The Evolution of Spatial Planning Research in Response to Societal Developments

A Longitudinal Analysis of MSc Theses

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Acknowledgements

This master's thesis was accomplished with the help and support of many people.

First, I would like to sincerely thank my supervisor, Dr Patrick Witte. His constructive feedback and remarkable patience throughout the process have been really valuable. I could not have asked for a more encouraging and supportive supervisor, and for that, I am truly grateful.

I would like to express my gratitude to the interviewees, namely Dr Ferry van Kann, Prof. Dr Jochen Monstadt, Dr Sander Lenferink, Dr Gerrit-Jan Carsjens, and Dr Ori Rubin, for their generous contribution of expertise and experiences.

Lastly, I would like to express my deepest thanks to my loving and devoted family and friends, whose support and trust have greatly assisted me throughout the writing process.

I hope that my MSc thesis can contribute to the advancement of spatial planning practices.

Enjoy reading it!

Mojde

28/06/2024

Abstract

The goal of this study is to evaluate the expanding body of literature on master students' spatial planning theses to discover patterns and developments in this field over the past 15 years. The 2008 global economic crisis could represent a new paradigm in spatial planning, as well as an important event that indicates the end of a certain period. Major challenges that the discipline of spatial planning has faced in recent decades have necessitated a thorough examination of traditional planning techniques and frameworks. This has been experienced by both scholars and practitioners. Furthermore, the number of interdisciplinary collaborations in spatial planning education has increased, highlighting the interdependence of economic, social, and environmental factors in shaping urban landscapes. This retrospective research seeks to reveal the changing significance of spatial planning topics over time. The findings of this study offer significant insights for policymakers, educators, and practitioners in the field of spatial planning. The study utilises a longitudinal content analysis of Master of Science theses from five planning universities in the Netherlands, covering a period of 15 years. The main question in this study is: How has Dutch spatial planning research responded to societal developments over the past 15 years, as reflected in MSc thesis research? To answer this question, a combination of qualitative and quantitative methods, incorporating text-mining techniques, was utilised. To further improve the results, interviews with experts and a manual examination of several theses were conducted. The research shows that the majority of thesis topics are influenced by the areas of expertise of supervisors, the curricula, and societal changes. The governance and policy innovation cluster has always been one of the most attractive themes among students. Another prominent topic that has increasingly received attention over time is environmental sustainability, resilience, and urban agriculture. This could be an indication of a tendency to tackle socio-economic and ecological concerns while focusing on regulatory frameworks.

Keywords: Spatial Planning, Urban Planning, longitudinal analysis, Societal development, Text Mining

List of Abbreviations

UU = Utrecht University

WUR = Wageningen University & Research

RU = Radboud University

RUG = Rijksuniversiteit Groningen

UvA = Universiteit van Amsterdam

AESOP = Association of European Schools of Planning

TM = Text-Mining

LDA = Latent Dirichlet Allocation

GIS = Geographic Information System

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1.Introduction

1.1 Background and Significance

Over the years, spatial planning has undergone major changes due to various societal, economic, and environmental influences. At their core, spatial planners seek to manage and coordinate the use of land and resources in a manner that balances various interests and needs while adapting to societal challenges. As noted in the 2024 Core Curriculum, "planners intervene in the organization of physical and non-physical (e.g., economic) spaces at different scales to respond to the needs of human society and the planet" (AESOP, 2024). According to scholars such as Cars et al. (2002), planning has become essential for communities and social organizations to effectively handle their common matters. Galland and Chettiparamb (2020) highlight and support the shift from traditional planning ideology to a new spatial planning paradigm that incorporates social, economic, and environmental factors. Academic and policy discussions have interpreted the concept of "spatial planning" in numerous ways. Nonetheless, there is a consensus that its primary role is to influence and structure the economic, social, cultural, and ecological aspects of society through the strategic development and management of spaces (Allmendinger & Haughton, 2013). Notably, Dutch spatial planning aims to provide spatial order and quality by employing thorough land use integration; however, in actual practice, there are conflicts between policy goals and legal certainty. Nevertheless, Needham (2014) identifies two primary variables that can potentially upset policy arrangements and provision structures: shifts in the social context, such as financial or economic crises, and political interventions, such as changes in legislation. "Spatial planning is a continuous and dynamic process that necessitates regular adaptation to meet the changing demands of society" (Witte & Hartmann, 2022, p. 9).

The concept of continuous adaptation, which has been emphasized by several academics, highlights in this regard how spatial planning is dynamic and needs to be adjusted constantly. As suggested by Nuissl and Heinrichs (2011), a *"governance lens"* approach to spatial planning analysis offers a more comprehensive picture of its social function. They argue that planning paradigms are influenced not just by planners' reflections but also by broader societal developments. This perspective emphasizes the pivotal role of governance principles in shaping planning processes and highlights the necessity for spatial planning to continuously adapt to societal changes. Additionally, integrating governance theory into planning discourse, as suggested by Schmitt and Wiechmann (2018), enriches our comprehension of spatial planning.

This places spatial planning within the realm of the social sciences, emphasizing its multifaceted nature and significance beyond technical aspects. Witte and Hartmann (2022) also touched on the concept of a “governance solution” in today’s societal context, which can provide an answer to increasing normativity, complexity, and uncertainty within planning issues in contemporary research.

1.2 A Changing Society?

Recent changes in the context of spatial planning have further heightened complexity and uncertainty, with societal developments such as pandemics, climate change, and political populism contributing to more dynamic and open planning environments (Witte & Hartmann, 2022). Our modern society is undergoing rapid and simultaneous changes, frequently referred to as poly crises. These include the 2008 global financial crisis, ongoing climate change, the COVID-19 epidemic, and growing political populism, among other notable obstacles.

Spatial planning, as an indicator of societal evolution, mirrors these profound changes and societal dialogues. Kreukels (1985) described spatial planning as a "mirror of Western society," reflecting the prevailing trends and values. This metaphor underscores the deep impact of societal dialogues and values on the practice of spatial planning, highlighting its role as both a reflection and a product of broader societal dynamics. Given these significant shifts in society, the field of spatial planning has undergone dynamic changes over the past decades, responding to evolving societal challenges that have shaped the discipline.

The 2008 economic crisis could serve as a focal point that significantly transformed the economic environment, resulting in extensive effects on urban planning. This underscores the pivotal role of adaptability and innovation in urban development. As Newton et al. (2023) emphasize, "There is a need to rebuild capacity for cross-scale, integrated planning after a period of laissez-faire, in which the state withdrew from managing spatial change. This requires capacity-building at the central level and the development of the ability to integrate policies and actions across scales" (p. 21). The recent emphasis on integrated planning highlights the necessity for urban planners to adapt to these changes and build robust, cross-scale planning capacities. Analyzing master theses of spatial planning from the past 15 years reveals shifting priorities in response to society's continuously evolving demands.

1.3 Objective

The study uses a comprehensive analysis of the MSc thesis through mixed methods as a proxy to answer the following questions:

Main question:

- How has Dutch spatial planning research responded to societal developments over the past 15 years, as reflected in MSc thesis research?

Sub-questions:

1. What are the predominant topics in recent theses, and how do they align with contemporary societal challenges?
2. What are the key developments in methods and theories within MSc theses in Spatial Planning over the past 15 years, as revealed through longitudinal content analysis?
3. What are the observable differences in planning approaches between the five selected Dutch spatial planning schools?

By conducting a longitudinal content analysis of MSc theses using text-mining techniques, this study aims to explore the topics used by spatial planning students over the past 15 years in the Netherlands. Moreover, text-mining is the preferred technique due to its efficient processing while analysing large volumes of textual data, which helps to reveal patterns and trends that might be overlooked with traditional methods. This analysis will provide valuable insights for educational improvements and ensure that spatial planning education and practice remain relevant.

1.4 Societal and Scientific Relevance

Societal relevance

This research explores a significant component of society by addressing crucial gaps in knowledge and providing guidance for the future of spatial planning education and practice. The study seeks to demonstrate how spatial planning students, in their MSc theses, have addressed the intricate difficulties of modern society in the last 15 years. As Tisma and Meijer (2018) assert, understanding and adapting to societal challenges is pivotal for the effectiveness of spatial planning initiatives. By investigating the evolving themes, methodologies, and theoretical

perspectives, the research contributes to a deeper comprehension of the dynamic relationship between spatial planning and societal development (Wolsink, 2002). As highlighted by Ding et al. (2001), such insights are crucial for informed decision-making and policy development in response to societal dynamics. Furthermore, the study's scope, covering five Dutch universities, provides a holistic overview of how spatial planning schools with diverse approaches and field areas have responded to societal challenges in the Dutch context.

Scientific relevance

Scientifically, the use of longitudinal content analysis, complemented by text mining techniques and expert interviews, positions this study at the forefront of spatial planning research methodology. The integration of quantitative and qualitative methodologies enables a comprehensive exploration of the academic landscape, offering nuanced insights into the changing nature of spatial planning (Karami et al., 2018). Weiss (2006) argues that longitudinal data analysis is crucial for comprehending the evolution of spatial planning, which mirrors larger societal shifts. The study aims to fill the gap in knowledge by conducting a systematic review and synthesis of MSc theses. The results will not only provide insights for future improvements in the Spatial Planning curriculum but also contribute valuable perspectives to the global discussion on the development of spatial planning as a crucial aspect of societal progress (Allmendinger & Haughton, 2013).

1.5 Reading Guide

Following the introduction, this thesis moves on to Chapter 2, which outlines the methodology. It provides a detailed explanation of the research methodologies employed in this thesis and discusses their validity and reliability. The chapter explains the case study and the information obtained through expert interviews. Chapter 3 integrates the outcomes of text-mining techniques, manual analysis, and expert interviews. These results are then examined alongside relevant graphs and charts. The discussion in Chapter 4 takes place before the conclusions in Chapter 5 and the section on future research recommendations that closes the latter. The appendices, which consist of the expert interview questions, a concise summary of the interviews, and the list of supervisors, follow the references.

2. METHODOLOGY

2.1 Research Design

This longitudinal study uses a combination of qualitative and quantitative methodologies to gain a thorough understanding of the expanding field of spatial planning studies. The use of both qualitative narratives and quantitative data in this research enhances its comprehensiveness and offers further context (O'Leary, 2010; Johnson, Onwuegbuzie, & Turner, 2007). The following sections of this chapter provide a detailed explanation of the research method.

