



Delft University of Technology

In-Between Nature

Reconsidering Design Practices for Territories In-Between from a Social-Ecological Perspective

van den Brink, L.; Rooij, R.M.; Tillie, Nico

DOI

[10.1007/978-3-030-97023-9_7](https://doi.org/10.1007/978-3-030-97023-9_7)

Publication date

2022

Document Version

Final published version

Published in

Design for Regenerative Cities and Landscapes

Citation (APA)

van den Brink, L., Rooij, R. M., & Tillie, N. (2022). In-Between Nature: Reconsidering Design Practices for Territories In-Between from a Social-Ecological Perspective. In R. Roggema (Ed.), *Design for Regenerative Cities and Landscapes : Rebalancing Human Impact and Natural Environment* (pp. 153-172). (Contemporary Urban Design Thinking). Springer. https://doi.org/10.1007/978-3-030-97023-9_7

Important note

To cite this publication, please use the final published version (if applicable).
Please check the document version above.

Copyright

Other than for strictly personal use, it is not permitted to download, forward or distribute the text or part of it, without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license such as Creative Commons.

Takedown policy

Please contact us and provide details if you believe this document breaches copyrights.
We will remove access to the work immediately and investigate your claim.

Green Open Access added to TU Delft Institutional Repository

'You share, we take care!' - Taverne project

<https://www.openaccess.nl/en/you-share-we-take-care>

Otherwise as indicated in the copyright section: the publisher is the copyright holder of this work and the author uses the Dutch legislation to make this work public.

Chapter 7

In-Between Nature: Reconsidering Design Practices for Territories In-Between from a Social-Ecological Perspective



Louisa van den Brink, Remon Rooij, and Nico Tillie

Abstract During past decades, Territories in-Between (TiB) have gained increased attention among researchers in the field of urban planning and design. TiB are often considered to be underused, lack spatial quality and are under mounting pressure of urban densification. However, the rich diversity of land uses and abundance of semi-open spaces in the TiB provide unique habitats and social-ecological potentials, different from exclusively urban or rural landscapes. Therefore, urban planners and designers should reconsider conventional planning and design approaches towards these kinds of territories. The objective of this paper is to present a holistic planning and design approach towards TiB which acknowledges and strengthens its unique social-ecological potentials on local and regional scales. The new spatial planning concept that was developed through a ‘research-by-design’ process is called: *The Recovering Membrane*. This concept was developed for the city of Rotterdam. The Recovering Membrane is defined as a spatial layer of interaction between two distinctive living environments – urban and rural – and various human and non-human actors in them. The research puts forward that design for the TiB should consider the urban fringe as a distinctive kind of TiB with unique social-ecological potentials. Moreover, spatial design should strengthen existing spatial qualities of the TiB, to protect its pressured, yet highly valuable, characteristics. Additionally, local nature-based interventions can provide an important tool for placemaking in the TiB, especially when integrated with long-term and large-scale area transformations.

Keywords Territories in-between · Urban fringe · Landscape ecology · Placemaking · Nature-based solutions

L. van den Brink (✉) · R. Rooij · N. Tillie
Department of Urbanism and Landscape Architecture, Urban Ecology & Ecocities Lab,
Delft University of Technology, Delft, The Netherlands

© The Author(s), under exclusive license to Springer Nature

Switzerland AG 2022

R. Roggema (ed.), *Design for Regenerative Cities and Landscapes*,

Contemporary Urban Design Thinking,

https://doi.org/10.1007/978-3-030-97023-9_7

7.1 Introduction

Ever since the emergence of their disciplines landscape architects and urban designers have been concerned with the distinction between their fields of interest, respectively the rural and urban landscapes. However, because of ongoing urbanisation and sustainability challenges the academic disciplines of urban design and landscape architecture are becoming increasingly intertwined with one another. Moreover, ongoing urban growth and densification in the Netherlands is pressuring semi-open spaces in between cities and rural land (Nabielek et al. 2014). Consequently, the distinction between the urban and rural landscape diffuses (Frijters et al. 2004; Zonneveld 2007). To understand the challenges that these semi-urban landscapes are facing researchers are looking for a more nuanced conceptualisation of the prevalent urban-rural dichotomy in spatial planning and design practice. One of the first and most ground-breaking theories that tries to conceptualise and centralise these semi-urban landscapes is Alexander Wandl's research on territories in-between (TiB) (Wandl 2020). The concept of TiB is used as an umbrella term to describe dispersed urban settlements which cannot merely be defined as urban or rural but are somewhere in-between.

7.2 Problem Field and Research Question

It is expected that the number of households in the Netherlands will further increase for several decades. This trend is the result of decreasing average household size and ongoing immigration (PBL 2011). To meet the housing demand about one million houses have been estimated to be built until 2040. The need is especially high in the larger cities in the Randstad region (Verdaas 2017). The main strategy to allocate these new houses is to transform and densify within the existing urban tissue. Brownfields, infrastructure corridors, old industrial districts, and semi-open spaces along the fringe of the city are key locations for urban redevelopment and new housing projects (Gemeente Rotterdam 2019). These are the typical locations that can be identified as Territories-in-Between (Wandl 2020). The abundance of unbuilt grey and green spaces in the TiB provides great potential for ecological development and the provisioning of ecosystem services (Wandl et al. 2012; Wandl 2020). Although the TiB have gained increased attention among researchers, limited attention is given to TiB in planning practices. As a result of this, its potential for the provisioning of ecosystem services is often not recognized (Wandl 2020). Moreover, the TiB are often considered to be underused and lack spatial quality. This wide underestimation of the existing qualities and potentials of TiB among spatial planners and designers is one of the core reasons for the one-dimensional urbanisation processes in the TiB. The densification process in the TiB increases the pressure on urban green spaces and requires urban designers to think of more holistic design

strategies that ensure the liveability of both human and non-human species in the TiB. This brings us to the research question that will be answered in this paper: What kind of holistic planning and design approach strengthens the ecological and social potentials of Territories-in-Between, while also taking into account urbanisation needs?

