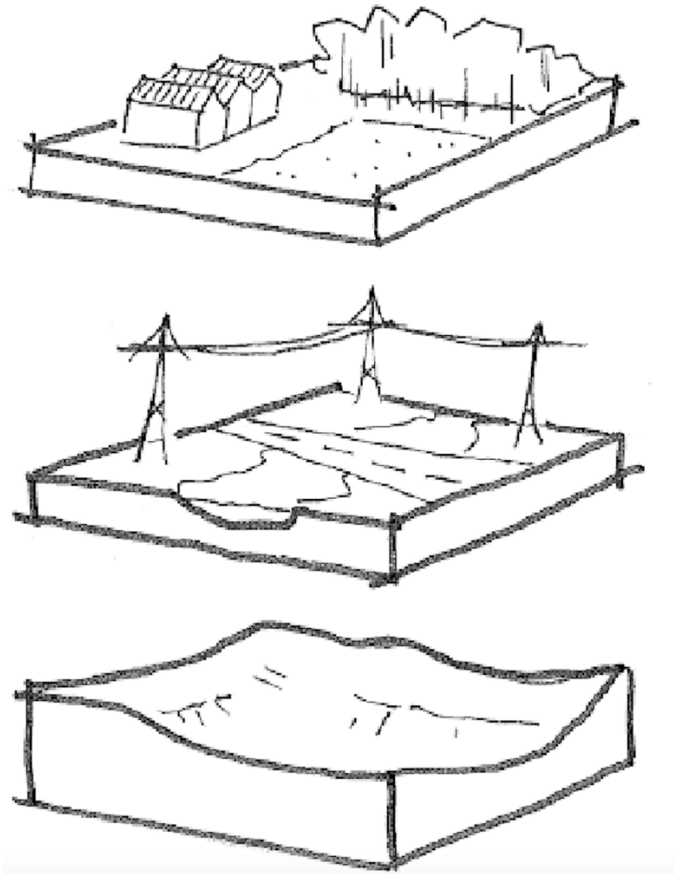
The Layer Approach
Simplifying Complexity

Explanatory research on the view and application of the layer approach in spatial planning in the Netherlands today

By

Johanna Tevérus



Het Lagen model by Hidding 1996, Een gelaagde weergave van het landschap Van boven

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Abstract

Currently, planners and policymakers are employing GIS (Geographic Information Systems) to understand and visualize physical features in geographical areas. These maps are used as the base for future urban developments. Yet there are critiques of using GIS this way since it uses a simple conceptualization of space where space is either continuous or discrete. Space is however multifaceted and therefore there is a need for more complex models focusing on both vertical and horizontal understanding of planning. This explanatory research analyzes how the understanding of landscapes in spatial planning models influences spatial planning. It does this by examining how complex models, such as the layer approach, are being implemented in urban planning. This research combines landscape theory and the usage and view of the layer approach to contribute to a deeper understanding of how spatial models affect the planner's view of landscapes for urban development.

The study consists of ten in-depth interviews, with experts selected to be knowledgeable of the layer approach, combined with four examples, retrieved from desk research, of how the approach has been applied in spatial planning in the Netherlands. The results show that the layer approach is used as a concept of space to discuss and comprehend the landscape. The usage and meaning of layer approach are, as well as its influence on spatial planning in the Netherlands, consequently, determined by its user. The layer approach, through its conceptualization of the landscape, highlights the importance of discussing and considering the natural aspects of the landscape in urban development. However, spatial planning and urban development are driven by social and economic factors and since the layer approach does not address these dimensions the concept is mostly considered an academic concept. Nevertheless, the layer approach has the potential to become influential as a communication tool concerning safety and climate adaptation for cities through its multidisciplinary view of the landscape.

KEYWORDS: The layer approach, Physical & social landscape, Changeability, Spatial planning

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Enjoy your reading!

KRAM

Johanna Tevérus

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1. Introduction

1.1. Background & Problem Statement

There are conflicting views in urban governance regarding what spatial planning is and, what it should be and do. Different understandings and perceptions of spatial planning differ depending on philosophical, political, or economic reasons. The term 'spatial planning' commonly refers to frequent measures done to reach spatial goals in the future (de Wit et al., 2009). Modern-day goals are focused on rising environmental threats, rapid urbanization, and technological innovation which force planners to shift towards a more sustainable urban development paradigm to guide modern planning (Rauws, 2017). Graham and Healey (1999) therefore asked the question: "in a world of tumultuous economic, social, cultural, technological, and physical change, how can we best conceptualize the dynamics of places and the role of planning action in shaping them? (Graham and Healey, 1999. p.623).

Currently, planners and policymakers are making use of GIS (Geographic Information Systems) to understand and visualize the physical features of areas to use as the basis for future urban developments (Goodchild, 2010). There are however critiques of using GIS as the basis of planning, since GIS uses a simple conceptualization of space where space is either continuous or discrete (Ballas et al., 2018). Space is however multifaceted and therefore there is a need for more complex models focusing on both vertical and horizontal understanding of planning. Often transformations completely change certainties humans think to be definite (Rauws, 2017). This creates a pressure for adaptive planning models that can guide planners in the complexity and uncertainty that societies face (van Buuren et al., 2013).

De Hoog, Sijmons, and Verschuuren (1998) developed the Dutch layer approach to incorporate natural aspects into spatial planning. The vision was that the model could transform the way planners view and understand cities to plan for resilience by building with nature instead of against it (van Schaick & Klaasen, 2011). The model aims to deal with urban challenges by dividing spatial reality into three hypothetical layers that interact with each other: the substratum, network, and occupation layer organized after the rate the layers change. The three layers display various components of the physical landscape. The substratum layer contains soil and water, the network layer holds the means of transportation

and infrastructure like roads and railways. However, some rivers are fully natural and therefore fit in the substratum layer, but most rivers nowadays have been altered by man and therefore belong in an in-between layer between the substratum and infrastructure layer. Finally, the occupation layer includes the built environment including houses and offices (see figure 1) (Priemus, 2004).

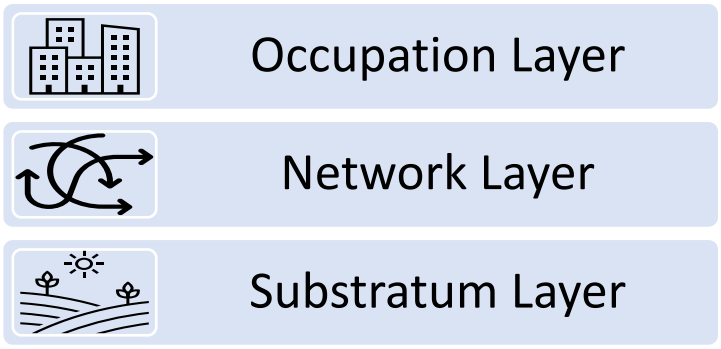

Figure 1: The layer approach

The layer approach gained popularity among Dutch spatial planners and politicians at the beginning of the 2000s and was incorporated into the Fifth Memorandum and later in Nota Ruimte (Ministry of Housing, Spatial Planning, and the Environment) to create a linkage between (inter)national and regional spatial planning, one effect of the decentralization of planning in the Netherlands in 2004 (Priemus, 2007). The layer approach has since developed and changed character and usage. Some argue that the approach has the potential to contribute to a new relational planning scheme that contributes to a more complex perspective of planning. This happens through the way it combines time and space where planners, through the model, can get a deeper understanding of landscapes as a whole eg. (Meyer & Nijhuis, 2013; Roo & Silva, 2010). Others, however, argue that the layer approach reinforces traditional ideas of planning in a new format (eg. Priemus, 2007; van Schaick & Klaasen, 2011). What seems clear, however, is that the layer approach affects the view on spatial planning challenges and how development is governed when adopted in the Netherlands through its conceptualization of the landscape. Secchi and Voltini (2020) discuss that by using the layer approach social issues tend to be overlooked, Priemus (2007) debates that the approach has a dated view on transportation and networks, while Nijhuis (2022) views the approach as necessary to use natural structure in urban development.

1.2. Research objective

This thesis aims to analyze how the understanding of the landscape in spatial planning models influences spatial planning by examining how complex models, such as the layer approach, are being implemented in urban planning. In addition, this study will provide selected recommendations on how to apply the approach successfully.

1.3. Research questions

The main research question and sub-questions of this study are as follows:

Main research question

- *How does the understanding of the landscape, as expressed in the layer approach, influence spatial planning in the Netherlands today?*

Sub-questions

- *How is the layer approach viewed?*
- *What is the aim of using the layer approach?*
- *When is the aim of using the layer approach being realized in practice?*

1.4. Societal & Scientific Relevance

The relevance of this research is to contribute to deepening the knowledge of the layer approach and its effect on spatial planning which has the potential of guiding urban development to being more sustainable. Existing research on the approach has so far shed light on a theoretical debate and the theoretical being of the layer approach e.g. (Meyer, 2017; Priemus, 2007; van Schaick & Klaasen, 2011). Combining landscape theory with the layer approach is a contribution to understanding how the approach affects the planner's view of landscapes and spatial relations. There are arguments in literature e.g. (Leichenko & O'Brien, 2019), arguing that the way humans view and understand phenomena affects the way they deal with them. Comprehending how the conceptualization of the landscape, as expressed in the layer approach, affects planning will therefore deepen the awareness of how spatial planning models, in general, affect planning and urban governance. Understanding this also has the potential to contribute to developing a better planning tool for planners to communicate to policymakers about how their decision affects society. For example, discovering when and how the layer approach has been used and how successfully this has

been done, will provide direction on when the approach can and should be used. The scope of this thesis can, therefore, reduce the gap that arises when using a traditional view of planning.

1.5. Definitions

This study applies the following definitions of key terms:

Layer approach: De Hoog, Sijmons, and Verschuuren (1998) developed the Dutch layer approach which aims to deal with urban challenges by dividing spatial reality into three hypothetical layers that interact with each other: the substratum, network, and occupation layer organized after the rate they change.

Landscape approach: Nijhuis (2022) defines the landscape approach as a way of recognizing aspects of the natural landscape, to make use of natural structures and processes when designing and planning for urban development.

Physical Landscape: Physical Landscape: The part of the landscape that is ecological and exists naturally without human intervention (Freeman, 2015; Nijhuis, 2022).

Social landscape: The landscape is viewed as a cultural construct of the interaction between people and nature since a designed landscape reflects its creator's perception of the landscape (Germundsson 2001).

1.6. Delimitation

This thesis is centered on how the understanding of landscape, as expressed through the layer approach, affects planning. The scope is limited to the layer approach introduced and developed by De Hoog, Sijmons, and Verschuuren (1998) and its usage in the Netherlands. The layer approach has been selected since it is well known and has been widely used by the government in the Netherlands. It has further regained popularity recently since it is viewed to guide a more sustainable urban development in the Netherlands. There are multiple layer approaches in the world, however, these approaches are outside of the scope of this thesis, due to the limited amount of time.

1.7. Structure of the Thesis

This study applies the following structure:

Introduction: The introduction presents the motivation and objectives of the research together with the social and scientific contribution of the study

Theoretical Framework: Selected literature and theories are presented in this chapter including literature concerning space and landscape theory, layers planning and the development of the layer approach. The chapter ends with a conceptual model.

Method: The research approach, method, and procedures used to collect and analyze the findings are presented and discussed.

Findings & Analysis: The collected findings are presented and discussed in this chapter.

Conclusions & Discussion: Here the research question is aimed to be answered, the findings are here analyzed and discussed with the literature presented in the theoretical framework and future research ideas and recommendations are also presented before the thesis is concluded.

2. Theoretical Framework

This chapter starts by introducing the thematical context of the thesis, conceptualizing space, and how different conceptualizations result in different approaches to spatial planning. Then the three main theoretical concepts are introduced. First, landscapes are defined, discussed, and linked to spatial planning and governance objectives. This is followed by a section discussing how planners deal with landscapes through different conceptualizations and models. More specifically, this passage introduces the theoretical idea that landscapes can be divided into layers, which is the basis for the layer approach. Subsequently, the layer approach itself will be introduced and presented from different theoretical standpoints throughout time. Finally, the conceptual model of this thesis will be presented and explained.

2.1. Thematical context: Conceptualizing space

The current challenges that society faces, calls for new adaptive planning models that planners use to comprehend and visualize space (Roo & Silva, 2010). However, when space is viewed in a model, a conceptualization of space needs to be made that makes the jump from the real world to the abstract world possible.

> *'The spatial practice of planning is the gerundic of making space – travelling the dialectic distance between abstract and concrete space' (Roo & Silva 2010, p. 161).*

Further, the way space is being conceptualized determines the planner's understanding of space which affects what aspects of planning is viewed as important for the planner (Davoudi et al., 2009).

2.1.1. Understanding Space

To discuss the understanding and the use of space as expressed in spatial planning, the concept of space needs to be discussed. It is in theory possible to distinguish between two perceptions of what space is. Space can be understood as something that is independent or dependent on interactions between people (Massey, 2007). Harvey (1994) combines the different views on space and divides space into three dimensions: absolute, relative, and relational space to present a holistic view of space.

- **Absolute space** contains physical features that can be measured by a ruler or a coordinate or can be visualized on a map.

- **Relative space** is the relationship between physical objects and time. For example, the time it takes to travel from Rotterdam to Amsterdam is relative to the type of transportation.
- **Relational space** is referring to the social aspects that affect space as culture, race, gender, and so on.

2.1.2. Traditional or relational approach to planning

Healey (2004) presents that there are two different planning approaches: traditional and relational. **The traditional approach** uses the conceptualization of space based on the Euclidian distance which Harvey (1994) refers to as absolute space. **The relational approach** focuses on the relationship between objects and focuses on the relative and relational space (Harvey, 1990, 1994; Healey, 2004).

The relational approach to planning is in this way argued to create a wider understanding of time/space implications in modern society (Healey, 2004). Graham and Healey (1999) argue that planners need to move from basing their understanding of space on planning instruments. This argument stems from the challenges present when adopting a conceptualization of space that is simplistic and independent on interactions between people, as done in GIS where space is treated as bounded areas that are definable. Space is according to the authors multifaceted and should be treated accordingly by being defined in relational terms and considering social relations. Haley (2004) continues by claiming that the current planning discourse has received critiques for ignoring dynamics in the city and that the relational approach to geography provides a more beneficial tool for understanding time/space implications (Healey, 2004).