2.1.1 Longitudinal Analysis

The analysis of data collected on the same units over time is known as longitudinal data analysis. People sometimes refer to longitudinal data as repeated measures data or panel data (Hsiao, 2003; Congdon, 2007). However, in this research, the notion of longitudinal analysis takes on a slightly distinct perspective. Rather than following the same empirical objects over time, it involves tracking the evolution of spatial planning theses as reflected in the collective body of spatial planning theses produced over time. Each spatial planning thesis represents a snapshot of the state of spatial planning research at a particular point in time, contributed by different students. The review begins in 2009 due to the limited availability of theses on some universities' repository platforms before this date.

2.2 Data Collection

Focusing on spatial planning theses from five Dutch universities between 2009 and 2023, this study gathered 2311 theses from the digital archives of the selected universities. Master theses are excellent references because they provide a comprehensive overview of recent research trends and methodologies in the field of spatial planning. Moreover, they are usually more prevalent and readily available than PhD dissertations, spanning a wider and more varied spectrum of subjects, which enriches the dataset for this study. Data collection required several stages, one after the other. At first, digital archives that store MSc theses in spatial planning or similar programmes were identified and accessed using the institutions' web platforms or databases. After identifying and downloading the relevant theses, they were gathered into a dataset for additional analysis. This dataset included important metadata such as the names of

supervisors, thesis titles, and publication dates. Subsequently, 270 theses were manually coded to develop a scheme for the text-mining process, specifically topic modelling in the Python environment. A further analysis was conducted to investigate the frequency of supervision done by each supervisor during the past 15 years in order to understand the correlation between the most frequented themes and supervisors. Simultaneously, semi-structured interviews with experts were done to enhance and provide greater insight into the analysis and findings. Python and Power BI software graphically depicted the data and patterns across the selected timeframe and universities.

2.2.1 Variables

A set of bibliometric indicators will be applied to assess key research trends and patterns in the spatial planning theses. Variables to be captured during this phase include the year of publication, titles, keywords, theories, methods, cases, and names of supervisors who each brought useful insights into Dutch planning schools over time.

2.2.2 Case Selection

The scope of this research encompasses five universities in the Netherlands, each offering unique programs in spatial planning within various faculties. These programs include Utrecht University's Spatial Planning program, Radboud University's Spatial Planning program, the University of Groningen's Environmental and Infrastructure Planning and Society, Sustainability and Planning programs, Amsterdam University's Urban and Regional Planning program, and Wageningen University's Land Use Planning program. Each institution provides a distinct perspective on spatial planning, which is discussed further in the following section. A brief overview of the faculties which host these programs is shown in Table 1.

University	Program	Faculty
Utrecht University (UU)	Spatial Planning	Geosciences
Nijmegen University (RU)	Spatial Planning	Management Sciences
Groningen University (RUG)	Environmental and Infrastructure Planning	Spatial Sciences
	Society, Sustainability and Planning	
Wageningen University (WUR)	Land use Planning	Environmental Sciences
Amsterdam University (UvA)	Urban and Regional Planning	Social and Behavioural Sciences

Table 1. A brief overview of selected universities

Universities Curricula

By examining the university's course guide, one can have a clearer understanding of the distinctions between their programs and how they address and prioritize societal concerns. All five universities promote sustainable development and urban planning in their Master's degree programs, and they all offer interdisciplinary courses that incorporate environmental, social, and economic considerations. Every curriculum combines practical application with theoretical knowledge, emphasizing current urban and environmental concerns in particular. Students have frequent opportunities to engage in thesis research, internships, and elective courses, enabling them to customize their learning experiences according to their own interests and career objectives.

Across these universities, there are some variations in the curricular focus. The University of Amsterdam focuses on the study of urban governance and sustainable development, combining social sciences disciplines to tackle the intricate challenges of urban problems. Radboud University provides a wide range of subjects, encompassing areas such as real estate management, water and climate change adaptation, and urban mobility. Groningen University distinguishes between infrastructure and environmental planning, as well as socio-spatial planning, and offers specialist paths for each of these specific topics. Utrecht University offers a well-rounded approach with a significant focus on sustainability, encompassing a diverse selection of courses that cover many facets of spatial planning, and Wageningen University focuses on planning and design practices, political dilemmas, and improving urban quality of life while having a strong environmental focus.

2.3 Manual Review

To guide the quantitative analysis and support the validation of our approach, 270 theses were selected for manual analysis. This selection aimed to ensure a comprehensive overview of the entire dataset, based on the relative output of each university over the years, with adjustments made to compensate for the varying availability. Table 2 below represents the population data, including the proportion of total theses contributed by each university and the number of theses selected for analysis.

University	Proportion of Total Theses (%)	Actual number	Selected Theses	Proportion of Selected Theses (%)x	Difference
UU	14.97%	346	45	16.67%	+1.7
RU	24.1%	557	60	22.22%	-1.88
WUR	10.64%	246	45	16.67%	+6.03
UvA	5.37%	124	30	11.11%	+5.74
RUG	44.91%	1038	90	33.33%	-11.58
Total	100%	2311	270	100%	

Table 2. Proportion and selection analysis of theses by university

The "Difference" column indicates the deviation between the actual proportion of theses and the proportion of selected theses, with smaller values representing a more accurate representation of each university's contribution. The University of Groningen's underrepresentation stands at -11.58 compared to other universities, particularly UvA. Despite this, a higher number of UvA theses were selected to offset their lower overall availability. Moreover, this selection strategy aimed to ensure a balanced representation across 15 years, taking into account the availability of theses from each university to maintain an even proportion. For instance, UU selected three theses from each year, resulting in a total of 45 theses.

The manual review procedure entailed extracting key information from 270 theses, including the year of publication, title, supervisor's name, case studies, methodology and methods used for data gathering, main theories, and keywords. They were collected in Excel data extraction form. These data were used to develop a scheme and served as a baseline for deeper text-mining techniques.

2.4 Text-Mining

Text mining (TM) is discovering and extracting interesting, non-trivial knowledge from free or unstructured text (Kao & Poteet, 2005). It involves the systematic extraction of meaningful patterns, relationships, and knowledge embedded within large volumes of textual information. TM is particularly valuable for handling the vast amount of unstructured data available in diverse sources such as documents, articles, social media, and other textual formats. Zhang et al. (2015) define text mining as a knowledge discovery process in a textual database in which new interesting knowledge is created. The process is highly transparent, as most decisions made by the researcher can be reviewed by other researchers, unlike, e.g., in the creation of coding sheets (Asmussen & Møller, 2019).

Text mining typically involves different stages; however, in this study, they are categorized into two distinct steps: text preprocessing and text mining operations. Each of these phases will be done in the Python environment using different libraries, such as Numpy and Pandas for data handling and preprocessing, Spacy for advanced NLP tasks, Genism for topic modelling besides text processing, and many other libraries.

2.4.1 Preprocessing

The preprocessing step is an essential stage that focuses on purifying and organizing unprocessed textual material to make it easier for further analysis. This complex procedure encompasses various essential processes. At the preprocessing level, various tasks are performed such as text cleaning, tokenization, stop word removal, stemming or lemmatization, removing numeric or special characters, handling contractions and abbreviations, handling synonyms, handling negations, creating a document-term matrix (DTM), and calculating TF-IDF (term frequency-inverse document frequency). Data cleaning strengthens the validity of retrieved patterns and correlations by improving data quality. The process of cleaning involves selectively preserving the pertinent text parts (Palmer, 2010). Text cleaning refers to the process of eliminating unnecessary letters, symbols, and HTML elements from the text, while also converting the text to lowercase to ensure uniformity. Tokenization is the process of breaking down the text into individual words, also known as tokens, while simultaneously deleting punctuation. Afterwards, stop words, which are common terms that lack significant meaning, are removed to improve the quality of the data. Afterwards, stemming or lemmatization is performed to reduce words to their base form to achieve uniformity. Afterwards, the process of standardizing synonyms takes place, dealing with negations, and constructing a Document-Term Matrix (DTM) to accurately depict the frequency of terms in each document. They are followed by the TF-IDF (Term Frequency-Inverse Document Frequency) method to determine the importance of terms by considering their frequency in relation to the complete collection of documents. By performing these preprocessing procedures, the text is refined and organized, which makes it more suitable for efficient analysis in later stages of text mining, such as topic modelling or sentiment analysis (Kobayashi et al., 2017), which is topic modelling in this study.

2.4.2 Operations

Topic Modelling

Following the preprocessing stage, text mining operations are applied, with a particular emphasis on topic modelling, which automatically derives topics from documents. These topics function as indicators of underlying constructs or themes within the text. Topic models are probabilistic models used in the fields of machine learning and natural language processing. They analyze patterns of term frequencies to reveal subjects (Kobayashi et al., 2017). Topic modelling is mostly used to discover the subjects that a specific text pertains to.

Latent Dirichlet Allocation (LDA)

Latent Dirichlet Allocation (LDA) is a highly used subject modelling technique. To be more specific, it is a generative probabilistic model that assumes documents are created by a combination of different subjects, and each topic is defined by a probability distribution of words. The underlying idea of LDA is that documents are composed of several topics, and each topic is characterized by a distinct set of words with different probabilities. LDA operates by allocating topics to words in texts based on the probability of encountering a specific dataset under certain assumptions about its creation (Campbell, Hindle, & Stroulia, 2015). This iterative procedure continues until the topic assignments reach a stable state. This enables the detection of concealed thematic patterns within the data. Moreover in this study, LDA allows for a detailed understanding of how the focus of spatial planning research has shifted in response to societal changes in the Netherlands, as reflected in the master theses produced over the past 15 years.

Furthermore, after completing the LDA process, the topics that were previously identified through manual analysis were reassigned to the designated corpus in text mining. This was done to ensure corpus data consistency. Ultimately, by performing this analysis, a comprehensive understanding of the eleven identified topics was gained.

2.5 Interviews

As previously mentioned, semi-structured interviews with experts are conducted to enhance and augment the results of the quantitative content analysis. The study organized the interviews in a way that allows for a more thorough exploration of certain themes and concerns that are important to spatial planning research. This is built upon the patterns and understandings that have been identified in the study so far. Questions are tailored to explore the underlying causes of observed trends, clarify dynamic processes, and incorporate expert perspectives from university coordinators and professors in the field. For every interview, a standard interview guide is used, and before every interview, the related information and data about each university are studied. As a result, the interview questions are more specific to the findings of the related university. By aligning the interview questions with the analysis outcomes, this structured approach ensures a more targeted and focused exploration. Table 3 provides details about the interviewee's names, university affiliations, roles, interview dates, and durations.

