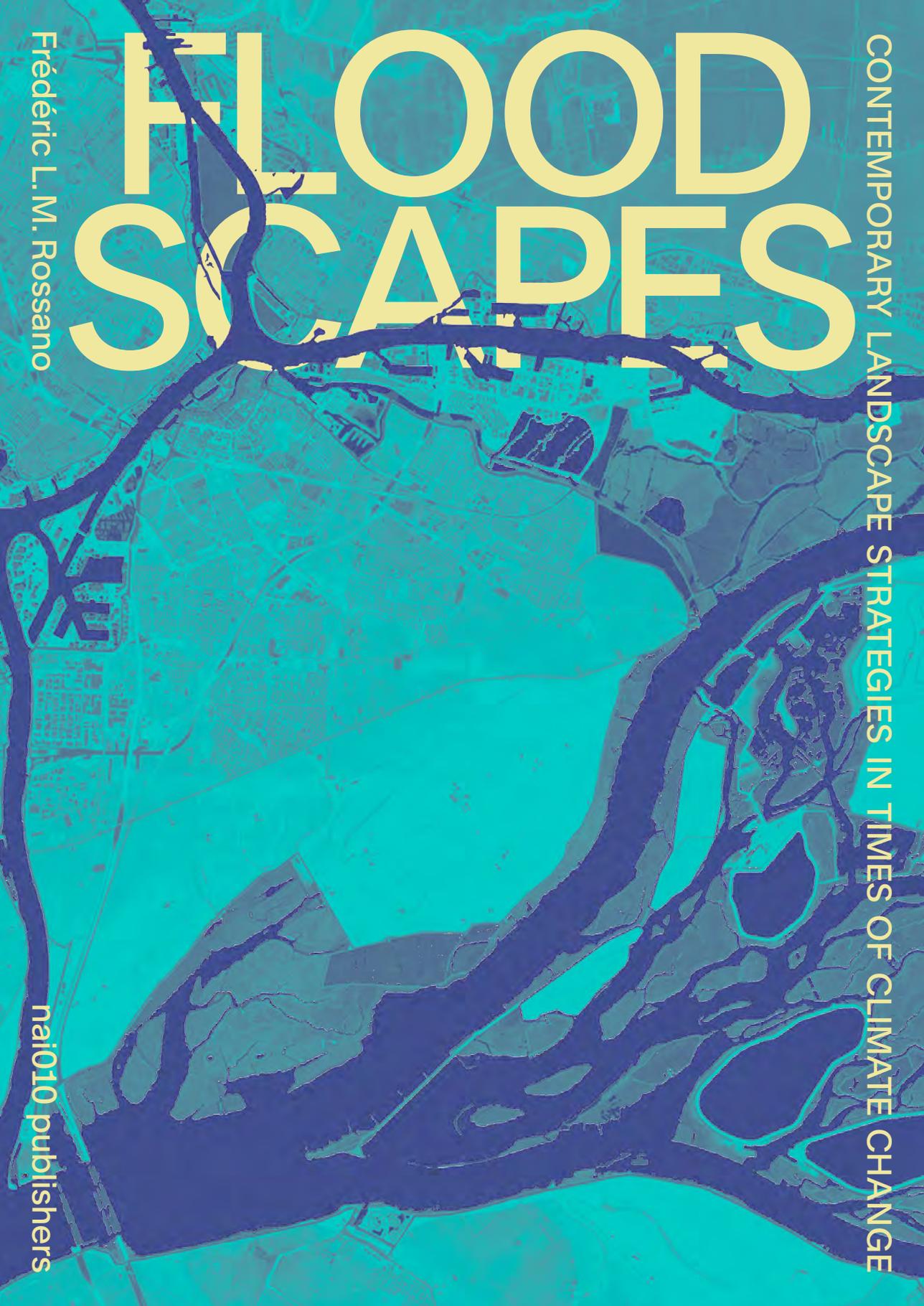


CONTEMPORARY LANDSCAPE STRATEGIES IN TIMES OF CLIMATE CHANGE

# FLOOD SCAPES

Frédéric L. M. Rossano

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The title of this book could be seen as a ‘contradiction in terms’: after all, flood spreads wherever gravity leads it, covering the familiar topography with a dark, grey, and uniform blanket. In that regard, flood is amorphous, as it can distort and temporarily erase forms and features of the visible landscape—nothing that could be described as a ‘scape’ in the sense of articulated and meaningful scenery. But when the boundaries of a flood are not only defined by the quantity or the velocity of water but also by land forms and structures carefully designed to shape and mitigate the ‘disaster’, the result can be considered a floodscape, physically and culturally defined.

