Basin-Valley of Mexico are part of these ecological alterations that scholars have seen as caused by the Spanish colonization since the 16<sup>th</sup> century, and identified with an early Anthropocene. In order to study this case in all its complexity a wide variety of aspects must be taken into consideration, such as geological strata, practices, ways of life, worldviews, social composition and infrastructure projects. In their seminal work, Crutzen and Stoermer (2000) related the Anthropocene to the ‘noösphere’ or sphere of thought which, they claimed, enabled the growing role of humankind in shaping its environment. But as Davis and Todd (2017) have pointed out, this idea of a unique

intellectual history is concomitant with the claims of universality of the European perspective. This unifying approach not only ignores other traditions of thought, but also fails to grasp the epistemic injustices which result from imposing Western culture—and ‘nature’—on other societies. Thus, more than positing a unique human agency acting in the geosphere in the Anthropocene, it is necessary to understand the cultural differences, the diverse ways of life, and the struggles between social groups for local environments that characterized the colonial period in the Americas.

In the early Americas, this clash was more radical since the *Weltanschauungen* of the Old World and the New World collided. In the multicultural case of Mexico City and of its surroundings, the natives’ and the Spaniards’ understandings of the relationships between man and nature were not only different, but sometimes even opposite. Therefore, the understanding of what represented an ideal environment, as well as the epistemic competences in water management were—as they still are—a matter of controversy. Evidently, this conflict was not only conceptual but involved substantial practical consequences. Nature and culture were closely linked as the environment was transformed to fit the desired ideal. Although since pre-Hispanic times there were already anthropogenic alterations in the Basin of Mexico, they intensified and acquired new directions under the Spanish rule. Thus, as Haraway affirms, “scale, rate/speed, synchronicity, and complexity” are important factors for environmental changes to be considered as part of the Anthropocene (Haraway 2015, 159). Moreover, as Candiani has showed, as part of the colonization of the Basin, new techniques, grazing animals, and relations of production were introduced. Furthermore, a new water management policy began to develop. All this bore important consequences for the local environment and for the traditional ways of life (Candiani 2014).

As the geo-hydrological modifications in the Basin of Mexico had important social repercussions, tensions began to arise between the Spanish settlers’ projects and the traditional indigenous water management practices. This conflict unfolded as a dispute over decision-making on the desired relationship between the city and the lake environment, which materialized in the different waterworks that were carried out over time. Since some groups benefited, or were affected, more than others, these works had important political implications. In a deeper sense, the conflict was not only over ideas and projects but

also between ways of life. On the one hand, the traditional indigenous way of life was closely connected to the lacustrine environment; on the other hand, the Spanish lifestyle sought a safe city and profitable lands. Since the imposition of one lifestyle project over the other was a process that lasted centuries, both coexisted in the same place for long time. Even today, despite the dominance of the city over the landscape, each season of heavy rains is marked by the struggle between the water—which seek to regain its original place—and the engineers—who endeavor to drain it out of the valley.

## 2. The Mexica promised land

In Mesoamerica, land and water played a fundamental role for both the environment and for the natives' cosmology. The Nahuatl people called the traditional sociopolitical unity 'altepetl', that is, a union of 'atl', 'water', and 'tepetl', 'hill'. Each community was represented by its particular *altepetl*. This indicated that it possessed its own land and water resources (Navarrete 2011, 24-25). Thus, an *altepetl* consisted not only of a urban space but also of rural areas, lakes, and forests (Flores 2022, 19-20). This conception of the relationship between land, water and society was complicated by two other factors. First, the Aztec empire collected not only tributes from other communities but also, in some cases, fresh water from nearby towns. Second, these societies were already trying to impose their will on nature by altering and controlling rivers and lakes.

According to Mexica stories, the god *Huitzilopochtli*—left-handed hummingbird—ordered them to make a pilgrimage to the promised land. Montero (2018) has interpreted this narrative by linking the periods of rest and activity attributed to hummingbird with the dry and rainy seasons, which were so important in the Mesoamerican world. The Mexica chosen land was situated in the middle of a closed basin composed by several interconnected lakes surrounded by mountains. Therefore, the annual variation in the water level of the basin could be interpreted as a sign of the seasonal changes represented by the hummingbird and the cult of *Huitzilopochtli*. The importance of rain cycles could explain why the main temple of Tenochtitlan was dedicated to both *Huitzilopochtli* and *Tlaloc*, the 'god' of rain. In any case, the Mexicas were not

only aware of the cyclical variations of the basin, but also expected the rainy season every year since it was linked to their agricultural process.

Although other groups that had previously settled on the shores of the lakes had already transformed the Basin in different ways, it was mainly with the arrival of the Aztecs that the changes became radical. The Mexicas developed diverse techniques to adapt to their environment and to transform it. The main core of Tenochtitlan City was built artificially inside the lake through the laying of earth and rocks (Mazari, Marsal, and Alberro 1989, 179). The Mexicas not only recovered land for their settlements but also for agriculture by implementing the traditional technique of the area, which was called *chinampas*, consisting of the construction of artificial plots formed with the mud from the bottom of the lake. This technique provided a very fertile soil and allowed an intensive cycle of production (Armillas 1971, 654).

The Mexicas increased their power through an alliance—the *Triple Alianza*—established with the Acolhuas of Texcoco and the Tepanec people of Tlacopan, both settled also on the shores of the lakes. Although the Mexicas were the main force, they had to take into account the other two members of the triumvirate, whose economies were closely related to the lake environment. As the Mexicas and their allies increased their power, they imposed their conditions not only on the neighboring towns, but also on the lacustrine environment in order to create the capital of their empire. Mexicas built around Tenochtitlan a complex web of constructions in order to establish a place in which the city could coexist with the lake environment. They built dikes to protect the city from flooding, aqueducts to carry fresh water, as well as roads and canals for transportation. This complex infrastructure not only sought to protect the city, but also allowed to take advantage of the lake's resources—such as plants, birds and fishes—and to enjoy a highly productive agriculture in the *chinampas*, all connected by canoe traffic. Being essential for the welfare of the population, water management was a political and symbolic issue, to the extent that the *tlahtoanis*, or governors, pursued effective water policies in order to increase their fame and rule (Mundy 2015, 37-39).