Interviewee	Name	University	Role	Date	Duration
1	Dr. Ferry van Kann	RUG	MSc thesis coordinator	24/May/2024	50 min
2	Prof. dr. Jochen Monstadt	UU	Chair of Spatial Planning	28/May/2024	30 min
3	Dr. Sander Lenferink	RU	Program coordinator	28/May/2024	40 min
4	Dr. Gerrit-Jan Carsjens	WUR	Program coordinator	31/May/2024	40 min
5	Dr. Ori Rubin	UvA	MSc thesis coordinator	06/June/2024	40 min

Table 3. Interview guide

2.6 Ethical Issues

This research studied master's theses, and there are no ethical concerns about confidentiality. All the sources used are publicly available online, eliminating any risk of revealing private information, and the students' names are not included. This careful approach ensures that everyone’s privacy is respected throughout the study.

2.7 Limitations

Although the findings of this study offer appealing insights, it is important to acknowledge multiple constraints. The dataset's time scope is limited to papers published from 2009 to 2023, which may result in the exclusion of relevant theses published before this period. Moreover, the process of choosing the theses might be susceptible to bias, as the actual quantity of uploaded theses is expected to be lower than the overall number of students in a program due to factors such as students dropping out, thesis failures, and failure to submit. The digital repository of Amsterdam University's urban and regional planning MSc theses contained a significantly lower number of available data than the actual number of data which was another area of concern during the study. Furthermore, the text mining technique has inherent limitations. To explain

more about it, the preprocessing stages, such as stemming and stop word removal, can potentially cause inconsistency. Additionally, dealing with negation, which can reverse the meaning of text segments, has proven to be challenging. In addition, although NLP technologies demonstrate efficacy with extensive datasets, they sometimes lack contextual awareness, complicating accurate analysis. Therefore, the interpretation of topics relies heavily on content knowledge, and clustering topics may vary depending on the analyst. During topic analysis, it is crucial to acknowledge that the identified topics lack meaningful interpretation without supplementary qualitative study. To tackle these issues, a comprehensive analysis of 270 theses was conducted, supplemented by further interviews with experts to validate the findings. Careful consideration of these limitations is essential for accurately interpreting the results and drawing appropriate conclusions.

3. Results

The results of both the quantitative and qualitative research are presented and analyzed in this chapter. The chapter begins with a descriptive overview that provides a comprehensive account of the distribution of languages derived from text mining, as well as the number of theses produced per university annually. The subsequent sections examine the theoretical frameworks, methodologies, and case studies utilized in the student's thesis, offering a comparative analysis of the general patterns and temporal developments that were observed throughout the investigation. Following this, the main topics and themes identified in the study are examined, with a focus on the general trends, similarities, and distinctions among the universities, as well as their evolution over time. The closing section provides a list of the five supervisors who had the highest number of supervisions at specified universities, which provides a deeper understanding of the relation between their expertise and topic trends. These insights are the foundation for the discussion chapter.

3.1 Descriptive Overview

3.1.1 The Distribution of Data

The following stacked bar chart shows the distribution of master theses published in the digital archives of the five universities (UU, WUR, RU, UvA, and RUG) over 15 years from 2009 to 2023. Figure 1 illustrates the number of theses published per year, presenting a dynamic representation of the distribution across the universities.

Between 2009 and 2011, the total number of theses gradually increased from 69 in 2009 to 142 in 2011. In 2009, RUG led with 42 theses, followed by UU with 15 and RU with 9, while WUR and UvA had minimal available files during this period. A significant surge was observed in 2012, peaking at 199 theses, with RUG being the major contributor with 73 theses, followed by RU with 57 and UU with 56. This period also marks the initial contribution from UvA in 2015 with 2 theses. The number of theses published varied between 137 and 151 from 2016 to 2020, with the highest number in 2019 at 198 theses. During this period, RU contributed 42 and RUG 79, with a steady increase in contributions from UvA, while WUR maintained consistent output.

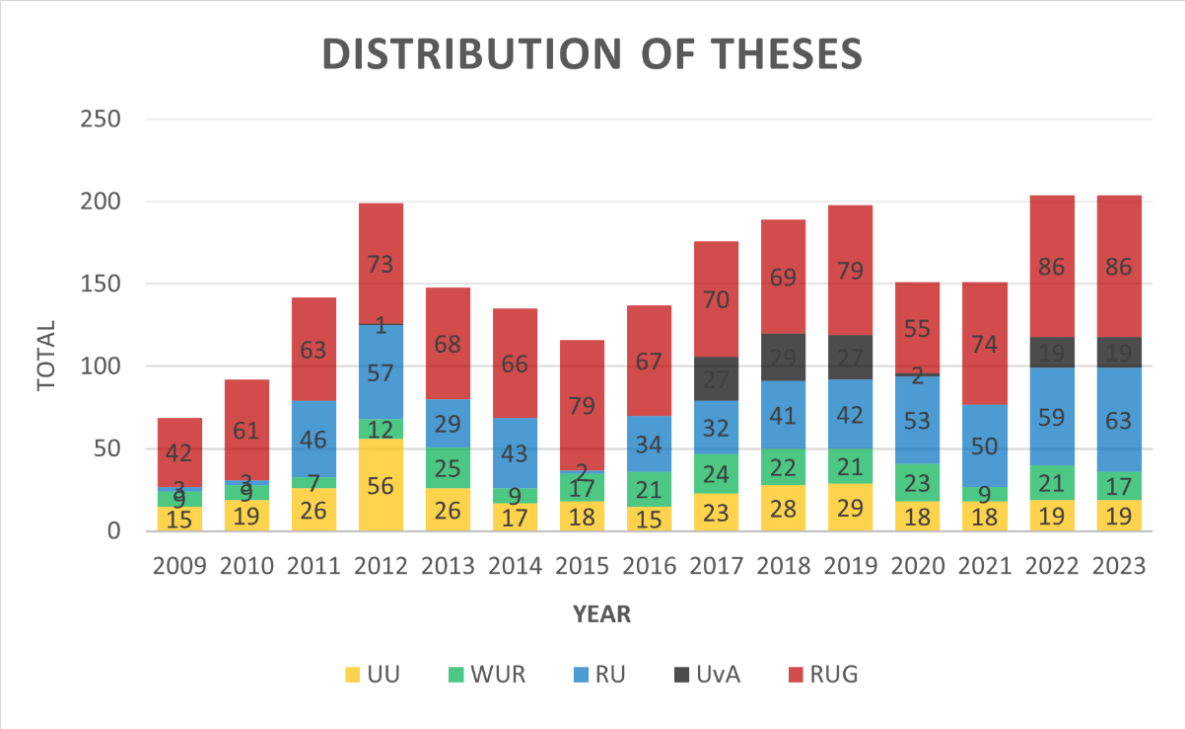

Figure 1. Distribution of selected MSc theses between 2009 to 2023 among chosen universities

In 2022 and 2023, the total number of theses stabilized at around 200. RUG consistently contributed the highest number of theses (86 each year), followed by RU, UvA, and UU. WUR continued to contribute a moderate number of theses throughout this period. When analyzed by the university, RUG demonstrates the highest and most consistent output of theses, with a notable peak in 2015 and high contributions in subsequent years. RU shows consistently high contributions, particularly from 2011 onwards. UU shows moderate contributions, with a significant increase in 2012. WUR maintains consistently low to moderate contributions across the years. Since the University of Amsterdam began offering online data availability in 2017, there has been a steady increase in the number of theses being published and accessible in digital archives. The bar chart indicates a general increase in the number of theses available in each university's online library over time, with significant contributions from RUG, RU, UU, and WUR, in that order, while UvA showed varying but notable outputs in recent years.

3.1.2 Language Trend

To further analyze the characteristics of the master theses, the language of publication over the 15 years from 2009 to 2023 was examined. The analysis differentiates between theses written in English and Dutch. Figure 2 demonstrates that between 2009 and 2012, there was a noticeable rise in the number of theses published in Dutch, reaching its highest point in 2012. During the period from 2013 to 2015, the number of Dutch theses saw fluctuations and a downward trend, whilst the number of English theses stayed relatively constant. This indicates a strong preference for English theses over time. Furthermore, starting in 2016, there has been a notable change, as the quantity of theses published in English has consistently increased, surpassing the number of Dutch theses. The number of English theses has been consistently increasing and will reach its highest point in 2023 with 200 theses. Conversely, the quantity of Dutch theses is consistently decreasing, and it reached its lowest level with slight contributions in 2023. The data clearly shows a significant shift towards English as the favoured language for master theses over 15 years.

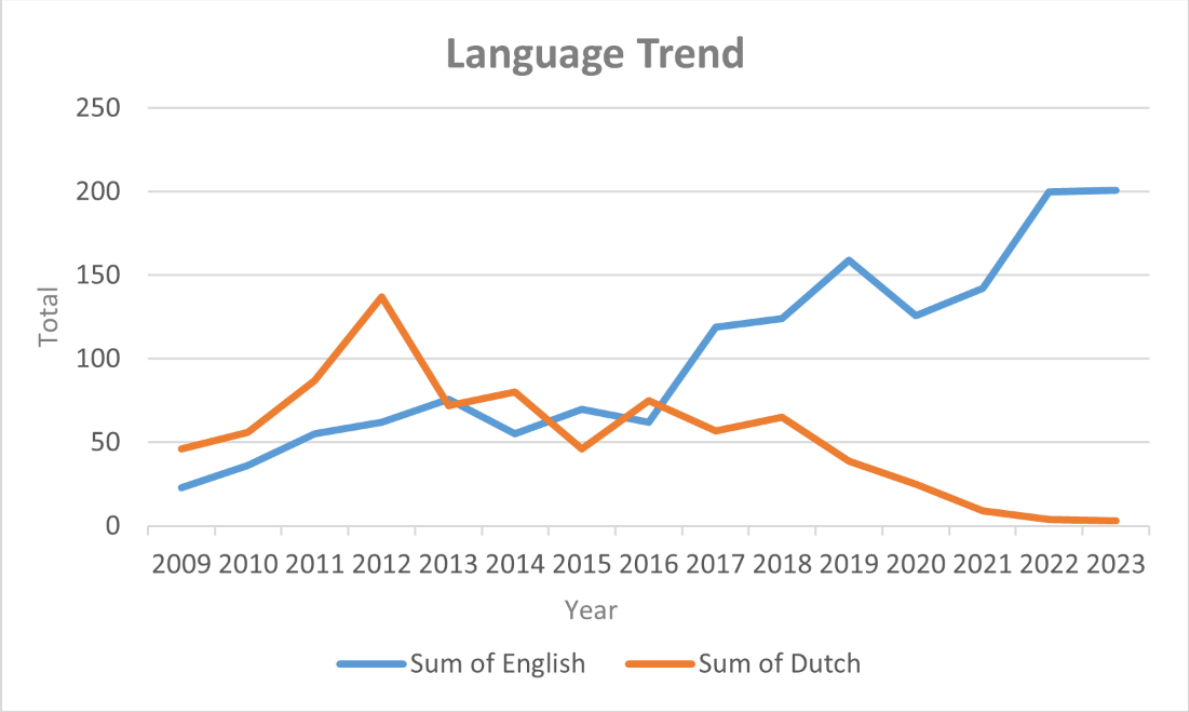

Figure 2. Distribution of thesis written in English and Dutch between 2009 and 2023

This trend reflects a broader shift in academic and research practices, potentially influenced by the increasing emphasis on internationalization and the global dissemination of research in the Netherlands. What is more, the results were different for each university, for instance, over the past 15 years, Wageningen University (WUR) has had the highest proportion of theses written in English, with approximately 95% of its dataset. This is likely due to WUR's strong international focus and its significant number of international students and staff, which necessitates the use of English as a common academic language.