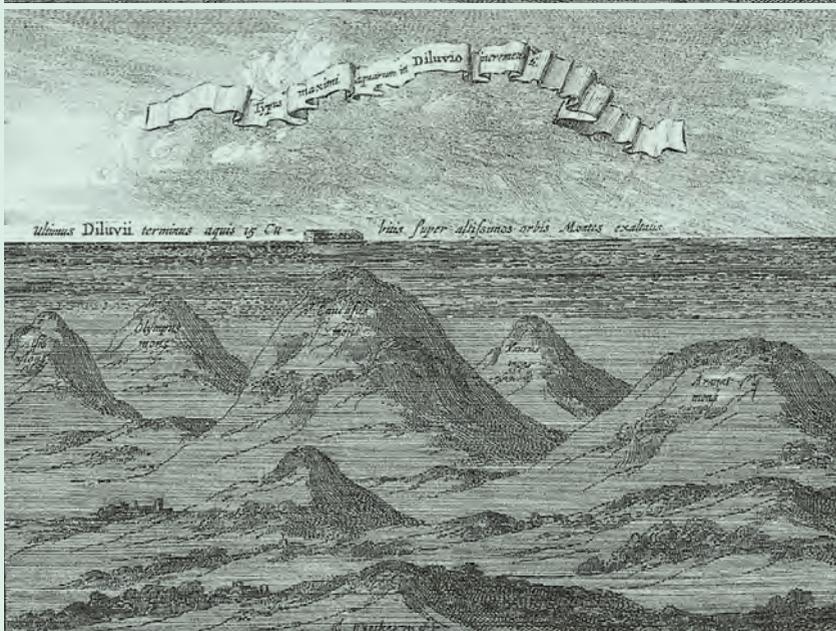
Existing defence infrastructures designed to tame and control dynamic streams and rivers over the past centuries, are increasingly challenged by storms and high waters. The combination of rising sea levels, increasing climatic fluctuations, and urban sprawl accentuate the risks incurred by flood plains. Since the end of the twentieth century, however, a long-awaited transition has been taking shape. Rivers and floodplains are transformed to make space for floods again, and a necessary cohabitation with natural fluctuations is reinvented. Focusing on both ends of the river network, this book discusses a selection of contemporary projects of floodplain restoration in Western Europe, currently implemented upstream in the Swiss Canton of Valais, the French Isère Département, the German State of Bavaria, and downstream in the Dutch Groningen Province and the Lower Rivers Region.

Today, these projects provide multiple sources of inspiration, themselves inspired by rich cultures of flood adaptation that were applied in the past centuries. These reappropriations widen the range of possible landscape strategies and make it possible to conceive the necessary adaptations outside of the classical oppositions. The issue is no longer to tame and control nature, nor to set it free again and obey its fluctuations, but to reconcile the natural variations of rivers with human activities. These combinatory approaches bring new challenges: beyond hydraulic and civil engineering, flood management becomes a territorial issue involving many stakeholders again. These engage into complex negotiations, together with the designers who are mobilized to sketch out new possibilities and facilitate consensual solutions.

This integrated approach, born out of necessity, is also a sign of profound cultural changes in our relationship to river space and fluctuations. Navigating between mobilization and a reassuring discourse, public policies today must create space for adapting to these increasing variations, rather than aim at a feeling of pseudo-permanent safety. Bringing flexibility into landscapes petrified by centuries of hard engineering is a difficult task, as these portraits of rivers show. Yet I hope that this book will contribute to the understanding of the past and the present of our rivers, and help designers, experts, and decision-makers provide our landscapes with the elasticity needed to face upcoming challenges. It will also be of interest to all those who, living on former marshes, estuaries or floodplains, aim at a safe living environment within a dynamic and fluctuating nature.



# GOD, THE RIVER AND THE ENGINEER



Coenraet Decker, Noah's ark in Mount Ararat, illustration for: Arca Noe, Athanasius Kircher, 1675

'A man is always a teller of tales, he lives somehow surrounded by his stories and the stories of others, he sees everything that happens to him through them; and he tries to live his own life as if he were telling a story.'  
(Jean-Paul Sartre, 1938, *Nausea*)

Flood prevention plans are more than univocal solutions or intervention proposals, but they still need clear concepts to ensure a large and lasting support. While the Swiss ongoing 'Third Rhône Correction' seemingly announced more coercive measures against an objectified river, the Dutch 'Room for the River' programme suggested a spatial negotiation between man and a personified river. Both programmes were, in fact, of comparable amplitude and undertook a similar task with similar means. How can they differ so radically in leitmotif? Which story is being told, how does it relate to pre-existing narratives, and what future does it propose?