In order to prevent flooding, the Mexicas diverted the Cuautitlan River so that in the rainy season its water would not enter the central lakes and flow into Lake Zumpango to the North. But this was not a permanent dam; as a consequence, in the dry season the river's water could enter the so-called Mexico Lagoon. They

built dikes around the city to prevent flooding and to control the water levels of the different lakes. With the help of the lord of Texcoco, Nezahualcoyotl, a large dike was built east of Tenochtitlan to separate the fresh water that flowed from the West into Mexico Lagoon from the brackish water of Lake Texcoco, so as to create a more pleasant and productive environment around the city throughout the year. Likewise, in the South, another dam was made to control the waters of the Xochimilco and Chalco lakes. Drinking water was mainly taken from western hills such as Chapultepec, but also from other towns such as Coyoacan in the South—although in this case they could not control the waters and as a consequence Tenochtitlan suffered an intense flood (Wicke 1984, 60).

All these works were not disconnected; rather, they were complementary to one another, and even multifunctional; moreover, they were conceived and managed in a comprehensive way (Palerm 1973, 20-22). For example, although the dikes and causeways encouraged sedimentation, indigenous construction methods used the silt to generate more useful soil for their chinampas, thus keeping the canals clean. Overall, in the basin there was no sharp and permanent separation between water and land; rather, the two elements had a more fluid and dynamic relationship (Candiani 2014, 15-16, 22). Instead of being seen as a problem, the seasonal changes were useful for both natural life and communities along the shores of the lakes, including Tenochtitlan.

### 3. Continuities and ruptures under Spanish rule

As in other parts of the Americas, in the Basin of Mexico European colonization brought about drastic social and natural transformations. These changes were more intense because, as we said, they involved the confrontation of the *Weltanschauungen* of the Old and New World as well as the imposition of European rule and ways of life over American lands and native populations. Thereby, different factors—including symbolic, political, and economic ones—must be studied together in order to comprehend the deep effects of this clash of worldviews.

The respective worldviews of the Spaniards and the natives involved different ideas on nature, society, and ways of life; these shaped their particular understanding of the relationships between the city and its lake environment. Indeed, the Hispanics were not used to manage lake cities; this applied especially



Figure 1: Basin of Mexico and Tenochtitlan, by Tomás Filsinger

to Cortés and his men, who came from the plains of Extremadura. Thus, the new rulers of Tenochtitlan had not experience of lacustrine life and water management. Moreover, they had a different ideal of the environment, the city and their relationship (Mundy 2015, 194). As a consequence, Hispanic water policies were not comprehensively concerned with the basin's environment, and seasonal changes were seen more as a risk than as a benefit. The main aim of the Spanish waterworks was to protect the city from flooding and supply it with drinking water.

Although the Mexicas had altered the basin to some extent, the changes became more radical with the Spanish colonization. First, the Spaniards destroyed a large part of the city and its hydraulic infrastructure—dikes and water supply—during its conquest. While they took the place of the traditional rulers in the center of the city, in the surroundings the native population was in decline; grazing animals and new agriculture products were introduced in the slopes of the watershed. Later on, even the *Ordenanzas de Indias* of 1573 ordered the settlers to bring with them all the seeds and livestock they could in order to multiply them. Due to the absence of native ruminants, the envi-

ronmental impact of the various grazing animals introduced by Europeans was particularly strong.<sup>1</sup> Although provoked by European colonizers, the spread of plants and animals was beyond human control and sometimes had unintended consequences. For instance, the non-native weeds proliferated quickly since, as Crosby points out, “colonizing plants had not had such an opportunity since the invention of agriculture” (Crosby 2004, 151-152).

In addition to biota, several elements from Europe’s material civilization entered the Americas changing the traditional forms of production and consumption and what Braudel called the structures of everyday life (Braudel 1985). For instance, Europeans introduced new techniques and agricultural methods which were foreign to the natives, such as the plow. Evidently, these innovations conjoined natural and cultural elements. As Haraway affirms (2015, 159), the anthropogenic impact on the environment cannot be separated from those of other species, such as cattle. At the same time, since they were part of the system of production, these novelties can be located within what Renn called the “ergosphere” or the “sphere of work,” which has the power to transform humanity and the environment at the same time (Renn 2020, 382-384). In the case of the Basin of Mexico, the introduction of livestock and of new agriculture products and techniques not only changed the dynamics of production and consumption, but also increased soil erosion, thus altering the complex relationship between land and lake waters.

Another factor of soil degradation was deforestation. The reconstruction of the city, the edification of new European buildings, and the use of wood for charcoal and for all kinds of tools increased the demand for timber. Thus, in the forests surrounding the watershed logging grew quickly. Worrying reports about the ongoing deforestation started circulating as early as 1533; therefore, in the following decades diverse measures were taken trying to control it, but without any success (Musset 1992, 64-65). Deforestation, along with the soil erosion resulting from grazing and plowing, caused a sedimentation growth that slowly accumulated in the lakes, raising their beds and, consequently, the water levels (López 2014 [2013], 128-129; Candiani 2014, 29).

<sup>1</sup> Crosby even claims that if Europeans had arrived with 20th century technology, their environmental impact would not have been as great due to the self-reproducing capacity of animals brought to the New World (2004), 173.