On the other hand, Utrecht University (UU) has had the highest proportion of theses written in Dutch, around 62%. This can be attributed to UU having the smallest share of international students among Dutch universities, with only 9.3% of its student body being international. This lower level of internationalization means that Dutch was the first language for the last decade in many academic activities, including the writing of theses. According to reports, UU's focus has been more on quality rather than increasing the number of international students, which reflects its strategic decisions in academic offerings and language use (Waterlander, 2019).

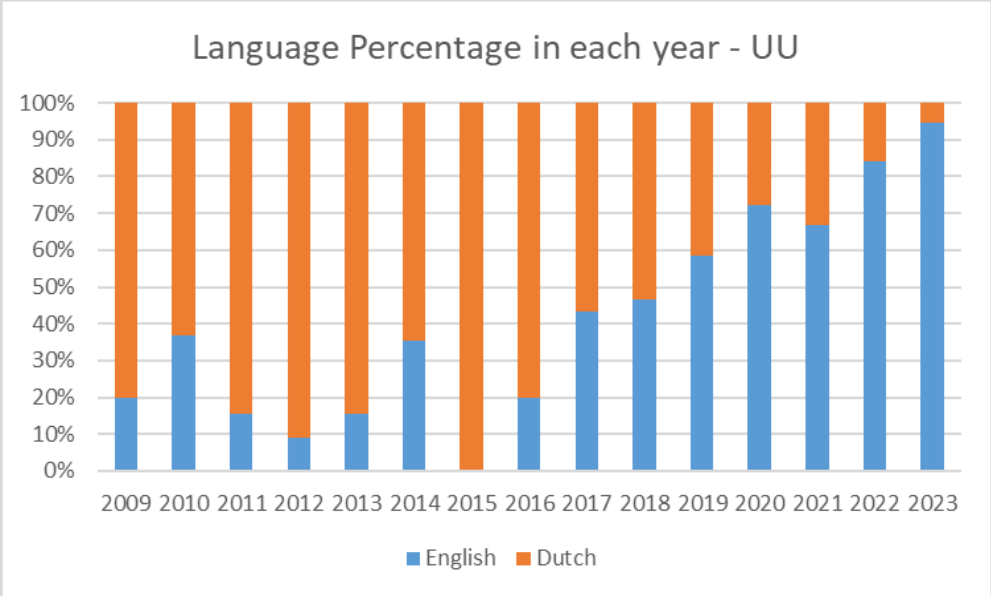

Figure 3. Distribution of languages at Utrecht University each year

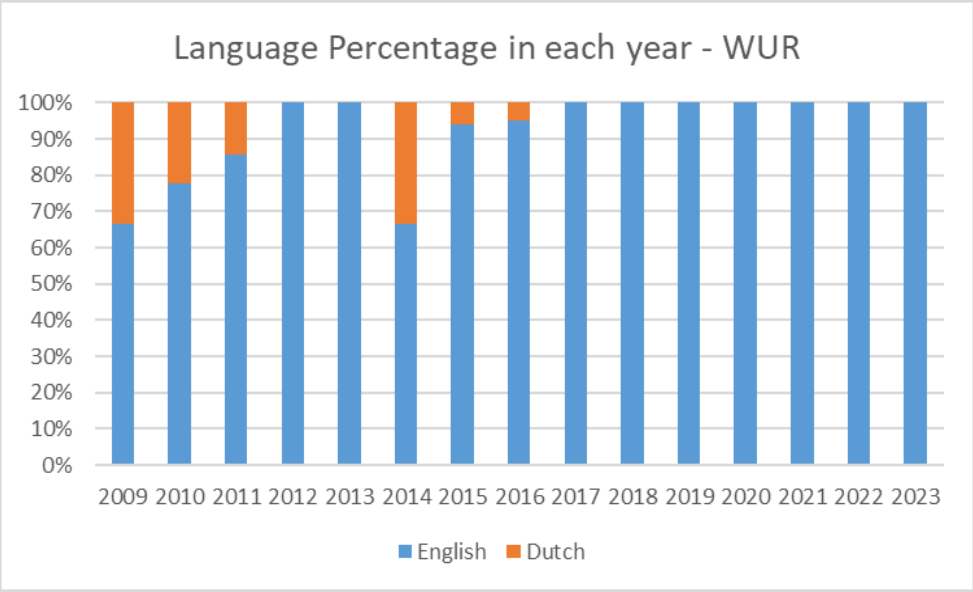

Figure 4. Distribution of languages at Wageningen University each year

3.2 Frequency Analysis

A frequency analysis was performed to assess the occurrence of words within a dataset of 2311 theses, utilizing a Python environment. This analysis offers insights into the significance and prevalence of specific terms throughout the dataset. Through analysing the frequency of these words, it becomes evident that they represent the primary areas of emphasis in the research. Figures 5 and 6 illustrate the top 20 and top 30 most frequently used words through a bar chart and a word cloud, respectively. These visualisations highlight the key themes and focus areas in the academic research of spatial planning.

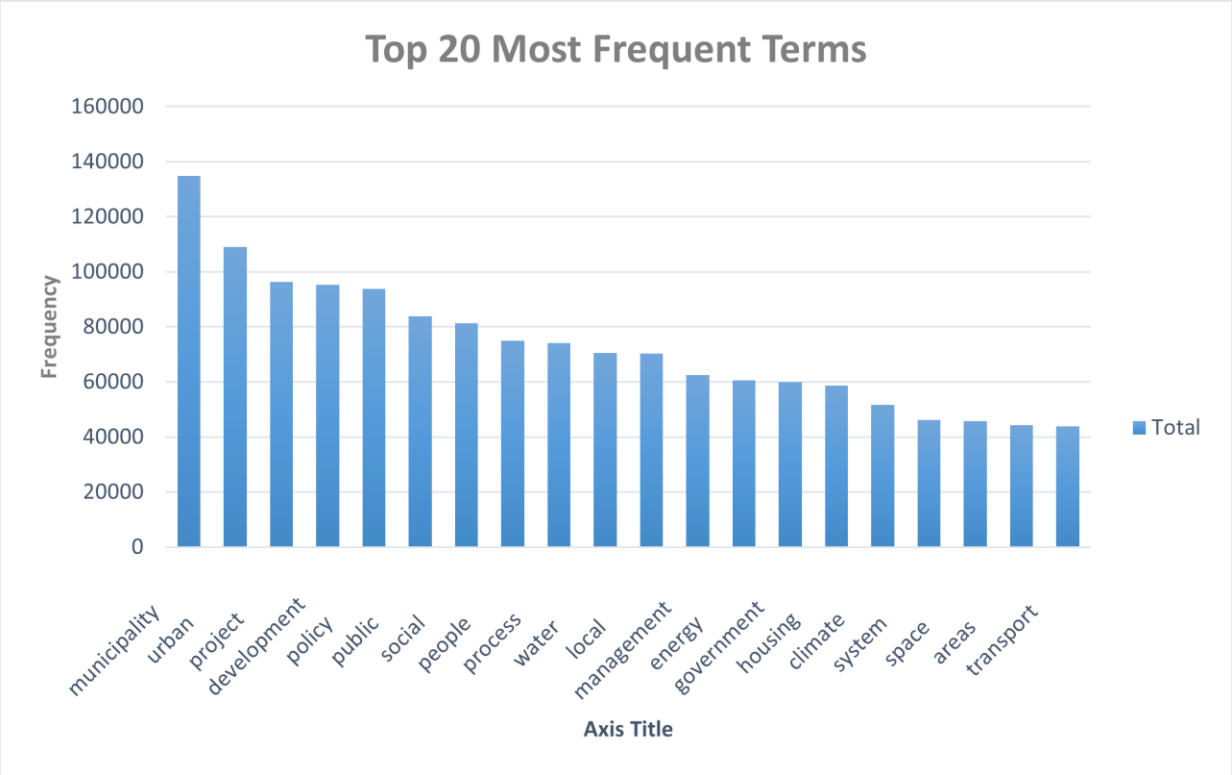

Figure 5. Frequency of the top 20 high-frequency words

Figure 6. Word cloud of the top 30 high-frequency words

As illustrated in the bar chart, "municipality" is the most frequent term, which suggests a strong interest among students in policy frameworks, initiatives, and regulations implemented by municipalities. The frequent use of terms such as "urban,""project," "development," and "policy" further emphasizes the attention given to urban development and related policies. Additionally, a considerable number of theses frequently use the words "public," "social," and "people," highlighting the strong relationship between spatial planning and societal factors. This indicates that many students explore the interplay between urban spaces and the communities that inhabit them, emphasizing the inseparable connection between spatial planning and social considerations. The frequent occurrence of the terms "water" and "management" suggests a strong interest in water governance and management, which is crucial considering the significance of sustainable water management in urban planning and development.

Furthermore, the frequency of the term "energy" highlights the importance of sustainable energy subjects in the study, specifically in the Dutch setting, where energy transition and sustainability are crucial matters. Terms such as "housing" and "climate" indicate a significant focus on tackling housing problems and climate change, which are both crucial subjects in current discussions on spatial planning. The frequency analysis, as depicted in the bar chart and word cloud, reveals prominent areas of interest and research patterns among students, including governance, societal dimensions, water management, sustainable energy, housing, and climate change. These findings offer a distinct representation of the objectives and issues within the academic discipline of spatial planning.

