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# DYNAMIC DESIGNS FOR FLUCTUATING LANDSCAPES: REDEFINING DELTA CITY AND NATURE ON THE ISLAND OF DORDRECHT

Frédéric Rossano



fig.1

From 2010 to 2012, the Chair of Landscape Architecture of Professor Christophe Girot at the ETH Zurich organized a design program for Bachelor's and Master's students<sup>1</sup> that investigated the complex and challenging situation of the Rhine-Meuse Delta in these times of climate change. In the same period, the Harvard School of Design and the Delft Institute of Technology engaged in a design-based investigation focused

<sup>1</sup> This program was headed by the author under the aegis of Professor Christophe Girot, in collaboration with Phillip Urech, James Melsom and Alexandre Kapellos from the ETH Zurich. Fifteen students joined the first semester studio: Siham Rafael Balutsch, Sarah Barth, Kristina Eickmeier,

Nikolaus Hamburger, Nikolas Klumpe, Matthias Knuser, Oliver Kunz, Lukas Murer, Karin Niederberger, Annina Peterer, Dario Pfammatter, Raphael Risi, Rosmarie Ruoss, Petra Schwyter, and Alain Weber. The elective studio which followed involved eleven of them, resulting in five projects.

figure 1: The Island of Dordrecht, between the Rijnmond-Drechtsteden conurbation and the Southern Rhine-Meuse Delta. Source: ETH Zurich

on a similar perimeter. What has made the Dutch Southern Delta so attractive for landscape and urban designers? Everywhere designers as well as policy makers today are looking for new answers to growing natural threats, with flood being the greatest threat for deltas as well as for riverine territories. The Netherlands, with the densest population of all European countries,<sup>2</sup> living on a territory where 59% is considered potentially floodable,<sup>3</sup> is widely regarded as a source of concern and admiration, since despite their situation the Low Lands have experienced not one deadly flood since 1953.

The Delta is, however, facing an urgent challenge: Flood risks are growing due to rising sea level, an increasingly irregular river regime, and more frequent extreme rainfalls. The Island of Dordrecht, the focus of our design studio, is a concentrated extract of the Dutch Delta in all its natural conditions and artificial features, offering one of the oldest and most beautiful examples of this typical Dutch combination of open water city and enclosed polder landscape. It is also isolated by two major arms of the Delta, located far outside the Dike Ring 14,<sup>4</sup> and thus does not as yet enjoy the same level of protection as the rest of the

<sup>2</sup> Within the Netherlands, South Holland is by far the most densely populated of all the Dutch provinces, with a population density of 1250 inh./km<sup>2</sup>, higher than the Ile de France Parisian Region. Eurostat: Population density by NUTS2 regions. Internet: <http://epp.eurostat.ec.europa.eu>

<sup>3</sup> Donkers, Henk; Leenaers, Henk. *De Bosatlas van Nederland Waterland*. Groningen, 2010.

<sup>4</sup> The lowest parts of the Netherlands are protected by 57 primary dike rings defined by law, each of them considered capable of resisting a certain level of flood risk. The dike ring No. 14 encompasses the biggest urban area, including the south of Amsterdam, Haarlem, The Hague, Leiden, and North-Rotterdam. It is designed and maintained to resist up to a 10,000 years of flood occurrence. The Island of Dordrecht, surrounded by open waters, has its own ring No. 22, whose safety is today set for a 2000-year occurrence. Donkers, Henk; Leenaers, Henk *De Bosatlas van Nederland Waterland*. Groningen 2010.

figure 2: The Biesbosch before implementation of the Nieuwe Merwede canal. Source: Kuiper, Jacob. Gemeente-Atlas van Nederland naar officieele bronnen bewerkt, Dubbeldam (detail). Leeuwarden, 1867

Dutch “Randstad.”<sup>5</sup> Should it integrate with the protective cocoon of the main dike system? Should it raise its own dikes, cutting itself loose from the Delta, or should it abandon a part of its territory to “New Nature”? Or could the necessary interventions actually achieve higher safety, while simultaneously securing the city’s relationship with its surrounding environment? These were obviously stimulating questions for the all students involved.