Currently, Dutch, and European planners deal with space as multifaceted by using *concepts of space* in planning (Roo & Silva, 2010). One example of a concept of space is "green hearts". “Green Hearts” refers to the role that open spaces have in forming spatial harmony by introducing an extensive open space in the middle of an urbanized place to unite various communities. The Randstad is argued to be united by green hearts (Kühn, 2003). Another example is argued to be the layer approach. Concepts of space are practical tools for understanding, categorizing, and communicating societal issues. They are further viewed as ‘labeled packages’ containing spatial information about space in one way or another. There

are however challenges with using concepts of space in planning practice since the concepts do not contain enough information about certain planning situations and can therefore not be used to justify decision making. The theoretical aim and their actual effect on planning practice, therefore, differ depending on its user. It is therefore common that planners to view space as dynamic and complex but use a traditional approach when analyzing spatial elements (Roo & Silva, 2010).

2.2. Landscape approach in Spatial Planning

2.2.1. Urban planning as a discipline

Behrend and Levin-Keitel (2020) differentiate between urban planning as an academic discipline and as a profession. Urban planning as an occupation aims to allocate functions in the landscape by collaborating on multiple scales with people from various disciplines. The academic field of planning on the other hand aims to describe the scientific discourse of urban planning (Behrend & Levin-Keitel, 2020). Roo and Silva (2010) highlight two reasons why planning space is complex: The first reason is the intention of the planner. Planners aim to remake the space in line with the planner's vision and policy targets. When modeling space, a conceptualization of space needs to be made that makes the jump from the real world to the abstract world possible. The way space is being conceptualized determines the understanding of space. The second reason relates to the nature of space. Planners use planning models and concepts of space to help them view and comprehend space, however, space includes complexities of both physical and social systems that are difficult to simplify (Roo & Silva, 2010). Fainstein (2021) further defines urban planning as follows:

> *'Urban planning, design, and regulation of the uses of space that focus on the physical form, economic functions, and social impacts of the urban environment and the location of different activities within it. Because urban planning draws upon engineering, architectural, and social and political concerns, it is variously a technical profession, an endeavour involving political will and public participation, and an academic discipline.'*
> *(Fainstein, 2021).*

Urban planning has spatial consequences, but the initial starting point stems from a socio-economical perspective. Planning can therefore be seen to exist between social science and politics since planning usually reflects the current state of politics and mirrors contemporary ideas and knowledge of space that are bound to change over time (Nyström, 2012). De Wit et al. (2009), therefore, argue that planning is culturally determined, and each country has a planning system that mirrors its history and culture, as expressed in the quote below:

> *"The world of spatial practice is a rich tapestry where space, ideology, and representation intertwine sometimes even when it is being woven or becoming unraveled" (Liggett & Perry in Davoudi et al., 2009, p . 4)*

Leichenko and O'Brien (2019) discuss that individuals' values, worldviews, and beliefs originate from their understanding of nature and society and the relationship between them. Campbell (1996) further discusses these issues among planners in his research on: Green cities, growing cities, and just cities. Campbell aimed to highlight the conflict of interest arising in contemporary planning, where he presents that the contemporary planner aims to combine social, economic, and environmental perspectives in planning to develop a sustainable society. Campbell however argues that it's nearly impossible for a planner to focus on more than one dimension at a time because the dimensions operate from different standpoints by planners. The *social equity* planner focuses on different groups in society and how they are related to each other. The planner promoting *economic development* sees the city as a place where ideas develop and create profit through consumption. The planner focusing on *environmental protection* pays close attention to limiting resources to save the planet. The different standpoints result in that it is practically impossible to achieve the perfect symbiosis between the three, a *"green, profitable, and fair"* city (Campbell, 1996).

2.2.2. Landscape approach

In the aim to transform to more sustainable, integrated, and relational understanding of landscapes in spatial planning, the landscape approach in planning has gained popularity (Freeman et al., 2015). Tress and Tress (2001) argue that within landscape research there are diverse concepts of `landscape'. Concepts that differ depending on which disciplines it was developed and therefore propose different landscape approaches (Tress & Tress, 2001). Freeman et al. (2015) discuss that the landscape approach does not contain one single definition of what using the landscape approach implies in practice. Freeman portrays three

categories of definitions of the landscape approach: "(1) addressing social-ecological systems at the landscape scale, (2) related to resource management and/or environmental goals, and (3) framed around the concept of multifunctionality, to achieve multiple objectives through the approach" (Freeman et al., 2015. p. 3). Nijhuis (2022) further defines the landscape approach as a way of recognizing the natural aspects of the natural landscape to make use of the natural structures and processes when designing and planning for urban development. However, in spatial planning, the landscape approach is most popular when it highlights the relationship between humans and nature and the expanding pressures on the soil, water, and other natural systems crucial for human existence (Freeman et al., 2015). The landscape approach's purpose can be seen to comprehend the way societies are connected to their environment (Bürgi et al., 2017). Tress and Tress (2001) therefore argue that landscape research and the landscape approach in planning need to be transdisciplinary to bridge the gap between human and natural sciences in landscape (Tress & Tress, 2001).

2.2.3. Definition of landscapes

A landscape is multidimensional and has both a cultural and natural dimension. The landscape has an absolute place and is physical but does also have a cultural approach since humans understand the landscape according to their own experiences and thoughts (Germundsson 2001). Landscape viewed this way stresses that landscape is a cultural construct of the interaction between people and nature since a designed landscape reflects the creators' perception of the landscape (Germundsson 2001; Nijhuis, 2022). Freeman (2015) further argues that the cultural view of the landscape has not received as much attention as the natural landscape approaches. The natural view of the landscape and specifically the development of landscape ecology have guided the current discourses concerning the landscape approach (Freeman et al., 2015). The natural landscape holds ecosystems, and biodiversity as well as crucial elements for human existence as food and fresh water (Nijhuis, 2022). The view of the landscape is further context-dependent, where different social and ecological dimensions affect the view of the landscape (Freeman et al., 2015). Nijhuis (2022) further views the layer approach as one way to approach the landscape approach.

2.2.4. Landscapes and time

The discipline of time-geography assumes that time and space coexist. The two dimensions interact with each other as space transforms through time (Yattaw, 1999; Ellegård, 2018). Time is further viewed as a crucial dimension in understanding landscapes as landscapes transform through time (Nijhuis, 2022). In the 17th century, it was presented in mineralogy and geology that mountains and landscapes were assembled through layers of rocks, the oldest at the bottom and the youngest at the top (Jordheim, 2017). Later Koselleck (1975) presented the concept of "layers of time" where he argued that geological formations differ in age and depth because of their different changeability through the history of the planet (in Koselleck et al., 2018). Braudel (1949) further divided landscape with time in three volumes when he analyzed the Mediterranean region in the 16th century, where each part was characterized by a time dimension. The first volume is about geographical time, 'longue durée', which is barely observable. The second volume is about social, economic, and cultural changes through time and trends in society, that change slowly but are noticeable. And the third volume is about politics and people's daily life which are short-term events that constantly changing (Hagens, 2006; Meyer & Nijhuis, 2016). Meyer & Nijhuis, (2016) further argue that the concept of the longue durée is essential in understanding the physical features of the landscape since it is based on long-term structures which are transforming slowly.

2.3. Landscapes in spatial planning models

To make sense of landscapes planners have aimed to simplify the complexity of landscapes into something that is graspable by using the concept of space. One way to make sense of landscapes is to divide space into layers: McHarg (1969) presented an overlay model in his book *Design with Nature* to strengthen his argument that nature needs to be the basis for planning livable cities (McHarg, 1992). McHarg became groundbreaking since he made a practical guide for urban design including ecology where he distinguished different dynamics of the layers (Meyer & Nijhuis, 2016; Tjallingii, 2015). Through his book, McHarg expanded the boundaries of landscape architecture to include large-scale environmental planning. This guided the discipline to a point that ecological planning is an established part of design and planning (Francis, 1985).

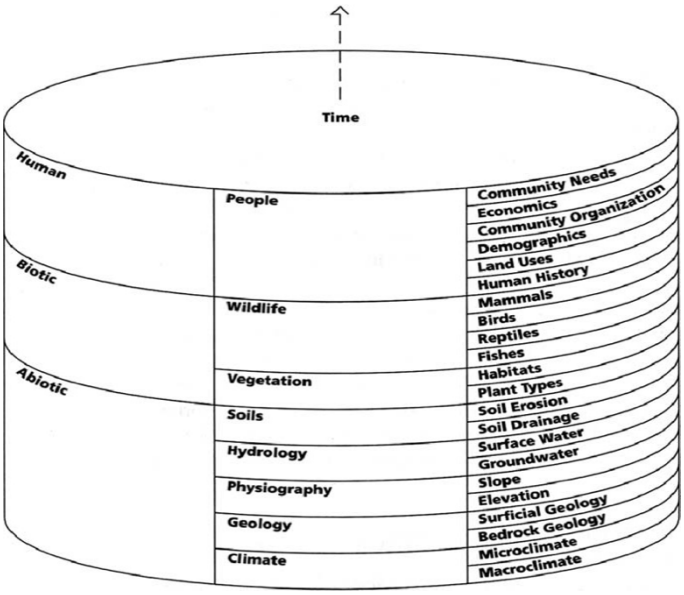

Figure 2: The Layer Cake Model (de Wit et al., 2009)

The layer cake, which can be seen in figure 2, was developed by McHarg and was used in academics from the 1970s to 1980s and in planning practices from the 1990s and was brought to the Netherlands by a professor of landscape architecture at Wageningen University (Hooimeijer & Maring, 2018). The overlay model was argued to clarify elements of the landscape and how they are related to each other (Turner, 1996). The key assumption of McHarg's approach was that land, like air and water, are a public good and should be managed accordingly. Unlike the earlier view that saw land as private property which is managed in a way that benefits the individual (Hendrix et al., 1988). Sprin (2000) however criticizes McHarg and argues that theory and practice cannot be discussed as the same thing. She highlights this confusion when McHarg calls ecology:

> *"not only an explanation, but also a command," (Sprin in Conan, 2000, p. 112).*

Sprin discusses that using ecology to describe the world is different from changing planning as a discipline. She, therefore, divides ecology into three parts: science, a cause, and an aesthetic, arguing that describing nature is not the same as being guided by nature which is not the same as the norm for beauty (Spirin, 2000).

2.3.1. Challenges with structuring space in layers

Structuring space in layers is argued to clarify elements of the landscape and how they are related to each other (Turner, 1996). McHarg (1969) strived for that planning with layers would provide the following:

> *"... a method whereby the values employed were explicit, where the selection method was explicit – where any man assembling the same evidence, would come to the same conclusion" (Turner, 1996, p.61).*

McHarg (1969) argued that if you look at the evidence from the past of nature changing, everyone will conclude that humans need to adapt to nature. Turner (1996) however argues that this statement is not true since there is always a decision of "layers of what", and what should be prioritized. Representation of space is complex and contains multi-dimensional issues. However, when space is structured in layers as done in the layer approach it is divided according to the physical features. This results in that anything that is not physically present in the environment, like social processes, cannot be visualized in such a way (Yuan, 2009). Secchi and Voltini (2020) published an article arguing that by using physical models, like the layer approach, to guide planning the focus tends to be on the aspects of planning that are possible to map and view visually. Arguing that by using physical layers to understand the landscape architects, urban designers, and politicians risk losing the social aspects of spatial planning.

2.3.2. Geographic Information System

The layer cake, as presented in figure 2, created the foundation for what became groundbreaking when McHarg's work was further developed by, for example, Jack Dangermond, who founded ESRI. Through the technological innovation at the time, it was possible to let different layers represent different datasets with geographical information that could be merged to show geographical patterns (de Wit et al., 2009). Since the 1990s, geographers and spatial planners use computer programs such as GIS, Adobe Photoshop, and Adobe Illustrator, which are using the structure of layers as planning tools (van Schaick & Klaasen, 2011).

GIS uses the conceptualization that space is either continuous or discrete. Continuous space is operationalized through a grid where each box, or cell, contains a single value. Examples of continuous data are temperature and height differences. Discrete space, on the other hand, is operationalized through points, lines, and polygons. Examples of discrete data are buildings and roads (Ballas et al., 2018).

GIS is argued to make it possible to incorporate empirical research in the spatial planning and design process by combining quantitative and qualitative data analysis which can increase the evidence necessary to base decision-making on it (Maliene et al., 2011). However, space in GIS is following the absolute conceptualization of space. It oversees the potential as presented in urban models where the relative and relational conceptualization is crucial (Su, 1998) (Freundschuh et al., 1997). Yuan (2009) argues that geographic information science (GIScience) aims to capture the essences of space, time, and geographic things through mathematical modeling but that the GIScience approach to modeling contains issues in representing space

1. The conceptualization refers to that space needs to be modeled in an absolute or relative way, space that cannot be conceptualized this way is ignored.
2. Representation of space is complex and contains multi-dimensional issues that do not fit within the limited space on a map.

Anything that is not possible to visualize is therefore considered nonexistent in GIS such as three-dimensional features, such as groundwater systems, and social processes (Yuan, 2009). Su (1998) further argues that dividing space into layers forces a segmentation of geographical features and overlapping features are not possible to express in GIS.

2.4. The layer approach

The layer approach was developed by De Hoog, Sijmons, and Verschuuren (1998) and, as described earlier, aimed to discuss the relationship between space and time. It does this by dividing space into layers based on their susceptibility to change, where the substratum layer has spatial conditions that change over centuries. Something similar applies to the network layer, where the argument is that infrastructure projects such as railways, airports, and ICT infrastructures take both time and money to develop. And the occupational layer is finally the most flexible one since the projects are smaller than the infrastructure ones.

The layer approach was created by using the idea of McHarg (1969) together with theories from Vidal de la Blache (1922) and Braudel (1949) on historical and social geography (van Schaick & Klaasen, 2011). The layer approach was built on McHarg's (1969) layer cake that became influential in the Netherlands (Hooimeijer & Maring, 2018). Below a theoretical understanding of the layer approach is being presented.

2.4.1. Providing context: The Netherlands

To provide context for the development and creation of the layer approach, a brief historical background of spatial planning in the Netherlands will be provided. The country went through a spatial planning reform which forms the motivation for developing the layer approach. In the year 1999, a government policy proposed a new spatial act that was more suited for a society affected by technological development and globalization (Roodbol-Mekkes & van den Brink, 2015). At the time, most of the government administrations in the Netherlands were organized by different individual sectors (e.g., agriculture, environment, and water.) and jurisdictions, each accountable for independent tasks, which was seen as ineffective (Tisma & Meijer, 2018b). The year 2004, a new national spatial planning policy document was developed together with a new Spatial Planning Act that became effective in 2008. The act made it possible for a clear division of tasks among the different levels of government. It was argued that policymaking should be organized according to the level most suitable for the implementation of the policy instead of it being centralized (Roodbol-Mekkes & van den Brink, 2015).

