Chinampas Agriculture and Settlement Patterns

The Contemporary Relevance of Aztec Floating Gardens

Bobbink, I.; Rey Hernández, C.D.P.

DOI
10.58981/bluepapers.2022.2.09

Publication date
2022

Document Version
Final published version

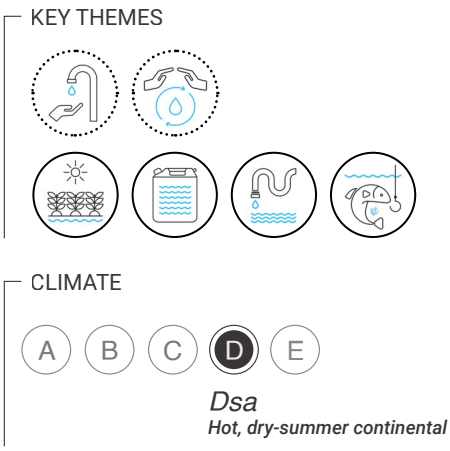
Published in
Blue Papers

Blue Papers
2022 (Vol. 1 No. 2), 90-99
10.58981/bluepapers.2022.2.09

Chinampas Agriculture and Settlement Patterns: The Contemporary Relevance of Aztec Floating Gardens

Catalina Rey-Hernández
Water Resources Management Group, Department of Environmental Sciences, Wageningen University
Inge Bobbink
Department of Urbanism, Section of Landscape Architecture, Faculty of Architecture and the Built Environment, Delft University of Technology

*The Chinampas are a system of floating gardens in the Valley of Mexico, including Mexico City, allowing for effective agriculture and sustainable water management since approximately 200 BC (Rojas-Rabiela 1993). Vernacular water systems like the Chinampas create opportunities for landscape architects to learn from historical approaches to water management to solve today's challenges (Bobbink and Ryu 2017; Bobbink 2019). Through a layered visual analysis – the illustrative method – vernacular knowledge about the Chinampas was collected and communicated by drawings to gather (new) visions toward more resilient, circular and interdisciplinary approaches (Surajaras and Rey 2021). The research is part of the "Circular Water Stories LAB," TU Delft, the Netherlands (*https://circularwaterstories.org*). Once the case study has been systematically documented, its circular character provides insights into landscape-based approaches to water-related cultivation. From there, it is possible to discuss the value of the traditional water system in addressing today's challenges.*



< Fig. 1 "Chinampa," September 2015 (Source: Sari Dennise, CC BY-NC-SA 2.0, color modified from original).