### Fringe of the Delta, backyard of the city

Trying to understand the formation of the Island of Dordrecht, the participants in the studio were stunned to discover a long history of territorial expansion and shrinkage that both revealed the Island’s vulnerability and put its present perimeter into perspective. Formerly attached to the “Grote Waard,” a large area unified by a dam that closed an arm of the Meuse River in 1283, Dordrecht was reduced to an isolated fortress surrounded by water after the Saint Elisabeth Flood in 1421. The Island was later extended again towards the south, partly through natural sedimentation and partly due to land reclamation. This history of territorial growth and decrease led to a very specific topographical situation which was shaped by man-made infrastructures as well as by natural hazards and processes. As a result, Dordrecht today enjoys three structural conditions: a relatively high landmass (mostly the historic center and the harbor docks) which is set high enough under normal conditions but unprotected against extreme storms and tides; low polders that are often below sea level found on the southern edge of the old city, drained by ditches and protected by impressive dikes; and finally the open areas and more recent polders on the south and east that benefited from natural sedimentation after the St. Elizabeth Flood and which generally lie above sea level. Unfortunately, most of the population of Dordrecht lives in

<sup>5</sup> The “Randstad,” literally the “periphery-city,” designates the densest urban area in the Netherlands, regrouping the country’s four biggest cities (Amsterdam, Utrecht, Rotterdam, The Hague) around a still relatively “Green Heart,” as it is called.

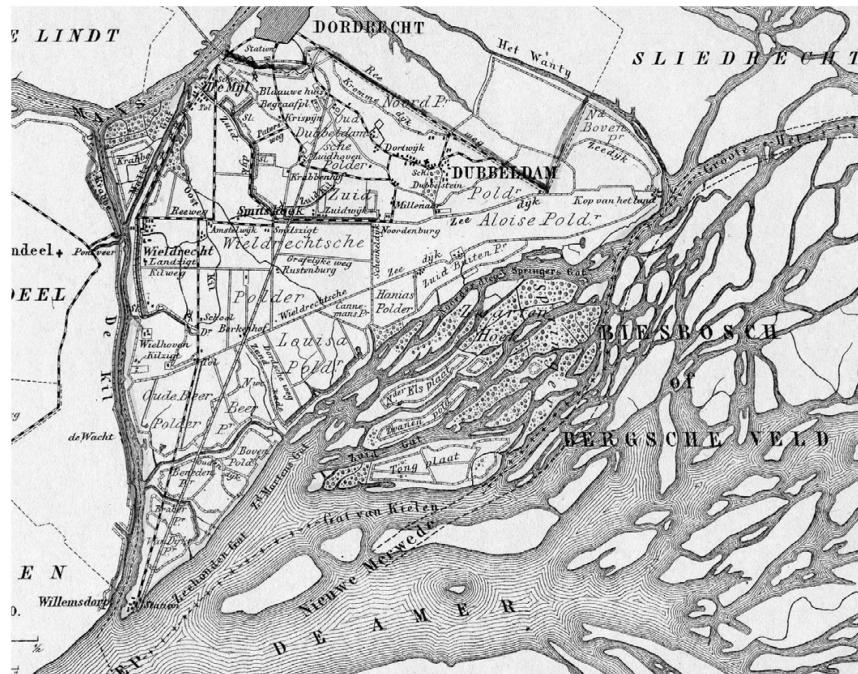


fig. 2

the second situation: the most densely populated areas are also the lowest, where flood would be the fastest and most irrepressible, while the highest areas stretch along the island's southeastern edge and are today mostly agricultural, when not set aside as nature reserves.

Along this sensitive border – the southern limit of the urban area of Rijnmond-Drechtsteden area and portal to the Delta – water, agriculture, nature, and city today lie next to each other with little or no interaction. While Dordrecht developed one of the most stunning Dutch waterfronts on its northern edge, inspiring many painters during the Dutch Golden Age,<sup>6</sup> the Island failed to define a clear relationship towards the Delta's wide horizons on its southern fringe, since this was reclaimed piece by piece from the marshes left after the St. Elisabeth Flood, an area known then as the Biesbosch.<sup>7</sup> When the Nieuwe Merwede canal was completed in 1874 in order to facilitate the evacuation of river waters into the Delta, it lacked as well a wider vision for the adjacent territories, and part of the Biesbosch remained captive between

<sup>6</sup> Dordrecht waterfront inspired among other Wouter Knijff (*Gezicht op Dordrecht*, 1643, Rijksmuseum), Jan van Goyen (*Riviergezicht bij Dordrecht*, 1651, Dordrechts Museum) and Albert Cuyp, who was born in Dordrecht and painted several views of the city's then famous skyline.

