Revealing the Beauty of Biesbosch

— Experiencing the Ecological Aesthetics of Dynamic Landscapes through Recreation

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1. Introduction

1.1 Fascination

Looking at the planet, I’ve always been caught by the pictures of the massive dynamic and islands landscape. In their unique distribution, there seems to be an invisible hand manipulating behind all and the elements in the landscape act like they operate in an agreed contract, depending and restricting on each other.
Therefore, when I saw the map of Biesbosch, I can’t let it go. From the aerial view, it is a combination of strange elements. The organic shape of the islands and streams, the pattern of agriculture, and the urbanized water reservoir. It really makes me wonder what it is like to be in there.

Actually, I’ve been to a dynamic landscape before, the Thousand Islands in China. It was a mountain area until the power station was constructed in the upper stream, forcing the valley to become a lake. This resulted the mountain tops higher than water surface turned to islands. And because of a water level difference of 2 meters per year, the islands adjusted itself into the most characteristic: the golden belt.

By comparison, differs from the vertical adjustment of the Thousand Islands in China, the islands in Biesbosch are more or less fish-shaped, flat, seems more flexible to the dynamics. And it really makes me wonder what the story is behind the Biebosch area.
After construction of power station

Before 1959

vertical adjust

fish shaped - flat - flexibility to flow

The story behind the fish-like islands...?
1.2 Biesbosch

I started the story through my own perception as well as others.

On my first visit to the site, I was astonished by how scattered the scenery is. Knowing Biesbosch is a national nature preserve, I noticed there are a lot of human intervention left-overs. And they are just left there with no further modification.

Then how others feel about this place became important to answer my gap of experience. Therefore, I looked into how different groups of people feel about this place.

First is the professionals. From the photos from quite professional and official magazines, Biesbosch is a vivid natural area with characteristics of many different aspects.

Then from the photos posted by visitors on social media, Biesbosch is quite dull from a scenery point of view. However, people do recognize the characteristic elements in the landscape.
Based on these, I have my first judgement that Biesbosch causes gaps in perception, which indicates its beauty can’t be addressed to people in a proper way, which can make people think it’s unworthy of its title.

Two aspects may have caused this situation: first, the landscape structure is not qualified. Second, accessibility to the landscape may be low.

1.3 The ecology and aesthetic of nature

Wild pristine nature is preserved in all over the world to protect and maintain the biodiversity. It is somehow different in the Netherlands. The Dutch landscape is always being changed. And people do this for different functions. Like for the use of cattle and agriculture, for use of flood protection with polders and dikes. The settlements grew and with them the infrastructures. Slowly every square meter of the Netherlands was cultivated to a certain degree.

Everything is designed and dedicated professionals always keep an eye on the fiercest natural element, the sea. This provides a sense of security, but the sublime nature experience is missing. (Slob, 2013)

New movement around 90’s became more focused on landscape reconstruction and development, focusing on the ecological development of certain species and the possibility for people to recreate, by controlling nature in order to create conditions for specific ecosystems. The essential characteristics of natural elements and the way they form the landscape is under pronounced, or in other words, the esthetic perspective is neglected.
By doing this, a specific end result is made, but only on the ecological functional level. It doesn’t give insight in the ideas and processes that shaped the landscape nor generate spiritual connection between public and nature, which is resulted from the under consideration of landscape experience that aesthetic could have delivered.

Given recent days the developments depend on placing responsibilities on the public, making nature address itself and please people in a spiritual way can generate public support. (Eric Luiten 2016) So the aesthetic perspective is just as important as the ecology perspective.

And this project is focused on how to deliver both perspectives through landscape design.
2.1 The relation between human and nature

On the premise of survival, the entire world ecosystem exists of all the abiotic processes and biotic species of plants and animals, including human. In primitive time human were a complimentary part of the ecosystem. With use of tools, we evolved from hunting in the wild to building house shelter, to cultivating the land. Human then started constructing settlements and infrastructure changing the morphology of landscape. We started feeling separated from this ecosystem. Instead of being part of nature, it became man versus nature.

The turn in relation between human and nature is also reflected in the landscape architecture design.

