Spatial water calendar

An illustrative workbook for adaptive transformation

Bobbink, I.; Naeema Ali, N.; Zuñiga Blanco, M.J.

DOI
10.48438/jdu.2.2021.6228

Publication date
2021

Document Version
Final published version

Published in
Journal of Delta Urbanism (JDU)

Citation (APA)
Bobbink, I., Naeema Ali, N., & Zuñiga Blanco, M. J. (2021). Spatial water calendar: An illustrative workbook for adaptive transformation . *Journal of Delta Urbanism (JDU)*, (2), 96-111. https://doi.org/10.48438/jdu.2.2021.6228

JDU

Journal of Delta Urbanism
Delft University of Technology

Issue #02 LONGUE DURÉE

Fall | Winter 2021

Spatial water calendar

An illustrative workbook for adaptive transformation

Inge Bobbink
Naeema Ali
María José Zúñíga

In this paper, concepts for deploying climate resilient design in deltaic regions which encounter environmental challenges are explored. Today, most deltas experience persistent flooding and long-term waterlogging which adversely affects the livelihood of its inhabitants. A new approach was formulated to rethink design and planning pedagogies in the discipline of landscape architecture at Delft University of Technology, to visualize open-ended spatial transformations involving both the landscape architect and the inhabitants over longer periods of time. The graduates proposed flexible spatial frameworks that integrate time and people[1]. This results in design interventions that do not rely on a fixed plan, but rather propose and visualize a process using a 'water calendar' as the driving force. The spatial water calendar is a chart that helps to represent time linked to space and water which can be useful to enumerate, elucidate, and determine time-based fluctuations in a landscape and make decisions accordingly. The idea was prompted by ancient calendars that were based on the rhythm of seasons – a method which farmers often used. However, the spatial water calendar also integrates other processes which are influenced by water, focussing specifically on the spatial impact, thereby becoming a design tool for landscape architects. The calendar developed in the Circular Water Stories lab is an open-ended framework stirred by a sequence of spatial drawings showing the temporal and social processes in relation to human-made interventions, resulting in spatial transformations through time and scale. Because working with a calendar is highly participatory in nature, the spatial water calendar will be more meaningful in vulnerable geographies[2] where there is still a strong connection between people and landscape. Nevertheless, in other parts of the world, we imagine that this approach also opens new possibilities for landscape architects to engage with dynamic sites.

INTRODUCTION

Deltas are attractive landscapes in a state of constant change since they are influenced by rivers and the sea. These changes may be experienced within the time span of a day, a month, or a year imparting a distinctive character to the respective deltas. But regardless of the type, deltas are one of the world's richest types of ecosystems, as they mark the transition between land and water and between saline water and freshwater. They serve as a reserve for biotopes and nurseries of numerous species crucial for maintaining the ecological balance of the world's rivers and oceans[3]. Besides their ecological value (based on their biological productivity and diversity), these ecosystems also offer significant economic value by providing ecosystem services like coastal protection, maintenance of fisheries and wildlife, erosion control, water catchment and purification, carbon sequestration, nutrient cycling, tourism, recreation, education, and research[4]. For this reason, deltas are home to many ancient civilizations and modern-day cities and urban regions. However, from the mid-nineteenth century, the industrial revolution and the forces behind globalization compelled people to keep land dry in order to increase agricultural production and further expand cities and settlements. This was done by controlling deltas through large-scale planning, as well as unplanned or short-term interventions that disregarded the dynamics associated with these ecosystems. As we can see now, this large-scale interference, like in the case of the Dutch delta, compared to ancient systems (managed by people living and working with the landscape), has a significant negative effect on the natural systems and living conditions which often results in disasters. Hence, deltas are vulnerable landscapes, sensitive to environmental changes containing diverse, uncertain, and unexpected social and natural processes. There is thus an opportunity to generate greater flexibility in delta regions through explicit adaptive spatial design.

Various ways in which an adaptive spatial model can help sites with very different water problematics are discussed in the paper through two cases. The deltas of Kuttanad, a low-lying wetland system at the mouth of Vembanad backwaters in Kerala, India and the Puntarenas peninsula at the Gulf of Nicoya, Costa Rica are explored here. In Kuttanad, parts of the backwaters were diked to create polders for rice production, and a dam was built to reduce salt water intrusion from the sea. In the case of Puntarenas, sediments brought by the river formed a peninsula protected by a natural dike that was later enforced by a railway line, which strengthened the commercial port activities and allowed a significant population increase of in the area. Both deltas experience persistent flooding and long-term water logging due to sea level rise and global warming. Consequently, there is a decrease of fish and farm products which adversely affects the livelihood of the inhabitants. This is a testimony to the fact that across the planet, extreme weather conditions and water scarcity will inflame and exacerbate existing social conflicts[5]. People who can afford to migrate and secure their livelihood will do so, while those with fewer resources to relocate will remain, constituting a new class of poverty - the climate refugees.

1 The work is developed within the Circular Water Stories lab, in the Flowscapes Studio of the master track of Landscape Architecture at Delft University of Technology, under the guidance of Dr. I. Bobbink. https://circularwaterstories.org. The research focuses on the identification of landscape architectonic and sustainable values and livelihood in (traditional) water systems worldwide. The goal is to learn from them and to transform its knowledge for today's challenges.

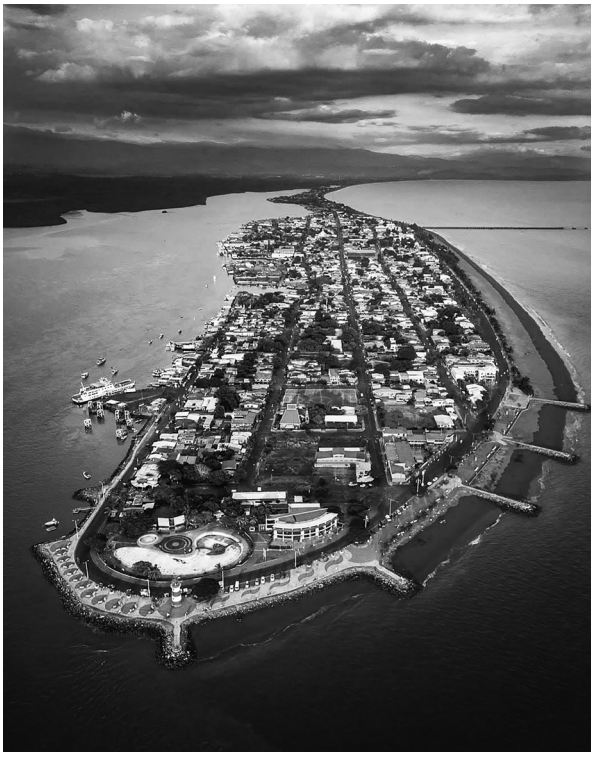
2 Vulnerable geographies: Areas which are most affected by the impacts of climate change due to the combination of their natural and socio-economic conditions. The word "geographies" is used to reflect places and the relationships between people and their environments.