<sup>7</sup> The second Saint Elisabeth Flood took place in November 1421, and submerged large parts of the Grote Waard area east of Dordrecht, leaving a large tidal inner lake. Its bottom slowly rose by natural sedimentation so that the lake partially turned into a marshy area later known as the Biesbosch – the “bulrush woods” – which remains today and is integrated into the National Park De Biesbosch.

the dikes of the new waterway and the polders. The dike which today affords the main protection for the Island meanders through this landscape, between agricultural polders and nature areas that have been incorporated into the recent Biesbosch Natural Park that is partly open to (tamed) tidal influences. This today forms a rather incoherent “backyard landscape,” a complex result of a long territorial competition between water, city, farmland, and marshes, unsatisfying in its level of safety and spatial relationship to the Southern Delta as well as to the city.

### Shifting borders

Following the design methodology developed in recent years at the Chair of Professor Christophe Girot, the design studio avoided the traditional project chronology – analyze, conceive, detail, visualize, communicate – preferring a simultaneous conceptual process which allowed each step to influence the others. Cartographic and hydrological data-analysis, field trips, and encounters with Dutch designers and policy-makers were thus organized simultaneously with the first sketching sessions, brainstorming, and workshops. To generate a multiple-scale approach and link local interventions to global strategy, detailed cross-sections were sought to support large-scale master plans. To stimulate interdisciplinary perspectives, each group of students was asked to envision landscape esthetics together with residential value, ecological continuity, and diversity, as well as agricultural productivity, in an integrated proposal that would together give a new impulse to Dordrecht in terms of its relationship with the Park and the Delta. Although each student group was free to develop its own strategy, the results of the studio showed consistent similarities. Anticipating higher fluctuations in water levels in the Merwede canal and in the Delta, it seemed to all a necessity to acknowledge the river as a dynamic element and, by the same token, to consider its banks as a potential riverbed extension, a perspective which is now widely accepted in the Netherlands as the national program “Room for the River” progresses.<sup>8</sup> This subsequently

<sup>8</sup> The program “Ruimte voor de rivier” (Room for the river) was elaborated after the 1993 and 1995 floods that led to massive evacuations in the Netherlands, and aims at restoring when possible the river’s natural flood plains in order to protect the

most valuable areas. It involves provinces, municipalities, water boards, and the Rijkswaterstaat in its implementation, which began in 2007.

Internet: <http://www.ruimtevoorderivier.nl>

implied reconsidering the location and protection levels of the Island's dike system which today follows the complex contours of existing polders and restrains the riverbed rather than adapting to its dynamic flow and accommodating its seasonal expansion. Reconsidering this dike structure, the projects prepared by the ETH students thus converged into proposing differentiated protection levels adapted to various conditions, defined by the topographical level, and the existing or projected ground use of each area.

This paradigmatic shift from a binary closed/open water system to a strategy of gradual protection and floodability made it necessary to rethink the relationship between the living environment and dynamic natural processes: When flood protection strategies, in terms of absolute protection, appear to be unattainable, a shift is needed from technological intervention alone to complex and multiple answers. An example of this is shifting the main dike closer to the city's edge, thus creating a dynamic space for temporary riverbed expansion, and simultaneously redefining both the city limits and open landscape into a richer and synergetic ensemble.