At Middle Ages, the landscape outside with its unpredictable processes was seen as wild and scary. So people built enclosed garden and use it for their own benefit like food production, leisure and aesthetics. (Bijlsma, 1995),(Aben, Wit, 1998)

In the Renaissance time, nature was seen as an aesthetic entity and an object of architecture. The unordered wild side of nature is discovered and appreciated as something to use for the view, horizon and perspective; the new landscape architectural design elements. The landscape functioned as a decor for which the villa on the foreground had to be brought in a perspective context. They served the purpose of otium, to recover from the busy daily life in the city. (Bijlsma, 1995)
In the time of the French formal baroque garden, man controls and forms the natural elements to create new shapes and illusions with it. The formal composition and symmetry address stability and great power to the viewers. (Bijlsma, 1995)

In English landscape park time, the designs show a romanticized Arcadian idea of landscape. Where the design is seen as a way to give an almost painting like view on natural and built elements. By giving these views, the walk through the park is seen as the telling of a story, with the charm of change and surprise. (Bijlsma, 1995)

Until this time, human mainly focus on the aesthetic value of nature. And landscape played a role as interface between human and nature. Landscape brought aesthetic of nature to human to stimulate emotionally pleasant experience. However, due to the gardens serve to a small scale of people, the experience actually can’t have too much of an impact on the public. Also, The design are from a architectonic point of view, which doesn’t have further effect on the processes in nature. So it’s a mono-directional relation between human and nature, mono-aesthetical.

Until 1900 the relation between human and nature is mostly visible in garden and park designs. A more urban-nature-view arose following the rapid development of the land reclamation of big parts of the country, the intensification of agriculture and the urbanization. Because of the increased use of the landscape, many species of plants and animals disappeared. Then there started
the movement of different nature protection organizations that wanted to protect the existing landscape, but always from this urban-nature perspective. (Bijlsma, 1995) (Feddes et al., 1998)

This period the design focuses on the balance between human interference and the ecological expression. In this controlled world with big cities where man works and lives, enclosed by agricultural fields and some fenced off nature reserves people are looking for a feeling of freedom, to feel the vastness of the existence where we are part of. (Slob, 2013)

Till then, human shifted the focus from aesthetical to ecological value of nature. And landscape played a role as engineer for ecology with slight additional concern of recreation. Landscape deals with natural processes and helps to lead nature towards biodiversity, which contributes to a better environment for entire human being from the context of the whole planet. However, the benefits of ecosystem is not visible to public and it is set in such huge context that people as individual can't sense the improvements of the nature that we are part of because the design didn’t facilities public to the aesthetic of the improved ecosystem. So it’s a mono-directional relation between human and nature during this period, too, mono-ecological.

The relation between human and nature is an ongoing process. In the context of Netherlands. The Oostvaardersplassen offered a new perspective that provided the social need for nature. Following it, Plan Ooievaar is developed, having a positive view on
‘nature-development’. Nature became more open to people. However, the negative influence that human can have on nature was still a big concern. Nature that was developed was only focusing on an ecological benefit and man was the viewer. (Feddes et al., 1998)

So the aesthetic value is gaining weight again. In the controlled world with big cities where man get the hang of how the urban works, nature can offer more than just a fence-off escape from cities. The beauty and forces of the vast existence takes the burden off people from workday pressure. The aesthetic value of nature can provide people the pleasure of leisure just as the traditional gardens. Nature can be a leisure garden for the city to sensitize people to its atmosphere, its formation, and to the forces and processes of nature.

Ecology protection is the base ground for human interventions in nature. Within its resilience, the aesthetical value should be enhanced so that the relation between human and nature achieves a bidirectional one, ecological-aesthetical bidirectional. Landscape generates the dialogue between human and nature.

2.2 Ecological aesthetics

The relation between man and nature is set in a new movement, the construction of new nature areas. In its most strict meaning, the term nature refers to the untouched biological environment. But that is not what we want. What we want is a type of tamed nature where the environment is safe and easy for people to experience while natural processes still have their way. In this tamed nature, ecology can be sacrificed a little bit to enhance the aesthetic value.

Under this context, ecological aesthetics can be the medium to deliver the dialogic relation between human and nature.

Ecological aesthetic refers to aesthetic that’s contained in living life existence and operations, relying on the species equality and ecological balance (Jiayuan Qin, 2006).

In landscape ecology, ‘landscape’ contains the structure, function, growth and decline of landscape. Therefore, the essence of landscape ecology model is the combination of science of ecology and art of design (Jinxiong Hou, 1999). Since this involves the combination of landscape integrity and aesthetic appeal, what ecology is to landscape architecture equals what structure is to architecture (Baljon, 1992).
Apart from achieving the ecological concerns, landscape design must include the appeal and form of aesthetics (Thorne and Huang, 1991). The key is to capture the infectious emotional factors through multiple approaches to highlight the ecologic and aesthetic value.

