**The Living Estuary**  

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**ABSTRACT**

The current state of progression in a delta region around the world can differ significantly from one to the other. In metropolitan delta region in the developed country, from the exploitation for a long time by the urbanization and industrialization and intensive farming, they are facing a deadlock and start to find a new balance between human and nature system. On the other hands, delta region in developing county is facing different challenges. With the limitation in the financial, technological and political sector, people are still living dependently to the natural resources. It is a big challenge and opportunity at the same time, to learn from the over-exploited delta, for the growing delta in developing countries so that it won’t make the same mistakes. The Volta Delta in Ghana, with artisanal fisheries and traditional farmers communities, could be a suitable location to study those challenges.

The Volta Delta is facing not only the challenge of severe coastal erosion but also the future challenge of a high rate of population growth, industrialization to exploit the natural resources more and the unavailability of long-term planning of the region.

The estuary area is one of the most dynamic parts of the delta with the combination of the sea and river water dynamics, it has high biodiversity of the mudflat and sandy shore ecosystems, and it is governed by three municipalities whose development strategy need to be integrated. By these challenges, this project aims to show the possibility of future spatial adaptive strategy to integrate the water, ecosystem, and anthropo-dynamics to guide the development in the estuary of Volta Delta.

This project was conducted in three main stages. First, is the investigation, where the landscape is seen as a form of interaction between water, ecosystem and social and economic processes. The design principles with the type of spatial configuration between human settlement and the role of the natural and cultural landscape become the result of this first stage. Scenario building as the second stage of this research exploring the possible extreme condition that may occur in the estuary area in the next 50 years from the influence of combination between several variables. By comparing the dependent variables from each scenario, the design strategies on estuary scale are formulated. These strategies comprise the water management, food production, erosion control, and settlement and mobility sectors. Three sites are selected from this process. All the sites are located in the most affected areas by all the extreme scenarios, and each has distinct landscape spatial configurations in the relation with the types of communities inhabit the sites.

The design implementation stage explores the landscape architectonic design on each site, with three main principles as the common frameworks. First is the sensitivity in placing the new infrastructure which could either trigger or restrain the development itself. On each site, the form of development will give more focus on the balance and re-establishment of the nature system. Second, is the type of intervention that could grow and adapt to certain changes by the natural process or its users. And last, the circular system, where the intervention should keep open for an opportunity of the local economy, as well as the ecological and environmental quality improvement.
The three selected sites were explored with distinct focus of intentions. In site one, the landscape design investigates the possible solution in compromising the erosion both on the sea and riversides. In site two, the effort in recovering the abandoned wetlands are discussed. At the town fringe, the transition zone that could help to control the expansion of the settlement towards the vulnerable area is presented.

In applying the gradual development, the application of the three sites needs to be considered in stages with long-term basis. The staging of the application part will discuss the priority and timeline of the processes on each site, as well as how the support of the government and stakeholders, and the involvement and participation of the local communities will be integrated into the plan.

After all, keeping balance and integration of the flows that put forward the collective economy improvement is prone to some challenges. For example, the complication to unify the future vision of the government and stakeholders, the possibilities conflict of interest for the broader investment both in the tourism industry and exploitation of natural resources, and even the reluctance of the communities to become part of the new system. Therefore, through the design strategy on the estuary scale, and spatial design configuration on the design principles, as well as the principles in developing the site-specific landscape design that was introduced in this research, is expected to be a guidance or starting point in the negotiation to achieve middle ground between economic and spatial development and nature conservation in a circular balance of its living systems.
REFLECTION

Relevance with the theme of the graduation studio

The studio Flowscape focus on developing innovative spatial landscape architectonic design in transport, green and water infrastructure that could guide urban and rural development and maintain their civic and cultural significant (Nijhuis et al., 2017). The landscape infrastructure facilitates aesthetic, functional, social and ecological relationship between human and nature system with movement and flow at its core.

In relation with Flowscape theme, this project can be one of design-based case study in which the perspective of Lanscape as ecologic, economic and social processes is used as a base in synthesizing the design principles and framework, especially for the vulnerable delta region in developing country.

This project explores possibilities in facilitating the aesthetic and spatial experiences aspect without neglecting the critical aspect in anticipating the impact of coastal erosion with the limitation in financial, political and technological sectors. This project use the combination of natural processes in one hand, and landscape architectonic intervention on the other hand to generate gradual transformation in the region. The transformation is not only in territorial aspect, but also emphasizing the potential of the spatial experiences to add value for new economy activity.