Vast, expensive, long-term enterprises need collective, broad, and lasting support. 'Dear Lord, give us our daily bread and a flood once in a while', Dutch water managers like to say to stress the perseverance and vigilance required for efficient flood prevention, as most flood disasters are the result of maintenance shortcomings or lack of foresight rather than exceptional natural conditions. The projects investigated in this book, as well as their predecessors, show that all projects, beyond offering a set of practical transformations, are embedded in complex and multi-layered narratives that differ in their ability to intertwine practical proposals with cultural elements, and create a meaningful ensemble that can be altogether manipulative, inspiring, and mobilizing.

Various myths and figures are brought into play to oppose or promote flood-prevention measures—with a technical rationale being paradoxically one of the many narrative tools. Furthermore, narration answers the individual need for each one of us to participate in a meaningful epic that is beyond the erratic manifestations of natural processes, their happy or dramatic consequences, and the subsequent human reactions. A man 'tries to live his own life as if he were telling a story': This is true also of collective enterprises. The various planning narrations we encountered differ greatly, depending on the cultural framework used to elaborate and

communicate the plan, and the reflexive positioning of humankind and Nature within the context of the project. In a Western European context, they also contain recurrent figures that can be tracked from millenarian myths. Understanding the success and the conflicts behind great river transformations implies uncovering those hidden prejudices that affect both the aim, the process, and the result. From the Flood sent by omnipotent gods, through the absolute protection promised by Promethean engineers, and on to the hopes of a final reconciliation with Nature, myths evolve and accumulate, and are worth investigating in order to better understand tomorrow's hopes, conflicts, pitfalls, and success factors.