Based on this acknowledgement, ecological aesthetics in landscape contains fundamentally two parts: ecological integrity and aesthetic appeal.

Ecological integrity can be categorized from three aspects: diversity of culture and the inheritance of itself, biodiversity and environmental quality such as water, air and soil. It emphasizes on the substances and relations that keep the ecosystem functioning. (Throne and Huang, 1991)

Aesthetic appeal can be categorized from three aspects: positive feelings or certain emotion response, meaning care of symbols, perceptual experience of joy: visual, hearing, smell, touch, etc. (Throne and Huang, 1991)

2.3 The role of landscape design

In the model of the dialogic relation between human and nature, two interests are being represented: the (physical) ecological development and the (social) recreational experience. On the level of ecological aesthetics, it’s ecological integrity and aesthetic appeal. Designers often use different layers to design these interests, but many of the interests are contradictory or have different outcomes, the trick is to combine them by design into one common spatial vision or concept. (Jong, 2007) Landscape design should be able to combine them from the physical context and the social context.
The physical context

To perceive this nature as it is now, a lot of management is needed. With the many environmental factors in the physical and social context, de Jong states that probable, desirable and possible future contexts models can be made. Where probable futures are predicted by research and show the problem field, desirable futures are the aims which are not expected to happen without action. Possible futures are the reaction to the probably and desirable futures and a combination in order to find these new possibilities. ‘The role of the designer is to imagine new possibilities.’ (Jong, 2007)

The social context

The developed nature areas are not that vulnerable to the disturbance of visitors. ‘If you let natural processes have their way, people can enjoy these great new nature areas. A big advantage is that it also increases the public support to reconstruct more natural areas.’ The nature reserve has to have a certain level of robustness before visitors can recreate without disturbing plants and animals. This takes time, but also requires a certain scale. (Buitelaar, 2012) People can be the visitor that wants to experience and explore nature and needs certain facilities like paths, cafes, museums, events and activities. By strengthening the recreational qualities, and most of all the experience of nature the dialogical relation between human and nature can be strengthened.
3.1 General information about Biesbosch

Biesbosch is located in the Haringvliet estuary in the Southwest delta. It is the ‘green heart’ in the urban ring of Rotterdam-Dordrecht-Breda-Antwerpen. At the confluence of River Nieuwe Merwede and River Maas, Biesboch is a very dynamic landscape with a lot of rivers, streams and islands.

At present, Biesbosch is a national nature reserve. However, flood and human intervention to fight against flood is the main theme of Biesbosch history. Biesbosch started its beginning from the St Elisabeth flood in 1421. That flood destroyed almost everything existed and turn it to a lagoon. Then people started terrastialization to gain land from water. Then there was flood time after time. After the severe one in 1953, people built up a series of coastal defenses in the Southwest Delta to shut the sea out. Biesbosch became a less dynamic place after the Haringvliet block construction. After that reservoirs were built in the islands. In attempt to protect nature, Biesbosch became a national nature reserve. And with the Room for River project, Biesbosch now is focusing on recreation.
3.2 The development of nature, culture and urban

There are a lot of changes in the three layers of nature, culture and urban in Biesbosch throughout its development. At an earlier stage, natural processes took charge. There grew the mudflats, marshes, reeds, and willows through natural succession.

Then later human interventions play a bigger role in the landscape. When the Haringvliet blocked the sea in 1970s, the tide reduced then the mudflats and marshes decreased dramatically. Then people took a lot of land to build polders for agriculture, leaving less room for vegetation. During the land consolidation, the reeds decreased. Until 2010s, with the project Room for River, there is the trend of depoldering. Nature then gain more room in Biesbosch.
Development of 3 layers: nature, culture, urban.

1730 terrestialization

cultural layer
- regulate ditches in willow fields
- early dikes and polders

natural layer
- reed vegetation
- willows start to grow

Development of 3 layers: nature, culture, urban.

1970 land consolidation

urban layer
- dikes are connected into roads

natural layer
- vegetation decrease, especially reed

Development of 3 layers: nature, culture, urban.

1850 wetland development

cultural layer
- ditch regulation in willow fields
- large area of polders

natural layer
- water vegetation
- reed, willow, trees

Development of 3 layers: nature, culture, urban.