7.3 Methodology

The research question is answered through a research-by-design process which is supported by findings from a literature study and spatial analysis of TiB in the Rotterdam region. The city of Rotterdam and its surrounding landscapes were chosen as a case area for the Urban Ecology graduation studio but were in particular relevant for the TiB design experiment, because of Rotterdam's diffuse urban-rural boundary, the great abundance of in-between territories and the great urbanisation pressure on these areas. The research by design process ran parallel to the literature study and spatial analysis. Therefore, the findings of the design process motivate the choice for specific literature domains and theories. This approach was especially helpful because of the limited available literature on territories in-between. In other words, the design process helped shaping the theoretical framework of the research. The following section discusses the spatial characteristics and current planning practices in the TiB with use of the findings of the spatial analysis and literature review. Thereafter, the main findings from the literature review are outlined and synthesised into concrete design recommendations for the in-between territories. Finally, the results and insights of the design experiment are presented for the case of the city of Rotterdam. The last section summarizes the main findings and presents design and policy recommendations for professionals in the field of urban planning and design.

7.4 Territories In-Between

In academic literature many concepts have been introduced to describe dispersed urban settlements such as peri-urban, urban sprawl, suburban and more (Wandl 2020). However, these concepts do not sufficiently cover the complexity and diversity of dispersed urbanization patterns. Moreover, Wandl argues that TiB have a distinct character and functioning that cannot be described by a simple urban to rural gradient; based on the dichotomy of urban and rural that most of these concepts rely on (Wandl et al. 2014). Therefore, he introduced the concept of territory in-between as an umbrella term to describe the significant spatial and functional characteristics of these landscapes. The TiB can be characterized by three prevalent

spatial features which distinct the TiB from rural and urban areas: the intermingling of built and unbuilt spaces, the strong functional mix, and the significant presence of infrastructures in the landscape (Wandl et al. 2014).

7.4.1 Social-Ecological Potentials

The semi-open structure and diversity of land uses in the TiB provides habitats for general as well as endangered species. Species which are more often associated with urban landscapes, but also species which are more associated with the rural landscape. For example, oyster catchers on flat roofed logistic or commercial buildings, common linnet and European goldfinch at brown fields, or the green woodpecker and beech marten at graveyards. Therefore, TiB provide a unique combination and diversity of habitats that differ from merely urban and rural landscapes (Fig. 7.1). Consequently, unique interactions between species takes place that are not seen anywhere else. Additionally, typical land uses like sports fields, allotment gardens and graveyards also provide crucial spaces for people to interact with the natural environment and relieve stress, which contributes significantly to people's well-being (Haines-Young and Potschin 2010). This 'active' interaction between people and their environment is also crucial for building up people's sense of place. Sense of place is an important cultural ecosystem service. This concept is further elaborated in Sect. 7.3.

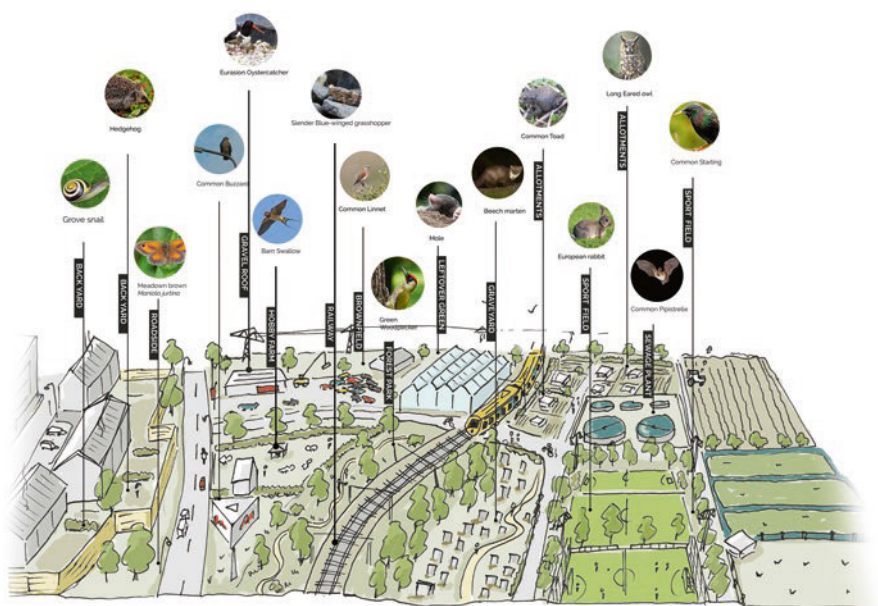


Fig. 7.1 Habitats and species of territories in-between (Van den Brink 2021)