3 Marchand, 2013

4 Meyer, 2019

5 Parenti, 2012

01



02

01 An aerial view of the Kayalnilams or polders of Kuttanad when subjected to low density flooding. Typically, the Kayalnilams form an intricate network of paddy farmlands divided by earthen bunds and interlinked by water. When the salinity level rises in the backwaters, the Kayalnilams become unsuitable for paddy cultivation, and it is a common practice to flood them deliberately to create a watery landscape barely undistinguishable from the backwaters. This condition of being drowned extends into the periods of monsoon in order to accommodate the excess water in the system.
Source: Prasanth (2018).

02 An aerial view of Puntarenas. Looking over the tip of the sand barrier in its most current state, completely urbanized with a population of about 10 000 people. The historical port remains, other structures have been built to retain sediments, giving space for boats to enter the estuary.
Source: Daniel Acosta (2019).

LAND AND WATER

Looking back in history, it is clear that the borders between land and water has never maintained a fixed line. However, separating land from water on the earth's surface is one of the most fundamental and enduring acts in the understanding and design of human habitation[6]. In reality, both land and water belong together and interrelate differently in the dimension of time. According to this understanding, the projects of Naeema Ali (Kuttanad) and Maria Jose Zúñiga (Puntarenas) imagine a possible future for people, flora, and fauna by developing an unfixed masterplan, incorporating a flexible design. The role of water is fundamental, due to its life sustaining properties. The two cases are sites which rely on water to support food production, secure livelihoods, and transport goods. In the case of Puntarenas, water was essential in forming the peninsula through the process of sedimentation. Humans lived and worked with water or different levels of wetness between land and water. Consequently, in the past, water shaped and enabled human development all over the world and has resulted in a rich array of cultural landscapes. With the development of civilization and the expansion of large urban areas, people have manipulated the function and form of water in order to fulfil their essential needs and ambitions[7]. This is evident if we carefully look at the history of urbanization in urban deltas. This brings to the forefront numerous interesting examples of how people perceived and interpreted the dynamics associated with these water landscapes and how they made use of them[8]. In the past, people lived in closer contact with the landscape and were able to more carefully read its dynamics and act accordingly[9].

In the case of Kuttanad, all infrastructural changes were done to improve agricultural productivity. Mostly poor people remain in the area and instead of having or feeling ownership became passive workers. This resulted in a monocultural use of the landscape for extensive paddy farming. The traditional farming system was more diverse and incorporated intelligent rotations of agriculture and aquaculture in response to changing conditions.

In the case of Puntarenas, the arrival of industrialization in fishing practices imposed both physical and intangible limits between people and water. The open waters and the soft edges around the peninsula which were once dedicated to small-scale fishing were replaced by bigger vessels and a border of industrial buildings. This resulted in a practical, cultural, and physical disconnection between people, land, and water. Both graduates rightly identified that the interaction between people and their surroundings is undermined, and this relationship needs to be revived.

ROLE OF TIME

Land and water are elements which are continually in transition, personifying a tangible image of a given situation. This quintessentially points to a shift in theoretical foundations, especially for landscape architects: from "landscape as an object" to "landscape as a situation". Landscape is a medium, as recalled by Corner, Allen, and others, uniquely capable of responding to temporal change, transformation, adaptation, and succession[10]. These qualities further recommend landscape as an analogue to contemporary processes of urbanization by acting as a medium uniquely

6 Da Cunha, 2012
7 Hein et al, 2020
8 Meyer 2019
9 Bobbink & Loen 2021
10 Waldheim, 2006

suited to the open-endedness, indeterminacy, and change demanded by contemporary urban conditions. We need a different approach in which we observe the landscape, try to understand the processes influencing the area, discuss with the inhabitants and develop a project which takes years of monitoring, making adaptation possible in the long run. One could speak of a 'slow landscape architecture approach, referring to the Slow Food movement[11], set up as a reaction to today's fast-paced food production and consumption systems that are harmful to the earth, to its ecosystems, and to humans. Slow Food envisions a world in which people can access and enjoy food that is good for them, good for those who grow it and good for the planet. Slow landscape architecture advocates the same attitude and asks for long-term design, project management, and participation. A landscape architectonic design cannot give a quick answer to a long-term problem, but needs time to observe and understand a site and the landscape architect needs to stay involved with the people living there over time.

In the past, Indigenous communities have developed complex land management practices attuned to local conditions, such as the dynamics associated with the water cycle. Examples in this regard are the Subak farming system in Indonesia and the Palayan farming system in Philippines - both designed complex water management systems that relied on harmonizing agricultural infrastructure and operations along with the lives of the people, in line with the ecological rhythm of the respective sites. Here, rhythm refers to the pulsating temporality unique to every landscape and this is embedded in both natural and social processe[12]. Our main critique regarding the present-day design pedagogy and practice in the discipline of landscape architecture is the dependence on fixed designs and masterplans that overlooks this concept of rhythm in landscapes. This approach also dictates our visual literacy that sticks to tools like plans and sections. But the Subak and Palayan systems developed calendars as a tool. The word Subak itself points to this, where Subak refers to both the unique farming terrace units in the area and self-governing farming associations that share water and planting schedules that are coordinated by calendrical rites in water temples[13]. In the case of the Palayan terrace farming, the chief agricultural operations of sowing, planting, harvesting, and fallowing were carried out in a sequential pattern which repeated every year depending upon the precipitation levels received. However, these ancient calendars followed a stringent pattern that repeated every year without accounting for uncertainties. They also perpetuate the idea of short-term planning as these calendars considered a rigid time frame of twelve months, as in the case of the Gregorian calendars.

Taking cue from this, we researched the possibility of developing open-ended calendars for designing a sustainable landscape. The proposed spatial calendar approaches time from the perspective of water, which is the driving force of change in both projects and hence, these are called spatial water calendars. Differently than in the case of the Subak and Palayan terraces, the conditions of the selected sites are more dynamic and unpredictable, owing to the deltaic contexts that experience frequent flooding. The water calendar is used as a design tool to guide future transformations by visualizing possible spatial changes over different time frames in areas which strive for resilience. Instead of designing a

11 Chengdu Declaration, 2017
12 Krause, 2017
13 Watson, 2020

fixed path to address the necessary changes for the future, both projects offer choices for people living in the area as well as for planning authorities to adapt to and consequently shape the area. This understanding of time and the role of people in visualizing both short-term and long-term designs play a key role in these graduation projects.