Origins and Development of Chinampas as a Land and Water Management System

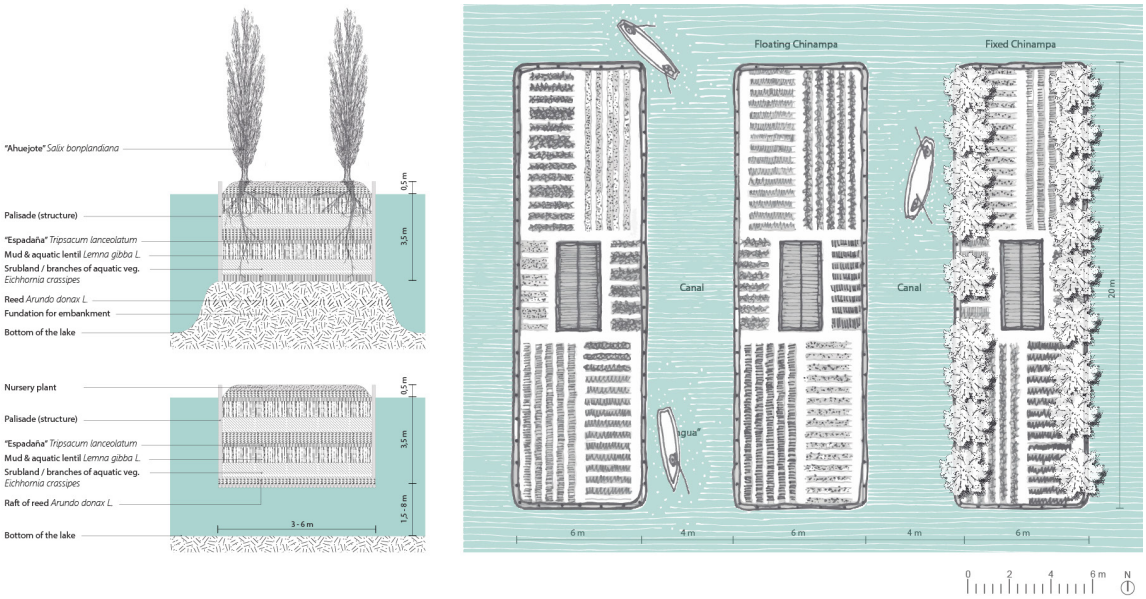
The Chinampas represent an ancient Mesoamerican land and water management system developed by the Aztec civilization to aid agricultural and territorial expansion in the enclosed basin of the Valley of Mexico, which once contained a wetland ecosystem of now-extinct interconnected lakes (Scarborough 2003). The Aztecs built the capital of their empire – Tenochtitlán – in the middle of the shallow waters of the now-extinct Texcoco lake, strategically protecting their city from external threats (Alcántara 2007). However, with the rapid growth of Tenochtitlán and its population, they soon faced a lack of land. Therefore, they started developing the Chinampas land-water management system to enlarge parts of the island where the water was shallow enough to reclaim land for settlement and agriculture (Gibson and Campos 1978). To do so, they developed a technical knowledge and practice of land reclamation that gradually expanded their territory into the surface water, transforming Tenochtitlán into a "floating city" (Surajaras and Rey 2021).

The Chinampas were developed through rafts made of reeds and fenced in a rectangle shape with a wattle (Alcántara 2007). The raft was then layered with mud, lake sediments and selected biodegradable and fertile topsoil constituted by grass, leaves, and husks. After being layered over and over, several artificial islands would eventually create a new landscape pattern (Surajaras and Rey 2021). Each of these islands formed a "Chinampa": a movable land area that Aztecs tied with ropes to their canoes to take them from one place to another in the lagoon, according to the territorial needs of Tenochtitlán (Gibson and Campos 1978). When necessary, they fixed some of the Chinampas by planting trees such as *Salix bonplandiana* and *Taxodium mucronatum* in the corner of the raft to secure it to the bottom of the lake. The mobile islands were mainly used as nurseries for vegetables that would later be transplanted to the fixed Chinampas.

With the arrival of Spanish conquistadors and subsequent colonization, the Chinampas system was transformed from movable land patches to static ones due to the newly introduced tax system, which did not consider the moving islands "taxable land." Therefore, the Spaniards ordered fixing all the floating gardens to the bottom of the lagoon with Ahuejotes trees *(Salix bonplandiana*) (Alcántara 2007). Furthermore, the lakes were drained to avoid flooding and to expand the city, transforming the lacustrine landscape into a dry valley, which led to the disappearance of large areas of Chinampas (Surajaras and Rey 2021).

Present and Future of Chinampas

The lake's draining process continues to the present day with the illegal extraction of water through clandestine wells (Alcántara 2007). This systematic drainage, combined with the ever-growing urban pressure in Mexico City (former Tenochtitlán), has modified traditional Chinampa techniques and the cultural landscape. However, despite these past and current challenges, Chinampas use and management have partly survived in the southern part of the Valley of Mexico, in the lacustrine zone of Xochimilco and Tlahuac (Government of Mexico City 2017). These zones form an extensive island of traditional urban agriculture in the middle of a densely populated Mexico City. In these areas, a variety of vegetables and ornamental plants continue to be cultivated. Productive activities have diversified, creating conditions for devel-