2017 depoldering

urban layer
- road network, drinking water reservoirs built

natural layer
- reed reduced, woods grow

Development of 3 layers: nature, culture, urban.
3.3 Relation between human and nature in Biesbosch

Being part of the national project Room for River, some polders in Biesbosch were open to give more room for water. Bringing back more mudflats and birds and other species, this has gained ecological benefits.

On the other hand, from the urban perspective. In the city Dordrecht, nature, to be more specifically, the water plays a leading role in people's life. People have balconies facing the canals, cafes beside the water, etc. After the fast transformation from river front to city center, the green takes over gradually. However, the green from city center to rural area is meant for passing through mainly, not for experiencing. When reach River Nieuwe Merwede, people get to connect with water again. And right after it’s the wilderness of Biesbosch. In summary, from the urban to wilderness, there’s no tamed nature in between as buffer for experiencing. There lacks the aesthetical connection of nature with people.

Based on the analysis, the relation between human and nature in Biesbosch is a ‘mono-ecological’ one. Experiencing and aesthetic has been given only very little concern.
The relation between human and nature from Dordrecht city center to Werkendam.
3.4 Recreation status

The museum of Biesbosch is the center for the tour. People get into the museum and get informed of the developments of the area. Then they take on boat sightseeing routes. Other ways of sightseeing are walking routes and biking route around the dikes near the Museum and Kleine Noordwaard polder.

The recreation status is very scattered in Biesbosch. It is a natural reserve, yet what people get most is in the museum instead of the outside landscape.
Based on the recent developments of depoldering, the connection with urban, and the recreational basis, the depoldered Kleine Noordwaard polder is a suitable site for design with ecological and aesthetical potentials.

3.5 Problem statement

Main problem:
Today’s recreation lay-out in the Biesbosch doesn’t use or reveal the identity of the place.

The Biesbosch area is presenting its identity in the Biesbosch museum. Why not experiencing the real dynamic landscape outside? So far recreational accessibility is mainly developed along the edges on the dikes. It’s hard to be ‘in’ the landscape itself.

Causes:
Broken landscape structure:
Due to long-term human intervention the dynamic natural landscape is transformed into a ‘fixed’ cultural landscape. Recently parts of the Biesbosch were transformed for the ‘room for the river’ project. Again a very functional landscape was created. These transformations are lacking ecological aesthetic concerns.

Biodiversity decrease:
The reduction of the water dynamics, consequences of the Delta works and large-scale poldering resulted in a decrease of the biodiversity. In the recent ‘room for the river’ project there are some additional ecological benefits, but more of an ecological expression without establishing the ecosystem out of a biodiversity concern.

Accessibility to landscape:
The accessibility of Biesbosch by walking and biking is difficult. Routes are mainly situated on dikes and along roads. No particular paths is leading into the landscape.
4. Theory

4.1 Research questions and objective

Based on the former analysis, the current design in Biesbosch didn't reveal the aesthetic of nature to people. It's basically 'mono-ecological' relation between human and nature.

However, given the trend that nature is treated more and more open, the Haringvliet block will probably allow more dynamics in the foreseen, which will result in the ecology in Biesbosch going back to old days when nature was in charge.

Also, with the fast pace life in the city, there's the need of natural experience as an alternation, but more tamed nature for experiencing that's not as fierce as the wildness.

With this regard, it is better for people to intervene the foreseen ecology of Biesbosch to some extent that the wildness is tailored to be more revealing for people to experience. Therefore, Biesbosch needs to address both aspects of ecology and aesthetic to establish the dialogic relation between human and nature.

Landscape design should contribute to establishing the dialogic 'ecological-aesthetic' relation between human and nature. And finding the unity of both and apply it in landscape design is where landscape design can intervene.
Based on the current analysis and the foreseen situation, the main research question is:

**How to experience the ecological aesthetics of Biesbosch through recreation?**

Sub questions:
- How to define ecological aesthetics?
- Which ecological aesthetics to be experienced in the Biesbosch?
- How can the ecological aesthetics be strengthened through landscape design?
- How to balance nature protection and recreation development?

**Objective:**
Through experiencing the ecological aesthetics of dynamic landscapes, the aim is to sensitize people to forces and processes of dynamics, to establish a dialogic relation between human and nature.

### 4.2 Dynamics

All the aesthetic appeals of ecology are based on the ecological integrity. In the case of Biesbosch, the most dominant environmental element is the dynamics. Being part of the estuary, the most basic dynamic is the tidal.