7.4.2 Current Planning Practices

In academic literature a consensus exists that dispersed urban settlements are being neglected in spatial planning and policy making. This is even described as one of the key characteristics of the TiB (Wandl 2020; Frijters et al. 2004). Several socio-economic trends and planning policies are fundamental in the emergence of territories in-between in the Netherlands. First, there is the renowned spatial planning tradition of the Netherlands starting from the 1960's, when the first National Policy Document on Spatial Planning was issued (*Eerste Nota Ruimtelijke Ordening*) by the national government (Zonneveld 2005). These national reports outline the spatial planning strategies that need to be implemented by provinces and local governments. The goal of all national spatial planning policies so far has been to control suburbanization and preserve the rural landscape (Healey 2006; Zonneveld 2005). This idea was explained with the use of Dutch concepts like *compact stad* (compact city), *gebundelde deconcentratie* (bundled deconcentration) and *stadsgewest* (city-region) which were used to give direction to urban growth (Frijters et al. 2004; Zonneveld 2005). However, in the last National Spatial Strategy it is argued that national spatial planning policies so far have failed to succeed their main goal of preserving the rural landscape (Bontje 2003; Zonneveld 2007). Moreover, they speak of *verrommeling* (cluttering) and spatial degradation of the landscape (Van Ool 2006; Veeneklaas et al. 2006). The prevalent lack of significant landscape features, and the presence of footloose industries and businesses are reasons why many people identify these landscapes as in-authentic and placeless (Arefi 1999; Wandl 2020). The current densification process taking place in most Dutch cities pushes large scale land uses, such as industrial facilities and sport facilities, towards the urban outskirts. These land-uses are often re-located along infrastructural routes or at the urban fringe of the city. Moreover, it is expected that the strong emphasis of the national government on economic development in combination with globalization and digitalization trends will put further pressure on the urban fringe of the city (Nabielek et al. 2014; Zonneveld 2005). Consequently, the TiB will only become a more fundamental part of the Dutch landscape (Van Ool 2006). Until 2006 when the last National Spatial Strategy (*Nota Ruimte*) was issued by the Ministry of Spatial Planning (MVROM) the national government took the lead in Dutch spatial planning (VROM 2005). In 2010, however the ministry of VROM was abolished as part of decentralization liberalization measures (Balz and Zonneveld 2018). Since then, urban development and sustaining spatial quality of the Dutch landscape was no longer a primary task of the national government. The national government concentrated its attention to spatial economic and infrastructural developments (Zonneveld 2005). Hence, sustaining the spatial quality within the TiB seems to be an issue of conflict between regional and local planning. A new planning approach for the TiB should therefore provide coherence between developments at the regional and local scale.

7.4.3 *The Particular Case of Rotterdam*

The greater Rotterdam area is particularly suitable for this kind of study, because of its diffuse urban-rural boundary, the great abundance of in-between territories and the great urbanisation pressure on these areas. Although earlier studies and plans have addressed the densification of Rotterdam's inner-city area (Tillie 2018; Tillie et al. 2018), Rotterdam now aims to build 50,000 new houses until 2040 of which most will be located in existing territories in-between (Gemeente Rotterdam 2019). As a result of the ongoing densification in these territories, the functions and services that they provide are under increasing pressure. This particularly includes allotment gardens, sport complexes and small commercial and industrial districts. This is a worrying development, especially because the demand for allotments and outdoor sport facilities has grown significantly during the covid-19 crisis. Spatial data mapping was used as a tool to get a qualitative understanding of the spatial distribution of Rotterdam's TiB and its spatial characteristics in different places, i.e., what typifies Rotterdam's TiB and what makes areas stand out? By overlapping different spatial characteristics of the TiB in a shadow map (Fig. 7.2), it is argued that certain places possess higher degrees of in-betweenness compared to others. The map is composed of four layers:

1. Functional land uses typical to the TiB (industry, sport/recreational land uses and commercial and logistic areas).
2. Large infrastructure corridors.



Fig. 7.2 Shadow map of Rotterdam's territories in-between (Van den Brink 2021)

3. Urban fringes within 200 m of built area of city limits.
4. Degree of protection by environmental policies such as Natura 2000 and Nature Network Netherlands (NNN).

This map is a first step towards qualitative mapping of TiB. Further improvement is expected to be made with more detailed spatial data analysis on open spaces (Open Space Ratio) and function mix (Mix-use Index) in the area (Pont and Haupt 2007; Van den Hoek 2008). It can be seen that Rotterdam's harbour district, the large green house areas in Westland and the major infrastructure corridors make up a significant amount of the total TiB within the city's surroundings.

7.5 Theoretical Framework

This section discusses the main scientific theories that have been of support and inspiration for the design research: edge-boundary theory, landscape heterogeneity, and theory on sense-of-place.

7.5.1 *Edge-Boundary Theory*

This theory is part of Richard Forman's Patch-Corridor-Matrix model (1995). This model is a fundamental research and design model used in the field of landscape ecology (Forman 1995). The model describes the arrangement of different spatial landscape elements that together make up the greater landscape structure: the landscape mosaic. According to Forman, the landscape mosaic is composed of three universal types of spatial elements: patches, corridors, and the matrix. The patch-corridor-matrix model can be applied in both anthropogenic and natural environments and at different scales. This makes the model a very effective research- and design tool for spatial planners and designers. Moreover, the model provides a way to compare dissimilar looking landscapes on a landscape structural level (Forman 1995). The design of patch edges and boundaries deserves specific attention because their characteristics are of great influence on species migration and human - wildlife interactions. The edge is described as the outer portion of a patch where the environment differs significantly from the interior of the patch. The change of behaviour of species near or in habitat edges is called the edge effect (Forman 1995). Territories in-between located at the urban fringes of cities can be considered the spatial edge between the urban and rural landscape with its distinctive edge effects. Because of the continuing expansion of human development into natural environments, spatial edges will increasingly form a critical point of interaction between human-made and natural habitats (Dramstad et al. 1996). Figure 7.3 shows the relationship between the spatial morphology of the edge and its related edge effects. Urban-rural boundaries which have a high structural diversity, are irregularly shaped and