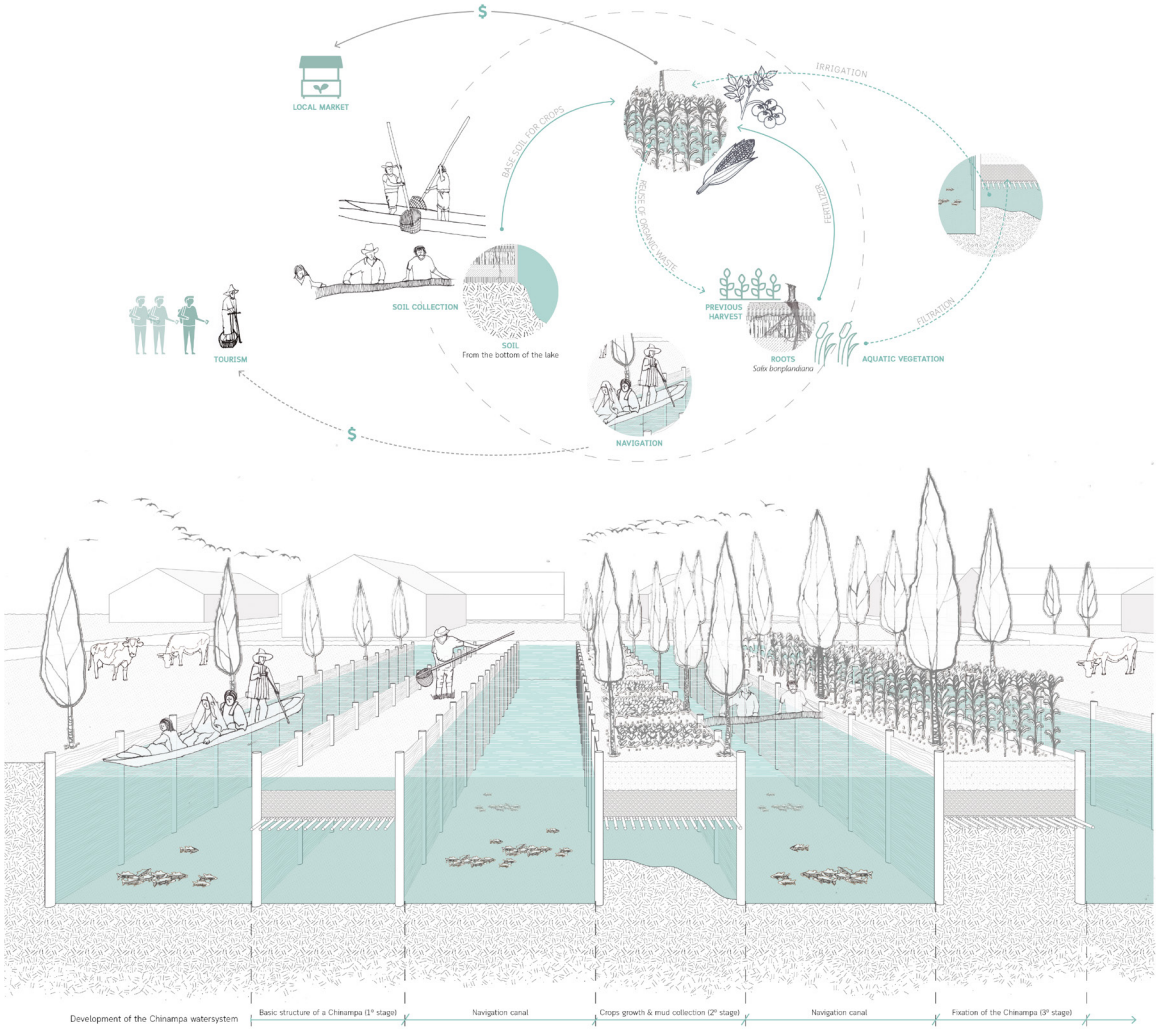
^ Fig. 2 Detail plan and section of Chinampas water system, 2019 (Source: Catalina Rey-Hernández, based on literature review).

oping the local economy and providing goods and services for the city. Tourism, stabled livestock, backyard crops, greenhouse floriculture and Chinampas horticulture are the main activities associated with the conservation of fertile soil fields (Echeverría 2009). Specifically, Xochimilco stands out for two kinds of cultivation: nursery production of horticultural plants to be later transplanted in the mainland, fulfilling a significant economic role. The second is the cultivation of ornamental flowers which are displayed in the Chinampas year round as an important tourist attraction as well as for symbolic reasons related to Mexican commemorations and local festivities (Government of Mexico City 2017). Many tourists are attracted by the traditional cultivation and the flower nurseries, which can be experienced by taking *piragüas* (traditional canoes) (Echeverría 2009).