Although the tidal difference is easy to be sensed at present due to the delta works, before the river mouths were blocked, Biesbosch had a tidal difference about 2m. With the Haringvliet blocked, the tidal difference in Biesbosch is about 0.3m at present.

A recent development is re-opening the Haringvliet block. To support fish migration and to bring back the dynamic natural processes the block will be partly opened. The effect for Biesbosch will be a bigger tidal difference, which will enable more surface for species that prefer the dynamics of the water on the edges of the land. (Storm, Kuijpers & Harmsen, 2006)

<table>
<thead>
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<th></th>
<th>high tide</th>
<th>low tide</th>
<th>difference</th>
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</thead>
<tbody>
<tr>
<td>Present</td>
<td>+65cm</td>
<td>+35cm</td>
<td>30cm</td>
</tr>
<tr>
<td>Foreseen</td>
<td>+65cm</td>
<td>-10cm</td>
<td>75cm</td>
</tr>
</tbody>
</table>

Tides at present and in scenario, retrieved from Hydrologische verkenning Tiengemeten & Zoet en Zout, Tracy Metz

<table>
<thead>
<tr>
<th></th>
<th>before</th>
<th>present</th>
<th>foreseen</th>
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</thead>
<tbody>
<tr>
<td>tidal difference</td>
<td>2m</td>
<td>0.3m</td>
<td>0.75m</td>
</tr>
</tbody>
</table>

Tides differences before, present and in the foreseen.
In the Getemd Getij (tamed tide scenario) option, there will be a tidal difference of 75cm daily instead of the current 30cm. If this Getemd Getij is set in motion there will be a huge change in both the abiotic and the biotic natural processes in the Harvingvliet, mostly due to the changing tide and flow of the water. (Menting, 2000)

In order to make a more ecological and aesthetical design in the foreseen, the Getemd Getij conditions will be used in the project.

Recent years, the Room for River project has added the dynamic of flood seasonally. The Kleine Noordwaard polder has been open and it now has a seasonal change of 50 cm difference between dry season (April- October) and flood season (November - March).

![Seasonal difference 50cm of flood in the depoldered Kleine Noordwaard.](image)

![Kleine Noordwaard from arable polder, to part of the Rom for River Project.](image)

![Tidal wave through time: 6 hours before high water - 6 hours after high water, on the basis of the 1/12 calculation method](image)
The intensed dynamics in Beisbosch area will surly influence the ecology, especially the biotopes on the edges of land. A new round of ecological succession along the shore will be generated. However, since the dynamics are still tamed, it’s safe for recreation developments. Human can intervene the ecological succession to reveal the beauties of the dynamics and the landscape they influenced through a more tailored landscape for experiencing. Concerning natural preservation, only Kleine Noordwaard is chosen in the project to design as a represent of Biesbosch.

4.3 Ecological stability

The dynamics in the foreseen will generate natural succession in Biesbosch area to a steady status. In order to better intervene, it’s essential to know what steady status it is for the design area.

From a historical point of view, Beisbosch has gone through a series of natural succession until it is interrupted by human interventions. When the tidal was much fiercer in the old times, Biesbosch evolved from bare sand flats to tidal forests in natural conditions. Through the succession processes, the conclusion can be drew that in natural situation, the most steady status of ecosystem is the terrace from shore to land with mainly four biotopes dominated, respectively, the mudflats, the bies marsh, the reeds field, and the willow forests.

However, the landscape structure doesn’t exist anymore at present. Mudflats, reeds, bies have decreased intensively. In Kleine Noordwaard, although the Room for River brought back more mudflats than before, there’s no terrace structure for dynamics to perform. The four biotopes can be found in site, but in a very scattered layout, and only very small scale of reeds and bies.

Human interventions can help bring back the terrace structure to settle the landscape at a relatively steady status. How to apply will be discussed in the next chapter.
Succession in Biesbosch area.

natural process
bare sand flats - rough herbage vegetation

natural process + human intervention
osier fields, willow beds

arable lands

nature take over again

Succession in Biesbosch area.
The most steady status in natural condition is the terrace from shore to land with mainly four biotopes.

The current scattered layout of four biotopes in Kleine Noordwaard.

The current situation in Kleine Noordwaard with steep banks from shore to land.

Site pictures of the steep banks from shore to land in Kleine Noordwaard.
4.3 Landscape characteristics

To restore the lost landscape, there needs to bring back the lost landscape characteristic that existed combining the landscape together and making them unique. By studying the history maps, the characteristics of streams, ponds, clearing in woods that used to exist now disappeared.