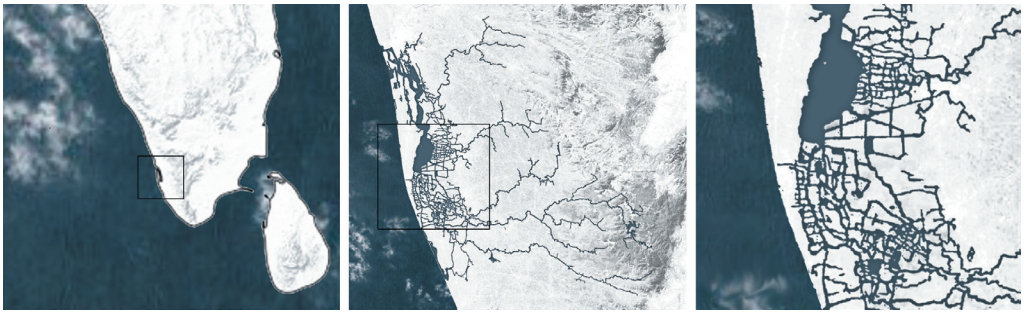
14 Sreejith, 2013
15 Krause, 2017

THE GRADUATION PROJECTS

The Kuttanad Kayalnilam Agro-system is an established, land-water-based system that has supported paddy farming below sea level for more than a century. If you pan over this area, you will come across a mosaic of polders lined by dike structures appearing like green ribbons which are interconnected by narrow water channels and canals. Positioned at the mouth of a delta in Kerala, India, the traditional farming system mutating between land and water, freshwater and saltwater, organized the landscape in line with the ecological rhythm of Kuttanad.

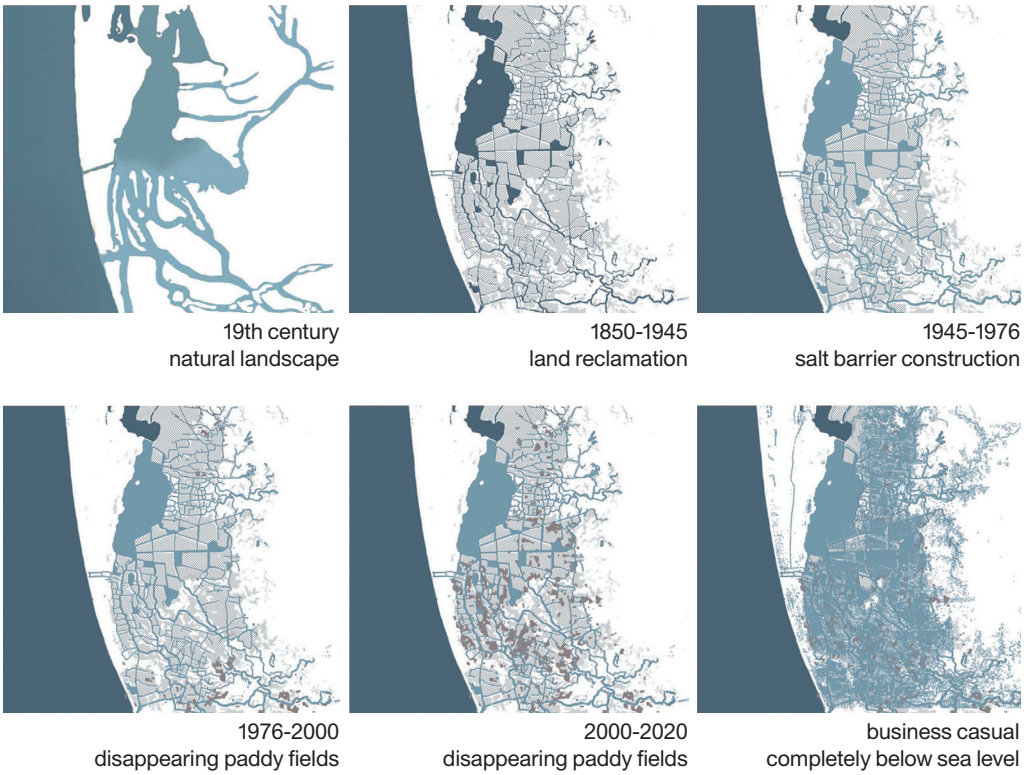
This rhythm was largely determined by the circular and cyclical movement of water and salt in the system. With the advent of the industrial revolution, vernacular practices were replaced by monofunctional infrastructural elements like concrete dikes, dams, and salt barriers which have proved to be quite incompetent in coping with the changing levels of water. In 1976, a permanent salt barrier was constructed across the backwaters and was largely responsible for a change in the hydrological and ecological structure of the Kuttanad Agro-system[14]. As a result, today, this agrarian landscape faces the threat of seasonal flooding, which adversely affects the livelihood of the inhabitants. Thus, modern-day landscape management practices, modelled on a terrestrial-centric ontology, controls and stifles the natural dynamics of the water and paves the way for anthropocentric activities. Maps show what would happen if we don't change anything and carry on with managing the landscape in the same way as we have for the last century, the outcome will be a disaster. Most of the agricultural lands will be lost due to the annual flooding episodes and the predicted sea level rise of 1.5m. That is why this project departs from classical terrestrial approaches by redefining the relationship between land and water for creating a flexible landscape which will improve the quality and diversity of life and space in the delta.

This new fluid geographical approach is based on a systematic understanding of the amphibious qualities embedded in the site context through a four-lens approach. The lenses being volatility, hydro-sociality, rhythm, and wetness, and reflect respectively: radical emergence of lives and landscapes, the mutual implications of social life and water flows, the pulsating temporality in hydro-social relations and the materialization of water in everyday life[15]. Together these lenses led to a site-specific spatial framework for enhancing the amphibious value of landscapes. In the specific case of Kuttanad, this called for a revival of the indigenous relationship between land and water which can be accomplished by reintroducing or partially restoring the cyclical movement of salt and water. These cycles would result in a palette of changing environmental conditions. The project offers different choices to address these varying conditions at an operational level depending upon the scale of magnitude- regional, polder or paddy field as shown in figure 5.