One of the main changes in terms of the spatial development of the system has been in the Chinampas pattern and size: the pre-colonization Chinampas plots have been merged due to land reclamation and drainage processes, in which many areas are becoming bigger land plots to host new zones for urbanization. However, some of the Chinampas are still sustainably used for agriculture. Farmers use roots, lake bottom mud and organic waste from the previous harvest to maintain and build the Chinampas. They use and reuse 100 per cent of the resources from the fields, as their ancestors did. The use of organic matter in the construction of the land layers allows water to filter and soak the upper soil layers, generating natural irrigation. At the same time, the system helps water retention through its filtration of the subsoil, avoiding erosion and subsidence (Alcántara 2007; Echeverría 2009).

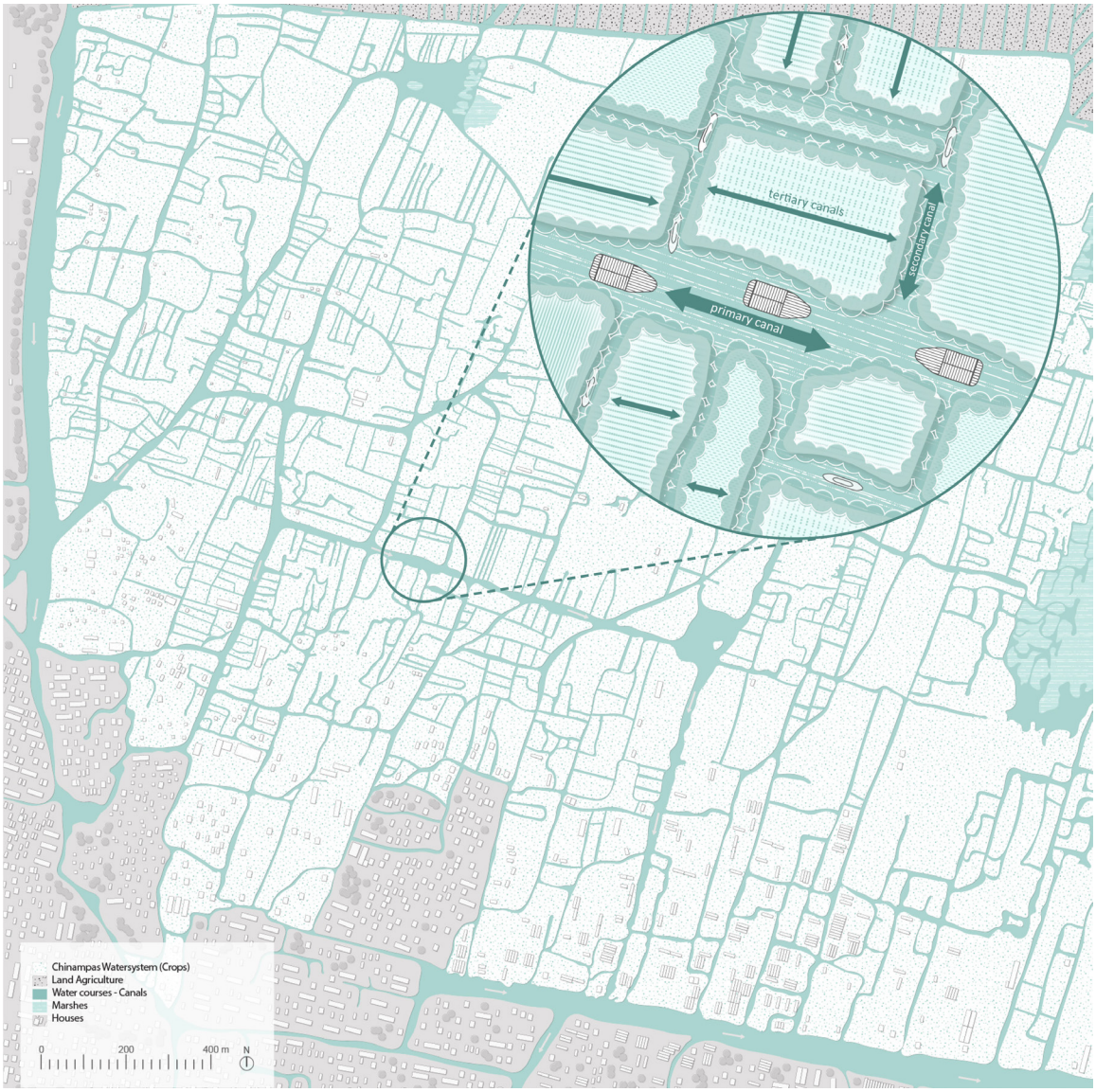
Lessons Learned

The Chinampas water system has been traditionally used for agriculture. Still, due to the



^ Fig. 3 Chinampas: Circularity of the system / Representation of sustainability (Top); Section perspective of the Chinampas water system (bottom), 2019 (Source: Catalina Rey-Hernández, based on literature review).

landscape and cultural transformations in the territory, the system has evolved to provide the possibility of new land uses such as cattle grasslands and horticulture combined with new economic activities like tourism. There is a new awareness of this system's landscape and economic value, encouraging farmers to continue using these sustainable traditional agricultural methods. Using the illustrative method, several values can be defined in relation to the Sustainable Development Goals (SDGs) defined by the UN.



^ Fig. 4 Overall (current) plan of Chinampas water system in Xochimilco (Source: Catalina Rey-Hernández, 2022, based on satellite image from Google Earth).

SDG 6

"Ensure availability and sustainable management of water and sanitation for all."

Ethnographic and identity values: Because the Aztecs created the system, it is one of the most tangible legacies still in use by farmers who continue to identify themselves as inhabitants of the Valley of Mexico. Vital to the construction of their identity is the water-related community they have been able to build around the construction

and maintenance of Chinampas, creating sustainable and circular water system management as part of their daily lives.

SDG 8

"Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all."