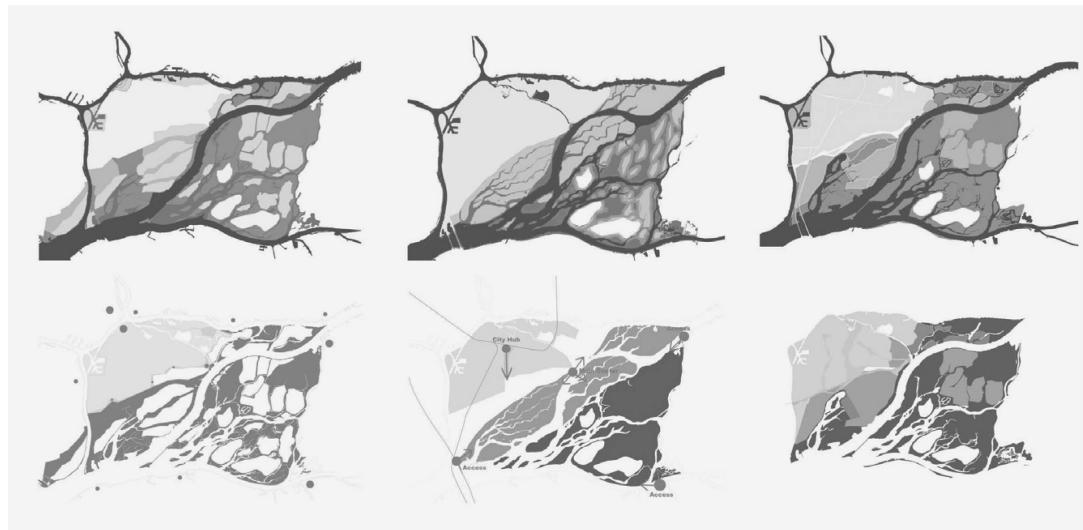


fig.3

figure 3: Students' scenarios for differentiated ground use and protection level. Source: ETH Zurich

### The dike as balcony

As it turned out, creating a new level of protection didn't necessarily mean fencing the city off by a green wall of steep dike slopes, but providing instead a unique opportunity to redefine the lost relationship between city and Delta. In this perspective, the proposals made for the



fig.4



fig.5

figure 4: Multifunctional landscape: the dike as sledging strip, Dordrecht, winter 2010–11. Photo: Rossano  
figure 5: The dike as urban promenade. Source: ETH Zurich, Ruoss, Klumpe

new main dike turn narrow segments of existing dikes into a dynamic and accessible infrastructure allowing inhabitants and visitors to enjoy the dynamic delta landscape along the whole southern fringe of the city. Re-interpreting the traditional polder edges, the designs illustrate how an enclosing and protective element can also become a place on its own, and a development tool for its surroundings, through adding value to existing neighborhoods and generating new urban extensions on its safe side by incorporating promenades, balconies, belvederes, and ponds into sculptural ground works, or even integrating multi-layered construction typologies as present on the south of the Island. Echoing the aesthetics and sharp slopes of ancient polders, these new designs celebrate the artificial beauty of Dutch landscapes, in which dikes not only form borders and limits but also physically connect distinct territories by means of shallow slopes and ramps, and visually unify wide horizons by offering raised roads and promenades.

### The Park's multiple natures

Between the city's edges and the Nieuwe Merwede River today lies a complex mosaic of productive farmland and nature areas incorporated into the Biesbosch Natural Park: woods, marshes, and old polders recently opened up to tidal waters. The Park's access route leads visitors along suburban neighborhoods, industrial areas, and a waste dump towards the Biesbosch Center (paradoxically located at its periphery). The old hamlet of Kop van 't Land occupies a central spot along the Nieuwe Merwede, marking the end of the provincial highway and the starting point for ferries joining up the southern half of the National Park. Simply following the Nieuwe Merwede remains a complicated and confusing experience and, as in most of Holland's countryside, farmland appears often inaccessible. As we witnessed during a previous studio held in the Swiss Valais,<sup>9</sup> farmers here as well seem to feel threatened

<sup>9</sup> Girot, Christophe; Rossano, Frédéric; Duner, Isabelle. *Sion-sur-Rhône, Un nouveau paysage pour la vallée du Rhône à Sion*. Zurich, 2010.

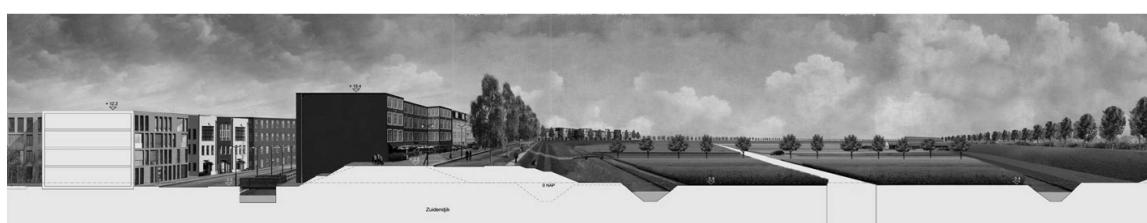
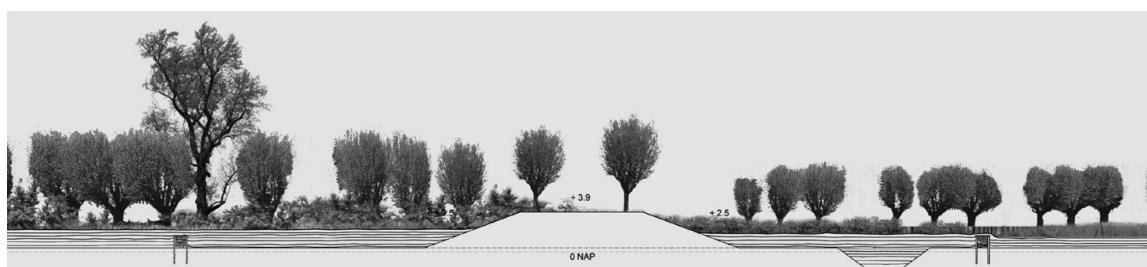
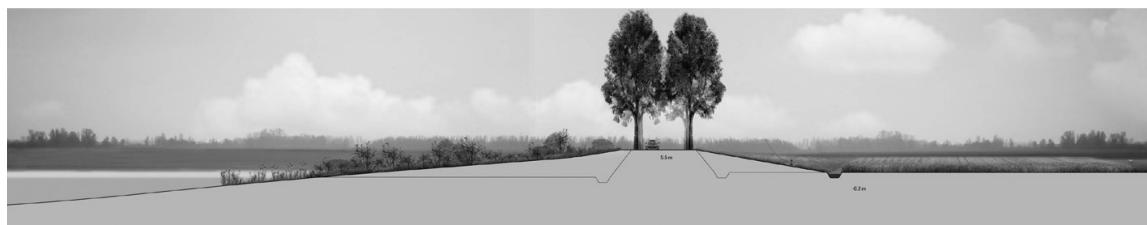