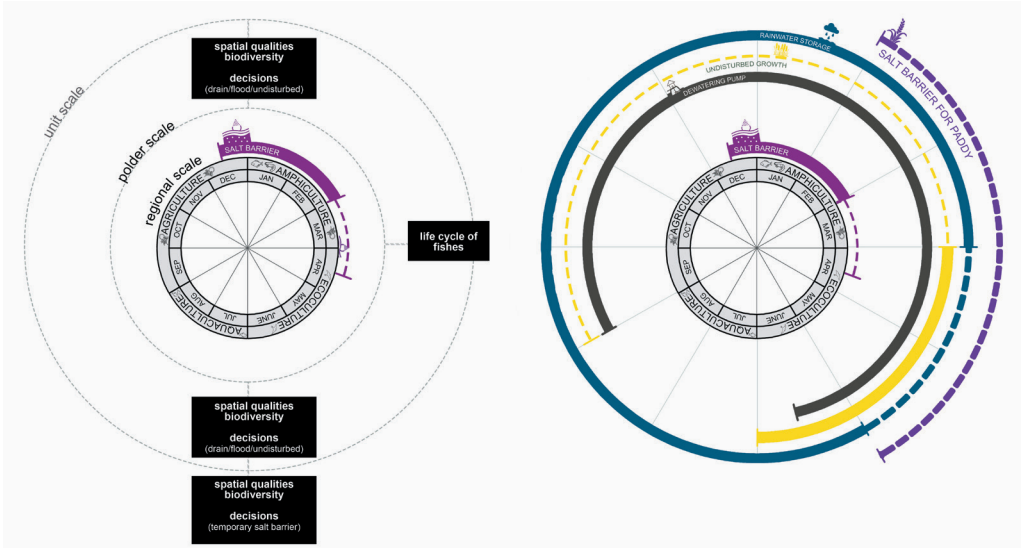
03

03 Southern India (left), Kuttanad Agro-farming system at the watershed scale (center), Kuttanad Agro-farming system (right). Source: Naeema Ali (2019).



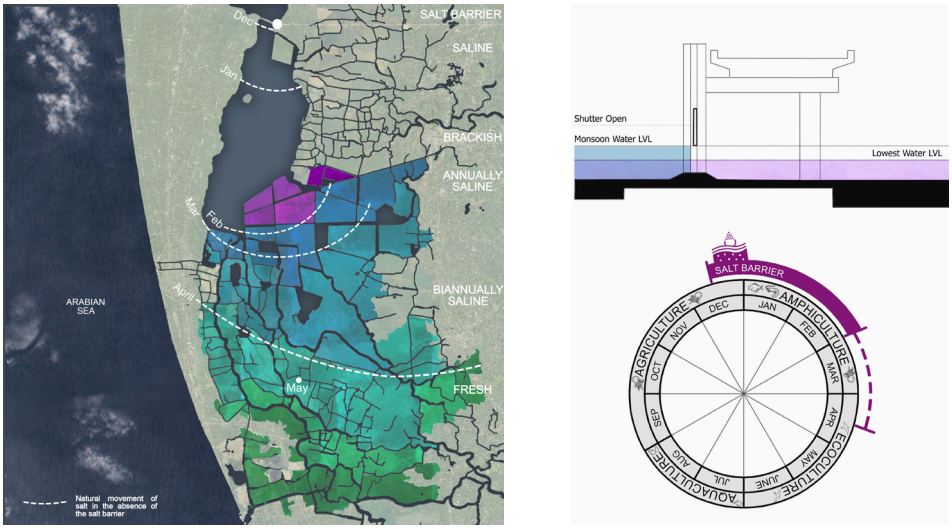
04

04 Prediction of extreme case scenario for Kuttanad through drawing the most significant changes and effects over the last century. Source: Naeema Ali (2019).



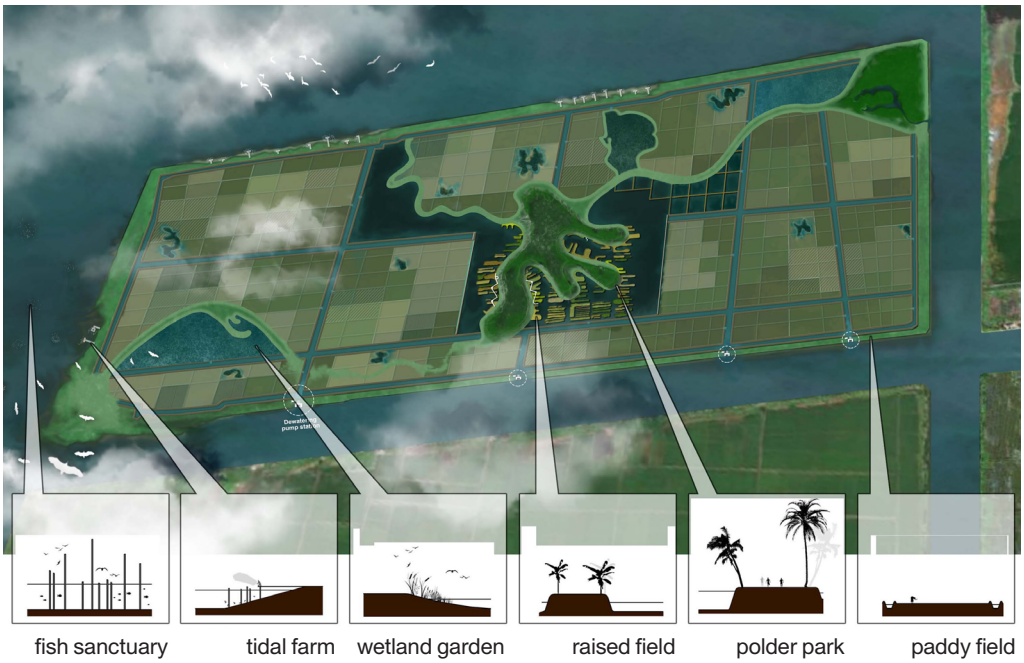
05

05 Conceptual zoning of the different kinds of information to be represented according to the scale of magnitude (left). The different operational strategies arranged in a time-based sequence (right). It is important to understand that depending upon the spatial scale of action, the strategies to be adopted would be different. For example, the operation of the salt barrier is a decision that would affect the whole region, whereas the decision to drain water from a polder only affects that particular polder. Source: Naeema Ali (2019).



06

06 Zoning of the region based on the natural movement of salt (left), section of the salt barrier with a shutter that can be moved up and down whenever necessary (right top), possibilities for the flexible operation of the salt barrier (right down). Source: Naeema Ali (2019).



07

07 Vision by 2050 for a selected polder Rani. The proposed design envisions six different amphibious spatial qualities that make more room for water and diversify and intensify stable livelihood opportunities in a dynamic landscape. The vision plan visualizes the long-term potential end result for this spatial transformation based on predicted uncertainties and this is subject to change depending upon the actions taken in the short-term. Source: Naeema Ali (2019).

At a regional scale, this means that the entire region will be divided into zones of varying qualities that alternate between saline, brackish, and fresh water, based on the cyclical movement of salt which can be controlled by the operation of the salt barrier with a flexible shutter.