Strategic values: Building Chinampas is an ingenious way to use the site conditions to achieve maximum profitability with minimum resources and infrastructure by taking advantage of natural wetlands that help generate efficient crops without using external energy sources.

SDG 11

"Make cities and human settlements inclusive, safe, resilient, and sustainable."

Values of sustainability and circularity: The materials from the surrounding area provide a sustainable way to use resources, creating cyclical crop harvests using natural irrigation and filtration of the water. The system uses the water existing in the site for natural irrigation, bringing it back into the biological circuit.

SDG 12

"Ensure sustainable consumption and production patterns."

Material and tangible values: The structural elements of the system derive from the knowledge of traditional construction techniques of the Aztec culture and are vernacular and situated. Due to its composition and materiality, the Chinampa water system allows constant humidity throughout its structure, which is helpful for growing a variety of crops.

SDG 15

"Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss."

Landscape values: The lacustrine landscape of the Valley of Mexico has dramatically changed due to the drainage used to build a city and avoid flooding events. Most of the territory has been transformed, from a lacustrine to a mountain valley landscape. However, approximately 16 per cent of the original Chinampa's extension remains (Armillas in Rojas-Rabiela 1993; DW 2020), along with its traditional and ancient understanding, generating a cultural landscape that rescues the water qualities of the former lakes with resilience and an adaptive version of land cultivation.

The analysis of Chinampas, especially its circular character, is instructive regarding landscape-based methods of water-related cultivation. Understanding water and land management systems based on the circularity of resources makes it possible to extrapolate specific design strategies that can be used to tackle current urban-rural issues related to sustainability and resource consumption patterns. By learning from these landscape-based approaches, we can (re)formulate the role of landscape as a multifunctional provider, where natural entities such as wetlands and lakes can be seen and understood as potential areas for multifunctional development by embracing cultural (heritage), as well as social, economic and ecological values.