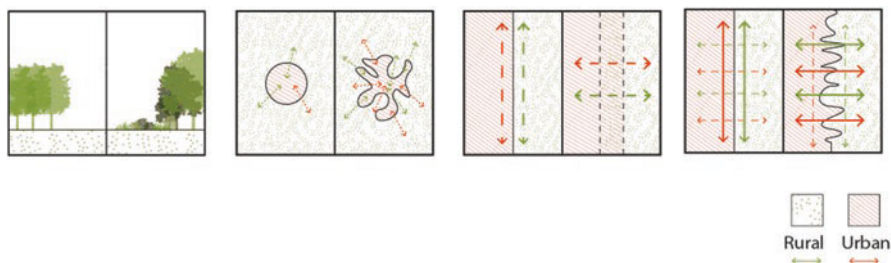


Fig. 7.3 Conceptual representation of design principles for patch edges and boundaries. (Adapted from: Dramstad et al., 1996)

provide a smooth gradient between urban and rural landscapes, which are essential for species richness, movement, and human-wildlife interactions. In other words, landscape architects and urban designers can re-shape spatial boundaries and influence the ecological functioning of the landscape at macro scale.

7.5.2 Landscape Heterogeneity

On a macro level, the mosaic of patches in the landscape can be described by its degree of spatial heterogeneity. The greater the diversity of patches and the greater the spatial mix of them within a specific area, the greater the landscape heterogeneity. Landscape heterogeneity is a fundamental aspect of landscape ecology that aims to relate spatial patterns to processes (Fahrig et al. 2011). Landscape heterogeneity is driven by two aspects: on the one hand the diversity of habitat types (compositional heterogeneity) and on the other hand the size, number, and spatial arrangement of these habitats (configurational heterogeneity). Theoretically speaking, increased compositional heterogeneity leads to more biodiversity because of greater habitat diversity within the territory. Additionally, a greater diversity of land cover types provides complementary resources, such as food, places of refuge and nesting places for different time periods in an organism's life cycle. Greater configurational heterogeneity can also increase biodiversity because of increased connectivity and interspecies interaction (Fahrig et al. 2011). The relationship between landscape heterogeneity and biodiversity is depicted in Fig. 7.4. Even though, landscape heterogeneity studies have mainly focused on natural, semi-natural and rural landscapes, the assumption is made that landscape heterogeneity principles can also be applied on more anthropogenic and semi-urban landscapes creating similar results. This theory on landscape heterogeneity is especially relevant for the TiB because of their multifunctional nature and rich diversity in spatial structure at macro level. Figure 7.5 is a good example of an aerial view of a highly heterogeneous in-between territory along the south border of the city of Rotterdam.

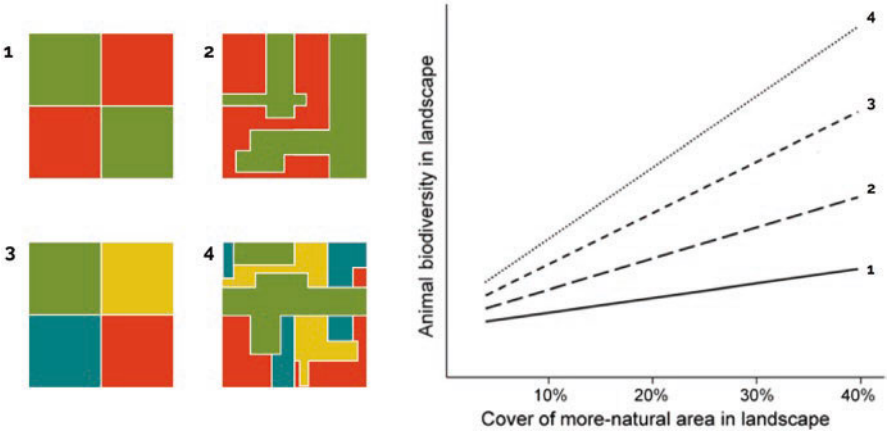


Fig. 7.4 (Left) Conceptual representation of landscape heterogeneity patterns. (Right) Correlation between heterogeneity patterns and biodiversity. (Adapted from: Fahrig et al., 2011 fig. 3&4 pag 104–105)



Fig. 7.5 Aerial picture of heterogeneous spatial structure of TiB at the south border of Rotterdam. (Retrieved from google earth)

7.5.3 Sense of Place

Sense of place can be described as the relationship between people, their imagination, and the physical environment. The concept is rooted in both objective influences of the environment such as landscape design, form, and sensory perceptions

(smell, sound, climate etc.) and on the other hand subjective experiences such as memories, emotion, and culture. Therefore, sense of place is a complex concept about the emotional attachment of people to their living environment because of their interaction with the landscape (Shamai 1991; Bush et al. 2020). Consequently, facilitating human-nature interaction is essential for the creation of sense of place. According to Canter, a place is created by three main elements: form, function, and meaning (Canter 1977; cited in Ghani et al. 2018). These elements also describe the type of relationships between humans and the environment, respectively, cognitive, behavioural, and emotional. It is argued that good physical form and good function lead to good emotional response (meaning) which results in enhanced sense of place experience. The emotional dimension is therefore a result of the other two dimensions; the behavioural and the cognitive. (Ghani et al. 2018). The heterogeneous spatial structure and the abundance of green open spaces in the TiB provides great potential for people to strengthen their relationship with the natural environment and participate in various kinds of stewardship activities such as restoration, cleaning, and maintenance activities. Actions of stewardship can change people's meanings and attachments over certain places and therefore contribute to people's sense of place (Masterson et al. 2017). Greater sense of place experience among locals positively influences people's willingness for stewardship activities and can therefore positively influence the ecological quality and performance of the landscape. In turn, greater ecological quality generally provides greater sense of place experience through the provisioning of cultural ecosystem services.