Especially the streams and ponds, they were the bonding elements of the reeds, bies and mudflats. To establish the ecological integrity and to add recreational atmosphere, they are essential.

What existed in the original landscape before from historical maps.

What had been existed but now lost?

Willows
Reeds
Trees
Mudflats

The current condition of the characteristics at present.
4.5 Aesthetic appeal

As is discussed earlier, ecological integrity is the base ground for ecological aesthetics. Therefore, which ecological aesthetics can be experienced in Kleine Noordwaard depends on the future ecology.

Firstly, what can be experienced at present is identified, mainly the formal beauty of the four biotopes, whose characteristics will stay even the landscape structure changes.

Secondly, what can be experienced when the ecosystem reaches a steady status. This part is identified by looking back at the time when the ecology was steady in natural condition. The sequential beauty and adaptive beauty are the ones that will be brought back.

Based on what can be experienced at present and what existed before and thus will be brought back, which ecological aesthetics in the future will be experienced become clear.

The formal beauty of the four biotopes that can be experienced at present, which will stay in the future.

Formal beauty of the mudflats and marshes biotopes.

Formal beauty of the willow forests biotope.

willow forests in site.
Water front in site.

Sequential beauty at present, which will be replaced in the future.

Sequential beauty in the past which will be brought back.

Adaptive beauty in the past, which will be brought back in the future.
5. Methodology

5.1 The physical context

To experience ecological aesthetics, to reveal the beauty of Biesbosch, both aspects of ecological integrity and aesthetic appeal should be delivered.

Ecological integrity is not only the base ground for aesthetic appeal, but it is also the basic ground for experiencing. The aesthetic appeal is the stimulus for experience. They are all part of the context. However, what’s in the context is not distinctive for visitors to notice, especially in a rather wild area. Therefore, how to reveal what’s in the context to people through spatial interventions is where landscape design come in.

To better identify what to reveal in design, the aesthetics are abstracted to dots, lines and plane. From there they are transformed to 3D intervention. Then the principles for landscape design are drew out.

Abstraction of elements.
As is discussed above, when the Haringvliet block opens partly, the intensified dynamics will cause new round succession. If no human interventions, Kleine Noordwaard will go through degeneration first since its biotopes are scattered and banks are steep slopes. It’ll then take years to adapt the new situation.

Now that the steady status is clear for the ecosystem, interventions can get in the process of building up the steady situation in a way that not only the ecological requirements are met, but also towards the aesthetic advantage.

**Principle - sculpture**
The borders where the water level meets the terrain however is fluid. What intervention can be done to reveal this feature is that to sculpture the border so that the specified quality can be grasped.

In reality, the borders where the water levels meet with terrain is not easy to be seen with various vegetation covered. The retaining walls to be put at the terrace will specify it. The emphasis allows people to get the special features of dynamic landscape through their own physical investigation, whether when in the landscape or view it from distance. The retaining walls not only echo with the water levels, but also reveals the sequential beauty of the configuration of biotopes.

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**5.2 The social context**

In the course of the growing ecological understanding that did not start until the late sixties, man came to perceive himself as an integral part of a set of connected, natural and cultural ecosystems, and thus also part of the nature surrounding him (Strelow, 2004). This connection is expressed in environmental art, aiming to bring the potential beauty out so that people won’t miss it and therefore can have a dialogue with nature. In this section, three ways to reveal the beauty of nature is discussed, from an abstract artistic point of view.
Signs
Signs are usually in the form of dots, lines and marks. Even in ancient times, they were signs of human intervention in the landscape and expressed a desire for identity, orientation and demarcation in a world without boundaries (Erzen, 2004). As the formal beauty of ensembles discussed above, the frame can pick the pattern out of the massive composition.

Or the line drew parallel to a certain lines then the orientation is strengthened. It can also divide an entirety into different parts so to make the composition relation evident. It can be seen as a way in order to define and interpret an entirety.