Hispanic settlers constructed their buildings mainly in the center of the city and on the West, on both sides of the Tacuba causeway. In order to support their new buildings, they tried to consolidate the swampy soil with woods and rocks taken from pre-Hispanic temples and dikes. The pedestrian walkways were enlarged in order to allow the transit of horses and carriages, while many canals and drains were filled up (Mathes 1970, 424-425; Mundy 2015, 194-195). In the first decades after the Conquest, all these changes coincided with a season of moderate rains. In reason of the low water levels, the dikes seemed superfluous in the eyes of the Hispanic settlers, who thus neglected their maintenance. As a consequence, the levees stopped retaining the waters that came down from the Western mountains and the small freshwater lagoon was lost.

The Spaniards not only neglected the maintenance of the canals but also began to contaminate them. Drinking water began to mix with irrigation water. Several slaughterhouses and at least one tanner were established on canals' shores, polluting their waters. Moreover, canals began to be used as open sewers. As a consequence, the settlers stopped using their waters, preferring instead those of the Chapultepec aqueduct; thus, they employed drinking water to irrigate their crops and even to wash animals and clothes (Mundy 2015, 197). As the Mexico Lagoon dried up, a shallow swampy area took its place, which, containing stagnant water, exhaled bad odors and provoked diseases. This seemed to confirm the classical idea that marshland and wet places were by nature unhealthy (Earle 2012, 89; Morera 2017, 58-60); in fact, this was mainly a consequence of the mismanagement of the water resources of the area.

The drop in water levels caused the hydraulic exchange to be interrupted and canoe traffic to become more complicated. In order to try to increase water levels, in 1542 the first viceroy, Antonio de Mendoza, ordered the reopening of the canals between the northern lakes and Lake Texcoco. Once again, the waters of the Cuautitlan River entered the Mexico Lagoon. These works were performed by following the local techniques: they were not only carried out by native hands, but also directed by an indigenous ruler (Rojas 1974, 108). But low water levels and unhealthy marshes continued to surround the city. This occurred mainly in the Western part of the city, which started to be seen as new land to be reclaimed (Mundy 2015, 194).

Over time, the reconnection between the lagoons apparently had some success in raising the water levels in Texcoco and Mexico. More importantly, the

drought years came to an end. Consequently, when unusual heavy rains fell on the city in 1555, it got rapidly flooded. This was the first time since the Conquest that the city was seriously threatened by water. This circumstance stimulated discussions concerning how to protect the city. The second viceroy, Luis de Velasco, conducted several consultations with different sectors of the society to find a solution. He not only consulted European engineers, but also the indigenous leaders and “elders who understood these matters as natives of the land and raised in it” (Pérez-Rocha 1996, 34). These local leaders were not only from Mexico City but also from the other two main lakeside towns—Tacuba and Texcoco. The viceroy asked for their “ancient paintings”, which showed how the water issue was handled in the past. After a discussion, the indigenous leaders concluded that the best solution was to rebuild the old dike in the East to protect the city from the waters of Lake Texcoco. This idea was supported by the Viceroy, who proposed that indigenous leaders organized the works, while he would supply the corn to feed the workers; further, he deliberated that the *cabildo* (city council), or the Spanish settlers, should provide the meat and the necessary tools (González 1902, 59-61; Pérez-Rocha 1996, 117).

The *cabildo* did not receive well the viceregal resolution, as it surely felt superseded by the indigenous leaders. Therefore, it was not willing to collaborate with this project, responding that neither the city council nor the Spaniards had enough money to pay for food or tools; they added that the indigenous people were not used to eating meat or using tools.<sup>1</sup> Since the viceroy had to travel to Michoacán to attend to other matters, there was no confrontation at first. But in the meantime, other plans emerged. Councilman Ruy González had previously proposed to clean canals and riverbeds in order to separate clearly streams and lakes from dry land, so that the marshy areas to the East of the city would once again form part of the lake while the land to the West could be reclaimed.<sup>2</sup> Now González complemented his proposal with the idea of, once again, blocking the flow of waters from the Northern lakes and rivers. At the same time, Francisco Gudiel propounded a more radical idea. He claimed that the dike could only protect the city but would not solve the cause of the floods, which he attributed to the waters of the lakes. On the basis of this conviction, he was the first to

<sup>1</sup> Bejarano [s.d.], vol. VI, 194-195.

<sup>2</sup> Bejarano [s.d.], vol. VI, 75-76.

propose the evacuation of these waters so that they would no longer affect the city; more specifically, he proposed to open an outlet in the North to drain the waters from the basin.<sup>1</sup>

Gudiel's project however did not aim to dry out the lakes completely, but only to control their levels. As a native of Mexico City, he knew well the importance of the water for the city, and was aware of the health and transportation issues that arose when the water levels decreased. Yet his project reflected the vision and interests of the Spanish settlers. In fact, he sought not only to protect the city, but also the grasslands, from the waters. As in González's project, Gudiel's proposal shows the intention of gaining ground from the waters, in this case by lowering the level of the lakes. So the cabildo saw it with better eyes, unlike the indigenous project. However, the viceroy Velasco supported the project of the natives of protecting the city through a dike in the traditional indigenous way (Rojas 1974, 123-126). So this time the indigenous proposal was chosen to be carried out. The works were completed in three months by around six thousand natives directed by the heads of the different indigenous peoples (Pérez-Rocha 1996, 117). Meanwhile, other works were also carried out; for instance, they restored the diversion of the Cuautitlan River towards the Northern lakes and the containment of its waters in the Coatepec Bridge (Cepeda and Carrillo 1637, 4v-6r; González 1902, 66, 69-71).