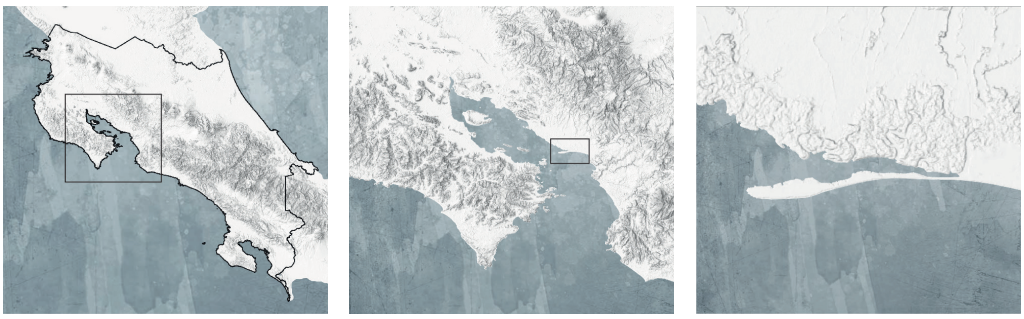
Accordingly, at a local scale this prompts a paradigm shift from an economy based purely on agriculture to a combination of agriculture, aquaculture, and nature-based tourism. For this, parts of the agricultural fields are converted into six amphibious functions. A fish sanctuary, tidal farm, wetland garden, raised field, polder park, and paddy field are proposed. More than 30% of the polder is expected to be transformed into one of these new spatial qualities, creating more room for water progressively over time. These qualities, apart from providing a solution to flooding, also add greater value to the landscape by creating additional opportunities for agriculture, aquaculture, tourism, and nature development along with making more room for water. Since this radical change is envisioned over a long timeframe of more than 20 years, by means of a slow landscape architectural process, this allows nature and humans to evolve and adapt to the cycle of salt and water in a more balanced, flexible way.

The Puntarenas peninsula, located in the North-Pacific coast of Costa Rica, is a 10 km long stretch of sand that resulted from an estimated 400 year long process of sedimentation, which is still ongoing. During this time, clay sediment from rivers have been transported by several currents along with sand sediment from the Gulf. The resulting clay and sand barrier allowed for the growth of a mangrove ecosystem on the internal side of the estuary. Anthropogenic development has affected the morphological transformation of the site since the 18th century, however, due to human interventions, the shape of the peninsula is fixed by an railway and dike on the South side and has relatively maintained the same form for the last 60 years. Today, the sand stretch is completely urbanized and inhabited by approximately 10 000 people.

According to the current climate scenario, the whole site will be inundated by water because of sea-level rise within 100 years. A combination of events could result in the breaking of the peninsula, creating a change of sedimentation patterns and altering the site's morphology. The peninsula is already affected by heavy seasonal floods, and by social and ecologically vulnerable conditions. This project deals with the knowledge of the inevitable, a future event that will eventually erase the site, just as much as with the notion of uncertainty, regarding precisely when and how the inevitable will happen. Under these conditions, an understanding of time and its influence in these landscape processes is essential. Time is not only shaping the form, growth, and movement of a site, but also opening room for emergence, movement, uncertainty and risk within new scales of intervention[16]. The project engages with a resilient articulation of life, community and nature while connecting people and space with the passing of time and the inevitable transformation of the territory.

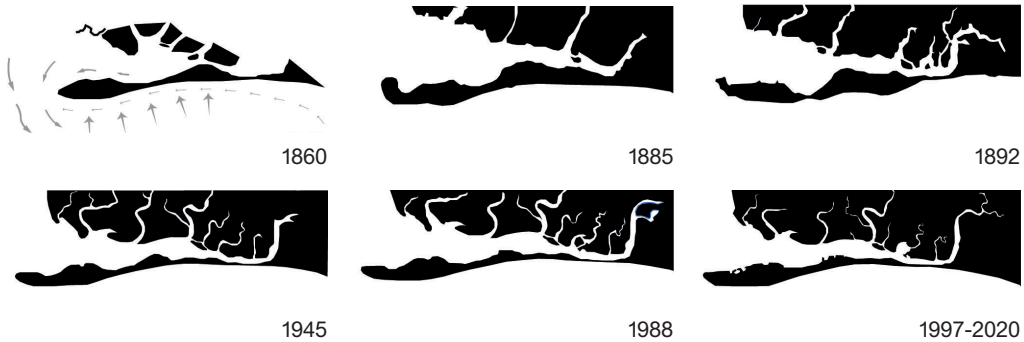
This project puts forward a scenario and a design solution that contrasts the proposed road expansion on a dike that is soon to be carried out by national entities and which intends to add two lanes to the narrow road that connects the Peninsula to the mainland. Instead, in this design

16 Bélanger, 2016



08

08 Costa Rica, Central America (left), the Gulf of Nicoya (center) and the Puntarenas peninsula (right).
Source: María José Zúñiga (2019).



09

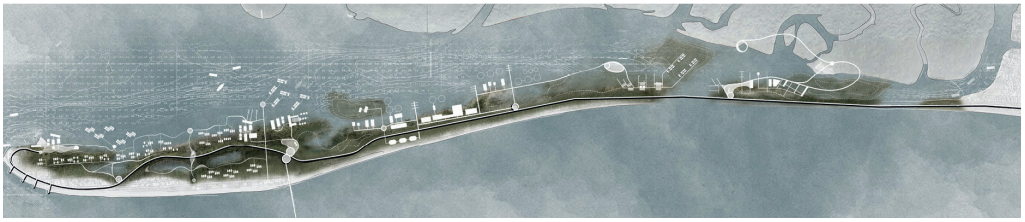
09 Morphological transformation of the Puntarenas peninsula due to sedimentation processes involving litoral, wave and tidal currents.
Source: María José Zúñiga (2019).

10

10 Current condition of the Puntarenas peninsula, the estuary and protected mangrove ecosystem. Source: IGN Ortofoto, SNIT (2017).