# UPSCALING FLOODSCAPES DESIGN

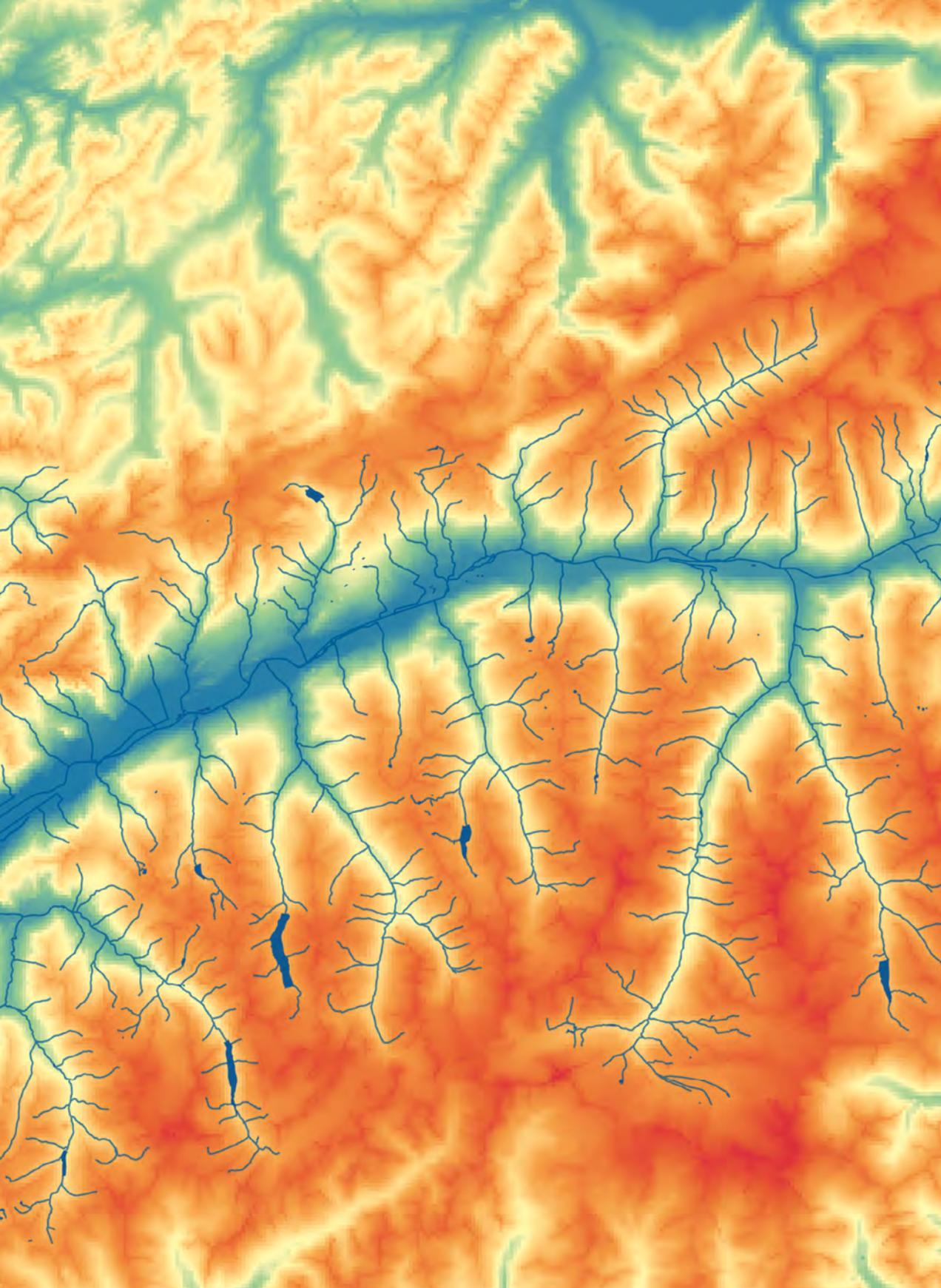


New submersible path through the Biesbosch area in South Holland (Rossano)

‘... Each project of river channelization highlights the social dynamics and allows us to understand the political dimension of man’s relationship with his environment. The eighteenth century proclaims without acting, the nineteenth century conquers but is weakened by its divisions, the twentieth century is arrogant and certain of its rightfulness. The twenty-first century produces a modest version in which the “Minister-Engineer” suggests to return to the river part of what it is due.’  
(Bender, 2004)

As seen in the previous chapters, flood management questions the boundaries of urban and landscape design: boundaries between city centres and peripheries, with new synergies developed in Groningen; boundaries between urban space and nature areas, with the necessary compromises made for the transformation of the Isar river in Munich; boundaries between river space and dry land, a boundary made porous in the Isère Valley in order to protect the city of Grenoble. In all these projects, interdisciplinary approaches were used, bringing with them new difficulties and new benefits in terms of safety and quality of life, a double goal that guided the design and the transformation of these landscapes.

Is there a maximum size to floodscape design? The Meerstad project aimed, at some stage, at building 10,000 dwellings, inundate or transform 4000 hectares of land, for a total budget of 800 million euros. Had it exceeded a feasibility limit when the whole enterprise almost went bankrupt, before going back to more modest ambitions? How to engage in flood management at the scale of a valley, a plain or a watershed, far beyond the city limits? This might seem out of reach in democratic countries with decentralized political systems, a common idea being that large-scale landscape design is the privilege of authoritarian regimes or the result of major crises, such as the post-war and reconstruction era that saw the Upper-Rhine river radically transformed for the sake of energy production and shipping. A large-scale perspective is however necessary from a hydrological point of view, in order to understand and influence flood processes, and integrate the seasonal changes and variations in climate and land use which altogether determine the frequency and intensity



Upper-Rhône Valley in Switzerland

# THE RIVER AS *GESAMTKUNSTWERK*? THE THIRD RHÔNE CORRECTION

With its length of 160 kilometres, thirty years of construction, and a budget of more than two billion Swiss Francs, the Third Rhône Correction is a project of extraordinary proportions. The project stems from a long history of human interventions on a limited space, long dominated by the river, but is also the result of relatively recent cultural and legal shifts that took place in Switzerland at the federal and local level. Born in the early 1990s and planned to last until 2030, the programme 'Rhône 3' is expected to deeply transform the landscape of the Valley through the widening of the river channel, breaking with a century of coercive engineering measures. Willing to integrate all components of the densely populated valley into a global approach, since its origins the Third Rhône Correction has been presented as a *Gesamtkunstwerk*, a comprehensive work of civil engineering capable of reconciling forces that were traditionally opposed, such as hydro-power, urban growth, intensive farming, recreation, and alluvial ecology. Although it is still too early to estimate the effects of the programme on the landscape of the Rhône Valley, it is already edifying to analyze the origins, ambiguities and successes of this grand enterprise set in an international perspective.

## THE RHÔNE RIVER, FROM LANDSCAPE TO INFRASTRUCTURE

As seen in part 1, for millennia the Upper Rhône Valley has been a space of activity, transit and trade, object of a continuous negotiation between the river's fluctuations and human efforts made by inhabitants to adapt their environment to their needs, and adapt their activity to their environment. The systematic channelling of the Upper Rhône finds its origins in the first agreements between the states of Valais and Bern in the seventeenth century, by which both states agreed about the width the river should remain along their common border (DFI, 1964: 41). In 1756, the two states had a precise map drawn of the river between Martigny and the Geneva Lake, including all the piecemeal works constructed along this segment. In 1768, the first general plan was developed for the regulation of the same segment, in the hope of making the river's course fixed—and thus the border between the two states. Upstream Martigny, the Valais canton together with the municipalities around Martigny, agreed