Due to the council's refusal to pay for the construction of the dike, the *Real Audiencia* opened an inquiry, calling indigenous leaders, friars, and Hispanic governors as witnesses. Among the witnesses, there were the native rulers who had suggested recovering the old dam to protect the city, as well as friars and authorities from the Northern areas that could be affected by the drainage. These witnesses were asked about unpaid work and on the convenient actions to protect the city and its surroundings. Although the indigenous project had been already carried out, the idea of draining the lakes and its possible consequences was again discussed. Yet, the inquiry shows a general vision closer to the indigenous proposal. The set of questions recorded in the *Audiencia* displays the complex relationship between the city and the waters. For instance, witnesses were asked if they knew about the importance of the lagoon for canoe traffic and for the supply of the city; about its usefulness as a source of natural resources; as

<sup>1</sup> Bejarano [s.d.], vol. VI, 197-199; González (1902), 62-67.



Figure 2: Map of Santa Cruz. Uppsala University Library

well as about the health consequences of draining the lagoon (Pérez-Rocha 1996, 35-36). In their responses, the indigenous leaders—most of whom had known the city before the arrival of the Spaniards—defended the idea of the construction of a dike, arguing, on the basis on their experience, that it was sufficient to protect the city from flooding.

Despite this inquiry, the Spanish cabildo never paid for the work of the dike, as the natives recalled, some years later, in the Osuna Codex (Mundy 2015, 200). Nevertheless, its construction could be considered as a victory of the indigenous understanding of waters and land management and techniques over those of the Hispanic settlers. On this occasion, the drainage project would not be carried out, though the idea of its realization was already beginning to be considered. From that time on, the understanding of the relationship with the lake environment and how to protect the city began to diverge, reflecting the ideals and interests of different sectors of the society (López 2014 [2013], 123).

## 4. The continuity of the water city and indigenous techniques

Although it is unknown what “ancient paintings” the native leaders presented to the viceroy, there is at least one depiction that shows how the indigenous people conceived the Basin of Mexico: The Santa Cruz or Uppsala Map. Made by indigenous hands, this painting represents Mexico City under Spanish rule, but idealizes it according to the understanding of the relationship between the city and the surrounding environment that had characterized the pre-Hispanic times. However, more than a utopia, it can be understood as the representation of the indigenous water management project presented to the viceregal government. Here, one can see not only the dam around the city, but also the other dam further to the East that separated the fresh waters of the Mexico Lagoon from the salty ones of Texcoco. In other words, they proposed to return to the previous organization of the relationship between the city and its surrounding environment—one that, according to them, allowed the city to obtain a more pleasant and productive environment. The map also depicts flourishing surroundings with figures of birds and of natives fishing in the lakes; it portrays not only roads, but also the canals that could be used by the canoes during the dry season (Mundy 2015, 40-41).

Throughout the 16<sup>th</sup> century, European and indigenous ideals and representations of Mexico City and its basin influenced each other. The European representation of Mexico-Tenochtitlan—starting from the very first one, that is, the so-called ‘Cortés map’ or ‘Nuremberg map’—highlighted the centrality of the city, depicting it, despite geographical features, at the center of a round lake. Although this idea also reflected traditional indigenous notions, this was commonplace in the context of the idealized European cartography of the time.<sup>1</sup> Moreover, European cartography tended to emphasize the urbanity and good order of the city, elements that were understood as signs of civility and good government by the Europeans. However, a central element of the Cortés map challenges this harmony: the representation of human sacrifices in the main square. These contrasting elements provided a justification for, and exalted, the conquest of the city (cfr. Mundy 1998).

<sup>1</sup> For instance, in the case of Venice. See Cosgrove 1982, 151-152.



Figure 3: Cortés map or Nuremberg map. Courtesy of Newberry Library

Later images of Mexico City began to omit such bloody elements to present instead the image of a peaceful city (Davies 2016, 228-230). Among other places, these drawings were developed in the Venetian milieu. These representations of Tenochtitlan highlighted its order and civility in a way that resembles the maps of the city of Venice. For example, one can compare Alessandro Zorzi's bird's-eye view of Tenochtitlan with the famous depiction of Venice by Jacobo de Barbari. The similarity in the representations of both cities is also clearly noticeable in Venetian texts such as *Libro di tutte le isole del mondo* of Benedetto Bordone (1528), Giulio Ballino's *De' disegni delle più illustri città et fortezze del mondo* (1569) and Thomaso Porcacchi's *L'isole piu famose del mondo* (1576). In the latter, for instance, it is said that "not without marvel, we see another Venice in the world" (Horodowich 2018, 55-57, 180-189; López 2013, 175-178). This graphic resemblance had important political implications, illustrating that, although under Hispanic rule, the government of Mexico City needed to take into account local cultures and communities, as well as their needs and solutions for the management of the water resources. In addition to highlighting the idea of a peaceful and well-ordered city, the Venetian representations of Mexico-Tenochtitlan also emphasized the role of the lake. As such, they inspired a pluralistic way of governing the city and propounded an image of the city as standing in a harmonious relationship with its surrounding environment.



However, despite such idealized representations, problems and conflicts over the issue of water management continued to arise in Mexico City. In the 1560s, inefficient hydraulic policies led to a shortage of drinking water, so the Spanish government started looking for new sources of water to supply the thirsty city. They took into consideration two main projects: taking the waters from Santa Fe at the Northwest of the city, or recover the old aqueduct of Coyoacan to the South. After several discussions, the government opted for the former option and started the construction of an aqueduct. Later, however, a commission discovered that the slope had been miscalculated and the arches of the aqueduct



misaligned. Therefore, the project was abandoned. In this problematic situation, in 1575 the rulers of the indigenous government of the city presented a new project to the Spanish Cabildo. Among these native leaders, the main figure was the Indian governor of the city, Antonio Valeriano, a descendant of the Nahua nobility but already educated in the European tradition. The indigenous rulers proposed to build another aqueduct from Chapultepec to the market at the South side of the city. Although this proposal was not very well received by the Spanish council, which was asked to provide materials for the works, the project was eventually approved. The workings began in 1576 but were quickly halted because a very severe epidemic hit the city; they resumed in 1579 and were finally completed in 1582 (Mundy 2015, 197-205).