Today, the Netherlands has three levels of government: national, provincial, and municipal with different responsibilities. Landscape planning, which was before a task for the national government, is now mostly deregulated to provinces and municipalities (Tisma & Meijer, 2018b). However, the national government still plays an important role by forming guiding principles, through national spatial plans, for the lower level of government to follow. The guiding principles, therefore, need to be adaptive to local circumstances to be implemented (Balz & Zonneveld, 2018).

2.4.2. The creation of the layer approach

The layer approach was developed by De Hoog, Sijmons, and Verschuuren (1998) as a response to the ineffective organization of spatial planning in the Netherlands (Meyer, 2017) The layer approach was first developed as an administrative tool to form a guideline for how the Netherlands could make strategic planning choices. The layer approach combined three major design and planning challenges in the Netherlands at the time: climate change and water management, economic growth focusing on infrastructure, and urban development to increase the attractiveness of the landscape (van Schaick & Klaasen, 2011). Planning tasks that were assumed to have different time scales to physically transform themselves and therefore called for different planning horizons to deal with them. Time is, therefore, a crucial element in the layer approach. Water management and climate change were argued to be dependent on the physical landscape and were argued to alter slowly and therefore require lengthened planning horizons. Building infrastructure was argued to be quicker than planning for, for example, climate change. However, building infrastructure was still a more complicated task than planning for urban development and therefore required longer planning horizons than urban development (Hooimeijer et al., 2022). In table 1 planning objectives related to horizons are visualized as presented in (van Schaick & Klaasen, 2011).

Table 1: Planning horizons (Adapted from van Schaick and Klaasen, 2011)

	Layers	**Objective**	**Planning Horizons**
	Layer 1 Substratum Layer	Water management Climate change	50 – 500 years
	Layer 2 Network Layer	Infrastructure	30 – 100 years
	Layer 3 Occupation Layer	Urban development	10 – 30 years

The result was a model on a regional level using time as the guideline for organizing planning tasks during the decentralization of planning in the Netherlands in the original model from 1998 (See figure 3).

The aim was for policy makers to focus on how to protect the land from the physical effects of climate change, improve the water management system in the substratum layer, to increase national international mobility in the network layer, and how to deal with population growth and the attractiveness of the country in the occupation layer (van Schaick & Klaasen, 2011) The layer approach aimed to understand the spatial order to prioritize and organize the spatial claims and interests accordingly (Hooimeijer et al., 2022). The model was not created to describe or explain the environment, which it was later used for, but it was created as a simple strategic planning tool. However, this version of the layer approach received critiques for not paying enough attention to the relation between the layers and therefore is too simplistic a planning instrument (Hooimeijer & Maring, 2018).

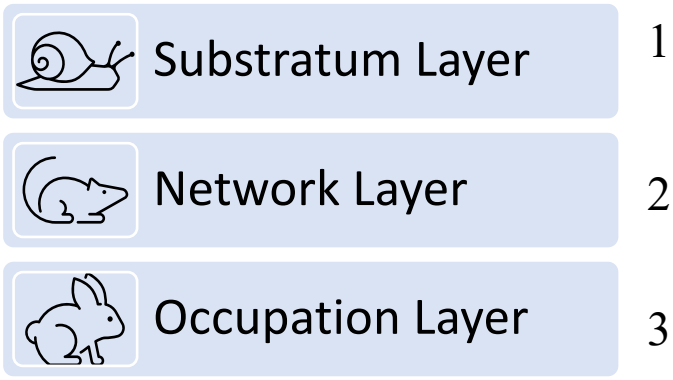

Figure 3: The first layer approach (Adapted from van Schaick and Klaasen, 2011)

2.4.3. Towards a spatial planning approach

The original model of the layer approach aimed to guide public administration (Van Schaick and Klaasen, 2011). Nevertheless, the layer approach gained popularity among planners and politicians as a spatial tool. However, one of the creators of the layer approach Sijmons (2002) argued that:

> *"The layers approach is meant as a contribution to the political-administrative steering of the 'spatial business'... it was a story about a subsidiarity. But it has often been used as a description of reality. That was a big mistake. They confused a planning concept, which it is, with a kind of director's trick to go through the same material in a new battle order" (van Schaick & Klaasen, 2011, p, 1781).*

Hooimeijer & Maring (2018) on the other hand argue that the approach could be a way to encourage a shift towards more sustainable use of the bottom layer in urban development. They argue that the substratum is the basis for urban development. Priemus (2004) and Priemus (2007) further defines the approach as a conceptualization of space where the substratum contains soil, biotic, and water systems, the network layer includes infrastructure, air routes, and digital connections, and the occupational layer includes human activities such as housing, work, and recreation. The different layers further provide the baseline for the next layer, ie. the type of soil affects the possibility for building roads, which further determines if a town can be built there.

Meyer (2017) discusses the layer approach with river deltas. The natural river is dependent on the slowest dynamics that the physical effects of climate change and rising sea levels contain. The network layer determines the position of the Netherlands in international networks and the occupation layer includes nature and social and spatial variations. See their understanding of the model below, in figure 4.

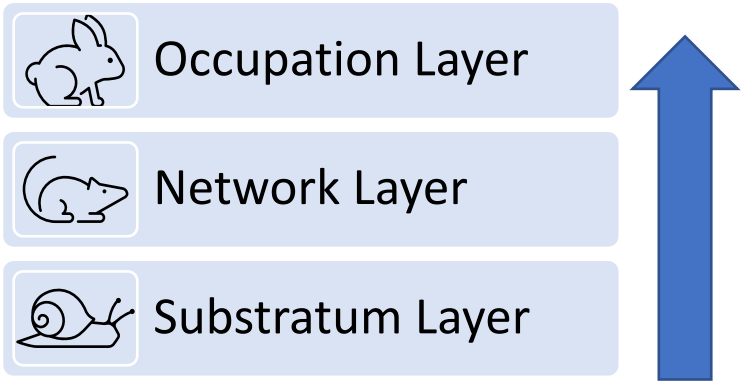

Figure 4: Planning tool (Adapted from Priemus, 2007)

Priemus however later argues that using the layer approach as a planning scheme is challenging since societies change and the time aspects also change over time. He argued that the layer approach has a simplistic view of time in a modern society where land can be claimed from the sea faster than it takes to move a city and the network layer is argued to change more rapidly in modern society since people's travel patterns change continuously (Priemus, 2007).

2.4.4. Towards an analytical model

Hagens (2006) argues that the layer approach is a concept used in planning that provides 'objective' knowledge about the space-time situation that aims to provide understanding for complex spatial tasks for planners in the Netherlands. She however criticizes the aim of providing a precise and complete answer to complex planning challenges and argues that such tasks cannot be accomplished straightforwardly without conflicts. The layer approach as a result offers opportunities for analyzing transition in the landscapes and urban development but there is not a 'correct' use of the approach related to control and decision-making (Hagens, 2006). Tjallingii (2015) further describes the layer approach as an analytical scheme that does not guide planning actions since it does not guide future planning after the analyses are made. Priemus (2004) agrees that the layer approach is a visually attractive model but argues that the organizing space in layers where one layer determines the form of the next is simplistic since layers affect each other both ways.

Meyer and Nijhuis (2013) agree with the conclusion of Priemus (2007) and argue that the layer approach can be adopted by using a complex-system approach where the layers are seen as parts of the whole and can either be seen as a system itself or as interconnected. The model is still presented to follow the time scheme where the layers are divided according to time, however, the layer suitably to change differs in comparison to Priemus (2007), see figure 4 and 5. The layer approach makes it possible to analyze how transitions in society affect major infrastructure projects which affect the movements of the delta if adopted into a complex-system approach where each layer is seen as its system (Meyer & Nijhuis, 2013).

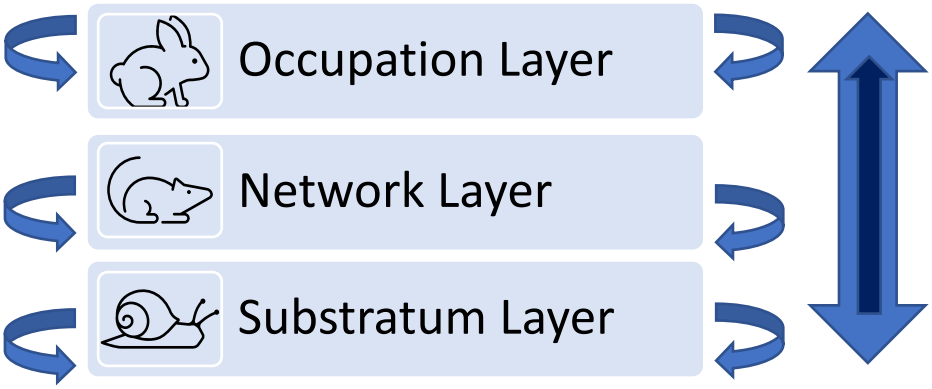

Figure 5: Analytical tool (Adapted from Meyer & Nijhuis, 2013)

Meyer and Nijhuis (2013) see the potential of using the layer approach as a tool to incorporate complexity into spatial planning since it provides methods for *design research* and *research by design*. They argue that the layer approach provides a better understanding of spatial processes in deltas where everything in the landscape affects each other. Meyer and Nijhuis (2013) lift one example of how the occupation layer also can affect the network and substratum. In the port of Rotterdam development occurred to t increase accessibility to the port by digging new channels resulting in a higher water level in the river. This national water management and flood-defense policy resulted in a reorganization of the whole delta region by changing the substratum, new road networks could be developed, which in turn enabled industrial and urban growth in the surrounding areas (Meyer & Nijhuis, 2013).

2.5. Conceptual Framework

The conceptual framework illustrates the relationships between the main concepts examined through empirical research in this thesis. This thesis asks the research question, "How does the understanding of the landscape, as expressed in the layer approach, influence spatial planning in the Netherlands today? This study, therefore, focuses on how the independent variable (Understanding of landscapes) influence the dependent variable (Influence on spatial planning in Netherland) through a mediating variable (The layer approach).

The independent variable: Based on an extensive literature review, four dimensions of the landscape were identified, by different authors: physical and social landscape, time, and layers. These specific dimensions of the landscape are related to how landscapes are discussed with the layer approach, which influences spatial planning. These dimensions, therefore, make up the components of the independent variable of this study.

The dependent variable: Different understandings of the landscapes are further argued to influence spatial planning. Through the literature review, four different effects, the understanding of landscapes have on spatial planning in the Netherlands were identified: (1) To address social-ecological systems. (2) To organize environmental goals. (3) To address the natural aspects of the landscape to make use of the natural structures. (4) To achieve multiple objectives. Influences on spatial planning in the Netherlands, therefore, form the dependent variable of this study.

The mediating variable: As presented in the literature review, planners, professors, and policymakers view and use the layer approach differently. In the theoretical framework, three main uses of the layer approach have been found: (1) as an administrative tool that guides how planning tasks should be organized, (2) as a planning tool that guides planners to prioritize differently when planning cities and (3) as an analytical tool that can be used to analyze complex issues in society. The way the landscape is understood and defined in the approach is argued to affect how the layer approach influences spatial planning. The use of the layer approach is the mediating variable of this study.

Based on the discussion presented, it is expected that the different understandings of the landscape, as expressed in the layer approach, influence spatial planning in the Netherlands differently (See the conceptual model in figure 6).

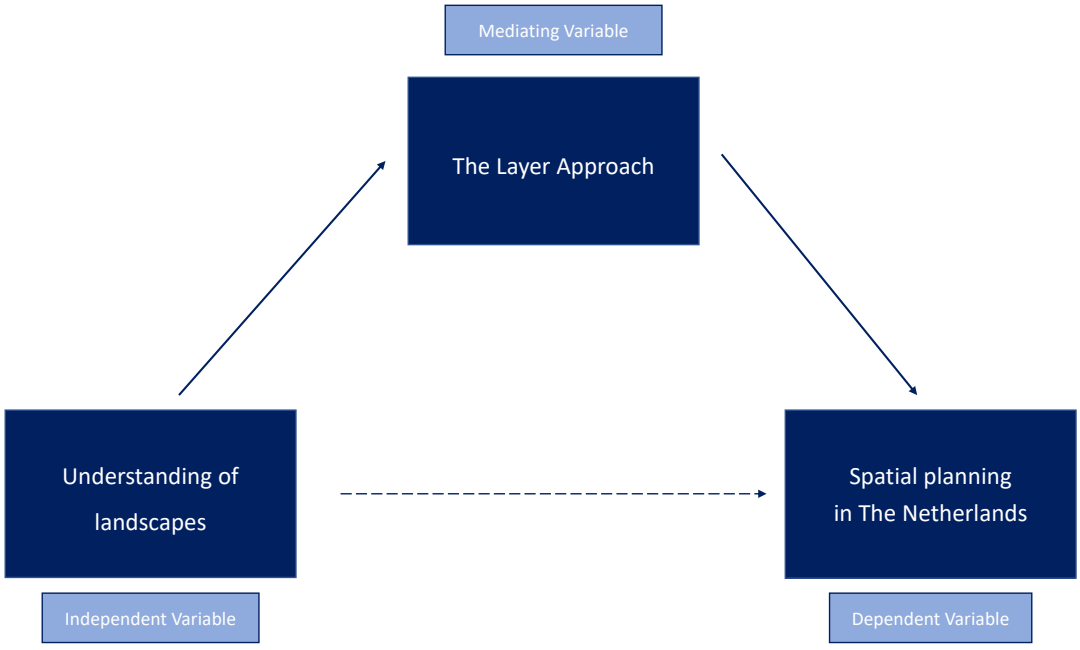

Figure 6: Conceptual model

3. Method

The following chapter presents the research design and methods used to collect and analyze the data for this study. The thesis uses desk research with complementary interviews. The thesis, therefore, uses both secondary and primary sources when investigating the layer approach with a mixed method by combining qualitative and quantitative data.

3.1. Research design

This master thesis aims to analyze how the understanding of the landscape in spatial planning models, as expressed in the layer approach, influences spatial planning by examining how complex models, such as the layer approach, are being implemented in spatial planning in The Netherlands. This research, therefore, adopted an ontological assumption of reality, since the research aims to understand how different people view and use the layer approach (Creswell & Poth, 2018). The research design adopted in this thesis is explanatory research. To answer the research questions a mixed methods approach was adopted where a systematic literature review of the literature available on discussing the layer approach was combined with an analysis of primary data gathered through interviews. The research used a grounded theory approach.

3.1.1. Explanatory research

Studies can either be exploratory, descriptive, or explanatory (Yin, 2014). The selected research question determines what type of study the research is. For example, the descriptive studies focus on the question (What is happening?) while the explanatory studies aim to understand (Why is it happening?) (Farthing, 2016).