Biesbosch region, gate of the Rhine and Maas estuary

# FROM RAISING DIKES TO MAKING ROOM FOR THE RIVER

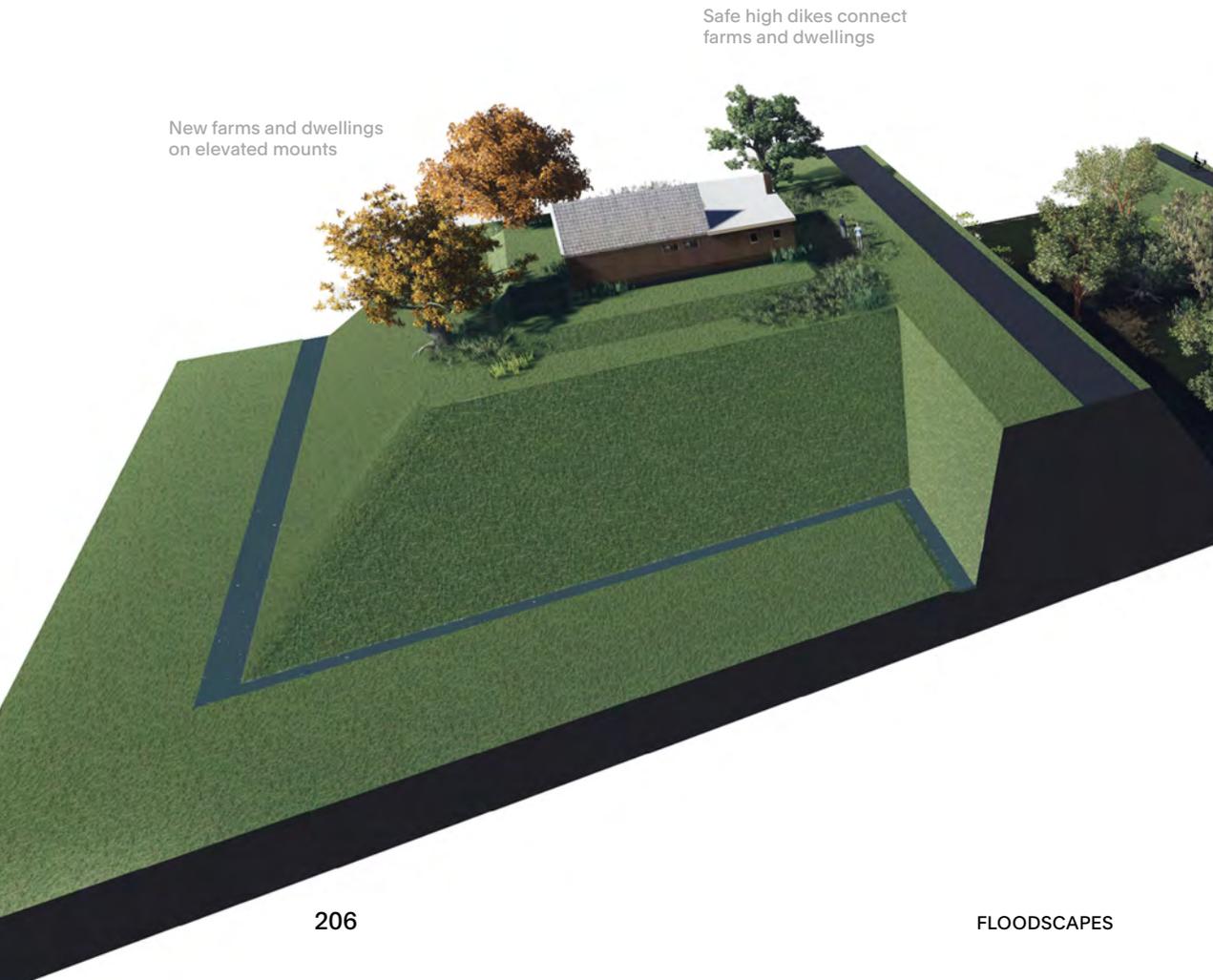
After the sea storm that submerged part of the Dutch coast in 1953, hydrologically quiet decades followed and flood protection along the rivers remained in the background in the Netherlands. While the country was building the famous 'Delta Works' against the North Sea, the reinforcement of old river levees went on intermittently, mostly along the great rivers, Rijn (Rhine), Waal and Maas (Meuse). However, as in the rest of the Western European countries, concerns grew about the environmental and living quality of the river areas, challenged by intensifying agriculture, urban sprawl, new infrastructures, and the increasing degradation of valuable cultural landscapes.