As we have seen, although there were already conflicts between natives' and European's understanding of the city and of its relation with water, until the end of the 16<sup>th</sup> century the idea of a city linked to its lake environment prevailed. Accordingly, the city and the lakes coexisted in the basin without one prevailing over the other. Traces of this ideal harmony can be found both in indigenous and European drawings of the time. This idea was the outcome of both natives and European conceptions, as it is showed by the case of Valeriano, who knew both traditions well. According to this approach, the 'urban' perspective did not overshadow the vision and interests of the surrounding inhabitants, whose lives were closely linked to the lakes. It was the product of a transversal form of decision-making concerning the management of the waters, one that recognized and validated the opinions and experience of the natives, including of those coming from the towns situated on the lake shores, such as Tacuba and Texcoco. As a consequence, the indigenous policies and techniques persisted and prevailed over the more disruptive plans propounded by the settlers and the Spanish cabildo. As Mundy has affirmed, throughout the 16<sup>th</sup> century indigenous people played an important role not only as a labor force but also as experts in the management of the basin, trying to implement a more harmonious coexistence with the waters (Mundy 2015, 199).



## 5. The conception of the possibility of changing the environment in the basin

However, with the turn of the century new power relations emerged. In the first half of the 17<sup>th</sup> century, the indigenous population declined steeply, and therefore its influence also decreased (Candiani 2014, xvii). This affected the ideas about the relationship between the city and the lake environment as well as the process of decision making within the government. The urban vision and the interest of the Spanish inhabitants of the city began to prevail in the public opinion and within the government. The expertise attributed to European technicians replaced the experience of indigenous leaders in the planning and management of waterworks.

In 1604 there was a severe flood in the city and the following year the situation became even more complicated. The new viceroy, Marquis of Montesclaros, once again asked for diverse opinions, but this time with the initial conviction about the necessity to undertake what was called a “general and perpetual drainage” (Cepeda and Carrillo 1637, 6v). This indicates the strength that the ‘urban’ vision had now acquired. The indigenous ideal of a coexistence between the city and its lakes began to be set aside in favor of the standpoint of Hispanic owners, who wanted to protect their properties in the city. As a consequence, lakes were now seen more as a threat than as a valuable resource. Despite several people were consulted, the opinion of the natives was not requested on this occasion; the design of the project was entrusted to European architects and cosmographers. From that moment on, the indigenous people were left out of the planning and direction of the hydraulic works, while the Europeans acquired a preponderant role.

A project to drain Lake Zumpango in the North was presented; initially, this was planned to be completed in six months employing a workforce of 15,000 indigenous people. The project also shows a change in the labor structure: it estimated the employment of one boss for every fifty indigenous workers, and four supervisors. Despite the opinions of the natives were not requested, the project did not win unanimous support among the Europeans: the royal fiscal, Espinosa de la Plaza, opposed the drainage, arguing that it was his duty to protect the natives. Analogously to the inquiry of 1556, the fiscal warned that such a project seemed almost impossible and would have involved the abandonment

of farmlands by part of the indigenous people; even if accomplished, he added, its benefit would have been quite limited. On this occasion, the decision of carrying on a comprehensive management of the Basin by mean of traditional techniques prevailed. The drainage project was not implemented, although the idea was gaining more strength every season of heavy rain (Cepeda and Carrillo 1637, 7v-10r).

A group of Franciscans was put in charge of repairing the dikes and causeways. One of them was Juan de Torquemada, guardian of the convent of Santiago Tlatelolco (Mathes 1970, 428). At the time, Torquemada was writing his *Monarquía indiana* in which he also referred to the hydraulic problems of the city. He was not the only European author to deal with these topics in print. Heinrich Martin or Enrico Martínez did the same in his *Reportorio de los tiempos* (1606). Martínez was born in Hamburg but grew up in Seville. Upon his arrival in New Spain, he established a printery and worked as a cosmographer; nonetheless, he was destined to have an important role in the waterworks of the basin.

Both Torquemada and Martínez provided a first account of the environmental changes provoked by Hispanics. They explained how the introduction of plowing and cattle caused soil erosion in the watershed and, with the rain, the sediments slowly filled the lake. They described how this caused the bed of the lake to rise and, consequently, some parts of the Mexico lagoon were transformed into farmland (Torquemada 1964, 423-424; Martínez 1606, 185-186). Furthermore, Martínez defended the idea that the weight of the Spanish constructions built on swampy soil, caused the buildings to sink.<sup>1</sup> Therefore, he warned of the risk posed by the elevation of the lake bottom along with the subsidence of buildings for the future of the city (Martínez 1606, 185-186).

The perceptible silting of the Mexico lagoon and its transformation into new land was not only caused by intense soil erosion in the hillsides but also by the changes in agricultural techniques within the lagoon. Traditionally, silt was recovered from the bottom of canals to be used in chinampas; this kept the canals clean and allowed the flow of waters. But in the eye of the Spanish settlers, the silting of the lagoon was creating new profitable land. Therefore, unlike what

<sup>1</sup> In the assembly of the council of September 17 of 1607 similar ideas were asserted (Bejarano 1901, 99).

happened elsewhere, such as for instance Venice (see Omodeo, Trevisani, and Babu 2020, 431-432), no measures were taken to prevent the reclaiming and cultivation of raised lands. The loss of the Mexico lagoon, allowed by Hispanics, shows that they failed to recognize its importance for the control and capture of excess water (cf. Mundy 2015, 194). In fact, the silting of the lagoon was not considered a problem as long as there were no strong rains.