Phase 1
2020-2050

Phase 2
2050-2080



Phase 3
2080-2100

11

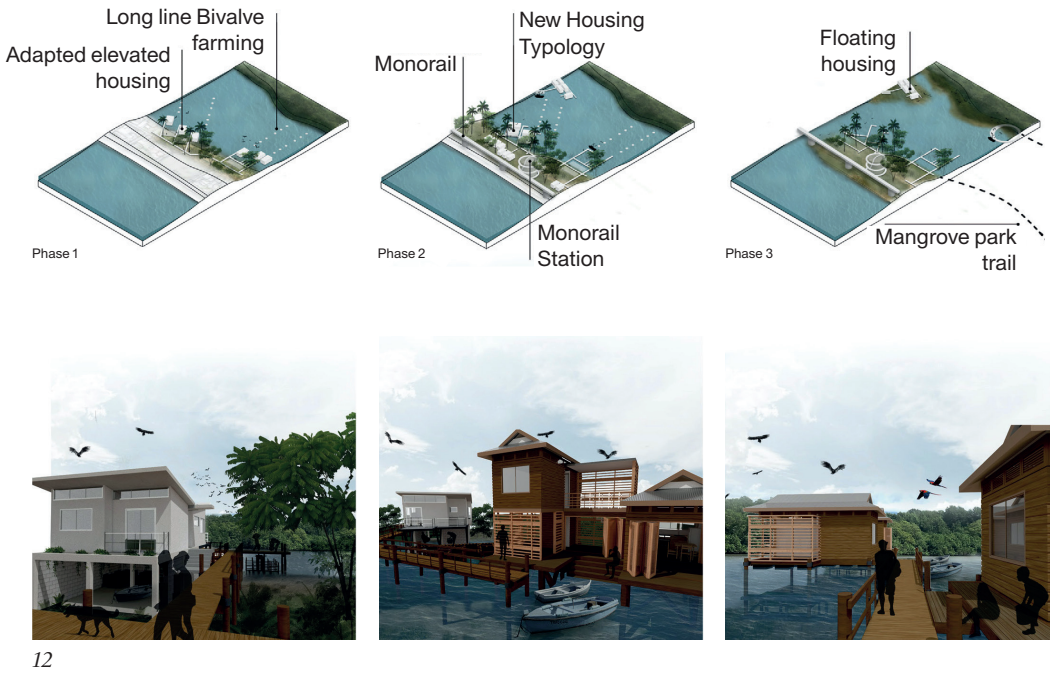
11 Proposed design phases for Puntarenas on a peninsula scale considering the chosen scenario of morphological transformation and the implementation of design strategies both in land and water. Source: María José Zúñiga (2020).

proposal the natural dynamics are once again the protagonists in shaping possible futures of this landscape in the long term. By understanding natural processes, the project envisions a future where the flows of water and sediment transform Puntarenas beyond the form. This drives a proposal to include measures that ensure structural adaptability, new ways of mobilizing people, alternative living spaces, and shifting economic and programmatic strategies. The residents of Puntarenas participate in the transformation of the site by appropriating the design elements and adapting their productive activities to the dynamics and resources provided by the natural environment. In this way, the design not only ensures social and ecological stability but also enhances their relationship with water and the natural environment.

The design emerges through 3 different scales, all connected by a scenario and a vision. The peninsula scale (1) organizes the spatial interventions within the shifting morphology. The neighbourhood scale (2) further articulates the relationship between land and water, between the structural and natural layers. Finally, a closer scale (3) engages with adaptive housing typologies in combination of functional elements, as shown in figure 11 and figure 12. The outcome is an interrelation of scales and time-

lines that are open to shifting conditions and adaptive measures, while remaining guided by a context-sensitive design vision. In order to deal with the inherent amount of uncertainty of this project, the role of precision and specificity is key, "in order for something to be adaptable, it needs to be precisely designed to be adaptable"[17].

17 Berrizbeitia, 2017



12

12 Possible design interventions on the neighborhood scale for the different phases in a selected area of the project. The illustration also shows adapted housing typologies and proposed floating housing typologies. Source: María José Zúñiga (2020).

THE SPATIAL WATER CALENDAR

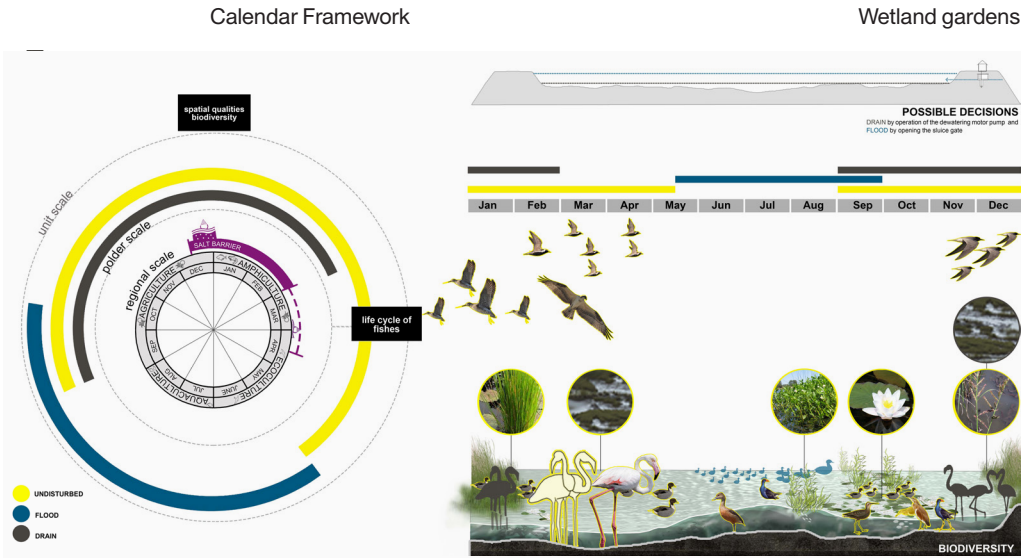
Both the projects address the aspect of time and uncertainty through designing a calendar which expounds the role of the local people, the landscape architect and other stakeholders in the landscape architectonic transformation. Addressing short-term and long-term planning, the calendar describes and informs people in a specific area about cycles of water movement, biodiversity, operations and other events. In both Kuttanad and Puntarenas, managing water sits at the nexus of economic development, ecological well-being, food security, human health, and peace. Here, following the major challenges both projects require designs that allow room and flexibility for water and consequently address the interconnected ecological and social cycles relating to water. This helps people to first understand the dependencies of the different processes in site: both human-made and natural, which will be listed in the calendar. Secondly, they can respond and act according to these enlisted processes, making the calendar a potential decision-making tool. In general, the graphical representation of the calendar depicts time and water linked to a space. This is why it becomes a spatial water calendar which is useful to enumerate, elucidate, and determine temporal fluctuations relating to the different processes, especially relating to water, within a specific area in the landscape. Further, this calendar can be used on different time frames which are not limited to conventional appreciations of time, but instead can be determined by natural and social processes like land formation, water or soil cycles, animal life span, agricultural and aquacultural

practices, and others. Therefore, the calendars in the graduation projects adopted different representations due to differences in the nature of the challenges they are addressing. In this sense, the spatial water calendar is a highly site-specific design tool that challenges humans and nature to adapt to the changing environment.