## NATURE ASSETS AND THE CULTURAL LANDSCAPE

In 1986, the today prestigious Eo Wijers competition for regional planning was organized on the theme 'Netherlands Land of Rivers' ('Nederland Rivierenland'). The Eo Wijers Foundation was then drawing attention to the future of the River Region, in the centre of the country, where the Meuse and Rhine rivers met and parted again before reaching the estuary. Out of 34 designs, the jury gave the first prize to the 'Stork Plan' ('Plan Ooievaar'). The Stork Plan proposed a reorganization of existing functions, acknowledging the rift between intensive agriculture permanently adapting to the market, and riverine nature that needed time to establish itself and develop. It also acknowledged a stronger differentiation between intensified agricultural areas behind the levees, adapted to the rapid pace of a changing economy, and the river's floodplain where slow processes should be granted space and time to recompose a rich, diverse, and dynamic environment—one not necessarily free from human intervention, in the eyes of the authors. Within this differentiated landscape, competing functions were isolated, while activities that could take place in the same areas and even reinforce each other, could be combined. To give the floodplain more legitimacy, the author proposed to create a new territorial status, the 'waardschap' going 'from dike to dike', a new entity that could turn the river space from 'administrative border and backside to an administrative backbone' (Eo Wijers Stichting, 1986: 16).

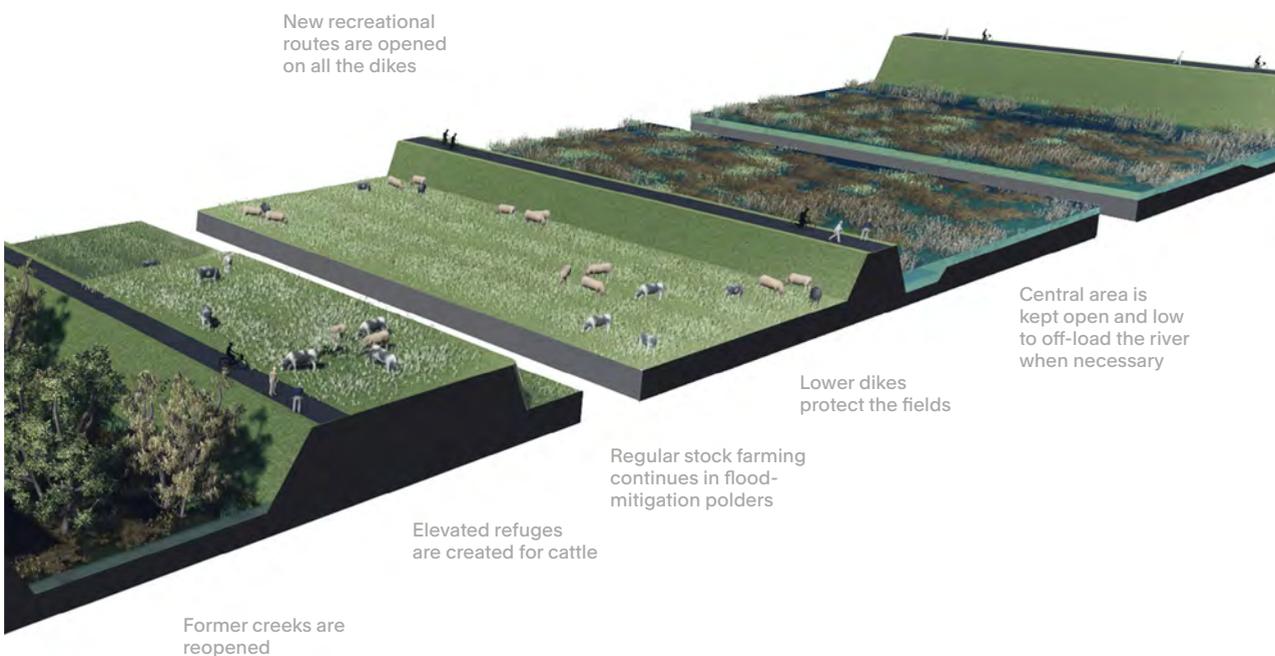
formed an enclosed polder with a 1/2000 years flood probability (fig. 1, p. 205). After completion of the project, five flood stages could occur. About 25 to 100 times a year, average high waters would come in from the estuary and gradually cover the areas surrounded by low dikes (fig. 2–3). Once a year, on average, the Merwede level would reach two metres above NAP (Dutch reference level), and the river would flow in through the inlets created in the winter dike (fig. 4). Small high-dike polders would face a one percent chance of inundation per year at peak discharge (fig. 5). Eventually, the whole Biesbosch could be flooded at extreme discharge, with a flood probability of 0.1 percent per year (fig. 6).