Although the Spanish settlers were aware of the transformations provoked in the basin by soil erosion and the silting of the Mexico Lagoon, they did not try to counteract them. On the contrary, they even gained awareness of their role of hydrogeological agents, that is, of their capacity to change the watershed environment. At the time, it was believed that man could be affected by exposure to strange climates. As showed by Earle (2012), in order to counteract these supposed effects, the settlers continued to eat European food in order to adapt to the American climate. At the same time, they also actively tried to adapt the environment to themselves. Thus, the local environment began to be seen not as an immutable factor but as a resource that can be altered and transformed for the benefit of specific social groups (in this case, to the benefit of urban welfare). This constituted an inherent element of early modern imperialism and Anthropocene (see Asmussen and Omodeo 2020, 364). Morera has showed that the idea that men can alter local environments and change social patterns for their own convenience was also developing in Europe between the 16<sup>th</sup> and the 17<sup>th</sup> centuries. He has pointed out that in contemporary France the drying up of marshlands “aimed to enforce a cultural as well as a socio-political order on natural sites” (Morera 2017, 62). In the case of New Spain, the disproportionate idea of transforming the Basin of Mexico into an open valley to protect the city from flooding was increasingly gaining steam among urban elites. Furthermore, one can bring forward the hypothesis that alteration of the basin’s environment was also linked to the Spaniards’ aim of sweeping away the indigenous understanding of nature stepped in divine symbolisms.<sup>1</sup>

<sup>1</sup> As Montero has studied for animals, mainly the hummingbird (Montero 2018, 119), but in this case, applied to lakes and the land itself.



## 6. Conflicting views on the environment. The attempt to create a valley for the city

In 1607, along with another intense rainy season, a new viceroy arrived: Luis de Velasco the second, whose father had served as viceroy half a century earlier, and had supported the natives' project to protect the city by rebuilding the dike. But now the political balance and the hegemonic ideas about the relationship between the city and the lakes had changed. Although Velasco recognized that, despite the works that had been already done, the dikes, canals, river's diversions and roads needed to be reinforced, he was also convinced that these works were not sufficient; therefore, he believed it was necessary to undertake a general drainage of the lakes in order to offer a perpetual solution to the city. In his eyes, the lakes were a threat to the city and even its "enemy" (Cepeda and Carrillo 1637, 10r-11v). Therefore, from the urban perspective, a gap between the city and its lacustrine environment began to develop.<sup>1</sup>

Once again, some witnesses were summoned: but this time they were chosen only among the inhabitants of the city. In particular, the viceroy asked for advice mainly the government elite. Although he also consulted the friars, the opinion of indigenous leaders was not requested. The people consulted had mainly in mind the safeguard the city and of its buildings; so they mostly agreed that a general drainage was the only solution against flooding (Cepeda and Carrillo 1637, 13r.-13v), arguing that the priority had to be that of preserving the city's properties and rents.<sup>2</sup> From the perspective of Hispanic settlers, the question was not whether, but how, the drainage should be done; in their eyes, it was

<sup>1</sup> This process is similar to the one studied by Daston for the European case in which nature "became the other" (Daston 1995).

<sup>2</sup> Pedro Núñez de Prado y Cordova was the only one who defended the comprehensive and traditional solution, arguing that drainage was very difficult to achieve (Bejarano 1901, 101).

only an engineering problem. With this aim, several projects were presented, all of them by European masters or technicians; finally, the plan to drain the waters of the Northern lakes via Nochistongo, elaborated by Enrico Martinez, was selected (Cepeda and Carrillo 1637, 13v-14v; Candiani 2014, 48-50). The “urban” vision of Spanish settlers began to prevail over that of the surrounding indigenous populations.

As in pre-Hispanic times, also in New Spain waterworks had important political implications. So in November of 1607, the viceroy in person inaugurated the works of the so-called *desagüe* in the presence of the most preeminent men of the city; the indigenous people were also present, but as labor. But in this case, with an unthinkable purpose for the indigenous vision, that is, to drain the lakes of the Mexica promised land. Although for the European vision of the time, this kind of works also had a symbolic and political meaning, as Morera has shown, their aim was very different; since the marshes were seen as a “sign of bad government,” they needed to be transformed into profitable land in order to reinforce the authority of the rulers (Morera 2017, 61-62).

The works of drainage extended for more than thirteen kilometers in length. The most remarkable element of the project was a tunnel of more than six kilometers—something exceptional for the time. While the soft ground allowed the excavations to be carried on quickly, this would bring future complications (Lopez 2014, 33). Despite the size of the project, ten months later an outlet was created for the waters of the Northern lakes, which joined those of the Tula River to finally flow into the Gulf of Mexico. For the payment of the works, taxes were imposed on the city’s properties and on some products. The private and communal lands that the *desagüe* needed for the project were expropriated; this predominantly affected small owners (Cepeda and Carrillo 1637, 14v & 18v-19r). The project employed a workforce of 60,000 indigenous peoples; this impacted significantly the human resources of their communities of origin. In short, land and labor were taken from the landowners and communities around the lakes to undertake a project that was of no utility for them, but only aimed to the welfare of the inhabitants of the city (Candiani 2014, 54-57, 64).

To sum up, from the 17<sup>th</sup> century on although the decisions on the issue of water management were the outcome of a consultation with local inhabitants, unlike in the past, now the natives’ opinions were no longer considered. Fur-

thermore, the urban interests of the Spaniards began to prevail on those of the indigenous communities who lived on the lakeshores, and the idea of seeking a balance between the city and the lakes began to give way to that of transforming the basin into a valley to seek the safety of the city, with the support of the viceregal government. The expertise of the indigenous peoples—which aimed to an overall management of the basin—began to be discarded in favor of that of the European technicians—which had a narrower scope, for they focused exclusively on the issue of flooding.