Relevance with the wider context

• Vulnerable delta region in a developing country

Overexploitation by urbanization in delta region in developed country inspired this project not to take the same path in a such dynamic situation. With the same effort to get back to a balance between development and conservation of natural dynamics, a same approach can not be directly applied. This is due to the difference in the relation of the social economy structure of the society that no longer highly dependent directly to the natural resources. Although for both society, a better quality of the natural system will improve the living quality for its inhabitants.

The application of spatial planning which could trigger and restrain the development will also be different, where the informal settlement that could grown uncontrollably in a developing country, might not be found in a developed country.

Volta Delta is one of example of a lot more delta regions in developing countries. With similar limitation and condition, this project depict alternative approach that could be used as guidance of the rural development in a delta region. This project also shows how cultural and social value could be enhanced to offer more various type of economy improvement. Moreover, some technical solutions to incorporate local material and technique are presented to show possible solution in adapting new intervention to the local system.

• Role of landscape architect and spatial design

At the beginning of this project, I thought that the urgent solution was a very technical, infrastructure solution, where the efficiency to anticipate the main challenge of coastal erosion is the only priority. But along with a broader analysis of its potential and long-term challenger that not only come from the natural dynamics, but also from the human dynamics where the high rate of population growth and the fulfillment of needs that come with it, the role of spatial design in dealing with these challenges become clearer.
The role of landscape architect in creating spatial design for its possible future can not be underestimated. Spatial design will give direction of the development. Although there is space for change and adaptation in the development process, but by showing the spatial design, it will give the common understanding of the goal to be achieved. Slow but constructive process is able to optimize the potential of the site. Aesthetic aspect will increase the value of an area and improve the living quality for the local communities.

- Participatory process and multi-stakeholders platform

During the process of this project, some workshops was conducted by DIMI and Delta Alliance (see Appendix 3, p. 195), which involve the discussion with some local authorities and community leaders to discuss about their expectation of the intervention or investment that may come. Although participatory process was not used further in determining the design decisions, the participatory processes and multi-stakeholder platform become important part in the proposed implementation of this project. Partnership between the authorities and local communities aims not only to transform the territory but also the society, to learn from each other for more sustainable project implementation.

**Applied Methods and Generalized Framework**

- Reading the site and understanding the culture

In the research process, understanding of the site condition both in physical and cultural aspect is crucial. To see landscape as processes, it is important to learn not only about the space it creates, but also how the system of water, ecosystem and social economy works and depend to each other.

Discussion with colleagues from various study field was very helpful. The knowledge from coastal engineering, water management, and marine sciences were useful in grasping the complexity of the delta and coastal system.

In data collection process, the availability of spatial data was very limited. Sometime the provided information doesn’t have consistency although they are showing aligned timeline. In facing this challenge, gathering more information from scientific papers from various field of study and making cross-reference map and diagrams were done. Translation of empirical data and technical information from various scientific researches into spatial drawings was one of the important steps to move forward in synthesizing the spatial design principles.

Site visit and interview with local people and authorities helps to understand the culture and social structure of the local communities. This information and understanding added significant insight in deciding the approach in the designs. Hopefully, the analysis result in this research that put the three dynamics together in spatial configuration can give useful input and new layer for future spatial research and design.

- Research methods & generalized framework

The chosen methods in this research are arguably has its strength and weakness. To see the landscape as an interaction between human and nature processes, the method to create type of integration of the dynamic systems and spatial design concept can actually be done in two directions. First, is by analyzing the system in general and then choose the location that can represent the dynamics of the system to be developed further. And second, is to choose a location based on a general issue and start to investigate the related system in this specific location.
This research uses the first method with several reasons. First, the synthesized design principle will cover a wider scope in the spatial relation of the water, ecosystem, and economy interconnection. Second, in the scenario building stage, we can learn how some major factors in spatial development can influence the decision to make the design and strategy in some common sectors. In this case, we are water management, food production, erosion control, and settlement and mobility sectors. Third, is that the chosen sites are proved from the scenario study to have significant influence in the future spatial development.