7.5.4 Theory Synthesis

The main theory domains that support the design research are the fields of Ecology and Sense of place. Within ecology specific attention is paid to theory on landscape ecology in relation to biodiversity, i.e. how landscape patterns influence species richness. The two theory domains are connected with one another through an integrated design approach called 'nature-based placemaking'. The aim of this approach is to transform spaces into places by integrating not only the needs of the local community in the design process, but also the needs of local nature. It looks at nature as primary tool for placemaking. This approach relies on a positive feedback mechanism through ecosystem services and stewardship (Fig. 7.6).

7.6 Design Research

This section presents the results of the design experiment. This design consists of four main elements:

1. A regional planning concept and vision.

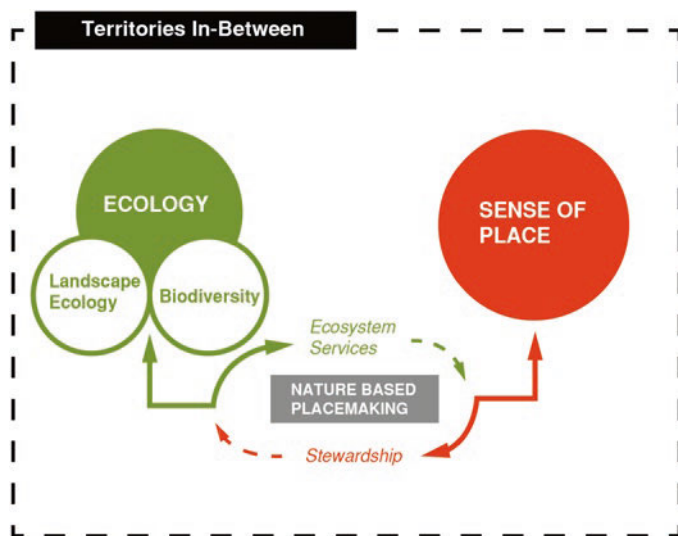


Fig. 7.6 Overview of key concepts and research approach (Van den Brink 2021)

2. A proposed staged development process.
3. A governing body at sub-regional scale.
4. Transferability study to other regions.

7.6.1 Regional Planning Concept and Vision

Through a research-by-design process, supported by the findings from the literature review and spatial analysis, a new planning approach for the TiB is developed. This new planning concept is named: 'The Recovering Membrane' and was applied and tested through design research for the case of Rotterdam. The recovering membrane is defined as a spatial layer of interaction between two distinctive living environments –urban and rural- and various human and non-human actors in them (Figs. 7.7 and 7.8). The membrane aims to bridge the urban-rural divide, enhance biodiversity and sense of place in the in-between territories at the urban fringes of the city. The membrane makes space for the pressured land uses in the territories in-between and strengthens the heterogeneous nature and multifunctionality of the urban fringes of the city. By doing so, the membrane can be considered as a unique kind of landscape with distinctive ecological and recreational qualities which are different from merely urban and rural environments. Moreover, the membrane provides a combination of services that are essential to the city resident's well-being.

Fig. 7.7 Illustration of membrane concept (Van den Brink 2021)

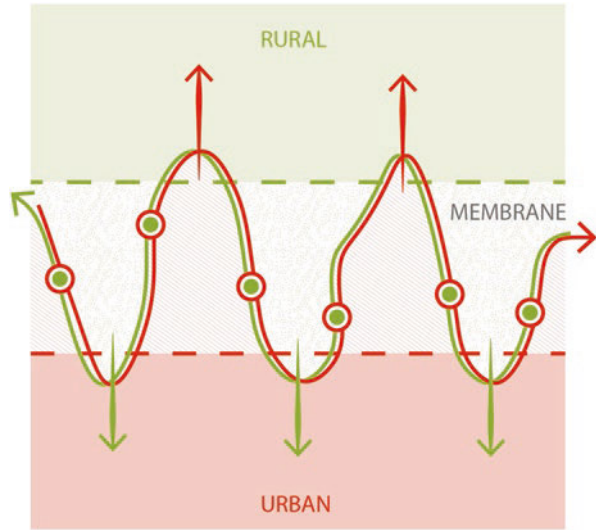


Fig. 7.8 Drawing of recovering membrane for the region of Rotterdam (Van den Brink 2021)

7.6.2 Staged Development Process

The second component of the spatial planning strategy is the staged development process. The spatial transformation of the in-between territory into a membrane landscape can be organised into three development stages at: short, medium, and long time. This kind of staged development process allows for a more gradual transformation process. A process which provides coherence between small- and large-scale developments, which creates support among the local community and better respects the existing qualities of landscapes. The paragraphs below discuss the main objectives for each stage in combination with a design impression for a particular case at Hoek van Holland (Fig. 7.9).