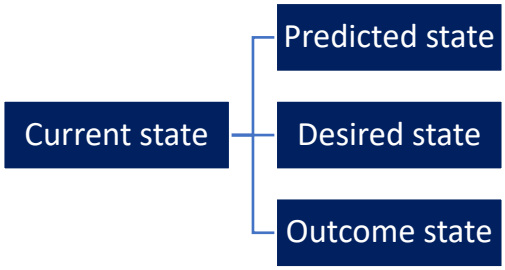

Figure 7: Explanatory Research (Farthing, 2016)

Farthing (2016) further differentiates between different states of knowledge claims in planning debates. Where there are differences between the predicted, desired, and outcome state. Where the explanatory aims to explain or understand why, for example, policies did not reach their desired state and instead reach a different outcome (See figure 7) (Farthing, 2016). This research is explanatory since it aims to identify the causes and circumstances that have led to the spatial layer model being used or not used, and in which contexts and the reasons why.

3.1.2. Research process

The research pursued the following structure. First, a literature review was conducted on the layer approach to comprehend how existing literature views and discusses the approach (See chapter 2). The literature was analyzed by categorizing the different academic views on the layer approach. Secondly, theories were selected through a comprehensive literature review. The literature review and analysis later guided the interview questions in line with the research questions.

Thirdly, semi-structured interviews were conducted to obtain additional knowledge of the layer approach. The empirical findings formed the contemporary knowledge of how the layer approach is viewed and used in practice today. To complement the interviews a small selection of projects and documents, where the layer approach has been used, was done to provide context for the usage of the approach. The interviews and documents from the desk research were further analyzed and later applied to the theoretical framework to answer the research questions. See the research process below in figure 8.

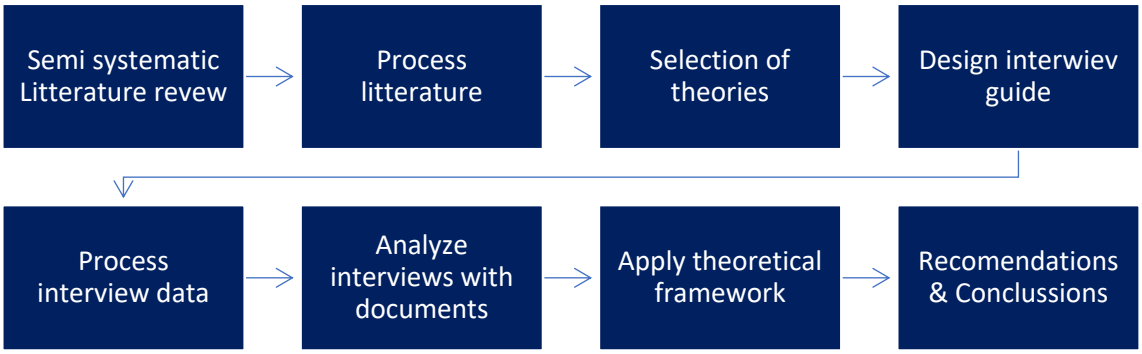

Figure 8: Research Process

3.2. Data collection

3.2.1. Interviews

Various stakeholders that have been using the layer approach as the basis for spatial planning have been interviewed. The respondents contributed to the study by giving a deeper understanding of how the use of the layer approach affects spatial planning by expressing their own experiences with the approach.

Semi-structured interviews

The interviews followed the form of a semi-structured interview since it allows for the researcher to address specific issues relevant to the research questions but at the same time let the respondents express their points of view. A set of prepared questions was used as the basis for the interviews. The questions were based on the operationalization of the key concept of the study (van Thiel, 2014). The interviews were conducted via MSTeams and in person between the 11th of April and the 23rd of June 2022. The interviews lasted between 40 and 75 minutes. The respondents are anonymized in this research in order to increase their comfortability to talk about their experiences. To further ensure that the respondent understood the purpose of the interview a consent form was sent out to the respondents for them to agree to the terms of the research.

Snowball Sampling

Ten in-depth interviews with actors of diverse disciplines and professions conducted as part of the study. Respondents were selected to be knowledgeable of the layer approach and how it is used in spatial planning in the Netherlands. To improve the validity of this research actors from different knowledge and practice backgrounds were interviewed to create triangulation of the answers; among the respondents were professors that have been using the layer approach in academia, professionals in spatial planning, professionals in landscape architecture and advisors in different disciplines.

The sampling method adopted to contact respondents relevant to the purpose of the research was established through the snowball sampling technique. Each contact person provided key actors, documents, and perspectives that further guided the selection of respondents. The snowball sampling technique is preferable when seeking access to a particular network. The critique of using snowball sampling is that it is not representative of the population (Bryman, 2012). However, since the objective of this thesis is to analyze a model in urban practice it is crucial to access a network with knowledge about the approach. An anonymized overview of interview respondents is presented in the chart below (see table 2) while an extended version can be found in Appendix C.

Table 2: Interview Respondents

No.	**Position / Affiliation**	**Company**
1	Professor of Urban Design	Delft University of Technology
2	Research Leader: Department of Urbanism	Delft University of Technology
3	Junior urban / landscape designer	H+N+S landschapsarchitecten
4	Strategist visioning and planning	Waterschap Vechtstromen
5	Coastal and estuarine policy and management	Deltares
6	Urban Designer	Royal HaskoningDHV
7	Geo-ecology and policy analysis	Deltares
8	Regional liaison, generic issues, and civil society organizations	Deltaprogramma
9	Landscape architect	BoschSlabbers
10	Head of Environmental Consultancy	Sweco

3.2.2. Desk research

Furthermore, some documents discussing the application of the layer approach in practice have been added to the analysis to complement and contextualize the findings from the interviews. An overview of the selected documents is provided in the table below in table 3.

Table 3: Selected documents

Examples	**Years**	**Document / Article**	**Authors**	**Year**
The project: Room for the river	2000–2015	The state of the delta: Engineering, urban development and nation building in the Netherland	Han Meyer	2017
		Room for the River: Delivering integrated river basin management in the Netherlands.	Jeroen Rijke et.al	2012
		Lessons learned from spatial planning in the Netherlands. In support of integrated landscape initiatives, globally	Alexandra Tisma & Johan Meijer	

		Flood Defense in The Netherlands: A New Era, a New Approach	Hein T.C. van Stokkom et.al	2005
		Implementing Room for the River: Narratives of success and failure in Kampen, the Netherlands	Jeroen Warner & Arwin van Buuren	2011
		Towards an adaptive, flood risk management strategy in The Netherlands: An overview of recent history	Chris Zevenbergen et.al	2016
Fith National Policy Document on Spatial Planning	2000-2020	Transformations of Planning Rationales: Changing Spaces for Governance in Recent Dutch National Planning	Verena Balz & Wil Zonneveld	2018
		The Treatment of Space and Place in the New Strategic Spatial Planning in Europe	Patsy Healey	2004
		Flood Defense in The Netherlands: A New Era, a New Approach	Piet H.Pellenbart & Paul J.M. van Steen	2001
		Implementing Room for the River: Narratives of success and failure in Kampen, the Netherlands	Gert de Roo & Elisabete A. Silva	2010
		Planning with water and traffic networks	Sybrand Tjallingii	2015
For policymakers	2021	Op Waterbasis	Deltares, Sweco & BoschSlabbers	2021
		De lagenbenadering	Frans Klijn	2022

3.3. Data analysis

The audio-recorded interviews were transcribed and together with the sources identified in the desk research coded before the content was analyzed. Coding as a strategy is used in qualitative analysis where text segments are separated into designated categories (Kvale, 2007). The qualitative data were further analyzed by using a qualitative content analysis where the transcribed answers from the interview are broken down into appropriate text sections and labeled with a code (van Thiel, 2014).

The interview transcripts and documents were studied and divided into suitable categories based on the interview guide, theoretical framework, and new additional themes identified in the interview transcript (See: Code book Appendix B). The coding was therefore thematical and was a combination of an inductive and deductive approach (Kvale, 2007). Thematical coding further makes analysis more systematic, transparent, and rigorous since it is possible to trace the researcher's insights back to data segments (Denscombe & Larson, 2018).

3.4. Grounded theory approach

Since this research aims to discuss and understand the layer approach, this thesis follows a grounded theory design. In the next sections, the main features of a grounded theory approach are presented following the argumentation of Verschuren et al. (2010).

3.4.1. An inquisitive attitude

An inquisitive attitude refers to the fact that theory and theoretical concepts are developed during the advancement of the study (Verschuren et al., 2010). The layer approach was studied first, before the theoretical framework, of this thesis, was formed. This is because this research aims to research how the understanding of the landscape in the layer approach affects spatial planning. A grounded theory approach continuously forces the researcher to use "theoretical sensitivity" which:

> *'Refers to the attribute of having insight, the ability to give meaning to data, the capacity to understand, and the ability to separate the pertinent from that which isn't' (Verschuren et al., 2010, p. 187).*

The author had previous experience using and working with GIS (both QGIS and ArcGIS), which proved to be useful when applying "theoretical sensitivity" to the understanding of the layer approach.

3.4.2. A process of continuous comparison

The grounded theory calls for a constant comparison between phenomena and whether the phenomena resemble earlier findings or not (Verschuren et al., 2010). In this study, a secondary theoretical comparison is made, where different views on the layer approach are discussed based on the literature review and the created theoretical framework.

3.4.3. Procedures and techniques

The grounded theory makes it possible to develop a theory despite its abstraction and makes it possible to obtain an overall understanding of a complex concept. The research approach is, therefore, appropriate when an area of research has hardly been studied (Verschuren et al., 2010). In section 3.2.2 a compiled list of articles discussing the layer approach is presented. However, none of the presented studies have compiled and discussed the layer approach through different understandings of landscapes and usage over time. The layer approach has, therefore, barely been analyzed through this angle.

The main challenge of using grounded theory is the risk of getting lost in the complexity of the subject. Therefore, the first step of using grounded theory is to understand the current field of study by conducting an extensive literature review. During the literature review 'sensitizing concepts' starts to appear. Sensitizing concepts are the main concepts that describe the research problem. Coding these concepts guides the researcher into selective coding where key concepts and a line of argumentation are identified (Verschuren et al., 2010). Searching for 'sensitizing concepts' was used, as a method, to identify key concepts in this research.

3.5. Validity and Reliability

The concepts developed must be tested for their validity and discarded if they cannot pass the empirical test (Verschuren et al., 2010). In this section, four concepts are presented and discussed to ensure the validity and reliability of this study are in line with the argumentation of Yin (2014).

Construct validity refers to the use of correct operational measures for the subject. This aspect is challenging since there is a tendency for researchers to fall into “subjective” judgments. To ensure constructed validity, the main concepts need to be defined clearly and operational measures, that match the concepts, need to be identified (Yin, 2014). To ensure construct validity, two techniques have been used, as presented by Yin (2014). The first one is to use multiple sources of evidence. In this study, 10 interviews have been conducted and 13 documents and articles have been reviewed concerning the application of the layer approach.

This research followed the argument of Bryman et al. (2019) arguing that there is no clear sample size that should be used in qualitative research. Instead, the researcher should aim for data saturation, where limited, new insights are added when doing another interview. The second technique, discussed by Yin (2014), is to link the main concepts in the thesis with other published articles as presented in the theoretical framework. Discussing landscape theory with the layer approach and its effect on spatial planning has been done by other researchers (eg. Roo & Silva, 2010; Nijhuis, 2022)

Internal validity is concerned with explanatory studies where a causal relationship is aimed to be found. The internal validity risks being compromised, if the researcher claims that "x led to y", but the concept of "z" that may be relevant is not considered. This means that the internal validity is compromised (Yin, 2014). To ensure internal validity two techniques have been used, as presented by Yin (2014). The first technique is pattern matching or explanation building, which is a specific form of pattern matching suitable for explanatory studies. The techniques refer to a comparison between the hypothesis, as presented in the conceptual model, and the findings, in order to see if they follow each other. The second technique used is time-series analysis, where the study is organized by describing events according to a timeline following a descriptive approach, which helps the researcher to stay on track with the subject.

External validity defines the probabilities for generalizing the study's findings. The conclusions about how landscape, as defined in the layer approach, affects planning, are generalizable findings. This study's research question is: *How does the understanding of the landscape, as expressed in the layer approach, influence spatial planning in the Netherlands today?* The research question starts with the word, How, which according to Yin (2014) helps the preference for seeking generalizations that strive for external validity. However, the layer approach is developed in the Netherlands and therefore it has case-specific features that have affected the model, since spatial planning is a product of a country's history and culture (de Wit et al., 2009). This provides a possibility for a deep understanding of a phenomenon but, at the same time, it limits the degree of generalization since there are country-specific aspects.

Reliability is referring to the fact that the operation of a study is well documented, so that the research can be repeated, and the same result can be obtained. This includes preparing and saving a case study protocol, that shows how the study has been done. In Appendix A of this thesis, the protocol can be found, and the transcribed interviews are saved by the researcher. A summary of the codebook can further be found in Appendix B.

3.6. Operationalization of key concepts.

An overview of how the main concepts is operationalized is provided in tables 4, 5 and 6, helping to understand how landscapes, as expressed in the layer approach, influence spatial planning.

Independent variable: Understanding of the landscape

Table 4: Operationalization - Independent variable

Concept	**Definition**	**Indicators**	**Source**
Physical	The landscape is viewed as physical where landscape ecology guides the understanding of the landscape (Freeman, 2015; Nijhuis, 2022).	Discuss natural aspects Ignores humans	Interviews
Social	The landscape is viewed as a cultural construct of the interaction between people and nature since a designed landscape reflects its creator's perception of the landscape (Germundsson 2001).	How humans affect the landscapes Cultural reasons for planning	Interviews
Time	The physical landscape is based on long-term structures which are transforming slowly which is important to consider planning space (Meyer and Nijhuis, 2016).	Planning horizons Rate of natural changes	Interviews
Layers	The landscape is argued to be possible to divide according to layers (McHarg, 1969).	View space as possible to divide into layers	Interviews

Mediating variable: Understanding of landscape in the layer approach

Table 5: Operationalization – Mediating variable

Concept	Definition	Indicators	Source
Administrative tool	The layer approach is considered to organize public administration (Van Schaick & Klaasen, 2011)	Discuss planning horizons No interaction between layers Used to prioritize planning tasks	Interviews
Practical tool	The layer approach is considered to restructure planning (Meyer, 2017; Priemus, 2004, 2007)	Discuss how landscapes change Bottom-up relation between layers Used to guide planning	Interviews
Analytical tool	The layer approach is considered to analyze physical phenomena (Meyer & Nijhuis, 2013, 2016)	Analyze how landscapes change Both way relation between layers Used to simplify complexity	Interviews

Dependent variable: Influence on spatial planning

Table 6: Operationalization – Dependent variable

Concept	Definition	Indicators	Source
Addressing social-ecological systems	Addressing social-ecological systems at the landscape scale (Freeman, 2015).	Discuss effects on urban development Highlight the importance of the social landscape	Interviews / Desk research
Organizing goals	Addressing resource management and/or environmental goals (Freeman, 2015).	Aims to prioritize planning tasks Used to divide tasks according to the layers	Interviews / Desk research
To use the natural structures	Addressing natural aspects of the natural landscape to make use of the natural structures and processes when designing and planning for urban development (Nijhuis, 2022).	Discuss how landscapes change naturally Discuss physical conditions for urban development	Interviews / Desk research
Multifunctionality	Framed around the concept of multifunctionality, to achieve multiple objectives through the approach (Freeman, 2015).	Aims to combine multiple goals	Interviews / Desk research

4. Empirical findings and analysis

This section presents the results from the coded interviews together with the examples analyzed in the desk research. The chapter begins by demonstrating the main findings of the sub-research questions of the study, which will provide the structure of this chapter. Firstly, the view of the layer approach among the respondents is presented. Secondly, the aim of the layer approach is discussed by combining the findings of the respondents with four selected examples. The examples are selected to highlight different usage of the layer approach since it was developed. *The Room for the river project* and the *Fith National Policy Document on Spatial Planning* are thoroughly discussed and mentioned in academic articles concerning the layer approach and are therefore selected. The last two documents *Op Waterbasis* & *De Lagenbenadering* are selected since they are published recently and illustrate a more current view of the approach. Thirdly, how the layer approach is being applied in practice, will be discussed from the view of the respondents. Finally, the chapter ends by summarizing the findings.