For the high-dike polders alongside the flood corridor, the designers chose seven small polders instead of two large ones in order to create more differentiation between the inhabited and cultivated areas on the one hand—making them more intimate and wooded—and the vast open horizons of the central portion on the other. Farmers opposed the idea, preferring larger and continuous farmland over small compartments, but the inhabitants eventually chose the proposed option, attracted by the perspective of having more streams and creeks around the area and along the houses (De Koning: 2013). Despite the differentiation among open, low-dike and high-dike areas, the whole Noordwaard officially changed status, from an ‘inside-the-dike’ area to an ‘outside-the-dike’ area



(two distinct statuses in Dutch law). Depending on their altitude, some of the pre-existing constructions were considered safe, while others were declared uninhabitable. In the latter case, inhabitants and farmers were expropriated and compensated. Some chose to remain in the area and move to one of the five new terpen that were built along the new dikes.

The project was also expected to change life in the area, with the development of new nature areas and recreational facilities. With its new network of streams and wetlands, the Biesbosch would soon be expected to attract not only more wild species but also more human visitors. Inhabitants who had enjoyed the Biesbosch for its nocturnal darkness and its silence, feared this permanent nuisance (*overlast*)—a word that appears no less than 27 times in the preliminary design booklet. To prevent future conflicts between ecological interests, residents, and visitors, recreational facilities were confined to two locations, with the rest of the area being restricted for car traffic. Eventually a ‘high-water Noordwaard road map’ was developed during the construction years, and later distributed by the municipality to help inhabitants anticipate flood situations (*Draaiboek Hoogwater Noordwaard*, 2015). Among other aspects, the guide detailed the risks of living ‘outside-the-dike-area’, the evacuation procedure in case of flooding, and the restoration procedures.



Schematic section of the flood gradient: permanent farmland within high dikes, new houses built on elevated platforms connected by high dikes, historical creeks reopened, low farmland diked but floodable by high water, nature area permanently opened to water fluctuation (Rossano/Orfanopoulos)

# DESIGNING ELASTIC LANDSCAPES FOR AN UNCERTAIN FUTURE



February 2020: High waters flow through the Noordwaard region (Rob Engelaar/ANP)

‘Uncertainty is ineradicable, and there is every reason to see it not as a limitation but to approach it positively as a challenging fact that is inherent to social action.’  
(D. Sijmons, Hajer, Maarten, et al.: 37)

The projects described in the previous chapters illustrate a global change in flood management in the whole of Western Europe. They also show many similarities in goals and development processes. Past civil works were often built by authoritarian regimes, in under-used areas, aimed at safety and economic growth. Today’s projects reach many objectives, sometimes contradictory, in developed regions. They involve numerous stakeholders in long negotiations.

This multiplicity of goals and stakeholders allows for new territorial deals, conditioned by two key dimensions: the space within which flood risks are managed and redistributed, and the temporality of the responses to various flood levels, which implies a great uncertainty. The drafting of these agreements generally follows a few essential steps: defining and communicating the overall framework; clarifying the risk levels and their possible redistribution within the area or region; creating favourable conditions for negotiation, deconstructing binary oppositions and clearing unfounded suspicion; valuing flood zones as useful and multifunctional spaces.

This complexity also calls for new design tools that go beyond pure engineering and involve other disciplines. On top of hydrological aspects, issues of functionality, land use, and aesthetics are addressed through various visual tools of communication, and discussed with more qualitative concepts, such as authenticity, beauty, or sustainability. Flood management uses diversified expertise, and involves more frequently designers of the living environment (landscape architects, urban planners and architects). However, these designers may encounter difficulties: their intervention can be either perceived as a source of conflict (and limited to a final shaping of a technical decision), or be integrated from the start as a true contribution to the whole project.



Combined uses in flood spaces: new lake for recreation and water storage in Meerstad, cultivated flood meadows in the Bergsche Maas' winter bed, along the Overdiepse Polder (photos Rossano) • Winter bed of the Isar River in Munich, transformed and opened for urban leisure (photo Kuenzel)

still be fit for farming activities: flood fields aren't necessarily marshlands surrounded by steep levees, they can provide suitable land for farming or pasture and multifunctional infrastructure.