Fig. 7.9 Street view of current situation at design location, Kulkweg Hoek van Holland (Van den Brink 2021)

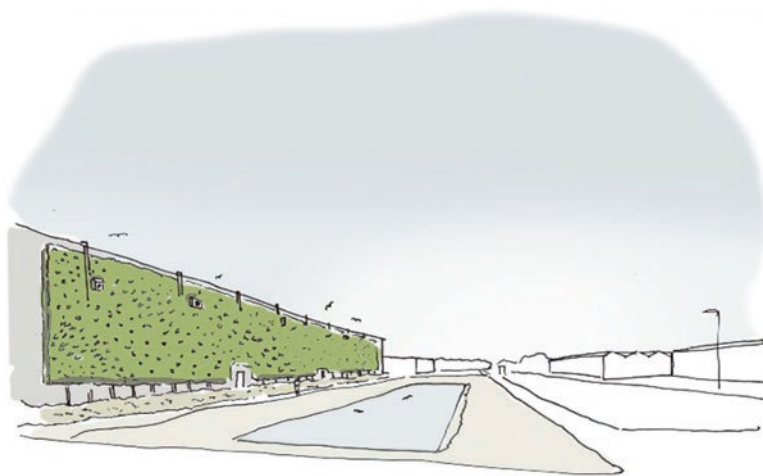


Fig. 7.10 Stage 1: Impression of design proposal (Van den Brink 2021)

Stage 1 (short term, < 5 years): Engagement and activation of the local community through a nature-based placemaking process. The aim of this stage is to improve the spatial quality within the membrane landscape through low cost and short-term interventions in co-creation with the local community. Figure 7.10 is an impression of relatively simple short-term nature-based intervention. The figure shows a green wall with bird nesting boxes mounted on the outside wall of a storage warehouse.



Fig. 7.11 Stage 2: Impression of design proposal (Van den Brink 2021)

Stage 2 (mid-term 5–20 years): Connectivity and integration of the territory in-between within its surroundings through social-ecological corridors. The primary aim of this stage is to improve the social accessibility and ecological connectivity of the landscape to its surroundings. This is especially important for the recreational quality of the membrane landscape that is often very fragmented by large infrastructures. Figure 7.11 shows how the green facade can become of greater ecological value when connected to an ecological corridor along the waterway and street.

Stage 3 (long term, > 20 years) Re-distribution of clustered land-uses to strengthen the heterogeneous nature of TiB. This stage is of specific importance as greater landscape heterogeneity does not only cause greater ecosystem resilience and biodiversity but can also positively contribute to people's sense of place experience, as has been discussed in Sect. 7.3. Figure 7.12 is an impression of the final situation where some of the greenhouses and large warehouses have made space for a greater diversity of land uses such as a day-care farm, sportsfield and extensive housing developments. This re-distribution of land-uses will further increase the ecological and recreational quality of this landscape.

7.6.3 *Governing the Membrane*

Existing institutions and partnerships for spatial development at sub-regional level do not sufficiently address the issue of spatial quality of the TiB at the urban fringes of the cities. They seem to be primarily interested in economic development. Therefore, there is an urgency for a distinct governance body that is primarily



Fig. 7.12 Stage 3: Impression of design proposal (Van den Brink 2021)

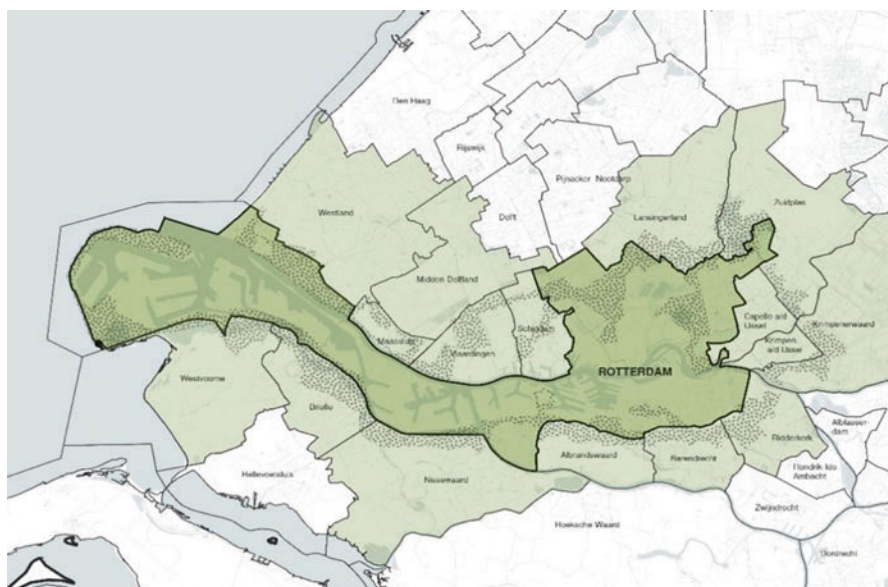


Fig. 7.13 Map of all municipalities in which the membrane landscape is located (Van den Brink 2021)

focused on improving spatial quality at sub-regional level for the territories in-between at this scale. To put this issue on the public agenda and achieve the spatial objectives of the membrane, a new governing body is proposed: The Membrane Management Group (MMG). The aim of such a new governing body is to facilitate coordination and cooperation between all municipalities connected to the membrane and ensure spatial quality and coherence of the membrane at sub-regional scale (Fig. 7.13). Interests of local municipalities are represented and together they

plan and monitor regional spatial developments in the membrane and ensure consistency between regional- and local-scale projects. By doing so the issue of lack of spatial quality in the TiB is addressed in an integrated way at multiple scales.