4.1. Main findings summarized

After collecting and analyzing the interview data it can be stated that the layer approach is not explicitly used in today's spatial planning practice. However, the layer approach is still known and considered among the respondents as a valuable concept to create a more sustainable spatial planning practice in the Netherlands.

4.1.1. View of the layer approach

The understanding of the layer approach differed among the respondents from various fields and professions who participated in the interviews. However, two main views of the approach could be distinguished: the view that the approach contains spatial elements, and one where these are not present. The view of the layer approach containing spatial elements was the most popular among the respondents. Nevertheless, the understanding of what is included in each layer, their interaction, relation to time, and GIS differed widely. Regardless, it can be stated based on the findings that the layer approach highlights the importance of considering natural elements in the physical landscape. The layer approach is therefore used to highlight that the natural landscape should set the boundaries and conditions for the man-made environment.

4.1.2. Aim of using the layer approach

The main goals for using the layer approach, identified in the interviews, can be divided into three main categories. The three different categories have been identified through coding of the interviews and studying the examples retrieved from the literature. The three categories are:

1. Prioritization and division tool for policymakers
2. Guide planning through its understanding of the landscape
3. Tool to take the substratum layer into account when building

The three different goals of the layer approach seem to stem from different views of the layer approach through the understanding of landscape, time, and the interaction between the layers in the model.

4.1.3. The layer approach in practice

The objectives and view of the approach differs between people, based on their occupation, the political climate and planning challenges. The layer approach does not seem to be commonly used in practice, outside of the academic world. Four main discussion themes were identified in the interviews concerning applying the layer approach in practice.

1. The layer approach suitability on different scales
2. The view on government and governance
3. The changeability of the landscape
4. The drivers of urban developments

4.2. View of the layer approach

This section will dig deeper into the summarized findings of the view of the layer approach.

4.2.1. The first layer approach

It can be concluded from the interview transcripts that there are two different perspectives on the layer approach. Respondent 3 (Regional liaison, generic issues, and civil society organizations) discussed the layer approach mainly from a perspective that does not contain spatial elements. The layer approach in this view is regarded to organize and divide planning tasks. Then the layer approach can be discussed as a prioritization of planning tasks as presented below in figure 9:

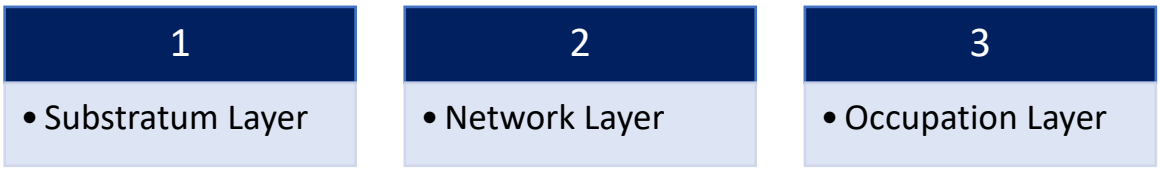

Figure 9: Guiding prioritization

Respondent 3 (Regional liaison, generic issues, and civil society organizations) further discuss that on creation of the layer approach, there was no intent to include spatial characteristics. Instead, the layer approach was aimed as a tool used to prioritize tasks for policymakers. Also, respondent 1 (Professor of Urban Design) discussed that the possibility to prioritize tasks according to the model guided the Netherlands from a centralized to decentralized spatial planning. This understanding of the layer approach was however not present in most of the other interviews.

4.2.2. Content of the layers

Among the rest of the interviews, the layer approach is discussed containing a spatial dimension. Therefore, the conclusion can be drawn that the layer approach has transformed from a priority list with tasks to something more. Respondents 5 (Coastal and estuarine policy and management) and 6 (Urban Designer) discuss the layer approach as "the classical picture" (See figure 10). The layers in the picture were described by respondent 9 (Landscape architect) as follows:

Figure 10: The layer approach (Ruimte met toekomst, 2022)

(1) **Substratum:** Includes abiotic systems, biotic systems**,** and water systems.

(2) **Network:** Includes green networks, traffic networks, and energy networks.

(3) **Occupation**: Contains how humans use the physical space for living, working, food production, recreation, etc.

4.2.3. Interaction between layers

When discussing the layer approach in the interviews, the relationship between the layers plays a prominent role. If you understand the relationship between nature and society the layer approach becomes a powerful planning tool (Respondent 5, Coastal and estuarine policy, and management).

> *"You could say that when you plan a bicycle track through a nature area you will get more leisure activities along the tracks. Maybe a playing field is discovered that attracts festivities, resulting in the need for additional tracks. So, in that way, I mean that development triggers more development. It has to do with functional activities and their demand for infrastructure" (Respondent 5, Coastal and estuarine policy and management)*

Respondent 9 (Landscape architect) recognized that there is a relationship between the layers but concludes that there is no relationship expressed in the classic picture (See figure 10). Respondent 7 (Geo-ecology and policy analysis), Respondent 9 (Landscape architect) and others, therefore, produced an alternative model in the document *Op Waterbasis*. The new model shows more clearly the relation between the layers which they argue to be crucial (See figure 11).

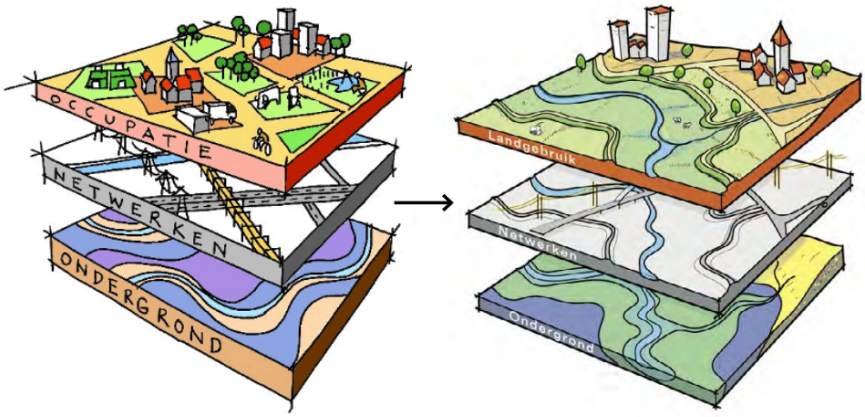

Figure 11: Adapted layer approach (Nieuwe lagenbenadering Deltares, BoschSlabbers, Sweco, 2021)

The new model as presented in figure 11 further highlights the view on the layer approach that is mentioned by all respondents: the need to plan bottom-up instead of top-down with regards to the physical landscape.

> *We wrote an essay explaining what's going wrong in our country, and in many other countries too, because we don't take into account the characteristics of the subsoil and the water enough when we do planning. So, what we get is a kind of planning where you have an infrastructure layer that is being designed without knowing what happens underneath (Respondent 7, Geo-ecology and policy analysis)*

4.2.4. Time in the layer approach

Time is related to the layer approach in two ways: Changes in the physical landscape over time and different planning horizons. The time aspect is a crucial element in the layer approach. Respondent 6 (Urban Designer) expresses that the layer approach is mainly used to highlight that the substratum layer should be considered first when planning due to the slow transformation in the physical landscape. The physical landscape forms a foundation to which the network and occupation layer should adjust too since they have shorter planning horizons.

> *So. what we do know is we try to take the basic layer into account more. Because the other layers can change quicker, you can also adapt them easier and adapt them to what is there, and that it's the natural landscape that is not going to change a lot because of what we put on top (Respondent 6, Urban Designer).*

Today two themes, therefore, return concerning the understanding of the layer approach. First, the topic of climate change and that the layer approach can guide planning into being more climate adaptive. Second is a reoccurring topic that mistakes were made by neglecting the substratum layer in planning. The network layer is discussed more briefly. Rivers are considered to belong in the substratum layer and are discussed accordingly while roads are discussed as a necessity for the development of the occupation layer. Only respondent 10 (Head of Environmental Consultancy) discussed the network layer regarding electricity and the current energy crisis. The respondent argues that electricity is becoming more important to consider since the world is in the middle of an energy transition that will affect development through extended planning horizons.

"We need to take the infrastructure into account, because if we don't and develop without it then we risk having houses that are without electricity" (Respondent 10, Head of Environmental Consultancy)

4.2.5. The layer approach and GIS

Before discussing the aim of using the layer approach, the relationship between GIS and the layer approach needs to be addressed. GIS is understood as the foundation for making use of the layer approach. By using maps to visualize spatial features in the physical and social landscape, it becomes possible to present and discuss space understandably.

Respondent 6 (Urban Designer) argues that there does not necessarily need to be a difference between GIS and the layer approach since both use layers. The respondent implies that the layer approach is a way to describe and communicate about space, but that GIS makes that visualization possible. For example, by using GIS, buildings can be overlayed with waterways to visualize where there is a risk for flooding in the future. The layer approach however guides planners to consider the substratum layer more explicitly in these overlays.

Respondent 7 (Geo-ecology and policy analysis), on the other hand, views GIS and the layer approach as completely different things. By using GIS, you aim to describe the world however GIS maps do necessarily reflect reality due to the margin of errors occurring in the collection of the geographical data. More data is, therefore, not the same as more information.

> *"Patterns are what you see on a map. So, no relation between the layers, or there is a relation, but you could map occupation, you could map infrastructure, you could map soils, you could map the geology, you could map vegetation and then you may see that those maps do not really correspond" (Respondent 7, Geo-ecology and policy analysis)*

Respondent 7 (Geo-ecology and policy analysis) views the layer approach as a concept that contains underlying information about the landscape since there is room for discussing the interaction between the layers in the layer approach which is not the case in GIS.

4.3. Aim of using the approach

This section will dig deeper into the summarized findings about the objectives of using the layer approach. Respondent 2 (Research Leader: Department of Urbanism) discusses that:

> *All layer's approaches stem from the same notion, to unraveling the complexity of an urban landscape in such a way that you can find clues for the development so based on a proper understanding of how these systems function." (Respondent 2, Research Leader: Department of Urbanism)*

The ambition of the approach is therefore to understand and make sense of the world. However, during the interviews, the respondents identified three specific drives of using the layer approach which will be presented in this section with examples related to each objective.

4.3.1. Prioritization & Division tool for policymakers

The layer approach, as presented by Respondent 1 (Professor of Urban Design), was used to guide the Netherlands from a centralized to decentralized spatial planning. Respondent 3 (Junior urban / landscape designer) further discussed the layer approach as a separation tool that guided and organized assignments according to priority related to challenges on a national scale in Dutch planning.

> *"The Dutch layer approach as a planning tool, organizes assignments and challenges in Dutch planning by priority. Originally intended just as a separation tool" (Respondent 3, Junior urban / landscape designer)*

Both argue that the layer approach was created to make it easier to prioritize and deal with planning challenges. It was invented as a separation tool on a national scale with the natural layer as the main priority and the potential of using the layer approach as a tool to divide tasks on a national level between government levels.

> *"I think the responsibility of the government or higher level of collaboration systems you could say is that you take care of things that have a bigger and longer space, the scale of time and space" (Respondent 5, Coastal and estuarine policy, and management).*

The layer approach was argued to be suitable for dividing planning tasks on large planning scales nationally where the layer approach organizes how and why certain tasks should be organized by a certain level of government, and which level of government is responsible for overseeing planning. The organization of the tasks in the project *Room for the River*, as explained by Respondent 1 (Professor of Urban Design) in section 4.3.2, is a clear example of the aim of using the layer approach to divide planning tasks. The central government oversaw the first two dimensions, the substratum, and the network layer, and the regional government at the occupational level (See the division in figure 12).

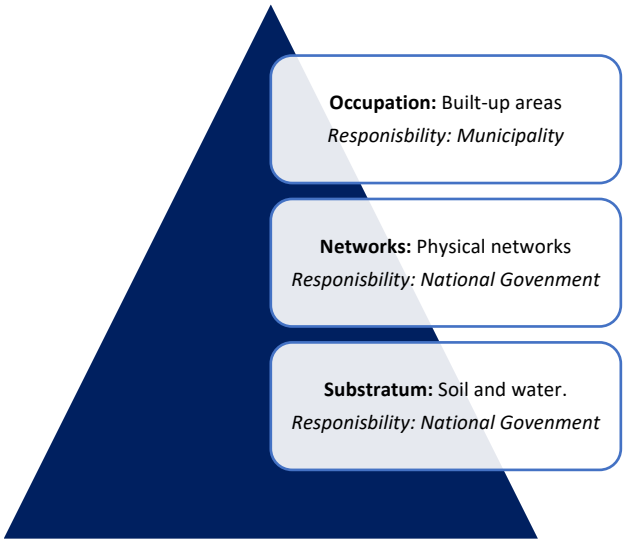

Figure 12: Dividing planning tasks

4.3.2. Example: Room for the River 2000 - 2015

Respondent 1 (Professor of Urban Design) discusses the layer approach from the perspective above in correlation to the *Room for the River* project.

Introducing the example

In Fourth Memorandum on Water Management, it was stated by the Dutch government that more sustainable water management is needed to meet the desired level of safety for the Dutch citizens. This represented a shift from the "traditional" flood protection policies, for example dike raising, towards creating more room for the river (van Stokkom et al., 2005). The central government decided that the regional government needed to build and develop their cities away from the river instead of towards it. Meyer describes the *Room for River* scheme that was developed between 2000 and 2015 as the first scheme to use the layer approach which illustrates the aim of using the layer approach as a prioritization & division tool for policymakers (Meyer, 2017).