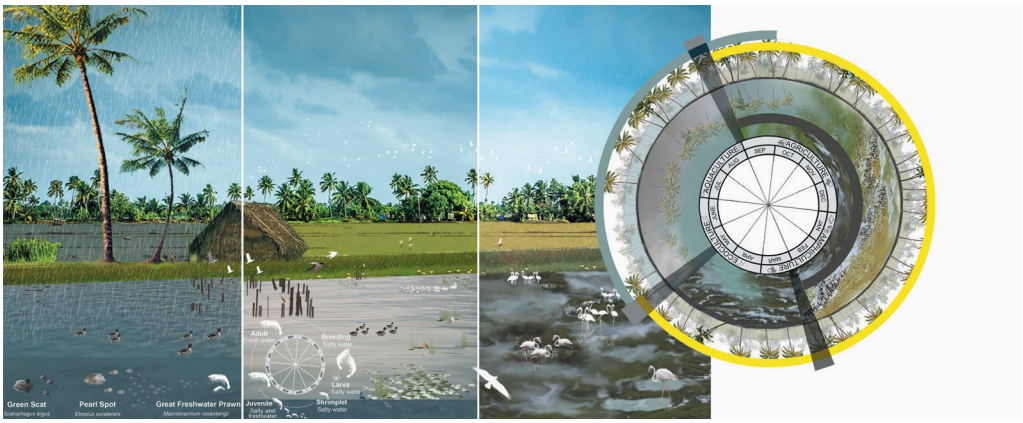
THE ADAPTIVE DESIGN CALENDAR

The low-lying polders are governed by a cycle of saline and freshwater, as discussed earlier. This seasonal mixing of saline and tidal water and the fluctuation of water levels result in a palette of saline and water conditions which can be linked explicitly to the climatic context of Kuttanad. These conditions, when arranged in a cyclical order, would arrive at a sequence synonymous to the modern-day cropping calendar.

Accordingly, the project visually presents design imaginations for each of the six proposed amphibious qualities as shown in figure 13 corresponding to the different combinations of salt and water conditions. By visualizing the different possibilities, people have an overview of what changes can be made and what would be the consequences if you make those changes. Although these design imaginations are the long-time goals of this slow landscape architectural transformation which may be achieved in a span of 20 years, the calendar also offers choices in the short-term annual planning which makes the framework for the calendar more adaptive. For example, although the long-term goal of every polder is to make more room for water to accommodate seasonal flooding, there are some years in certain polders when water may be drained deliberately, even during a monsoon, in order to create favourable bird habitats. Ultimately, this calendar would help in maintaining the new amphibious qualities which require decisions to be taken at different spatial scales. The adaptive design calendar will specify the maintenance strategies and actors carrying them out at the regional scale, polder scale and the unit scale of intervention.



13 Calendar framework for wetland gardens (left). Calendar showing the design strategies, spatial transformation and information relating to biodiversity and water levels developed specifically for wetland gardens (right). Similar calendars were developed for the other proposed amphibious qualities as well.
Source: Naeema Ali (2019).

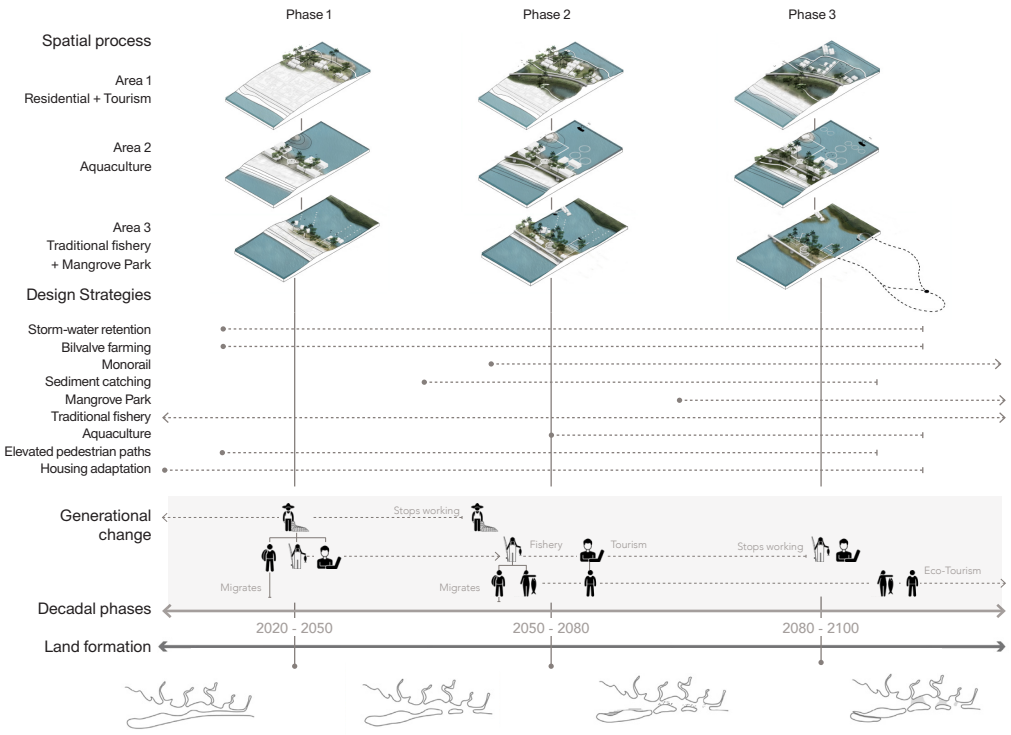


14 Calendar showing the spatial transformation in Kuttanad in paddy fields and wetland garden. Source: Naeema Ali (2019).

14

THE SHIFTING CALENDAR

The morphological and social dynamics that can be predicted in the Puntarenas peninsula result in a scenario where different landscape conditions overlap in time. Among these conditions are the processes of land formation, predictable and unpredictable natural events, economic shifts, migration, long and short-term infrastructural interventions, ecosystem degradation, and restoration, etc. The project visually presents three phases, yet these only show a small portion of a complicated timeline where different design strategies have different scales, starting and ending points, and different durations. The main level of uncertainty can be found when natural events such as the breaking of the peninsula are difficult to predict. Because this event could happen at any time, this suggests the possibility of additional timelines with shifting strategies. The calendar becomes a tool not only to organize interventions in the long-term, but also to visualize the differences in scales, the permanence of the strategies and the spaces opened to uncertainty. The landscape architect needs to stay involved over a long period of time monitoring the changes and adapting



15 Calendar including spatial, social and temporal processes along with design strategies for a long-term landscape transformation in Puntarenas. Source: María José Zúñiga (2020).

15

the calendar according to the events and the people's input.

Over a timespan of days and years, people living in Kuttanad and Puntarenas are challenged by Naeema and Maria's design to take part in the transformation of the landscape where spatial scenarios can guide interventions at various operational levels. The project in Kuttanad deals with short-term, seasonal, and yearly changes which are linked to the cycle of salt and water. Here the focus is on understanding that certain decisions taken at a local scale have a large impact on the whole system. According to expected outcomes at the respective spatial scales, decisions can be guided in desired directions and the different operational levels already include the possibility to anticipate uncertainties. On the other hand, the project in Puntarenas covers a time frame of transformations for up to 100 years with 30 years phasing. It is directly dependent on land formation and sedimentation processes which occur over a relatively longer time span than that of tidal processes. In the case of Puntarenas, the option to consider that living on the peninsula will be someday impossible is also taken seriously. In the long-term, spatial scenarios can guide interventions at various operational levels. In that respect, the anticipatory capacity of flood risk management is not linear, as illustrated in figure 13, 14 and 15, but circular, according to the proposed spatial water calendars.