fig.6a–e

figure 6: The dike as versatile structure: variations for adaptive dike design. Source: ETH Zurich. 6a: Kunz, Niederberger. 6b: Klumpe, Ruoss. 6c: Barth, Schwyter. 6d–e: Knuser, Murer, Weber

figure 7: Nature Angst in the polder: “Behoud de Polder, geen natuurkolder” – keep the polder, no nature nonsense. Photo: Rossano



fig. 7

by the development of nature areas, quickly perceived as a regression into an original unproductive chaos, opposing nature to cultivated land (while here nearly all of the farmland lost in the past decennia has been turned into low-density urban developments).

The physical isolation of nature reserves and agricultural areas, however, leads to a frustrating experience for all actors and visitors, creating a confusing spatial fragmentation. It might reveal a conceptual confusion as well: Is the Biesbosch Park, with its carefully engineered ecosystem, its controlled tidal influence, and recently imported beaver population,<sup>10</sup> much more natural than agricultural areas? Are agricultural polders intrinsically poor natural habitats? The segregation between “productive” and “wild” nature within Dordrecht’s open landscape diminishes its value as a whole, both in terms of image as well as in terms of accessibility and ecological value, since the Biesbosch remains literally “half what it used to be” and is cut into three disconnected pieces, while farmland remains more a barrier than a part of the whole. In this status quo, the National Park remains “the elephant in the living room,” big enough for farmers to worry about alleged expansionary ambitions, but leaving a much greater potential unexploited. A greater Biesbosch National Park could indeed provide a new dynamic to the region and multiply the attractiveness of the Dordrecht area vis-à-vis the Randstad and beyond. Envisioning Dordrecht as Park City, Gate to the Biesbosch, or Delta City

<sup>10</sup> 42 beavers were brought from East Germany into the Biesbosch National Park between 1988 and 1992 by the Dutch Governmental Forestry Agency “Staatsbosbeheer.” Internet: [www.np-debiesbosch.nl](http://www.np-debiesbosch.nl)



fig.8

calls for a more holistic vision of its landscape, in which the Park can be simultaneously a city embellishment project, a protected nature reserve, a productive territory, an enjoyable leisure area, and a tool for integrated water-management benefiting the safety of both city and Delta – all this through an integrated and coherent project.

Questioning this current spatial and functional segregation, the students of the ETH reconsidered the wider territory stretching from Dordrecht's city's edge down to the Bergsche Maas, while looking back at its origins and physical qualities. They explored its complex topographical configuration. They identified within the project perimeter the key components of its landscape: the low urban polders that would always remain protected and be allocated for future densification; the lowest open areas most suitable for nature development and water catchments during extreme river discharge or water storage for drought periods; the relatively high open areas, allowing sustainable and productive agriculture which could be surrounded by water and, in some cases, temporarily flooded in extreme situations; and finally the elevated network of raised dikes and promontories that support transport and construction, creating a legible canvas for a multi-faceted territory. The proposed topographical interventions were tested using 3D models, unfolding each project into networks, water systems, and floodability