Result of the project

Zevenbergen et al. (2015) argue that the *Room for the River* program can be seen as the tipping point where Dutch planning moved from dike improvement to an integrated approach aiming to combine minimizing flood risk and delivering spatial quality. The program is considered the first in the Netherlands to adopt a multi-level governance approach where stakeholders from both the private and public sector were included (Zevenbergen et al., 2016). By dividing space into layers and assigning tasks according to the model, multiple stakeholders could be involved in the project. This allowed The *Room for the River* Program to apply the "Integrated River Basin Management (IRBM)" (Zevenbergen et al., 2016). Rijke et al. (2012) define (IRBM) as a comprehensive approach where water, land, and resources are evaluated simultaneously to be economic, social, and ecologically sustainable. It's a holistic approach where every part of the river, including natural and man-made flows and their function, increases the chances of successful development (Rijke et al., 2012).

The *Room for the River* program is argued to be an experiment that created a new balance between the network, substratum, and the occupational layer. The project put the river first, which meant that the substratum layer gained priority over the others, which was something that had not been done before. The project also contributed to implementing a policy where

national spatial planning creates strategy and local government implements projects (Meyer, 2017). Warner and van Buuren (2011)argue that the program can also be considered successful in combining the disciplines of water management and spatial planning. However, the project is viewed to be less successful in reducing the gap between the professions of civil engineers, planners, citizens, and local stakeholders. The *Room for the River* program was created by the central government, which was argued to favor a "natural engineering approach" instead of a "civil engineering approach". The included stakeholders, therefore, felt ignored, and when spatial planning in the Netherlands became decentralized the motivation for the program was gone (Meyer, 2017; Tisma & Meijer, 2018a)

4.3.3. Guiding principal for spatial planning

The layer approach is argued by many of the respondents to be a powerful communication tool and a way to think and communicate about spatial issues. Respondent 5 (Coastal and estuarine policy and management) states the layer approach can be used as a communication tool concerning spatial elements to highlight how the spatial elements relate to each other in the physical landscape. Respondent 2 (Research Leader: Department of Urbanism) additionally sees the layer approach to communicate the complexity of the landscape simplistically, so the landscape is understood.

" The basic premise of a layer approach is that you like to understand the urban landscape as a system so that everything is related to each other. And the only way to get a grip on this complexity is by decomposing it into a couple of elements and layers, which help you to discover certain relationships but also the layers themselves" (Respondent 2, Research Leader: Department of Urbanism)

The argument created during the interviews was therefore that "if you understand the landscape according to the layer approach and analyze it accordingly it becomes a clear planning tool".

4.3.4. Example: The Fifth National Policy Document on Spatial Planning

In the Fifth Report on Spatial Planning published by the Ministry of Housing, Spatial Planning and Environment (VROM) the layer approach was used to guide the document and spatial planning (Balz & Zonneveld, 2018).

Introducing the example

In the Fifth Report on Spatial Planning, the layer approach was used to structure the document according to the three layers, by discussing soil and nature, infrastructure, and urban occupation. The document was based on analytical knowledge of how these structural characteristics would transform and affect each other in theory (Balz & Zonneveld, 2018). Pellenbart and Van Steen (2001) further present the publication of the Fifth Memorandum as the first document to use maps in spatial planning in the Netherlands to guide it. The Fifth National Policy Document on Spatial Planning 2000-2020 aspired by this to move towards a relational integrated approach to planning. It does this by focusing on space-time and transnational dimensions by utilizing the layer approach (Healey, 2004).

Result of the project

Healey (2004) assumes that the layer approach aims for a relational approach where urban and regional economic and social relations are discussed together with nature and water management. However, the approach was used and discussed in the Fifth National Policy Document on Spatial Planning to perform traditional planning of physical landscapes. The layer approach was, as a result, argued to not have been applied cleverly but instead used according to current planning practice tradition. Tjallingii (2015) argues that the layer approach, as presented in the planning documents, is a tool used to organize the document rather than considering the meaning of the model. The document aims to express the need for urban development in the occupation layer and supporting networks. The substratum layer is only being discussed if it needs to be adapted to fill the need of the occupation layer. Pellenbart and Van Steen (2001) draw the same conclusion when they claim that the government, through the Fifth Memorandum, aimed to shape society by determining space and its usage, with limited policy measures accompanying the spatial ambitions. Roo and Silva (2010) agree with Tjallingii (2015) that the layer approach is operated in spatial planning without taking the aspects of the model into account.

"The use of the layer Approach by [the province of] Noord-Brabant is a typical example; a consequence of the actual 'authoritative' interpretation is that 'creative' opportunities are overlooked, like innovative solutions rooted in the occupation layer to protect the surface-layer" (Roo & Silva, 2010, p. 166).

4.3.5. Strengthen the importance of the substratum layer

The objective of the layer approach stated in all the interviews is to take the substratum layer more carefully into account to plan sustainable cities. Respondent 2 (Research Leader: Department of Urbanism) discussed that if you understand the layer approach, it becomes a powerful planning tool since it highlights the importance of planning with nature instead of against it. The layer approach is therefore argued by the respondents to be a powerful planning tool that should guide spatial planners. The argument is that when humans started to build cities centuries ago, they built with nature since they had no means to do otherwise. However, as time progressed, humans gained a stronger belief in themselves and stopped taking nature into account when planning. Today cities and farmlands are, nevertheless, facing challenges related to this neglect of nature. Therefore, it is argued that the bottom layer needs to be more prominent in planning and decision-making for developing sustainable cities.

"The layer approach helps you to understand how the system functions and then also to identify the most important structural elements which you should develop safeguard connect whatever and when you do so, you create better conditions. And when you create better conditions, yeah, the elements dependent on it will thrive (Respondent 2, Research Leader: Department of Urbanism)"

4.3.6. Examples: Op Waterbasis & De Lagenbenadering

The layer approach in Op Waterbasis (2021)

Deltares, BoschSlabbers, and Sweco (2021) wrote an essay discussing what the Netherlands has done wrong in its approach to spatial planning in recent years. The authors used the layer approach and adapted it to highlight the importance of the relationship between the bottom layer and the other two. The argument put forward in the document is that a landscape that is flexible enough to deal with climate change, sea-level rise, and soil position is sustainable. The current landscape, however, in the Netherlands is not built to be flexible and adaptive. Therefore, there is a need for a swift transition to build adaptive since spatial planning projects takes several decades to be complete.

The layer approach in De Lagenbenadering (2022)

Klijn (2022) created a document on the layer approach continuing the discussion in the document *Op Waterbasis (2021)* and further discussing the importance of the relation of the layers to each other. Klijn (2022) furthermore discusses that the planning horizons presented in the layer approach are incorrect. The water streams change faster than expressed in the layer approach. Klijn argues that nature changes constantly and is something that is needed to be on top of mind when planning and discussing space.

Klijn (2022) further references to the sustainability layer cake which is argued to resemble the layer approach. The biosphere is represented in the layer approach as the substratum, the green networks in the network layer, and the social and economic dimensions are represented in the occupational layer together with the man-made networks (See figure 13).

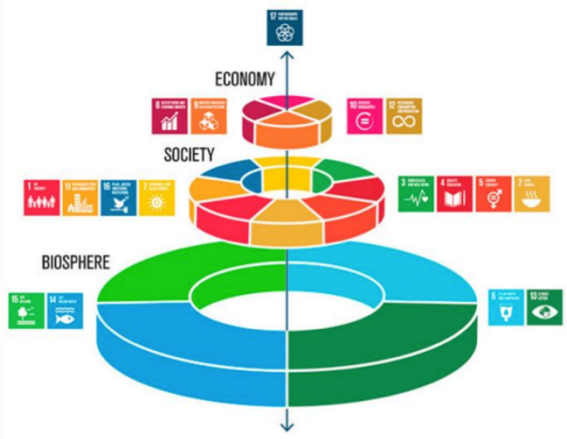

Figure 13: Sustainability layer cake (Klijn, 2022)

4.4. The layer approach in planning practice

This section will dig deeper into the summarized findings of the realization of using the layer approach in practice. The selected respondents were chosen because the individuals themselves or their company have been writing about the layer approach or have been active in projects concerning the approach. However, the author still received comments such as, "I never work with the layer approach anymore, could you explain the approach for me" or "As soon as I left the academic world, I stopped using the approach explicitly". The layer approach does therefore seem to be an academic approach and concept, which is not used outside of the academic world. In this section, four topics related to the use of the layer approach in practice, which were discussed in the interviews, are presented.

4.4.1. Scale

There is an unclarity concerning what scale the layer approach should be used in. Respondent 3 (Junior urban / landscape designer) discussed the layer approach as a tool to prioritize planning tasks and concluded that the approach is most suitable for a larger scale of planning.

.... but we did realize that the layer approach as a planning tool (read: administrative tool) is more useful for the larger scales and the layer model is as an analytical tool, more useful for the smaller scales and on a project scale (Respondent 3, Junior urban / landscape designer)

The layer approach on a project scale

Respondent 3 (Junior urban / landscape designer) strengthens the argument by giving an example of a project within the *Room for the River* program located in Nijmegen. The project aimed to connect the historic center with the north shore of the Waal River. (See figure 14).

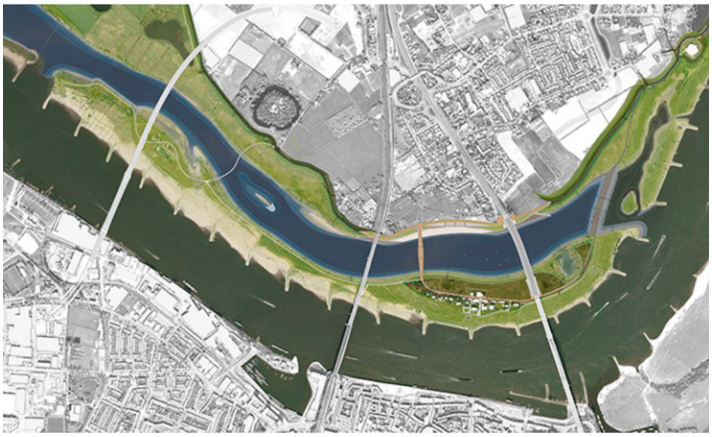

Figure 14: Definitief ruimtelijk inrichtingsplan, Ruimte voor de Waal, 2016)

When the project progressed, tasks were done differently than suggested in the layer approach, concerning the prioritizing of planning tasks (See figure 15). Planners started by analyzing the bottom layer and the water levels of the river. Secondly, they looked at the occupation layer instead of the network layer, and lastly, they viewed the network layer to connect the other two layers since they wanted to build on ground suitable for building and then build roads and networks between the buildings.

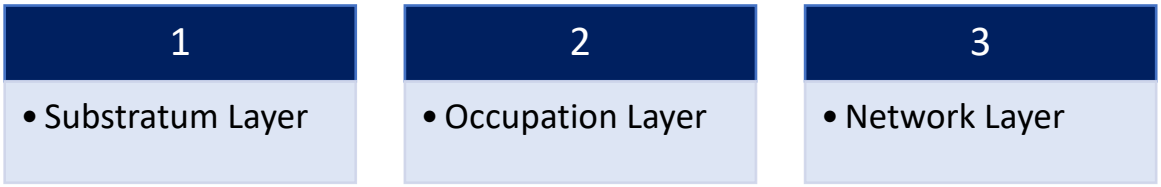

Figure 15: Prioritization of tasks - Nijmegen

The layer approach on a national scale

Others, however, argue that, by discussing the layer approach on a broader scale, there is a risk that the view of the landscape becomes too general, resulting in smaller municipalities and provinces not understanding how to realize what is decided on a national scale. Respondent 7 (Geo-ecology and policy analysis) relates this to GIS and the fact that when using GIS to visualize the layer approach, it is not possible to develop maps that are detailed enough to show local conditions on a national map. (See figure 16).

Figure 16: National scale (Op Waterbasis, 2021)

Respondent 1 (Professor of Urban Design) further argues that, in the *Room for the River* program, the aim was to divide tasks according to the layers in the layer approach, resulting in challenges to realize the national goal on a local level. Respondent 8 (Regional liaison, generic issues, and civil society organizations) further discusses that different regions struggle with different challenges and refers to the fact that the Netherlands does not have strict goals related to climate adaptation.

We don't have strict goals for climate adaptation. Like, the whole of the Netherlands must be taking measures so that the rainfall of 100 millimeters every hour doesn't damage because all the areas have a different kind of geography (Respondent 8, Regional liaison, generic issues, and civil society organizations)

In the *Room for the River* program this resulted in introducing a quality group that came to review if the local projects followed the national guidelines. However, respondent 8 (Regional liaison, generic issues, and civil society organizations) presented that there was multiple discussion during the project, where local politicians local were not happy with the changes that needed to be made locally for the country in its entirety.

4.4.2. Governance structures

The aim of using the layer approach to divide planning tasks is discussed regarding the development of a new governance approach. The layer approach was argued by respondent 3 (Junior urban / landscape designer) to guide the Netherlands towards decentralization. The approach provided a structure for how the tasks among different government levels should be divided. However, respondent 1 (Professor of Urban Design) argues that, when the Netherlands moved further in their decentralization of spatial planning, dividing tasks according to the layer approach was no longer necessary. Respondent 8 (Regional liaison, generic issues, and civil society organizations) explains that today the national government has limited power over how the municipalities and provinces plan their landscapes. The respondent, however, presents that there is a stress test developed by the Deltaprogramma regarding water management; this is a tool, which municipalities can use to track existing shortcomings in their water management.

Using the layer approach as a tool for the national government to divide tasks for municipalities, is for the respondents not clear or necessary. Questions concerning the layer approach as a tool to divide tasks led to some confusion and respondent 7 (Geo-ecology and policy analysis), for example, answered that dividing tasks according to the layer approach could reduce the transdisciplinary way of planning.

"It might, but the danger of dividing tasks is that you then move from what I would call transdisciplinary to interdisciplinary to even multidisciplinary and coming back from multidisciplinary to an integrated view. Is already difficult." (Respondent 7, Geo-ecology and policy analysis)

Further, respondent 2 (Research Leader: Department of Urbanism) mentions that there are numerous experts in multiple fields and that there is a need for a more integrated approach to planning, where experts from multiple fields and professions work together.

"But one thing the layer approach has taught me is that usually the challenges and opportunities connected to it, or let's say calling for more interdisciplinary and transdisciplinary approaches." (Respondent 2, Research Leader: Department of Urbanism)

The layer approach is, according to the respondents, viewed to communicate between disciplines and geographical areas about planning challenges instead of being understood properly and used to divide tasks.