Within the selected universities, there were notable similarities in the frequency of phrase usage. Nevertheless, every institution had minor differences in the frequency of keywords that were less frequently repeated in comparison to other universities, but did not rank among their most frequently repeated terms. For instance, "Omgevingswet" and "urban logistics" were frequently used by UU and RU. The University of Groningen distinguishes itself by frequently employing the terms "flood" and "resilience." While students from other universities may also employ similar words, they are more widespread at Groningen. Similarly, the term "agriculture" is mainly linked to WUR, whereas "behaviour" is especially common at UvA, possibly due to its connection to theories of travel mode behaviour or planned behaviour, which are employed in many of their research frameworks. The theories employed by students are further explored in the next section.

3.3 The Pattern of Theories

By reviewing 270 theses, the study identified a variety of theories used by students in their research frameworks, with many incorporating multiple theories. Figure 7 illustrates the distribution of the top 15 cited theories among students from the five selected universities, presenting each theory as a proportion of the whole rather than numerical values.

Remarkably, the “Participatory Planning Theory” consistently maintained its prominence, being the most cited theory across the years. This enduring popularity underscores the significance of involving local communities and stakeholders in planning processes. This theory is an umbrella for other participatory planning methods, such as collaborative planning. All the interviewees agreed on the importance and relevance of participatory planning theory in the spatial planning field and research, highlighting its essential role in fostering inclusive and effective urban development strategies.

The “Transition Theory,” which also featured prominently, likely reflects shifts in planning practices over time. As urban environments evolve, planners deal with transitions in policy frameworks, technological advancements, and societal needs. Utrecht University representative, Interviewee 2 emphasised the increasing usage of the “*transition”* theory over time, noting the significance of various transitions in spatial planning, such as “*the ongoing energy transition and the shift towards more specific transitions like heating and mobility*.” He highlighted that “*the focus on smart cities has also evolved towards incorporating artificial intelligence”*, demonstrating how technological advancements continue to shape planning practices. This underscores the need for integrated and adaptive approaches to manage these multifaceted transitions effectively. Similarly, "multi-level governance” highlights the importance of understanding interactions between various governance levels—local, regional, and national—when shaping urban landscapes.

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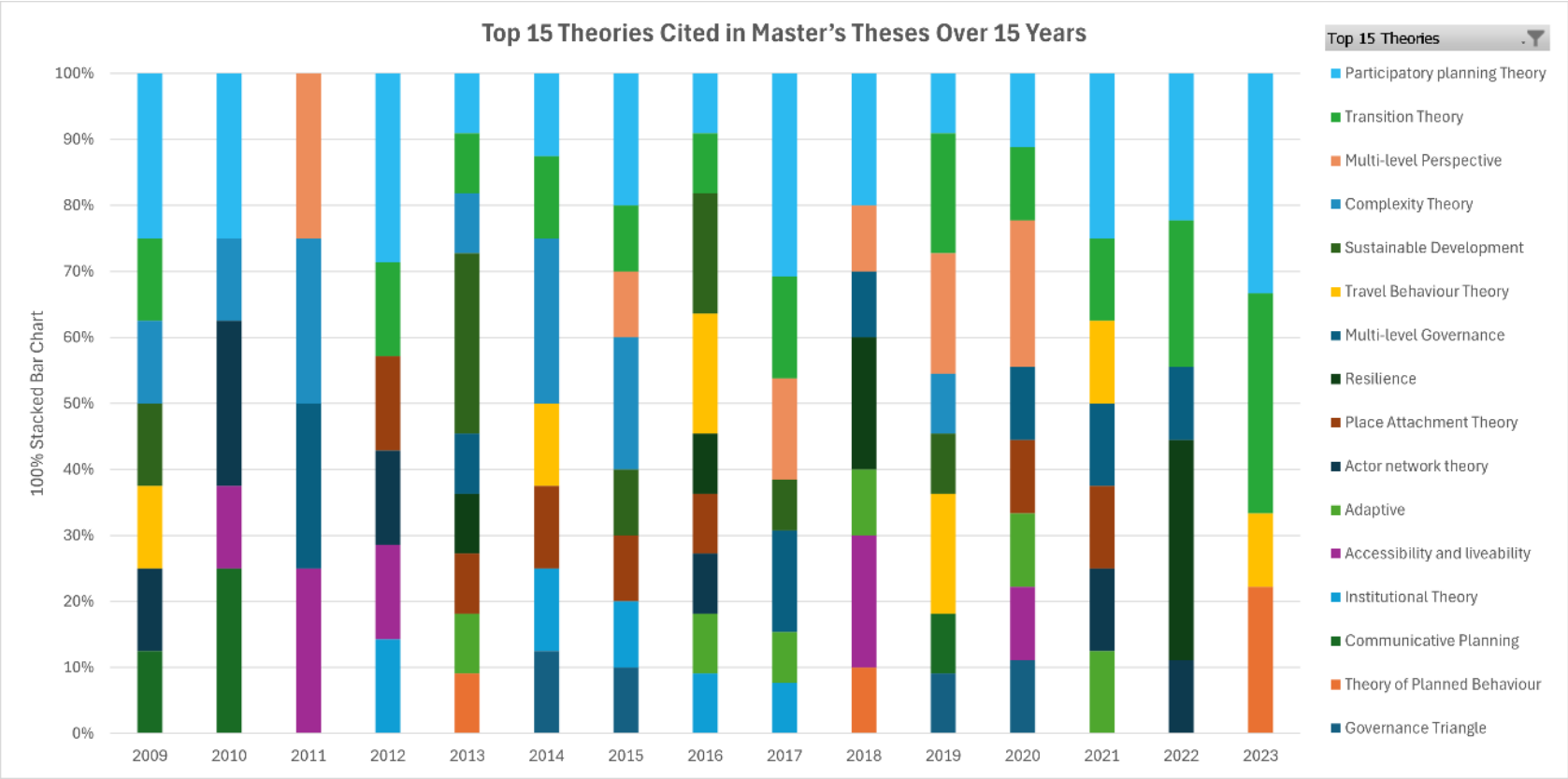


Figure 7. Top 15 theories employed by students on a percentage scale (2009-2023)

Complexity theory, another recurrent theme, acknowledges the intricate dynamics of planning systems. As cities become more interconnected and multifaceted, planners deal with nonlinear relationships, feedback loops, and emergent behaviours. Interviewee 1, the representative of Groningen University, emphasized the importance of "*complexity theory"* in their spatial planning programs at RUG. He stated, "*Complexity theory deals with adaptive and emerging practices, highlighting the importance of understanding and managing uncertainty in spatial planning*." He added that this theory is particularly relevant in fields such as water and energy management, where technical and organizational challenges are intertwined. He stated that complexity theory helps in addressing interlinked problems, which are inherently complex due to their interconnected nature. Furthermore, he noted that the emphasis on complexity theory reflects a broader shift in educational approaches at the university, aiming to equip students with the skills to handle multifaceted issues in urban and regional planning. Meanwhile, the emphasis on "sustainable development" aligns with global imperatives for environmentally conscious planning, considering ecological resilience, social equity, and economic viability.

The "Travel Behavior Theory" likely explores how people's mobility choices impact urban planning. As transportation patterns evolve, planners must address issues like congestion, accessibility, and sustainable modes of travel. The "resilience" concept also underscores adaptability and robustness in planning, recognizing that cities face unforeseen shocks and stresses. Last but not least among the most used theories by students are theories like "Place Attachment Theory" which delves into emotional connections to places, emphasizing the human dimension in planning decisions. Meanwhile, "communicative planning" advocates for dialogue and collaboration among stakeholders, recognizing that effective planning transcends technical expertise—it involves negotiation, empathy, and shared visions. In summary, these theories collectively shape the academic discourse on spatial planning, reflecting both enduring principles and adaptive responses to evolving urban challenges.

3.4 The Pattern of Methodologies

The research designs employed in the Master's thesis of students were studied and categorized into three different categories: quantitative, qualitative and mixed methods. Figure 8 presents an overview of the methodological approaches used by students in their thesis. The pie chart is based on the manual review of 270 theses and shows a predominant reliance on qualitative methods, which constitute around 77% of the methodologies employed. On the other hand, quantitative methods are minimally represented, making up only 4% of the total methodologies used. Finally, mixed methods, which combine qualitative and quantitative techniques, make up 19% of the methodology. The distribution of methodologies highlights a clear preference for qualitative analysis in the study framework, accompanied by a notable but less prominent use of mixed methods and a modest incorporation of quantitative approaches.

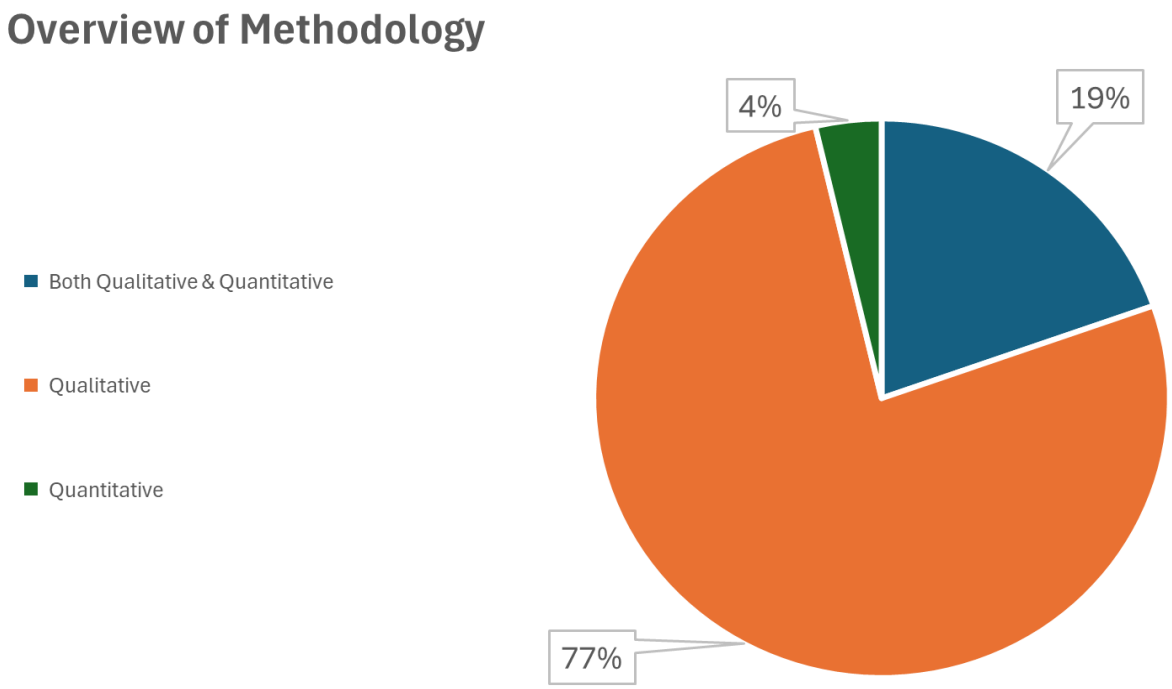


Figure 7. Overview of different methodologies

In order to analyse the distribution of methodologies in this study, an examination of the methodologies used over the years was conducted. However, no significant trends were

observed over the course of 15 years. There was only a slight increase in the utilisation of mixed methods techniques in the later years of the study, observed in certain universities. The study examined the distribution of methodological methods in chosen universities from 2009 to 2023 to determine if there was a discernible pattern. The findings are presented in Figure 9.