More generally, this was also a conflict between different ways of life. On the one hand, the traditional indigenous lifestyle intertwined with the natural environment for the livelihood of native communities connected to the resources of the lakes.<sup>1</sup> The cyclical changes in lake levels and between water and land were not seen a problem *per se*, but rather as a vital rhythm that allowed the life of animals, plants, and humans in the lacustrine environment. On the other hand, the way of life of the urban Spaniards mainly aimed to establish a safe city and profitable land. Under this perspective, cyclical changes, mainly the rainy season, were seen negatively; therefore, the settlers sought a solution that could permanently rid the city of flooding. The water of the lakes was not seen by Spanish settlers as a common good and therefore they did not take care about its conservation. The drainage project privileged the private interests of the city over the common interest of the lake life. As Candiani has said: “the *Desagüe* mediated the superimposition in space” of European private urban property and indigenous communal relations (Candiani 2014, 4-5, 291).

## 7. The persistence of the basin and lake life

With the outflow of its waters, the basin began to transform into a valley; but this was a complicated process, and for long it would only be a frustrated desire. At first the works focused on opening an outlet for the waters of Lake Zumpango and the Cuautitlan river, which could be later used for draining the

<sup>1</sup> Morera (2017, 69-70) makes a similar observation in the case of the coastal plain of Languedoc, where local communities opposed drainage projects because they obtained some basic resources from marshes.

other lakes. But the depth of the canal was not sufficient to drain the waters of the Mexico Lagoon and Lake Texcoco, so it needed to be enlarged.<sup>1</sup> Furthermore, its small section, along with the constant landslides, often blocked even the drainage of the waters of the Northern lakes.

Due to the problems emerged in the construction of the *desagüe*, the city council wrote to the king requesting an engineer and mathematician who knew how to “measure and weigh the waters” (Cepeda and Carrillo 1637, 1v). A Dutch engineer was selected for this task: Adrian Boot, who had experience in draining lakes. Paradoxically, Boot made a proposal that was contrary to drainage and more akin to the indigenous solution. He proposed to fence the city not only in the East side, but all around—a work that, by then, had already been done in many parts of the city. Boot’s plan was to reinforce these dikes, build more floodgates and introduce new ‘instruments’<sup>2</sup> to remove the water when necessary. Boot did not want to reduce the waters of the lakes around Mexico but only to expel the excess of water from the city (Hoberman 1980, 401-402). For this, he recovered the old indigenous solutions as well as hydraulic technology used in the Netherlands to protect the land from the seawater. His project was rejected with the motivation that a project of this kind had already been carried out without solving the problem of floods (Cepeda and Carrillo 1637, 5r-8r; López 2014, 190-200).

The similarity of Boot’s project with the indigenous management of the waters was also pointed out by his contemporaries. Enrico Martínez affirmed that this type of works, such as cleaning canals and raising dikes and causeways, were so simple that even indigenous people used to make them. Martínez even questioned Boot’s competence as an engineer since, he said, he was ignorant of “arithmetic, geometry, architecture, the science of weights and natural science”.<sup>3</sup> For Martínez, the hydraulic management was merely an engineering problem, that is, mainly limited to measurement and quantification without a comprehensive approach. Likewise, water management policies were also related to notions about soil mechanics. Thus, Martínez defended the idea that

<sup>1</sup> As Enrico Martínez acknowledges. Archivo General de la Nación, Mexico, Desagüe, vol. 3, exp. 1: 3r.

<sup>2</sup> Martínez calls them ‘windmills’. Archivo General de la Nación, Mexico, Desagüe, vol. 3, exp. 1: 4v.

<sup>3</sup> Archivo General de la Nación, Mexico, Desagüe, vol. 3, exp. 1: 5v.

moisture should be expelled from the soil since it caused the sinking of the heavy buildings in the city (Martínez 1606, 186).<sup>1</sup> On the contrary, Boot was the first to affirm that water helps the clayey soil to support the weight of buildings, so if it were extracted, the sinking of the city would increase (Cepeda and Carrillo 1637, 12r; Hoberman 1980, 402). Although Martínez's project of draining the lakes was eventually achieved, this would prove Boot right, since the subsidence of the city increased notably.

The differences between the ideas of Martínez and Boot can also be seen in their respective graphic representations of the basin-valley. In Martínez's depiction, Mexico City is represented as a castle settled on a road within the lakes with no other protection against the flooding than drainage works. Contrariwise, in the map included in the *Giro del mondo* (Naples, 1700) by Gemelli Careri, made from a sketch of Boot, the city is drawn as an island. In this case, the city is not directly exposed to the lakes, but the causeways and the land itself surround it. Furthermore, the round shape of the island recalls Boot's idea of encircling the city with a dike (López 2014, 39-40). As we have seen, Boot valued and defended the importance and necessity of the water for the city, so it is likely that the characterization of the lakes as 'hydrocamelo' was his idea. Unlike other interpretations that saw the waters as a threat, naming them as 'hydrocamelo' suggests that the lakes were a useful reservoir of water for the city.

In 1616, King Philippe III wrote a decree that mediated between the projects of Martínez and Boot. Although it recognized the importance of the lakes and their waters for the city, it once again recovered the solution of containing the Cuautitlan river and the Northern lakes as well as Martínez's plan to drain them.<sup>2</sup> Nevertheless, it was evident that the drainage works were insufficient to keep the city safe due to its limited capacity. Thus, despite the first water outlet, the lakes remained, and the environment continued to behave largely like a basin. Although generally seen as a problem for the city, this was welcomed by the surrounding areas where the rich lake life was able to continue for much

<sup>1</sup> Despite their differences about the drainage project, San Miguel shared these ideas of Martínez. See San Miguel 1887, 178.