4.4.3. Changeability of the landscape

The layer approach is arguing that it is possible to change the occupation layer within 10 – 30 years (See figure 17).

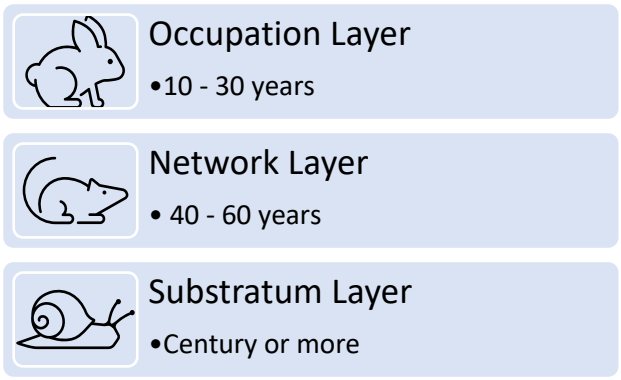

Figure 17: Changeability of the landscape (Priemus 2007)

However, in the interviews, it is argued that, when the infrastructure layer is built, it is difficult to change the infrastructure since it defines other activities. Respondent 9 (Landscape architect) argues, for example, that the city of Amsterdam is situated where it is, because of historical reasons. It will further remain and grow because of social and economic reasons

even if the soil does not consist of suitable ground for building houses. Further, respondent 5 (Coastal and estuarine policy and management) argues that:

> *"Infrastructure is never temporary, almost never, the challenge is that we say that infrastructure is temporary, but it is always there because it defines other activities for as long as it is there, and it has been defining other activities. So, there is a need for maintaining the infrastructure in itself" (Respondent 5, Coastal and estuarine policy and management)*

The layer changeability is therefore argued to be different than suggested in the layer approach. However, when viewing and discussing the planning horizons, the layer approach is argued to be true for the occupation and network layer. For example, respondent 10 (Head of Environmental Consultancy) discussed that the network layer related to the energy network is becoming more and more prominent in the transition from fossil fuel to sustainable energy. That transition takes time and determines future urban development.

4.4.4. Drivers for urban developments

The main motivation for using the layer approach is argued to be the need to build with nature instead of against it in urban developments, which is illustrated in the two papers *Op Waterbasis* (2021) and *De Lagenbenadering* (2022). However, when the layer approach is discussed regarding urban development, the tone of the respondent's changes. The understanding of space, as presented in the layer approach, is viewed to understand, and discuss landscape in its entirety. However, the layer approach is not used in planning practice according to the intended purpose of the approach.

> *"The problem is that if you take the first layer as you should take it. A lot of developments in Holland should not have been possible in the last two decades (Respondent 4, Strategist visioning and planning).*

Urban development as the driver

Respondent 10 (Head of Environmental Consultancy) discusses that the occupation layer steers where buildings are being built today.

"I suppose the Netherlands would be ahead of a lot of other countries in implementing this approach because we need to, but It does need to be taken with a grain of salt because the main driver for urban development is the social aspect" (Respondent 10, Head of Environmental Consultancy)

He mentions the example from a development project in Gemeente Zuidplas where there is political pressure to build houses in the municipality. However, the location is the lowest place in the Netherlands with a high risk of flooding. The respondent further differentiates between urban development and safety, when labelling the *Room for the River* program as a necessity to save the country from flooding; in that case using the layer approach becomes interesting. However, in urban developments, the drivers are economic development or a need to address social challenges, such as a shortage of housing. These drivers are stronger in society than challenges in the bottom layers, as expressed in the example of the development project in Gemeente Zuidplas, which is progressing, even though there are pushbacks from various organizations (such as, for example, the waterboard).

Urban developments within cities

Yet, it becomes complicated to use the layer approach in existing cities. The respondents view that the layer approach should be used for new urban development. The layer approach does therefore not guide development within a city. In these cases, the space is already occupied. Respondent 7 (Geo-ecology and policy analysis) argues that the layer approach cannot guide spatial planning. The layer approach can. regardless, give clues about how the landscape has changed over time. However, respondent 2 (Research Leader: Department of Urbanism) discusses that, by viewing and understanding the landscape, the layer approach can be a powerful planning tool as it is giving the planner certain hints on how to plan.

"So, when you, for instance, map out the locations of McDonald's, for instance, then you will see that that most of its locations are located near highway exits, which is part of their allocation strategy, to be on the best accessible places" (Respondent 2, Research Leader: Department of Urbanism)

Further, respondent 6 (Urban Designer) also argues that the layer approach, for instance, can be used to identify and reintroduce historic waterways to bring an identity to a city. He gives the example of Arnhem, where the river flowing through the city was rediscovered with the help of looking at the history of the area. Respondent 8 (Regional liaison, generic issues, and civil society organizations) further discuss that these measures are done as a combination of minimizing the effect of climate change in the cities but also following a current trend and ideal of living with nature in the cities.

"It's because people love living like that, so it's not only measures against effects on climate change, but also to make a nice environment"
(Respondent 8, Regional liaison, generic issues, and civil society organization)

Safety as the driver

Another motivation for using the layer approach, argued by multiple respondents, is related to safety. If safety becomes the main driver for urban development, then the layer approach can flourish. Respondent 4 (Strategist visioning and planning) and Respondent 8 (Regional liaison, generic issues, and civil society organizations) refer to disasters:

So, the only thing that can help is a disaster and preferably two disasters in a row because then they change for real change. One disaster is easily forgotten, and they say ah, it was a disaster and now it won't happen again. But if you have two after each other, yeah, then something changes
(Respondent 4, Strategist visioning and planning)

Respondent 8 (Regional liaison, generic issues, and civil society organizations) mentions the example from areas that flooded in the summer of 2021 and how the citizens' approach concerning their safety changed after the massive rainfall that caused flooding. Respondent 4 (Strategist visioning and planning) further concluded the discussion about the challenges in planning with the layer approach, where he argued that planners and policy makers know about the need for building with nature, but other values (such as economic and social values) play a prominent role in the use and application of the layer approach.

"I'm still a smoker. It's not so good. But I don't quit smoking. If you give me a part of a paper that says how unhealthy smoking is. Because I know that smoking is not healthy, but I still smoke for other reasons because I'm addicted to it. The people don't build in the wrong places because they don't know that you shouldn't do that. They know exactly what they are doing but they have no other choices, so it must be done with money, a sense of urgency, and disaster" (Respondent 4, Strategist visioning and planning)

Respondent 8 (Regional liaison, generic issues, and civil society organizations) further discusses the need for a sense of urgency in planning and policy.

" You must have a mindset that climate change is not something of the future. It can happen tomorrow, or it can happen in 10 years. So, you must make sure that you know that it will happen, but you don't know where and in what extreme form. Because we never expected this kind of rainfall in the models, and we didn't expect it in the summer. We expected that if it would happen, it would happen in the winter. So, the models are one thing, but nature can be different." (Respondent 8, Regional liaison, generic issues, and civil society organizations)

4.5. Summarizing findings

The layer approach has developed as time has passed, from guiding the divisions of planning tasks to simplifying complexity in the landscape to move toward a more sustainable urban governance. The layer approach today is however used with the same aim as when it was created. However, the ambition of the approach, which was to organize and structure the national government, has faded. Instead, the approach has moved toward a way to be adapted to the current planning debate, where human relation and understanding of nature is more prominent. The layer approaches, as a planning tool (presented in the national spatial planning document), contains issues concerning time, scale, and drivers of urban development. In the next sections, the findings will be discussed together with the presented examples. Thereafter the findings from this chapter will be visualized through an adaptive conceptual model.

4.5.1. Findings in correlation to the examples

The layer approach in "Room for the River"

The layer approach in the *Room for the River* project was aimed to communicate and guide the need for focusing on the base layer in spatial planning. The layer approach used in the *Room for the River* program followed the idea of the layer approach as presented by respondents 1(Professor of Urban Design), 3 (Junior urban / landscape designer), and 4 (Strategist visioning and planning), where the approach was developed on a national scale with the national government introducing the guidelines for the municipalities to follow. The project aimed to save the Netherlands from flooding. The example of the layer approach in the *Room for the River* program shows that, for the bottom layer to steer the urban development or planning, it is beneficial if there is an argument concerning safety that steers the process.

The layer approach in The National Policy Document

The layer approach in this document was aimed to develop a relational understanding of the model, by using the layer approach to show an analytical view of landscapes to structure the document. The layer approach in the Fifth National Policy Document on Spatial Planning was used to organize and structure planning in the Netherlands as a whole, in order to make it easier for planners to understand the national guidelines on spatial planning. The way in which the approach was used in the document has however been criticized for not understanding and embracing the layer approach to its fullest. The respondents in this study further discuss that the aim of the layer approach cannot be urban development, since the layer approach does not consider political, economic, and social interests.

The layer approach in "Op Waterbasis & De lagenbenadering"

The layer approach in both these documents is discussed regarding the substratum layer to form the argument of the importance of considering natural structures in spatial planning. Thinking about natural structures in planning can also guide urban development towards more suitable areas for building. In these instances, the layer approach is used and discussed as a communication tool to guide planners into more sustainable development for the sake of safety.

4.5.2. Visualized Findings

The conceptual model argued that the understanding of landscapes, as expressed in the layer approach, influences spatial planning in the Netherlands. However, what appears to be more crucial is that the layer approach mirrors and adapts to contemporary planning challenges, where the model (as a concept of space) reflects the society and challenges of its time (See figure 18).

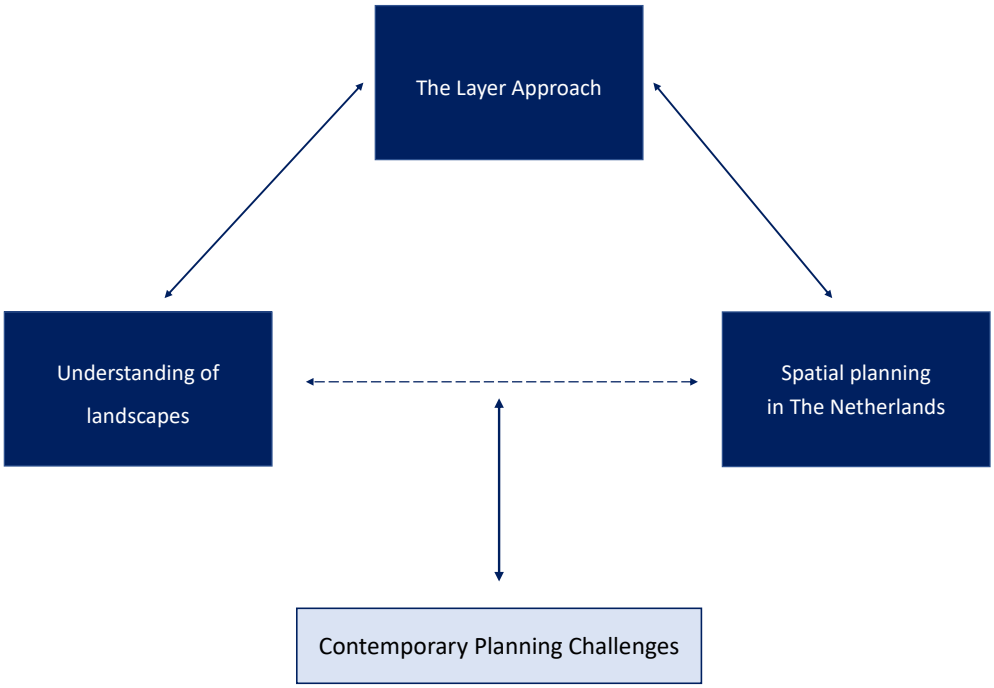

Figure 18: Modified Conceptual Model

5. Conclusions and Discussion

This research has studied how the understanding of the landscape, as expressed in the layer approach, influences spatial planning in the Netherlands today, by making use of the examples and insights from selected actors. The findings suggest that understanding of landscape, as expressed in the layer approach, highlights the benefits of planning with the substratum layer. However, if not highlighting and discussing the social and cultural landscape and the driver for urban development, the layer approach is viewed and used in practice as an academic concept. In the first part of this chapter, the research questions and related answers will be revisited After that follows a discussion on the main concepts, identified in the theoretical framework, together with the findings from the interviews and desk research, to back up the answers provided for the research questions. Lastly, to conclude the thesis, final reflections and recommendations are provided.

5.1. Revisiting the research questions

How is the layer approach viewed?

The layer approach stems from scholars that aimed to incorporate and highlight the importance of nature and physical elements in the landscape. By dividing space into layers, as demonstrated by earlier scholars, the layer approach follows their aims and is today viewed to analyse and discuss urban elements. The application of the layer approach is done through communication concerning urban development, as an analytical tool, in order to analyse how the physical landscape looks currently and has looked like in the past to guide future development.

What is the aim of using the layer approach?

The layer approach aims to highlight the need for discussing the physical landscape to guide urban development. The aim is further to simplify the complexity of the landscape to make the landscape easier to grasp and plan. The layers are, therefore, used to highlight the relationship between elements expressed in the approach to guide planners toward a sustainable way of planning.

When is the aim of using the layer approach being realized in practice?

The layer approach, through its conceptualization and view of the landscape, does not contain social and cultural dimensions of the landscape. The main drivers for urban development are of a social and economic nature. The layer approach aims to make nature the guiding principle for planning which are not the case in planning today. The findings however suggest that when the layer approach is discussed in the interviews, concerning pressing climate issues (such as issues with flooding in a town) the layer approach provides a possibility to discuss and understand the reasons for the flooding. The layer approach is, therefore, viewed to be suitable to be applied to planning projects, where action related to safety is needed.

How does the understanding of the landscape, as expressed in the layer approach, influence spatial planning in the Netherlands today?

The layer approach is viewed to be a concept of space, providing a way to discuss and understand the landscape, in order to simplify the complexity. The difference between the layer approach and GIS is that; GIS is a spatial planning model, aiming to collect and present geographical data, that can be used to visualize physical planning challenges. The layer approach is broader, its usage and meaning are determined by its actual user and its influence on spatial planning, therefore, differs from case to case. However, the layer approach, through its conceptualization of the landscape, expresses the importance of discussing and viewing the substratum layer in planning (See figure 19).

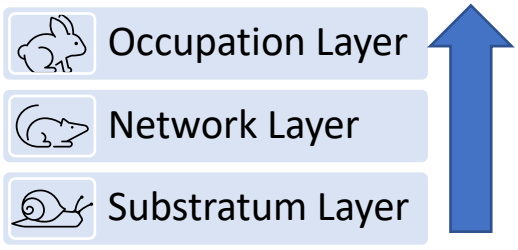

Figure 19: How the layer approach influences spatial planning

Regardless, as one of the respondents expressed it “it is only a concept”. Spatial planning and urban development are mainly driven by social and economic views. Planning is, therefore, viewed and understood the opposite way from how the layer approach suggests that planning should be done.