Contrast
Once the natural elements fire, water, earth, air, and natural growth, destruction and renewal are included, the natural processes themselves acquire a creative artistic quality. And only with increasing sensitivity to the creative power of nature did the idea of a dialogue between human and nature gain greater significance (Erzen, 2004). To demonstrate the progress of growth and decline, appearance and disappearance in nature, contrast to create an opposition can lead to the goal. Like in the process of tidal in which appearance and disappearance alternates, a fixed sign in the image as a reference can reveal the change.
**Principle - Framing**

For the formal beauty of each biotope in dynamic landscape, it is a good way to apply a sign of territory to reduce distractions. Framing is a suitable intervention. A hollow on the path of mudflats which is above the surface creates a frame of mudflat pattern. A frame along with the bench can provide a view of the reeds while relaxing. A plain wall behind the willow tree is a framing to demonstrate the unique trunks. It provides nodes in the landscape experience.
Principle - Orientation of Paths
Some of the aesthetics of the dynamic landscape has a quality of the form of line. For those, they have an oriented characteristic, like the different angels of the willow trunk distribution. By inheriting the orientation quality to the path going through them, people are sensitized to the uniqueness of the biotope and nature through their own physical movement in the space. In this way, the path design not only seek stimulus from nature, but also build her in as partner, as their fellow creator.

6. Design

Application of principles in design process
6.1 Concept

The whole concept of the design contains mainly two parts. First part is to restore the landscape types and to reconstruct the ecological integrity based on the present scattered site. Second part is to add a new layer of paths and other kind of human interventions to enhance the aesthetic appeal values based on the new context.

The development idea of the concept is that human interventions bring back the terrain and the natural processes take over the plantation evolution. And to divide the restored landscape into two parts, half for program and the other mainly for nature. The program half is the paths experience.
6.2 Design steps

The landscape structure of the current site is very scattered. It is a space for rivers to pass through. However, with the tides coming back, the site is transformed into a basin to better deal with different levels of water. And it is water that provides the basic structure for landscape.

When the basic ground is ready, the next step is to add the essential facilities like the parking lot, the cafe building, the visitor center and to construct the terrace structure. Then the path experience is added. Then the nodes along the paths to enhance the quality of the experience.

Since there is the dig and fill strategy for forming the landscape structure, same amount of clay is used to test if the soil can be balanced. As it turns out, the soil can be balanced before and after.
Roads to enter site.
The terrace structure.
Facilities of visitor center, etc.

Paths connections in site.
Visual connections with other parts.

Nodes for programs along the path experience.
6.3 Landscape restoration

The designed landscape shows different atmosphere in dry season and in flood season. Some parts like the mudflats and the bies will be drown in winter.

In the first two years, the transformation is relatively fast. Human construction at first and the let nature take over. Being in a coastal area, things are always changing. So in the long term when sea level rise needs to be taken care of, human interventions works with sedimentation to guarantee the landscape type and structure will be kept along the sea level rises.
Master plan - dry season - summer.

Legends:
- view point
- camping site
- cafe
- hostel
- museum
- visitor center
- parking lot
- harbor
Master plan - flood season - winter.
Section - dry season.
Section flood season.
**Willow Fascine with Double Row of Poles**

**What is fascine?**
A biotechnical riverbank stabilization design approach. A fascine is a rough bundle of brushwood or other material used for strengthening an earthen structure, or making a path across uneven or wet terrain. Typical uses are protecting the banks of streams from erosion, covering marshy ground and so on.

**Willow fascine with double row of poles**
- Set foot embankment and protect it both from erosion, but also cast clay materials.
- Allow for height difference from both sides.
- Allow for people walking through.
- Resistant for the water passing through on a daily basis.

**Main material**
- Branches of pollard willow, Ø 2-4cm, long 70-200cm.
- Twigs of pollard willow, Ø 0.5-1.5cm, long 70cm.

1. Section of river channel indicating the location of a fascine.
2. Site image of a willow fascine with two rows of poles.
3. Piled willow.
4. Main branch material.
Transformation - fast - tides, floods

Phase 0 | original

Phase 1 | 0.5y
terrain setting,
dig & fill strategy

Phase 2 | 0.5-1y
facility construction
Phase 3 | 1-2y

platation, seeding by man
natural succession to take over

Phase 4 | 2y, ready for total open to public
steady status

Legend:
- Area open to public
- Activity by human
- Activity by human
- Natural process
Master plan - flood season - winter.

Historical and Projected Sea Level Rise

Possible situation is nothing is done.