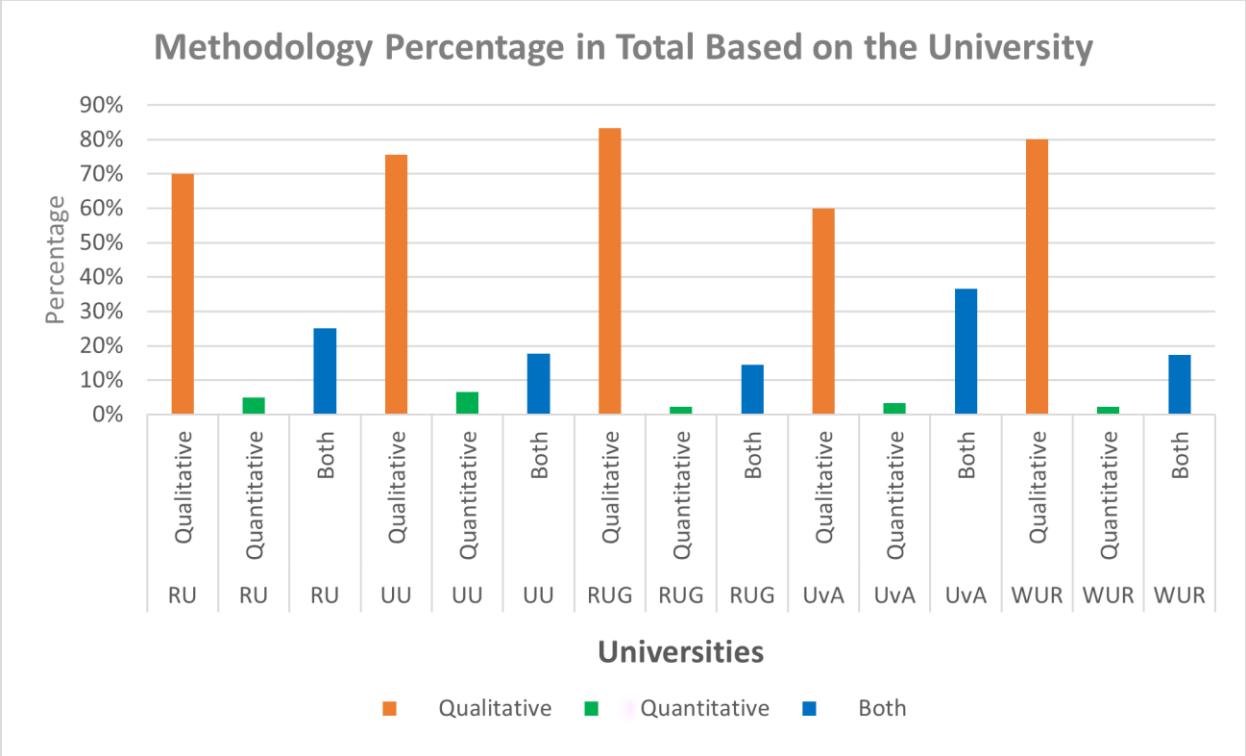


Figure 8. Distribution of methodologies in percentage-based

a closer look at the bar chart, reveals that qualitative research consistently prevails in all universities and on the other hand, quantitative research is the least commonly used method in all universities. As it is illustrated in the graph, UU has the highest utilisation rate of quantitative methods, roughly 6.5%, followed by RU with around 5%, then the University of Amsterdam with approximately 3.3%, and RUG and WUR with less than 2.2%. Mixed methods, which integrate qualitative and quantitative approaches, exhibit a degree of variability. UvA predominantly utilises this strategy, including mixed approaches in 36.6% of its research. Radboud University utilizes mixed methods frequently, accounting for around 25% of its research approach. Utrecht University and Wageningen University & Research utilize a combination of different research methods in around 18% and 17.3% of their research, respectively. In contrast, the RUG employs mixed methods in just under 14.4% of the research. The larger percentage at UvA may be attributed to the fact that the available data from this university is based on more

recent years. As previously stated the past few years have witnessed an increased utilization of mixed methods in research. In general, the data indicates a clear inclination towards qualitative research in spatial planning education, with a persistent interest in mixed approaches and a consistently low preference for quantitative research.

Figure 10 demonstrates the various methods employed by students in their master theses to gather, interpret, or analyse data, excluding literature reviews which are universally used. The data is represented in a frequency distribution, highlighting the ten most commonly employed techniques.

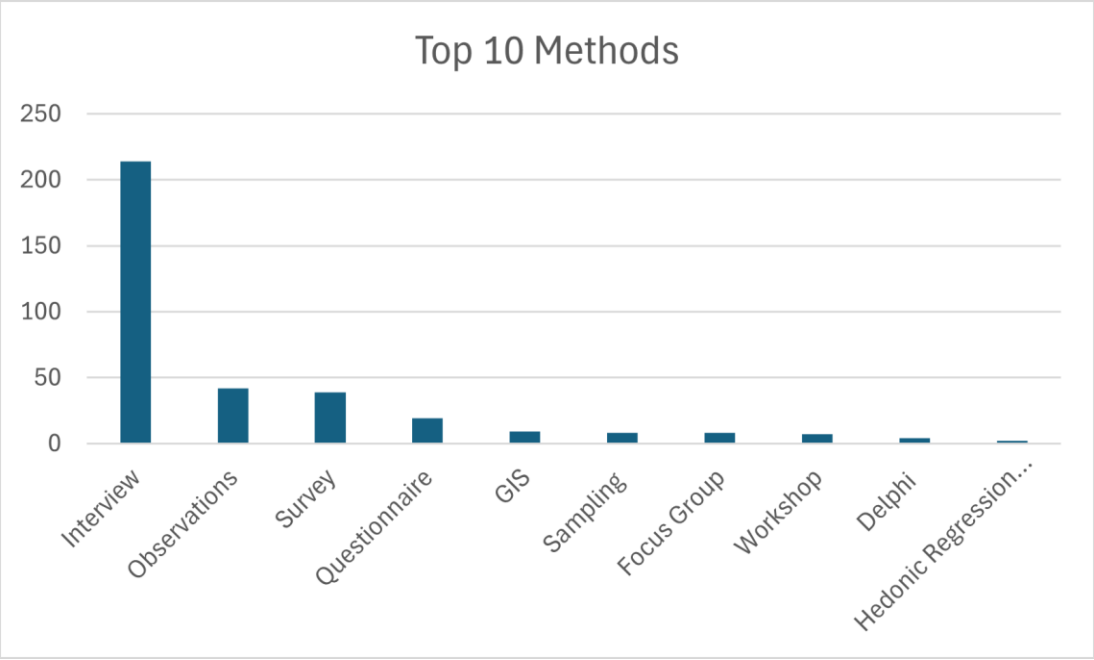


Figure 9. Top 10 methods used by students (Literature review excluded)

Interviewing is the predominant method, either used alone or combined with other methods. This indicates that students have a strong preference for gathering direct, qualitative information through interviews conducted either individually or in groups. Following the completion of interviews, observation methods, which encompass many forms such as interactive and field observations, rank as the second most often employed technique. This suggests that a significant percentage of students have a preference for gathering data through direct engagement with their subjects or their immediate environment.

Another notable method is the utilization of surveys and questionnaires. Although questionnaires are commonly used in surveys, it is crucial to recognize that certain students chose to apply them independently without carrying out a more comprehensive survey. This distinction highlights the flexibility with which students approach their data collection processes. Additionally, Geographic Information Systems (GIS), sampling, focus groups, workshops, Delphi methods, and hedonic regression are among the top ten methods identified. While GIS is commonly included as a mandatory course in bachelor's or master's programs in universities, students often underutilize it, preferring to rely more on interviews for their research. The need for greater integration of quantitative techniques like GIS in students' research was also highlighted by interviewees from all five universities.

The additional approaches shown in Figure 10 have specific uses in the collecting and processing of data, the sampling method is essential for attaining statistical representation and making inferences about the entire population. Focus groups enable interactive group discussions, providing qualitative insights into participants' viewpoints and experiences. Workshops serve as a forum for collective data collection, fostering interactive problem-solving and idea generation among participants. The Delphi technique entails a series of iterative rounds of surveys or conversations among experts to attain consensus on intricate matters or future predictions. The hedonic regression method is used in economic analysis to measure and comprehend the elements that impact pricing. It is particularly useful in evaluating how the characteristics of items or services influence their market values. Each method fulfils a unique function in the process of research and analysis, designed to suit the specific goals and characteristics of the data under investigation. The variety of these methods demonstrates the broad spectrum of research approaches and academic disciplines found in master's theses. However, there remains potential for further utilization of these methods. Recent trends indicate that GIS has notably increased in popularity, especially within Wageningen University.