5.2. Linking findings back to theory

In this second section the findings related to the main research questions are discussed in light of the reviewed literature. How does the understanding of the landscape, as expressed in the layer approach, influence spatial planning in the Netherlands today?

5.2.1. Understanding of the landscape

Physical & Social landscape

When relating the findings from this research with the current body of relevant literature on the layer approach and its theoretical background, it is possible to conclude that the theoretical background is aligned with the suitable uses for the approach. Nijhuis (2022) argued that the natural landscape holds crucial elements for human existence, such as food and fresh water, and that there is a need for humans to make use of the natural structures and processes when designing and planning urban development. The layer approach exemplifies the need for discussing the physical landscape and understanding the physical features of the landscape to build sustainably. However, Freeman et al. (2015) argued that the view of the landscape is context-dependent and that different people understand and view the landscape differently. Nijhuis (2022) and Germundsson (2001) also argue that the landscape reflects the creator's perception of the landscape. The layer approach is a physical model which hold clues on how to build and analyze movements in the landscape. However, the layer approach does not discuss the human perception of space, social challenges, or economic benefits, which are important aspects steering urban development.

Time & Landscapes

Further, time is argued to be the guiding dimension of the layer approach. Koselleck et al. (1975) discussed “layers of time” through changes in the physical environment (Koselleck et al., 2018). In Hagens (2006) the concept of 'longue durée' was presented by Braudel (1949), that views the changes through a historical context by observing events, which are related to each other. The concept of 'longue durée' was shared by all respondents as the motivation for the structure of the layer approach. Through the research issues with the view of time in the layer approach have appeared. Priemus (2004) discussed that the social layer is not as flexible as argued in the layer approach, which is also the view among the respondents in this study.

The layer approach combines physical natural processes that occur without human intervention with layers such as the network and the occupation layer, where changes are dependent on human interaction. The layer approach, therefore, uses time without reflecting on the difference between social and natural processes, which is problematic.

Landscape in Layers

McHarg (1969) developed the layer cake to argue that land, air, and water, are public goods and should be managed accordingly. Structuring space in layers is argued to clarify elements of the landscape and how they are related to each other and, consequently, highlight that nature is of vital importance to be considered in spatial planning (Turner, 1996). This is in line with the respondents, who put forward that the usefulness of the layer approach is to stress the importance of consulting nature when planning. Turner's (1996) arguments, however, also become prominent in the interviews regarding the question, layers of what? The social and cultural landscape is absent in literature and among respondents, regarding the view of the layer approach. The layer approach is applied by many by using GIS, which has been criticized for its simplistic conceptualization of space, where the relational space is absent. The challenges with the layer approach are therefore in line with the critiques of GIS, which is the real challenge of combining and discussing all dimensions of space.

5.2.2. Landscapes in the layer approach

Administrative tool

The layer approach was developed by De Hoog, Sijmons, and Verschuuren (1998) as a response to the ineffective organization of spatial planning in the Netherlands (Meyer, 2017). The layer approach was argued to help in guiding the Netherlands through the decentralization of planning where different planning tasks were allocated to different government levels (van Schaick & Klaasen, 2011). However, currently the model is no longer needed for guiding policymakers in that way. The view of the layer approach to not containing a spatial dimension is therefore no longer relevant among the majority of the respondents. However, the approach is still argued to highlight the importance of considering the substratum layer.

Planning tool

Hooimeijer and Marings (2018) argue that the layer approach could encourage a shift towards more sustainable use of the bottom layer in urban development. The respondents also highlight this as the main argument for using the layer approach. Priemus (2007), on the other hand, argued that the layer approach had a simplistic view of time in a modern society, where the layer approach's suitability to change is wrong. According to the findings, the landscape changes in a different way than suggested in the model. Existing cities and infrastructure determine where future urban development will be placed, and climate change makes substratum layers change faster than suggested in the layer approach.

This understanding of the layer approach further introduces a relationship between the layers, where the natural layer should determine the activities in the other layers and in that way guide planning. Urban development, however, is argued to be determined by social and economic values and is not steered by the attributes in the physical landscape, as viewed in the planning tool. Hagens's (2006) argument that the layer approach aims to provide a precise and complete answer to complex planning challenges is, therefore, not possible.

Analytical tool

Tjallingii (2015) argued that the layer approach is an analytical scheme that does not guide future planning actions after the analyses are made. However, according to the interviews and the desk research, this does not seem to be true. Many of the respondents argues that, understanding how the landscape changes and has changed, will provide clues about future developments appear. Priemus (2007) argued that the layers in the layer approach affect each other both ways and that activities in the occupation layer do affect the network and substratum layers. In the findings from the interviews and desk research this view of the approach is dominant concerning for example humans' effect on the climate.

Using the layer approach – Summary

The layer approach is discussed in the interviews to be more complex than just organizing planning tasks. The layer approach is viewed to simplify the urban landscape to understand the complexity of the landscape by decompose the landscape in a simple model. In that way it becomes a tool to understand reality and the natural system we live in, as well as guide us into more sustainable development. Table 7 is showing the views among the respondents, where most of the respondents view the layer approach as multi-faceted and containing more than one possible usage. Two of the respondents did not discuss different usage of the layer approach explicitly and are therefore expressed in grey.

Table 7: Respondents' view of the layer approach

No.	**People**	**Administrative tool**	**Planning tool**	**Analytical tool**
1	Professor of Urban Design			
2	Research Leader: Department of Urbanism			
3	Junior urban / landscape designer			
4	Strategist visioning and planning			
5	Coastal and estuarine policy and management			
6	Urban Designer			
7	Geo-ecology and policy analysis			
8	Regional liaison, generic issues, and civil society organizations			
9	Landscape architect			
10	Head of Environmental Consultancy			

5.2.3. The layer approach in spatial planning

Landscape approach

Freeman portrayed three categories of how to define using a landscape approach: "(1) addressing social-ecological systems at the landscape scale, (2) related to resource management and/or environmental goals, and (3) framed around the concept of multifunctionality, to achieve multiple objectives through the approach " (Freeman et al., 2015. p. 3.) Nijhuis (2022), further, defined the landscape approach as a way of recognizing the natural aspects of the natural landscape to make use of the natural structures in urban development. The layer approach, through its conceptualization and understanding of the landscape, aims to address the relationship between humans and nature, to address social-ecological systems by mainly addressing natural aspects of the natural landscape in line with the definition of Nijhuis (2022). However, through time the aim, of why the layer approach is used, has further changed to included other goals and aspirations.

Urban Planning

The key assumption of McHarg's approach was that land, like air and water, is a public good and should be managed accordingly. Sprin (2000) however criticizes McHarg for viewing theory and practice as the same. Sprin discusses that using ecology to describe the world is different from changing planning as a discipline (Spirin, 2000). Based on the findings from the interviews and desk research, the argument made by Spirin seems to be true: the layer approach used in practice in spatial planning differs from how the layer approach is understood and discussed academically. Behrend and Levin-Keitel (2020) differentiated between urban planning as an academic discipline and the practical application of the word. In the interviews, it becomes clear that the layer approach stems from academia and has since its first application become more adaptive according to the need of urban planners. The model was introduced to guide decentralization (van Schaick & Klaasen, 2011) but is not used and discussed as such in the current planning discourse. This further relates to the view of Nyström (2012) that planning reflects the current state of politics and mirrors contemporary ideas and therefore changes over time.

Planners' triangle

The theory of Campbell (1996) can explain the challenges and flaws of the layer approach when used in practice. The layer approach views a conflict between the three different planners, the economic, social, and environmental planners. The environmental planner highlights the need for understanding and viewing the bottom layer to create a sustainable city. However, as expressed in the interviews, being an environmental planner is difficult since other planners do not see or understand the importance of planning with nature. Instead, they view challenges such as housing shortages due to massive urbanization. Challenges that drive urban development in areas that are not suitable since there is no other room for municipalities to fill the demands of the city elsewhere. This seems, on the other hand, only be true if there are no threats to people's safety; in that case, the environment is allowed to steer. In this instance, the layer approach is viewed as a communication tool and awareness-raising tool for the environmental planners to communicate the importance of taking the bottom layer into account. The layer approach does however not combine the view of the social, economic, and environmental planners.

5.3. Final Reflections & Recommendations:

The layer approach stems from academia and has, since its creation, become more adaptive to use in urban practices. The approach is today mostly used and discussed as a communication tool where people from different disciplines can discuss the landscape together. This is where the author views the layer approach has indeed its biggest potential. The approach combines multiple disciplines through the way it is designed, which is crucial when dealing with multidisciplinary subjects. However, it is essential that the layer approach, which is a concept of space that is used and formed by its user, is being addressed as such since the layer approach is not used in the same way by anyone. A recommendation from this research is to attempt more explicitly to agree upon a common view of the approach to make the approach more manageable to use.

This study combined desk research with examples to understand how the layer approach has developed through time and in different fields. One conclusion of this thesis is that how the layer approach is used depend on its user. One limitation of this study however is that through this general study of the approach containing multiple actors it is possible to answer how the understanding of the approach differs. By using comparative case studies in future research on

this topic, this could further be answered. Continued studies regarding other concepts of space and their conceptualization of landscapes, such as "green hearts", would further be interesting. By continue studying these concepts, a deeper knowledge of how the conceptualization of landscapes affects spatial planning would be formed.

The layer approach is today viewed as an important tool to push planners to plan with nature when designing cities. The approach further appears to be most successfully adapted when climate change and climate adaptiveness are discussed since the approach does not address the social and cultural dimensions of landscapes. This reduces the ability of the layer approach to address economic and social dimensions, which are crucial for planners to consider when planning a city. Future studies of the approach should, therefore, aim to investigate the possibility of incorporating social aspects to make the layer approach easier to manage in practice.

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Appendix A: Interview Protocol

The goal of this interview is to learn about the experience of using the layer approach practice.

Introduction

- The goal of the interview
- Ask for current role & experience

View of the Layer approach

- What is your knowledge of the layer approach?
    - Explain?
- How do you understand the model?
    - What do you include in each layer?
        - Dividing tasks?
            - Regional → national
        - To guide planning.
        - Analytical
    - How do you view the time aspect of the model?

Aim of using the layer approach

- Why was the layer approach used?
- Was it successful?
    - Why?
    - Why not?
- How did the use of the layer approach affect the project you were involved in?
- What do you think the layer approach can contribute to in planning?
- What are the pitfalls of using the layer approach to guide integrated planning?

Experience from using the layer approach.

- What challenges did you face?
- What are the challenges / possibilities of thinking of the base layer first?

- Did the use, structure your thoughts differently?
- What would you change with the approach?

Final remarks

- How do you experience that the layer approach is viewed today?
- What do you see the potential for the layer approach going forward?

Appendix B: Code Book

Summary of codebook.

Themes	Definition	Examples
Layers	The reason for dividing space into layers in the layer approach according to the respondents.	"And the only way to get a grip on this complexity is by decomposing it into a couple of elements and layers, which help you to discover certain relationships but also the layers themselves. I think that that's what all these, regardless of which layer approach you use, that's let's say the thing they share" (Respondent 2, Research Leader: Department of Urbanism).
GIS	The difference between GIS and the layer approach, as identified by the respondents.	“Well, GIS is a kind of a layer approach, but it's a stupid one. Whereas with the layer approach, the idea is that you think about how the occupational layer which you plan, geology you can’t plan, geology simply is. Groundwater is, but the occupation layer you plan, and you should plan your occupation and your infrastructure. Based on this. And geological geographical setting which exists. Which simply is” (Respondent 7, Geo-ecology and policy analysis).
Time	How time is discussed and viewed concerning the layer approach by the respondents.	Infrastructure is never temporary, almost never, the challenge is that we say that infrastructure is temporary, but it is always there because it defines other activities for as long as it is there, and it has been defining other activities. So, there is a need for maintaining the infrastructure in itself” (Respondent 5, Coastal and estuarine policy and management).
Usage	How the layer approach is used, as presented by the respondents.	“I’d say, it is a way of working, so yeah, it's I think it's a way of working and it really depends on the place or the question that the customer that the client asks and how you use it” (Respondent 6, Urban Designer)
Drivers	Factors explaining why the layer approach is used in	"So, we think it's also like a living system, so it has a certain past. Then it will have a certain future, so it's

	practice identified by the respondents.	very important also to understand the yeah, the development of certain areas before you propose. Yeah, concepts or ideas on how to deal with that and therefore now the layer approach at different scales, levels ranging from the regional scale level up to the city level to the district level. Is a very important tool used in our daily practice" (Respondent 2, Research Leader: Department of Urbanism).
Challenges	Potential problems and difficulties with using the the layer approach in practice identified by the respondents.	“For example, industry to housing or officers to housing. And what happens then is that a layer of sand is already put on top of the natural layer or networks are already in place. People are already using this space, occupying it in a certain way. And so then. It's of course more difficult to sort of grab back to that first layer and make room for a natural eco ecosystem so that is sometimes difficult. Space is always difficult. That's also. That's also the challenge” (Respondent 6, Urban Designer)
Possibilities	Factors viewed as potential drivers for using the the layer approach in practice identified by the respondents.	”So the only thing that can help Is disaster and preferably two disasters in a row because then they change for real change. One disaster is easily forgotten, and they say ah, it was a disaster and now it won't happen again. And if you have two after each other, yeah, then there's something changes” (Respondent 4, Strategist *visioning and planning)*

Appendix C: List of Respondents

No.	**Position / Affiliation**	**Company**	**Length of Interview**	**Date of Interview**	**Location**
1	Professor of Urban Design	Delft University of Technology	75 min	11/4- 2022	Rotterdam
2	Research Leader: Department of Urbanism	Delft University of Technology	40 min	23/5–2022	MSTeams
3	Junior urban / landscape designer	H+N+S landschapsarchitecten	65 min	23/5–2022	MSTeams
4	Strategist visioning and planning	Waterschap Vechtstromen	40 min	17/5–2022	MSTeams
5	Coastal and estuarine policy and management	Deltares	55 min	12/5–2022	MSTeams
6	Urban Designer	Royal HaskoningDHV	58 min	3/6–2022	MSTeams
7	Geo-ecology and policy analysis	Deltares	50 min	7/6–2022	MSTeams
8	Regional liaison, generic issues, and civil society organizations	Deltaprogramma	85 min	20/6–2022	The Hauge
9	Landscape architect	BoschSlabbers	56 min	8/6–2022	MSTeams
10	Head of Environmental Consultancy	Sweco	40 min	23/6–2022	Rotterdam