<sup>2</sup> Archivo General de la Nación, Mexico, Desagüe, vol. 3, exp. 1, f. 8r-8v. Cepeda and Carrillo 1637, 12v-13r.



longer. Moreover, because the *desagüe* was not sufficient to protect the city, the traditional techniques were still necessary. For example, the diversion of Cuautitlan River, the repair of San Lázaro dike, and the cleaning of the canals had to be performed from time to time, and the need for a comprehensive water management reappeared again and again.

Nevertheless, the illusion of the feasibility of a general drainage caused the neglect of other alternative works. Thus, the *desagüe* was not a solution for the protection of the city: in fact, the most dramatic floods of its history occurred two decades after the first drainage work was inaugurated. From 1629 to 1634, the inundations were so severe that it was considered to move the city to a higher and safer place. This idea was supported by the Crown but the Hispanic settlers and the clergy were not willing to lose their properties. Once again, there was a discussion to try to reach the best solution; this time, it materialized in a great volume: the *Relación universal, legitima, verdadera, del sitio en que está fundada la muy noble, insigne, y muy leal Ciudad de México* printed in 1637. This text offers an overview of the state of things related to the drainage of lakes and the urban ideals of the time. The possibility of changing the environment as well as its political and symbolic implications was proclaimed from its dedication, which stated that the viceroy should, like a new thaumaturge, “move mountains” and “drain lakes”.

The *Relación universal* begins by expounding Martínez’s idea that the changes introduced by Hispanics had increased the silting of the lake, making flooding more frequent (Cepeda and Carrillo 1637, 1r). Nevertheless, no attempt was made to counteract sedimentation; rather, this was seen as practically inevitable and, paradoxically, almost as a natural phenomenon. On the contrary, the less “natural” solution, which consisted of transforming the basin into a valley by opening an outlet to the lakes’ waters, was seen as the only solution. Therefore, the *Relación* ends with the agreement to transform the drainage tunnel into an open trench in order to increase its capacity. Once again, however, this was a massive and complicated work that would take more than a century and a half to accomplish (Hoberman 1930, 405).

The importance acquired by the urban vision can be appreciated not only in the discussions on hydraulic policies but also in pictorial representations. By the 17<sup>th</sup> century, the ideal of the city had changed and, in its representations, the land and the city itself became increasingly important, in contrast to the



Figure 6: View of Mexico City. Folding screen of the Conquest.  
Courtesy of the Franz Mayer Museum

lakes. For instance, some *biombos* or folding screens offer an image in which the main protagonists are the land and the city while the waters of the lakes have only a marginal role. This is opposed to the 16<sup>th</sup> century representations, which highlighted the importance of the lakes for the city in a similar way to its pre-Hispanic conditions (even when the Mexico Lagoon was shrinking). As in the 16<sup>th</sup>-century representations, in these new drawings the idea of the city and its environment did not correspond to the reality of the time. They were more an ideal and a project for the future. They revealed a gap between the aspiration to transform the environment and its persistence over time.

## 8. Concluding remarks

Since the 16<sup>th</sup> century, the Basin of Mexico began to suffer important alterations caused by the European colonization. Following authors who locate the beginning of the Anthropocene in early modernity (Asmussen and Omodeo 2020, 364) as well as others who considered the colonization of the Americas as the beginning of the modern era (Dussel 1994, 7-8), the changes in the Basin of Mexico can be situated not only in the process of emergence of modernity, but

also seen as an example of the rise of man as a geological agent—that is, as the beginning of Anthropocene.

These transformations were not a predetermined linear process, but were produced by the confrontation between social groups in particular environments. Similar to what has been proposed with regards to the hydrogeological management in the 17<sup>th</sup> century Venice (Omodeo, Trevisani, and Babu 2020), two different positions emerged also in the case of water policies in the Basin of Mexico. On the one hand, there was a comprehensive approach that considered not only urban interests but also natural and social life in the lake environment. This approach was held mainly by indigenous peoples,<sup>1</sup> but throughout the 16<sup>th</sup> century it was also supported by the government of New Spain. On the other hand, most Spanish urban settlers and technicians shared a narrower vision of the relationship between the city and the environment, mainly focusing on preventing flooding in the city, seeing this as an engineering problem. So, they offered a simplistic solution—the drainage of the Basin—which however entailed great practical complexity.

The confrontation between these two perspectives involved diverse layers and aspects. First, the cultural clash between two different ways of life with different ways of understanding human beings and nature, as well as the relationship between society and the lake environment. Second, it entailed an epistemic and ontological conflict concerning the relationship between man and the environment. Third, it involved a dispute to validate one own competence to conceive and carry out the works that were deemed as necessary in order to accomplish the desired relationship between the city and the lacustrine environment.

Situated in diverse places of the basin, different ways of life not only carried different visions, but also interests. Accordingly, cyclical flooding was not necessarily undesirable for everyone. So different social groups had different ideas about what was to be considered as a problem, as well as what was valuable and beneficial to society. At the same time, the project of transform the basin into a valley had differentiated impacts, mainly affecting communities along lakeshores and where drainage was built. In this way, it had important politi-

<sup>1</sup> According to Montero (2018), 113, in indigenous conceptions the human and non-human domains were intertwined.

cal implications, although usually hidden by equating urban interests with the common good.

Although perhaps slower than urban dwellers wanted, seen from the *longue durée* perspective, the geo-hydrology of the basin began to be affected in new ways by productive practices, civilizing projects, and even political history. As these different elements interacted, their respective temporalities also affected each other. Even though ultimately it was a political decision, the transformation of the basin into a valley was a huge task closer to geological time. Although its completion would take much longer, the inception of this process of anthropogenic environmental change can be placed at least as early as the 17<sup>th</sup> century.



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