3.5 The pattern of case studies

Figure 11 demonstrates the pattern of case studies reviewed in this research. Each university included case studies focusing on both urban and rural areas, tackling a variety of issues from urban renewal and infrastructure development to rural sustainability and agricultural planning. A shared theme across the universities was the emphasis on environmental sustainability, covering topics like green spaces, water management, energy transition, and sustainable

agriculture. The case studies revealed a significant geographical diversity, encompassing several areas in the Netherlands as well as worldwide sites. This reflects a comprehensive global perspective on urban planning and related disciplines. While conducting the manual review of 270 theses, the case studies were classified into five distinct categories depending on their geographical scope: international, national, regional, local, and others. The 'Others' category covers case studies that do not have a defined geographical location, such as those involving old or young individuals, focus groups, etc. The graph below depicts the percentage distribution of various categories. The data indicates that 26.70% of the case studies were conducted on an international scale, while 31.40% were focused on national issues, emphasizing significant attention towards addressing country-wide concerns. Despite the frequent mention of municipalities, the majority of research focuses on the national level. Nevertheless, when two distinct provinces are included, a cross-sectional study examining various municipalities is categorised as a national group due to its wider scope of study. Regional case studies, which made up 16.20% of the total, had a smaller scope than national ones and could be a comparison of municipalities or issues within the same region or province, whereas local case studies accounted for 21.50% and focused on specific local and neighbourhood challenges and topics. The 'Others' group accounted for 4.20% of the total, encompassing studies that did not fall within the typical geographical limits.

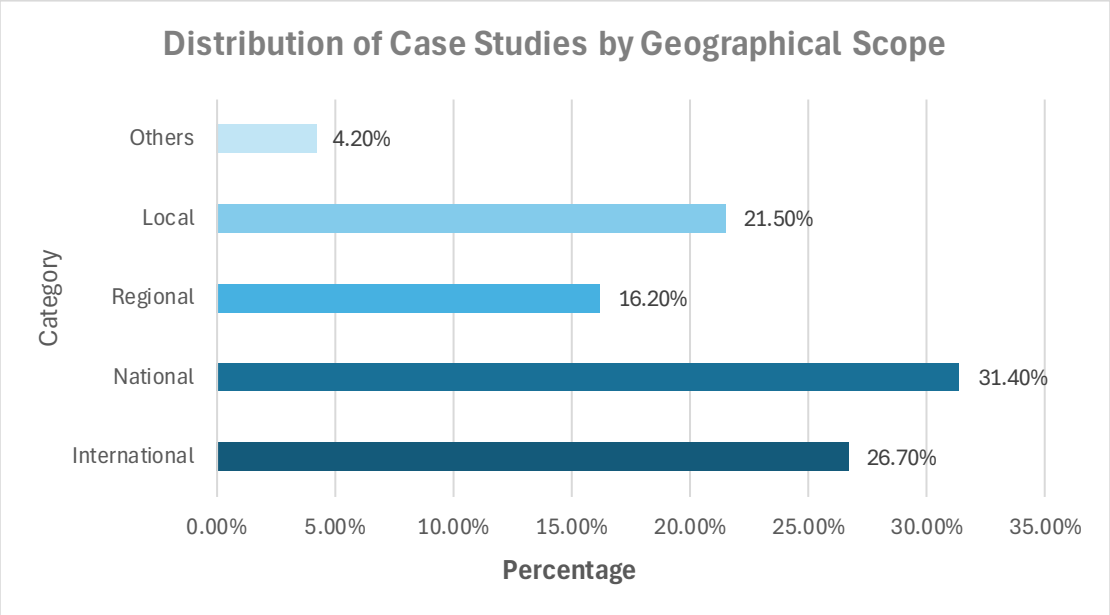


Figure 10. Distribution of case studies by geographical scope in percentage

The universities displayed comparable patterns in the allocation of geographical scope, including studies at the national, regional, and local levels. RUG, WUR, and UvA had the highest proportions of international case studies, whereas UU and RU had the lowest. During the study period, there was a clear rise in international case studies compared to case studies focused on the Netherlands, which include national, regional, and local scopes. Additionally, it is worth mentioning that there was a significant rise in international case studies, reaching its highest point in 2019. However, after 2019, a small decline in international case studies was noticed.

3.6 Topic Analysis

The subsequent section outlines the examination of the emerging themes or subjects derived from the manual review and LDA analysis, emphasizing the important aspects of student theses in spatial planning. To provide more detailed information, at first, a manual examination of 270 theses from the complete dataset was conducted, extracting theories, case studies, techniques, and keywords. Afterwards, text mining analysis using topic modelling (LDA) was applied to the main dataset consisting of 2311 theses. This research entailed extracting keywords by evaluating their significance and frequency within the dataset. These specified keywords were utilized to create a collection of texts and a reference book, enabling the Latent Dirichlet Allocation (LDA) model to detect patterns and categorize related phrases into meaningful subjects. The LDA analysis validated and refined the topics found via the manual review, resulting in the discovery of eleven different subjects.

The eleven subjects, or clusters, are listed in Table 4, together with the top ten related terms for each. It should be mentioned that, according to the topic modelling study, the following list includes the top 10 terms that are closely associated with each topic. The whole list is far more extensive, though, and many terms cross over into other subjects and clusters.

Topic	Name	Keywords
T1	Environmental Sustainability, Urban Agriculture, and Resilience	Sustainability, Green spaces, Climate change, Urban agriculture, Resilience, Biodiversity, Ecological Conservation, Urban-Rural farming, Urban food, Adaptive planning
T2	Water Resource Management	Water management strategies, Coastal Management, Flood risk management, Sustainable drainage systems, Water conservation techniques, Zone water security, River, Stormwater Management, Water corridors, Water conflicts
T3	Economic Resilience, Market Dynamics, and Urban Economics	Market dynamics, Circularity, Economic resilience, Investment strategies, Financial contribution, Tourism, Circular economy, Free market, Marketplaces, Integrated Territorial Investment (ITI)
T4	Governance and Policy Innovation	Policy, Governance models, Municipal structure, Power dynamics, Regulatory frameworks, Governmental levels, Sector integration, Regulation, Dutch spatial policy, Public Administration
T5	Infrastructure and Digital Technologies in Urban Planning	Smart cities, Infrastructure, Supplies, E-Planning, Railway, Port networks, Transportation Infrastructure, Resilient Infrastructure, Socio-Technical Systems, GIS
T6	Comprehensive Housing and Urban and Rural Developments	Housing, mixed-use development, Urban regeneration, Rural development, Smart Growth, Sustainable architecture, Land use planning, Community redevelopment, Housing policy, Zoning regulations
T7	Transportation Systems and Mobility	Sustainable transportation, Mobility planning, Public transit systems, Active transport, Road infrastructure projects, Urban mobility, Transit-oriented development, Electric bicycles, Bike sharing system, travel behaviour
T8	Cultural Heritage and Identity Preservation	Cultural preservation, Heritage sites, Urban identity, Historical urban landscapes, Cultural heritage, Historical preservation, Museums, Traditional practices, Archaeological conservation, and Intangible heritage.

T9	Public Health, Well-being, and Social Equity in Urban Spaces	Health in urban planning, Active living environments, Public health strategies, Green spaces, Community well-being, Justice, Elderly care, Youth health, Accessibility, Pandemics, Equity
T10	Energy Transition and Renewable Practices	Energy transition, Renewable energy integration, Solar systems, Sustainable energy policies, Energy-efficient buildings, Wind farms, Offshore wind farms, Wind energy, Climate action, Waste management
T11	Community Engagement and Participatory Planning	Community engagement, Participatory design, Stakeholder involvement, Community-led planning, Public participation, Stakeholder collaboration, Public involvement, Participatory planning, Stakeholder perceptions, Community-driven development.

Table 4. Topic names with the top 10 repeated terms in each cluster

- **Environmental Sustainability, Urban Agriculture, and Resilience**: This is a very broad topic which encompasses sustainable practices within urban environments, such as integrating urban agriculture and enhancing urban food systems. It also delves into themes related to urban resilience through adaptive planning, ecological initiatives, and green infrastructure. Moreover, this area includes various subtopics like urban forestry, green roofs, climate adaptation strategies, sustainable urban design, etc.
- **Water Resource Management**: This topic focuses on strategies and regulations for the effective administration and preservation of water resources in urban settings. This cluster concentrates on any other topics related to water. Themes such as flood management, river basin management, and urban water infrastructure are all included. Additional subtopics that might be explored include stormwater management, water recycling and reuse, water-sensitive urban design, coastal zone management and many other themes in this area.

- **Economic Resilience, Market Dynamics, and Urban Economics**: It focuses on studying the ability of urban areas to withstand economic shocks and assessing the financial aspects of urban development, including market trends and the functioning of enterprises in both urban and rural settings. Moreover, it encompasses urban tourism, the expansion of economic activities, and strategies to address economic disturbances. The subtopics include urban regeneration, property market dynamics, economic impact evaluations, and measures for promoting sustainable economic growth.
- **Governance and Policy Innovation**: This subject examines novel governance frameworks and policy development procedures to enhance urban planning and administration. The content encompasses deliberations on the principles, guidelines, and protocols that enable efficient urban administration. The subtopics within this category encompass participatory governance, policy assessment, regulatory frameworks, public-private partnerships, and the involvement of local government in urban planning. This cluster encompasses topics about the function of municipalities or any other governing bodies that have responsibilities or involvement in policies
- **Infrastructure and Digital Technologies in Urban Planning**: This area acts as an umbrella for the infrastructural themes and digital technologies in urban spaces and planning processes. It covers roads, railways, ports, underground infrastructure and many other urban facilities. Subtopics include smart cities, digital twins, intelligent transportation systems, urban informatics, and the integration of IoT (Internet of Things) in urban management among many others.
- **Comprehensive Housing and Urban-Rural Developments**: Issues with sustainable urban expansion, urban development plans, and housing policies are covered in this topic. Rural planning and social housing programs are also included. The subtopics encompassed in this domain consist of affordable housing, housing market analysis, land use planning, urban sprawl control, and mixed-use development, among others.
- **Transportation Systems and Mobility**: This area focuses on the examination of transportation planning and solutions for moving people and goods. It involves investigating how multiple forms of transportation can be integrated effectively in urban environments. The infrastructure encompasses dedicated lanes for bicycles, comprehensive public transportation networks, and cutting-edge technologies for efficient and convenient transportation. The subtopics encompass transit-oriented development, pedestrian

infrastructure, last-mile connectivity, shared mobility services, and sustainable transport policies, among other related subjects.