THE CALENDAR AS A TOOL FOR SPATIAL DESIGN

The Circular Water Stories lab situates itself within the academic realm of landscape architecture and explores the possibility of designing open-ended frameworks for deploying climate resilient design in deltaic regions that often encounter adverse environmental challenges. This results in design interventions that propose a process to integrate water as the driving force or leverage[18], instead of relying on a fixed plan. These open-ended frameworks are stirred by sequences of spatial drawings showing temporal and social processes in relation to human-made interventions that best represents the spatial transformations through time and scale. The transformation becomes part of a specific culture again, by framing change as an attractive factor and involving people living in the area in the design and decision-making process. This approach questions conventional one-dimensional drawings and instead systematically derives a more dynamic multi-dimensional representation tool. The spatial water calendar is one such iterative tool that extends through the process of change and uncertainty. It is an illustrative workbook, preferably accessible on-site for all participants and must be updated and questioned throughout the transformation process. So far, this research puts forward that the way of representing the spatial water calendar is manifold. When it comes to the process of transforming an area, its value depends on multiple factors like the specific problem and the chosen narrative, the skills of the author, the level of detailing within the calendar, etc. Ultimately, its purpose is to guide to gradually build a complex narrative of how humans and nature exchange roles between being makers and takers of landscapes over time. These kinds of tools which envision slow landscape architectural transformations that are participatory in nature will be more meaningful in vulnerable geographies where there is still a strong connection between people and their landscapes. In countries where water is managed by higher planning authorities, the calendar approach may be

18 Recently there has been a shift in paradigm essaying how to adapt with changing environmental conditions and uncertainties by seeing them as an opportunity for innovation and integration. Likewise, the Water as leverage (WAL) approach uses the dynamics relating to water as an opportunity or as leverage to adapt to climate challenges.

handled differently, more as an instrument to guide change in approaching water management. In all cases, the role of the landscape architect is to analyse, design, and visualize the much-needed opportunities for future adaptive spaces with the help of drawings for carefully predicted scenarios that point at if-then relations.

The graduates made possible the synthesis of spatial water calendars for designing and managing landscapes through abstraction of a lot of complex interconnected parameters relevant to their projects. But one should keep in mind that due to the extensive nature and the given time frame of a graduation project, these calendars need further research and elaboration to be fully developed into a readable design tool. In real-time scenarios, this will act as a colossal working document which is accessible for all relevant stakeholders. Additionally, the spatial water calendar should include knowledge from multiple disciplines integrating civil engineers, ecologists, hydrologists, planners, architects, landscape architects, and others involved in such extensive transformation processes. The illustrative workbook will be a promising tool in the field of landscape architecture that would lead to new approaches while dealing with long-term spatial transformations that can also be used in the event of uncertainty. In that sense, the projects show only a window to establish the foundations of this emerging concept of spatial water calendars. Furthermore, this concept will be expanded in the design lab Circular Water Stories, Delft University of Technology, and we hope to contribute to a more resilient world in which people once again become part of the natural dynamics and the landscape they live in.

REFERENCE

Bélanger, P. (2016). Landscape as infrastructure: a base primer. Routledge.

Berrizbeitia, A., & Harvard University. Graduate School of Design. (2016, April 19). Anita Berrizbeitia, "On the Limits of Process: The Case for Precision in Landscape" [Presentation slides]. Retrieved January 4, 2020, from https://www.youtube.com/watch?v=xbXd1iznH7I

Bobbink, I & Loen, S (2021). Visual Water Biography, translating stories in space and time. In: Circular Water Stories. Bobbink I, Loen, S & Hooimeijer, F (eds.). Spool, # 6, TU Delft Open.

Da Cunha, D. (2012). https://www.mathurdacunha.com/ocean-of-wetness

Hein, C., van Schaik H., Six D., Mager T., Kolen J. J., Ertsen M. & Verschuure-Stuip, G. (2020). Introduction: Connecting Water and Heritage for the Future. In: Adaptive Strategies for Water Heritage. Switzerland: Springer Open.

Krause, F. (2017). Towards an amphibious anthropology of delta life. Human Ecology, 45(3), 403-408.

Marchand, M., Bucx, T. H. M., van de Guchte, K., Makaske, B., & van Driel, W. (2013). Enabling Delta Life:'What Makes Managing Land and Water in Deltas Different?'. Delta Alliance.

Meyer, H. (2019). Toward a Cultural Heritage of Adaptation: A Plea to Embrace the Heritage of a Culture of Risk, Vulnerability and Adaptation. In: Adaptive Strategies for Water Heritage. Switzerland: Springer Open.

Parenti, C. (2011). Tropic of chaos: Climate change and the new geography of violence. Bold Type Books.

Slow Food movement (ChengduDeclaration, 2017). Retrieved March 10, 2021, from https://www.slowfood.com/wpcontent/uploads/2017/10/00_Dich_Chengdu.pdf

Sreejith, K. A. (2013). Human impact on Kuttanad wetland ecosystem-An overview. International Journal of Science and Technology, 2(4), 679-670.

Waldheim, C. (ed.) (2006) The Landscape Urbanism Reader. New York, Princeton Architectural Press.

Watson, J. (2019). Lo-TEK, design by radical Indigenism. TASCHEN, Cologne.

JDU
Journal of Delta Urbanism

JDU is a project by Delta Urbanism Research Group
and DIMI Delft Deltas, Infrastructure and Mobility Initiative
Delft University of Technology

Graphic Layout
bruno, Venice (Italy)

Typefaces
Union, Radim Peško, 2006
JJannon, François Rappo, 2019

Publisher
TU Delft OPEN
https://www.tudelft.nl/library/openpublishing

Subscription and Printing on Demand
Open access journal: available subscription on the journal website
For subscriptions and any further information: JDU-BK@tudelft.nl
Printing on demand will be available from January 2021

Frequency: 1 volume per year

Publication Funding
TUDelft Delta, Infrastructure and Mobility Initiative

Contacts
For any further information:
JDU-BK@tudelft.nl
https://journals.open.tudelft.nl/jdu/
www.deltaurbanism.org

N.2 / Longue Durée / Practice / 02
Fall / Winter 2021

Authors
Inge Bobbink, *Delft University of Technology, the Netherlands*
Naeema Ali, *Delft University of Technology, the Netherlands*
María José Zúñiga, *Delft University of Technology, the Netherlands*

Citation
Bobbink, I., Ali, N., Zúñiga, M. J., Spatial water calendar. An
illustrative workbook for adaptive transformatione, J. Delta
Urbanism 2(2021), doi.org/10.7480/jdu.2.2021.6228

ISSN: 2666-7851
p-ISSN 2667-3487