### COMBINED AMBITIONS FOR MULTIFUNCTIONAL LANDSCAPES: FLOODSCAPES AREN'T LOST SPACES?

The main argument used against the widening of rivers and horizontal flood mitigation strategies is partly true and partly contradicted by old and new examples: floodscapes are indeed generally lost for cultures that require costly equipment and built infrastructures, and lost for regular urban extensions, which cannot withstand temporary flooding. Floodplain cultivation and flood-resistant urban spaces have however existed for a long time, and recent research and projects show that there are solutions for combining space for flood mitigation with profitable land exploitation, provided this combinatory approach is integrated at an early stage. As shown earlier for past flood-resistant civilizations, flood-prone areas have long been exploited, not only in-between floods but also through the exploitation of the flood itself for fertilization or land-making. For the farmers of the Overdiepse Polder, cultivating flood prone spaces wasn't new either: from a 730 hectare-large area, 180 hectares were located in the floodplain of the Bergsche Maas River, below high-water level and nevertheless cultivated since the Middle Ages. When the Bergsche Maas channel was dug in 1904, a winter bed was kept outside of the levee to allow for extra capacity at peak discharge. This winter bed remained exploited after the construction of the channel—the trees planted in the floodplain conveniently marking its edges for ships to remain on course even at high waters (De Bont, 2013).

In 2003, more than half of the farms active in the Overdiepse Polder were still renting land in this floodplain, using it mainly as meadow and, for a small part, for raising corn (Van Rooy and Slootweg, 2003). The majority of the farmers were thus used to exploiting flood-prone land, long before the polder itself was identified as potential space for flood mitigation, which was not the case along the Swiss Rhône and the French Isère. This familiarity with combinatory use may explain the fact that the farmers of the Overdiepse Polder actively participated in the planning process, even initiating an accelerated procedure to promote a solution that allowed them to sustain their activity in the future flood mitigation space. For the farmers of the Overdiepse Polder, just as for the

## BEFORE PROJECT IMPLEMENTATION

## AFTER PROJECT IMPLEMENTATION

	BEFORE PROJECT IMPLEMENTATION	AFTER PROJECT IMPLEMENTATION
Rhône 3	Fruit culture Agroforestry Sand and gravel mining	Nature development Urban recreation (Sion-sur-Rhône) Recreational cycling / pedestrian route Farming on new shallow levees
Isar Plan	Unexploited meadow	Urban recreation Swimming / beach Recreational cycling / pedestrian route Nature redevelopment
Isère Amont	Crop farming Isolated riparian woodland Recreational ponds	Crop farming Riparian woodland reopened to river flood Recreational cycling / pedestrian route
Meerstad Groningen	Arable land Intensive pasture Rowing basin	Water recreation Sailing and rowing sports Nature development (wetlands) 'Sail-in' villas on islands
Noordwaard	Arable land Intensive pasture Farm buildings and dwellings	Arable land Intensive pasture Farm buildings and dwellings on terpen
Overdiepse Polder	Arable land Intensive pasture Farm buildings and dwellings	Arable land Intensive pasture Farm buildings and dwellings on terpen

Land use before and after transformation into flood expansion areas

farmers of the Isère Valley, the land is today no less productive than before, despite its change of status.

The case of the neighbouring Noordwaard Polder is different in that regard, since the area will function as a by-pass for the Merwede and should be flooded at a higher frequency and higher speed, making intensive farming more uncertain. As a consequence, farmland in the 2050-hectare flow area decreased from 80 percent to about 50 percent after completion. The Noordwaard Polder is, however, located in the heart of the Biesbosch and surrounded by several isolated nature reserves: its transformation was thus partly a step towards the restoration of a greater and more natural Biesbosch that made sense on a regional and national scale—although nature restoration was not communicated as a primary goal but rather as a side effect welcomed between two conurbations. This choice was also legitimized by the position of the Biesbosch nature area, in a densely urbanized region and in a country where nature occupied only three percent of the national territory in 2000 (CBS, 2004).

The re-balancing of nature and farming was more difficult to defend for the architects of the Third Rhône Correction, where river widening was explicitly related to the restoration of riparian nature, excluding productive land-use in a canton where more than 50 percent of the land was classified as unproductive. Although the ecological state of the Swiss Rhône was as poor as that of the Dutch Rhine, the global balance between cultivated and natural space was more often used *against* the renaturation

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*Floodscapes* tells the multifaceted story of humankind's relationship with flooding, oscillating between fight and symbiosis. Modern water engineering has turned plains and valleys into fully inhabitable environments. At the same time, they have become rigid and highly vulnerable to climate change. In ground-breaking efforts to prevent future floods, countries are rediscovering adaptation strategies: making room for flooding, redistributing risks and reconsidering the use and legal status of floodplains.

Through historical investigations and through the analysis of six contemporary projects implemented in four European countries, Frédéric Rossano illustrates in *Floodscapes* how flood-mitigation measures can be embedded in local space and culture. Merged with landscape development, agriculture, recreation, nature and even urban growth, river management becomes a design issue again, giving landscape architects and urban designers a prominent role in future transitions.

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