However, each of the system dynamics embody a huge complexity of its own. It takes carefulness to determine the boundary and extract it into spatial principles. The same challenge appeared in determining the variables to be used in building the extreme scenarios. To determine these variables could be better if it involves discussion among stakeholders who will participate in the application of the strategies. This method also needs several sites to test the combination of some principles, which took more time in the process comparing the application of the second methods.

As the result of this research, the three main concepts in developing site specific landscape design are the main framework that can be used in delta area with similar condition in social and economy sectors. These concepts include the sensibility in placing the new infrastructure, the growing spaces, and the establishment of circular systems.

**Relevance in design, moral sensibility and ethical implementation**

- **Moral sensibility**

  The moral issues related to the project come from some aspects. One of them is the possible conflict of interest that involve various stakeholders. Complication to unify the vision for long-term development may conflict the determination of actions and strategy which may lead to a hindrance in the development itself. Potential growth of large scale tourism investment and other industrialization sector may also be against the principle of collective economy derived from this research. In addition, limiting the development and placement of hard infrastructure in order to prevent exacerbation burden in a vulnerable area, may generate conflict in the society who would expect the same treatment for the whole area.

  This project shows the possibility of partnership between all stakeholders in the landscape, that take long time period to ensure the territorial transformations. However, depart from the issues discussed above, this project aims to create guideline in the land use planning and integration principles. It is expected to influence the decision making and become starting points in the negotiation to take middle ground between economic development and nature conservation.

- **Further researches**

  Although this project was initiated by in-depth analysis and tried to cover the 3 main dynamics sectors, it still needs further research about the feasibility and technical implementation in the main landscape infrastructure part. For example, the implementation of river dredging and placement of sand nourishment which are influenced by many aspects in the water dynamic that still needs more accurate calculation and simulation, and the same thing for the establishment of the ecosystems in helping to prevent further erosion.

  However, I think that the project successfully enhance the spatial quality of the landscape by working together with the natural processes, as well as cultural identity of the place. Spatial design is not only about try to solve the technical urgency, but also bring the interconnection of
the landscape with the inhabitants as a better living space.

- Gradual change in nature and society
  With the limitation in financial, technological, and political sectors, comprehensive top-down planning and design might not be suitable in this project. It might not be readily accepted and adapted by the local communities which may lead to unsustainable implementation. Therefore, a gradual transformation in the design strategy will give space and time for the communities to adapt in the changes in their living environment. Similar strategy is used in using the natural processes as part of the design. It may not suitable to put large scale hard infrastructure where people live still dependently to the natural resources.

  However, this strategy needs to be accompanied by establishment of better education for the local communities. A better understanding on the system by new interventions, the importance of maintaining native ecosystems, and training skills for new type of livelihood will be needed. Balance in applying local knowledge and new technology is expected to form contextual solution and engage people to participate in the processes.

- Circular systems
  Improvement in quality of natural ecosystems also means the improvement of people’s livelihood. The circular system is one of important part in this research, where the type of intervention should be able to trigger improvement in natural regeneration that will benefit people in the economic sector. This dependency could bring some challenges where disruption to one system will instantly affecting the others. Especially when we deal with natural processes which we can not fully predict.

  In this case, the design needs a flexibility to form resiliency in social-economy sector. Review of the plans and designs is required after certain period of time. The review will become input for subsequent strategy and actions that could change the initial design.

- Materialization
  The materialization for the architectonic elements of this project has offered a realistic way of its implementation. The adaptation in architectonic style and techniques in utilizing the local materials is intended to allow the involvement of the local communities in the construction process of this project.

  Nevertheless, one of the main framework of this project is that the intervention has the flexibility and should be able to adapt and grow with the influence of the users. Open-ended strategy will allow people in the interpretation of applying the design in individual or community scale, while this project aims to show how the unity in the systems can be a direction to create common understanding in achieving the same goal.

In conclusion

The project shows the possible future of integrated landscape to create balance between nature and human system in a dynamic situation of a delta region in a developing country. The project offers ideas of landscape transformation as whole, linking the spatial, economic and ecological systems, as well as technical solutions and vision on how the project may be implemented.

The concept and frameworks resulted in this project are expected to be the starting point of development strategy for the whole Volta Delta coastline in facing the future challenges both
from the coastal erosion and urbanization sectors.

The display of possible future in the project aims to start a discussion of decision making between the stakeholders in the reality for the future of the Volta Delta. The project also shows the role of landscape architect and spatial design in developing a vulnerable area with limitations in financial, political and technological sectors.