- Natural situation
- Sendiments cut in the upper stream
- 47% from the river
- 53% from the Noordward

Master plan - flood season - winter.
Transformation - slow - sea level rise

Phase 5 | 50y, reaction to sea level rise
open dike for more sediments,
man creates pile buffer,
old terrace submerging

Phase 6 | 60y
old terrace submerging,
new terrace forming

Phase 7 | 100y
old terrace submerged,
new terrace formed
### 6.4 Path experience

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7. Epilogue

7.1 Reflection

Relationship between the theme of graduation studio and graduation project

The graduation studio of landscape architecture has established the concept of Flowscapes. ‘Flowscapes explores infrastructure as a type of landscape and landscape as a type of infrastructure (cf. Strang, 1996) “The hybridisation of the two concepts seeks to redefine infrastructure beyond its strictly utilitarian definition, while allowing spatial design to gain operative force in territorial transformation processes” (Nijhuis, 2015). With movement and flows at the core, landscape infrastructure facilitate aesthetic, functional, social and ecological relationships between natural and human systems.

In this specific graduation project this concept of Flowscapes is adopted since the landscape (terraces) as part of infrastructure (water management). The terraces are transformed according to the prediction of the water levels in the scenario. In one way, it deals with fast dynamics: tide and flood. In the other, it deals with slow dynamics: sea level rise. And it is not only on the level of ecology, but also on aesthetic level. With the flows at the core, the opened polder facilitates aesthetic and ecological relations between human and nature.
Relationship between the project and the wilder social context

From a historical point of view, landscape was based on aesthetic in the past. However, with the near time movement for nature protection, ecological function has been the priority in design. There's very little concern for aesthetic in the scheme.

In the context of Netherlands, the Oostvaardersplassen offered a new perspective that provided the social need for nature. Following it, Plan Ooievaar is developed, having a positive view on ‘nature-development’. Nature became more open to people. However, the negative influence that human can have on nature was still a big concern. Nature that was developed was only focusing on an ecological benefit and man was the viewer. (Feddes et al., 1998)

Until recent years, national project Room for River has been carried out from a starting point as to give more room to nature.

The graduation project is located in one of the project of Room for River. Actually, it is based on the technical left over of the depolder for Room for River that the project is developed. Therefore it can be seen as a refinement based on the Room for River project, refining the ecological function as to be more suitable for dynamic changes in the foreseen and adding an aesthetical layer to enlarge its existance to a park. Therefore, it is not only a part of water management, but also a connection with the urban.

Method, possible application and ethical dilemmas

It can be argued that the methodology could be considered to have both strong and weak sides. The research on natural succession and aesthetic appeal in the area provided design tools and principles for the design. With this regard, the research and the design were highly interrelated. The design was based on the conclusions and logical arguments that were from the research. The methodology provided necessary supplies to be able to link the research and design. However, while working with aesthetics, difficulties occurred. Since aesthetic is quite subjective, it requires not only researching, but also expression in an artistic way. And whether other people consider it as ‘beautiful’ remains to be verified. And when the research conclusions are drew, there’s the gap between design and research. In what way should be aesthetic be expressed in the landscape really got me stuck. It is only after the research of the relations between human and nature from the city Dordrecht and village Werkendam from an urban perspective that it became settled that this should be a garden-park to link people in city with nature. And the aesthetic really involves with art and people’s perception. With this regard, more could be done to the aesthetic research and application.

The graduation project is located in an estuary that not only the natural dynamics are formative force, but also human interventions play an important part in. The tides in the estuary is controlled by the block to a huge extent. Even though in the scenario the block will be open to some extent, it is still controlled by human. And it is this tamed dynamic that the whole project is based upon. It is in the not total nature environment that an eco-park is built on. Therefore, an eco-park here in the Netherlands may not fit every estuary dynamic landscape. However, with different kinds of water management or other natural forces and processes management, the idea of the balance of ecology and aesthetic can always be achieved.
Ethical dilemmas

There are two main ethical dilemmas that the project is facing. One is about opening the Haringvliet block. The project applied one scenario that has been predicted to be half open to allow more dynamics in. However, it is a lot more than more dynamics that will follow. There’s still other aspects that are needed to be taken care of. Like the water will turn from fresh to brackish water, which can influence the agriculture and water supply in the South West delta. Therefore, how the block will control the dynamics in the future needs discussion and research on ecology, agriculture, etc. a lot of aspects.

The other is about the balance between nature protection and development. Any human intervention can do harm to the ecosystem. Therefore, it is the basic rule that human intervention must be kept within the resiliency of ecosystem. The project hold it as a principle that as little construction as possible and give recreation and nature separate zones. However, all the ecosystems are connected in multiple ways like the though the water, the food chain, etc. So, whether the construction in the project site effect the whole ecosystem of Biesboch area requires research on a larger scale.

7.1 Bibliography