Acknowledgment
The analysis of Chinampa's case was conducted in the framework of the first Circular Water Stories Lab 2018/19. The lab is part of the graduation studio "Flowscapes" in the master track of Landscape Architecture at TU Delft and is led by Dr Ir Inge Bobbink. This contribution was peer-reviewed. It was edited by members of the editorial team of the UNESCO Chair Water, Ports and Historic Cities: Carola Hein and Hilde Sennema.

References

Alcántara, Saúl. 2007. "The Chinampas Before and After the Conquest." In *Botanical Progress, Horticultural Innovation and Cultural Changes*, edited by Michael Conan and W. John Kress, 159–75. Washington, DC: Dumbarton Oaks Research Library and Collection.

Bobbink, Inge. 2019. "Testing the Illustrative Method: How to Reveal Hidden Knowledge Stored in Traditional Water Systems." In *Lessons From the Past, Visions for the Future: Celebrating One Hundred Years of Landscape Architecture Education in Europe*, edited by Lei Gao and Shelly Egoz, 100–02. Ås: Norwegian University of Life Sciences.

Bobbink, Inge, and Maki Ryu. 2017. "Traditional Water Systems, an Analytical Method to Reveal Its Knowledge for Today." Unpublished manuscript.

DW. 2020. "The Chinampas of Mexico – An Agricultural System – the Millennium." Accessed 29 November 2022. https://www.dw.com/es/las-chinampas-de-m%C3%A9xico-un-sistema-agr%C3%ADcola-milenario/a55711440#:~:text=Las%20chinampas%20ubicadas%20en%20Xochimilco,131%20especies%20de%20plantas%20ornamentales. (in Spanish)

Echeverría, Iñaki. 2009. "Ecological Park, Lake Tecxoco." http://www.parquetexcoco.com/descargas/presentacion_en.pdf. (in Spanish)

Gibson, Charles. 1978. *The Aztecs Under Spanish Rule (1519–1810)*. Translated by Julieta Campos. Tres Cantos: Siglo Veintiuno. (in Spanish)

Government of Mexico City. 2017. *Chinampa Agricultural System of Mexico City*. GIAHS Proposal.

Rojas-Rabiela, María Teresa. 1993. "The Chinampas of Mexico: Construction Methods." *Arqueología Mexicana* 4: 48–51. (in Spanish)

Scarborough, Vernon L. 2003. *The Flow of Power: Ancient Water Systems and Landscapes*. Santa Fe, NM: SAR Press.

Surajaras, Rapa, and Catalina Rey. 2021. "Rising above Surface: Comparative Review of Xinghua Duotian and Chinampas Water Systems." *Spool* 8: 29–42. https://doi.org/https://doi.org/10.7480/spool.2021.3.6216.

Catalina Rey-Hernández is a Chilean architect and landscape designer with a special interest in resilient and nature-based solutions to create design alternatives for a sustainable future. She has worked as an architect in Chile and as landscape designer in the Netherlands. Currently, Catalina is a PhD researcher in the Riverhood project at Wageningen University of Research, where she is focusing on territorial design and counter-design in riverine landscapes. Her research aims to investigate how river management through landscape design and territorial planning has generated socio-material transformations that directly affect river communities and their livelihoods, generating local confrontations with imposed designs. Within this framework, she is particularly interested in investigating how these confrontations are supported through instruments of counter-designs and counter-cartographies.

Contact: catalina.reyhernandez@wur.nl

Inge Bobbink is an associate professor in Landscape Architecture at the Faculty of Architecture and Built Environment at Delft University of Technology. Her current research focuses on identifying landscape architectonic and sustainable values in traditional water systems worldwide. The goal is to use the acquired knowledge to transform today's water systems into site-specific circular systems.

Contact: i.bobbink@tudelft.nl