7.6.4 *Transferability of the Membrane*

Even though the design approach was developed through a design experiment for the case of Rotterdam the main concept of the membrane is most likely transferable to other urbanised regions and cities. Figures 7.14 and 7.15 show the first step of transferability of the membrane concept to other urban regions. The concept can provide urban planners and policy makers with input for urban growth scenarios. A proposed strategy for the monocentric region of Paris is to improve accessibility of the membrane and increase the total membrane surface, in relation to interior urban area, by increasing curvilinearity of the urban border of Paris (Fig. 7.14). A different strategy is proposed for the polycentric region of the Randstad. For the Randstad region the strategy should be focused on protection of the interior (rural) environment, because of the high degree of spatial fragmentation of rural area, resulting from polycentric urban development. In this case a macro membrane landscape for the entire region can act as a buffer for the interior rural landscape, while also connecting different membranes at city level (Fig. 7.15). Therefore, the membrane concept can offer various insights and development scenarios depending on existing spatial conditions at regional scale.

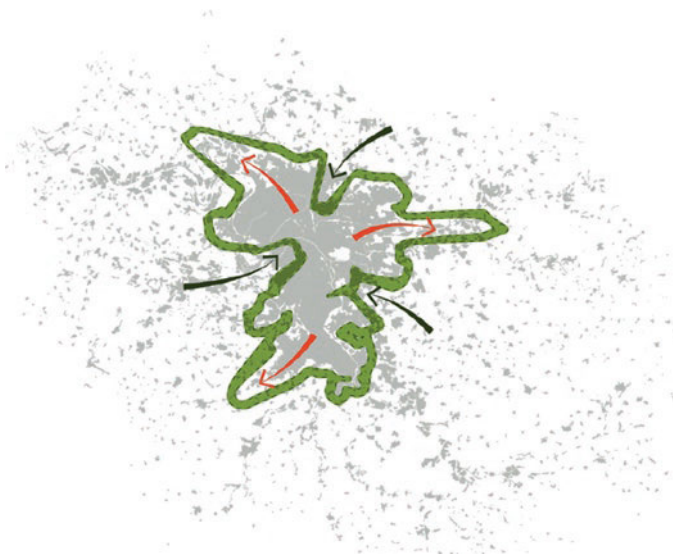


Fig. 7.14 Membrane proposal for urbanised region of Paris. Shape of membrane can operate as guide for urban development, indicated with arrows (van den Brink 2021)

Fig. 7.15 Membrane proposal for greater Randstad region (Van den Brink 2021)



7.7 Link with Regenerative Urbanism

Regenerative urbanism understands cities as living systems that maintain a mutually symbiotic relationship with their surrounding peri-urban and rural territories. This is achieved by not just minimizing the city's environmental impact, but by actively improving and regenerating the productive capacity of the ecosystems from which it depends (Girardet et al. 2013). This understanding of the regenerative city stresses the need for an integrated design approach that looks beyond the urban structures of the city. Hence, it also considers lands surrounding the city. In the past the land-use around our cities was closely related to the demands of that particular city, for example old fishing villages like Marken and Urk in the Netherlands, but also typical villages on higher sand grounds that relied on their surrounding communal lands for their resources. Nowadays, these productive lands are not anymore located around the urban fringes of our cities, but find themselves scattered across the globe. Consequently, the rural lands that surround our cities are often socially and economically disconnected from our cities. Therefore, a shift towards a more local economy is needed in order to recover the symbiotic relationship between our cities and their surrounding landscapes. This implies that a shift is needed inside and outside the city. This requires spatial adaptations beyond the urban borders of our cities.

The membrane landscape as it is being proposed in this research provides a first step towards this ambition. The design driven research has tried to investigate what this landscape looks like, especially concerning its social and ecological potentials. With the introduction of the membrane landscape we deliberately make space for this interaction between our cities and the surrounding landscape on social, ecological and economic level. Even though the economic aspect has not been much

elaborated In the design research, it is an essential aspect In the shift towards the regenerative city. Local industries, food production and production of building materials can become an integrated part of the city's membrane landscape. Therefore, the concept of the membrane landscape can be a promising addition towards to the existing body of knowledge on regenerative urban design.

7.8 Conclusions

In this paper it was argued that there is a need for a new holistic planning approach towards TiB which acknowledges the social and ecological potentials of these landscapes. A literature review, spatial analysis of TiB for the case of Rotterdam, and a research-by-design process were conducted to create the newly introduced planning approach. The approach can be described with four key recommendations for practitioners and policy makers in the field of spatial planning and design:

1. Consider the urban fringe of the city as a unique kind of in-between landscape (membrane), because of its ability to bridge the urban-rural divide.
2. Acknowledge and strengthen existing qualities and potentials of the TiB, such as spatial heterogeneity.
3. Address issues of spatial quality in the TiB through an integration of different spatial (regional and local) and temporal scales (short- and long-term) with use of a new sub-regional governing body (MMG) which is primarily concerned with spatial quality in these landscapes.
4. Provide spatial interventions that maximise human-nature interactions and increase stewardship and sense of place within the TiB. To do so, nature-based interventions should be used as a primary tool for placemaking within the TiB.

By considering the In-between territories as an integral part of a larger ecological system, the concept of the membrane landscape maximizes Its unique potentials for human exploration and wildlife interactions. Additionally, the membrane landscape can provide various kinds of resources for the city and provide a place of transition towards a more localised economy. Therefore, It reconnects the city to Its surroundings and vice versa, on social, ecological and economic level. Finally, the design driven research explores what this membrane landscape could look like and how these territories can evolve towards achieving this ambition.