figure 8: Transition Landscapes, a sculptural groundwork to protect and redefine the city's edge. Source: ETH Zurich

figure 9: Gates to Nature, three key development along the Nieuwe Merwede, here on the eastern tip of the Island. Source: ETH Zurich

figure 10: Wildlife unfurled, an ancient hamlet transformed into central hub for the National Park. Source: ETH Zurich



fig.9



fig.10

maps, with students keeping the dynamic nature of the Delta in mind, while drawing secure lines and fluctuant surfaces. Merging their own design intentions with precise water-level data, the students reorganized these basic landscape components into a coherent structure which integrates economically and culturally valuable features such as ancient dikes, hamlets, and productive polders into a greater and open Biesbosch area offering a diverse experience of the Delta.

Within these proposals, each one of the five projects brought in a specific development strategy for the new ensemble. The project “Transition Landscapes” (Karin Niederberger and Oliver Kunz) stresses the leading role of a new main dike as a public park organizing elements in terms of urban, hydrological, and recreational redevelopment. The project “Gates to Nature” (Rosmarie Ruoss with Nikolas Klumpe) reorganizes a wide landscape park around three new polarities, strategically located along the Nieuw Merwede, envisioning micro building developments in the center and at both tips of the Island. “Wildlife Unfurled” (Sarah Barth and Petra Schwyter) gives a prominent role to the isolated hamlet of Kop van ‘t Land, expanding it into a central gateway to the Biesbosch that could offer all the facilities and means of transportation for visitors to discover the park, while simultaneously restoring water and ecological continuities around this new core. The projects “Archipelago” (Kristina Eickmeier with Annina Peterer) and “Rising Lands” (Matthias Knuser with Lukas Murer and Alain Weber) literally use topography as a founding element of their design. Offering a long-term and visionary perspective, the project “Rising Lands” proposes to reopen the south of the Island to the river’s influence, and accelerate natural sedimentation in order to raise new land for future occupation, keeping an agricultural fringe along the city’s periphery to supply its inhabitants. “Archipelago”



fig.11

enhances the meandering nature of the deltaic landscape by securing existing agricultural polders within a wide and fluctuant network of creeks and marshes which could best be seen and discovered from the air – a new cable car offering a breathtaking journey over the Biesbosch, reminiscent of the spectacular infrastructures built in the Swiss Alps to access remote villages and natural monuments.

#### Designing for fluctuant territories

Gaining land from water, and defending its limits against tides and storms, has been one of the greatest achievements of the Dutch nation over the past centuries, making the Rhine-Meuse Delta one of the world's densest and wealthiest through the art of "droogmakerij."<sup>11</sup> However, the restraints this has imposed on riverine and coastal processes are now colliding with the growing amplitudes of these same processes, calling for a more complex and differentiated approach, where control and flexibility form a dynamic balance. Nonetheless, the sustainability of the Dutch Delta as a habitable environment is also concomitant with its high productivity and attractiveness; the inhabited polders remain dependant on stable energy sources, technological knowledge, and costly maintenance. Although a necessity, adapting the Delta to more fluctuant conditions cannot be resolved by simply abandoning productive land for the sake of "renaturation," nor could the cities' futures be secured by new infrastructures that would close them off from their environment. The benefit of a landscape design investigation in this regard has

<sup>11</sup> "Droogmakerij," literally "dry-making" in Dutch, defines the reclamation of wetlands or a lake through drainage and pumping. By extension, it is today associated with the monotonous open polder landscapes.



fig.12

been to reconcile these two paradigms within a holistic perspective, in which human scale and activity remains central and territorial decisions go beyond the simple duality culture/ nature. Developing the Biesbosch National Park from a limited nature reserve into a wider and multi-functional territory – including agriculture, sports, leisure, and tourism, without loosing its ecological value, would offer lasting perspectives for regional development, benefiting the city and neighboring provinces in terms of image, safety, economy, attractiveness, and quality of life. This implies that each territorial project should reconsider the traditional antagonisms and disciplinary boundaries, and reconsider territorial design not as a final step following upon a political and technological decision process, but as an active and central element of this process. With its interdisciplinary governmental and program, “Room for the River” the Netherlands today shows that such a methodology can lead to fruitful discussion and rapid achievements.

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figure 11: Project “Archipelago”: a journey by cable car over the Biesbosch. Source: ETH Zurich. Eickmeier, Peterer

figure 12: Project “Rising Lands”: making land by controloled sedimentation. Source: ETH Zurich