References

- Arefi M (1999) Non-place and placelessness as narratives of loss: rethinking the notion of place. *J Urban Des* 4(2):179–193
- Balz V, Zonneveld W (2018) Transformations of planning rationales: Changing spaces for governance in recent Dutch national planning. *Planning Theory & Practice* 19(3):363–384

- Bontje M (2003) A 'planner's paradise' lost? Past, present and future of Dutch national urbanization policy. *Eur Urban Reg Stud* 10(2):135–151
- Bush J, Hernandez-Santin C, Hes D (2020) Nature in place: placemaking in the biosphere. In: *Placemaking fundamentals for the built environment*. Palgrave Macmillan, Singapore, pp 39–61
- Dramstad W, Olson JD, Forman RT (1996) *Landscape ecology principles in landscape architecture and land-use planning*. Island Press, Washington, DC
- Fahrig L, Baudry J, Brotons L, Burel FG, Crist TO, Fuller RJ et al (2011) Functional landscape heterogeneity and animal biodiversity in agricultural landscapes. *Ecol Lett* 14(2):101–112
- Forman RT (1995) *Land mosaics: the ecology of landscapes and regions*. Cambridge University Press, New York
- Frijters E, Hamers D, Johann R, Kirschner J, Lurzing H, Nabielek K et al (2004) *Tussenland*. Netherlands: NAI Publishers/RPB (Netherlands Institute for Spatial Research), Rotterdam/The Hague
- Gemeente Rotterdam (2019) *Strategische Verkenning Verstedelijking*. Retrieved from: https://rotterdam.raadsinformatie.nl/document/7827160/1/s19bb017999_3_50801_tds
- Ghani I, Rahman NA, Nayan NM, Bahaluddin A (2018) Experiential virtual urban environments: a preliminary investigation. *PLANNING MALAYSIA* 16(5):25–37
- Girardet H, Schurig S, Leidreiter A, Woo F (2013) *Towards the regenerative city*. World Future Council, Hamburg
- Haines-Young R, Potschin M (2010) The links between biodiversity, ecosystem services and human well-being. In: *Ecosystem ecology: a new synthesis*, vol 1. Cambridge University Press, Cambridge, pp 110–139
- Healey P (2006) *Urban complexity and spatial strategies: Towards a relational planning for our times*. Routledge
- Masterson VA, Stedman RC, Enqvist J, Tengö M, Giusti M, Wahl D, Svedin U (2017) The contribution of sense of place to social-ecological systems research: a review and research agenda. *Ecol Soc* 22(1):49
- Nabielek K, Kronberger-Nabielek P, Hamers D (2014) The rural-urban fringe in the Netherlands: recent developments and future challenges. *Spool* 1:101–120
- Planbureau voor de Leefomgeving (PBL) (2011) *Nederland in 2040 een land van regio's, ruimtelijke verkenning 2011*. PBL, The Hague
- Pont MB, Haupt P (2007) The relation between urban form and density. *Urban Morphol* 11(1):62
- Shamai S (1991) Sense of place: an empirical measurement. *Geoforum* 22(3):347–358
- Tillie N (2018) *Synergetic urban landscape planning in Rotterdam: liveable low-carbon cities*. Delft University of Technology. <https://doi.org/10.7480/abe.2018.24>
- Tillie N, Borsboom-van Beurden J, Doepel D, Aarts M (2018) Exploring a stakeholder based urban densification and greening agenda for Rotterdam inner city—accelerating the transition to a liveable low carbon city. *Sustainability (Switzerland)* 10(6):1927. <https://doi.org/10.3390/su10061927>
- Van den Brink L (2021) *In between nature: nature-based placemaking for Rotterdam's territories in-between*. TU Delft, Delft
- Van den Hoek JW (2008) *The MXI (Mixed-use Index) as tool for urban planning and analysis*. In: *Corporations and cities: envisioning corporate real estate in the urban future*. TU Delft, Delft, pp 1–15
- Van Ool M (ed) (2006) *Stad noch land: de ruimtelijke ontordening van Nederland*. NAI Uitgevers, Rotterdam
- Veeneklaas FR, Donders JLM, Salverda IE (2006) *Verrommeling in Nederland (No. 6)*. WOT Natuur & Milieu, Wageningen
- Verdaas C (2017) *De Nationale Omgevingsvisie (NOVI), een selectieve, cyclische en doelgerichte dialoog*. Co Verdaas, Beuningen
- VROM, Ministry for Housing, Spatial Planning and the Environment (Netherlands) (2005) *Nota Ruimte (National Spatial Strategy)*. VROM, Den Haag

- Wandl A (2020) Territories-in-between: a cross-case comparison of dispersed urban development in Europe. A+ BEI architecture and the built environment, (02). Cambridge University Press, Cambridge, pp 1–392
- Wandl A, Rooij RM, Rocco RC (2012) Understanding the planning of open-spaces in territories-in-between: Dupuy's network urbanism approach applied to areas in-between urban and rural. In: RSA European conference: "networked regions and cities in times of fragmentation: developing smart, sustainable and inclusive places", Delft, The Netherlands, 13–16 May, 2012. Regional Studies Association, London
- Wandl DA, Nadin V, Zonneveld W. & Rooij R (2014) Beyond urban-rural classifications: Characterising and mapping territories-in-between across Europe. *Landscape and Urban Planning* 130:50–63
- Zonneveld W (2005) In search of conceptual modernization: The new Dutch 'national spatial strategy'. *Journal of Housing and the Built Environment* 20(4):425–443. <https://doi.org/10.1007/s10901-005-9024-3>
- Zonneveld W (2007) A sea of houses: Preserving open space in an urbanised country. *Journal of Environmental Planning and Management* 50(5):657–675. <https://doi.org/10.1080/09640560701475303>