- **Cultural Heritage and Identity Preservation**: It focuses on preserving cultural heritage and maintaining the unique identity of urban spaces amidst development. It includes the conservation of historical sites, adaptive reuse of heritage buildings, and maintaining cultural landscapes. Subtopics include heritage tourism, cultural resource management, urban revitalization, and community-based heritage preservation and additional examples.
- **Public Health, Well-being, and Social Equity in Urban Spaces**: This topic explores the influence of urban design on the overall health, well-being, and fairness within urban areas. The topics included include feminism, gentrification, accessibility, and concerns impacting the elderly, children, and disabled citizens. Additionally, it analyzes the consequences of pandemics on urban health and development. The subtopics encompassed in this area of study consist of healthy urban design, social inclusion policies, accessibility to public spaces, mental health in urban environments, and the health effects of urban pollution, among other related concerns.
- **Energy Transition and Renewable Practices**: It mainly covers the transition from non-renewable to renewable energy sources and the implementation of sustainable energy practices in urban planning. The concept encompasses a range of energy sources in the context of urban planning, with a focus on shifting towards energy systems that are both environmentally friendly and able to withstand challenges. The subtopics encompass the integration of solar and wind energy, the design of energy-efficient buildings, the implementation of smart networks, the formulation of urban energy policies, and the financing of sustainable energy. However, these subtopics are not exhaustive.
- **Community Engagement and Participatory Planning**: This topic is the umbrella for the topics involving local communities and stakeholders in the urban planning process. It explores methods and strategies to ensure inclusive and participatory development. Subtopics include community-led planning, stakeholder analysis, participatory budgeting, social capital in urban planning, the role of NGOs and civic organizations, and many more.

3.6.1 In-Depth Topic Exploration

To better understand the pattern of topics over the study timeframe, in this step, each document was assigned to its most relevant topics while considering the highest contribution of keywords. Figure 12 visualizes the evolution of eleven topics using a ribbon chart with coloured layers representing each topic. This visualization facilitates an easy comparison of trends and patterns across multiple topics simultaneously, showing how the value of each data category changes over time. The ribbons connect the category values across the timeline, clearly indicating periods of increase or decrease. The results highlight significant differences among the universities, which will be analyzed in detail.

Environmental sustainability, urban agriculture, and resilience

According to the results, Topic 1, which covers environmental sustainability, urban agriculture, and resilience, has consistently been one of the top three most popular topics among students at all five colleges, with its popularity increasing over time. At Wageningen University, this topic has attracted the largest number of theses. The fourth interviewee from Wageningen University emphasized the institution's significant role in sustainability, highlighting their "*commitment to creating environmentally friendly environments and advocating for urban agriculture*". Students at Wageningen University demonstrate their commitment to sustainability by consistently studying topics related to urban agriculture and sustainable practices.

The second interviewee from Utrecht University stressed the importance of sustainability in spatial planning, particularly regarding "*climate adaptation and sustainable urban growth".* The representative from Radboud University, Interviewee 3, highlighted the focus on *"urban green spaces and the role municipalities play in promoting sustainable practices*." The fifth interviewee from the University of Amsterdam emphasized the growing emphasis on "*sustainability and resilience in addressing social issues like climate change and urbanization."* This focus aligns with the United Nations' (2015) 2030 Agenda for Sustainable Development, which outlines 17 Sustainable Development Goals aimed at addressing global challenges, including those related to environmental sustainability and urban agriculture (United Nations, 2015). Van den Bosch and Rotmans (2008) stated as well that, Dutch universities have incorporated sustainability, climate resilience, and green infrastructure into their curricula and these shifts reflect broader societal demands for sustainable living and the need for cities to adapt to environmental challenges.

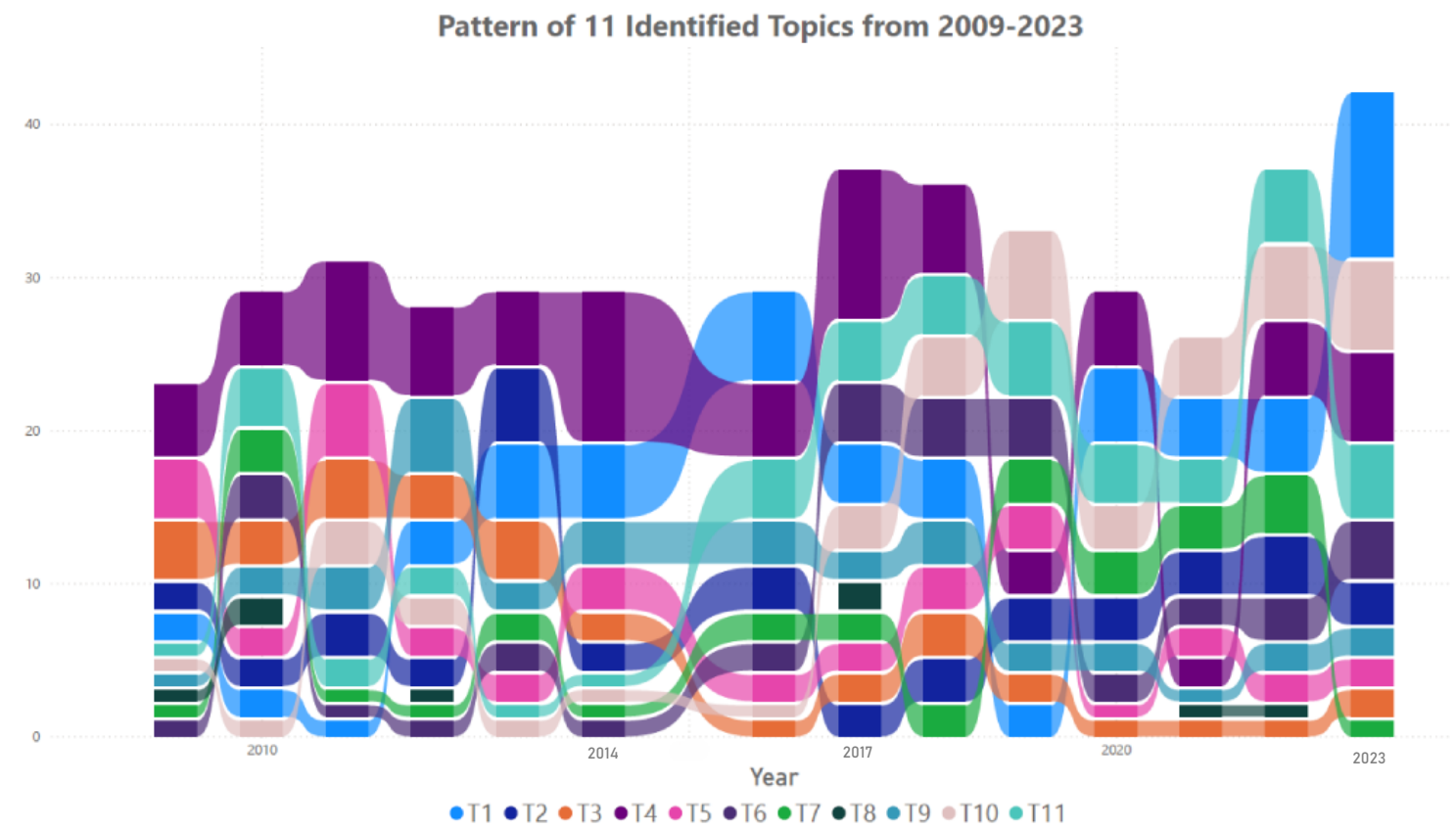


Figure 11. The patterns of 11 identified topics across five universities (2009-2023)

Governance and policy frameworks

During the study period, there was notable attention to Topic 4, which focuses on governance and policy frameworks, with a significant focus on all universities, especially among students at Utrecht University. This interest reached its highest point in 2017. Interviewee 2 from Utrecht University, highlighted the crucial significance of governance in spatial planning, specifically emphasizing the obstacles in organizing and the necessity for efficient coordination across many domains within urban planning. He specified the crucial "*role of governing systems in tackling complex matters like urban sprawl, sustainability, and infrastructure development*". He emphasized the significance of handling various issues, such as climate adaptation and the nitrogen crisis among many others which all require strong governance frameworks to effectively navigate. Similarly, Interviewee 5 from the University of Amsterdam noted that "*governance and policy frameworks are crucial for tackling current urban difficulties"*. He observed that students at UvA had a specific interest in the impact of governance frameworks on social fairness, public health, and urban resilience. This signifies an increasing acknowledgement of the significance of policy in spatial planning and its potential to generate urban landscapes that are both fair and sustainable. Nowak et al. (2021) assert that governance and legal frameworks play a crucial role in influencing spatial planning methods and dealing with the complexities of land use and urban growth. In addition, Robin (2016) emphasized the fundamental role of local governments in strategic spatial planning, specifically concerning the achievement of sustainable development goals (SDGs), underscoring the necessity of governance at all levels.

Economic Resilience, Market Dynamics, and Urban Economics

The interest in the economic resilience cluster, T3, is mostly observed during the initial years of the study, possibly due to the impact of the global financial crisis. This has led to a greater emphasis on market dynamics and the stability of urban economies. Interviewee 2 from Utrecht University states that students' research issues often reflect societal concerns. He added, following the 2008 financial crisis, "*there was a considerable focus on economic resilience for a certain length of time*". Interviewee 4 from Wageningen University also emphasized the growing focus on economic subjects and observed that students were increasingly investigating the resilience of urban areas in the face of economic shocks in the early years of the study period.

Water resource management

The diversity of topics increased over time. While clusters such as water resource management (T2), infrastructure and digital innovation (T5), mobility and transportation (T7), and housing and rural-urban developments (T6) always held student interest, however, their prominence varied. For example, water management was consistently among the top five topics, but it received more attention at certain universities, specifically Groningen University. The representative of Groningen University highlighted the university's strong emphasis on water resource management, noting how "*topics related to water management are particularly among the top three most important topics not only in the Netherlands but globally*." As van der Brugge, Rotmans, and Loorbach (2005) noted, "the Dutch water management system has undergone significant transitions over the past decades, moving towards a more integral and participatory style." Additionally, they emphasized that "water is postulated as a guiding principle in spatial planning, meaning that water is one of the dominating issues in spatial planning processes" (van der Brugge, Rotmans, & Loorbach, 2005). This stresses the significance of water management in Dutch spatial planning and its adaptation in light of environmental and societal problems.

Infrastructure and Digital Technologies in Urban Planning

What can be clearly seen in Figure 12 is the variation in student interest in the topics related to infrastructure and digital technologies in urban planning over time. This topic has followed a pattern similar to mobility studies, with its unique ups and downs while consistently attracting student interest. In the early years of the study, it was among the top three topics, showing its importance. This broad cluster includes both infrastructure and digital technologies, recognizing that digital innovation is closely tied to infrastructure development and management. The representative of Utrecht University emphasized the importance of "*urban infrastructure, particularly underground spatial planning, and the organizational challenges it presents"*. Despite the recent surge in digital innovation, there have been relatively few theses focused solely on this area. Instead, these topics are often combined within broader studies on infrastructure, reflecting the changing and dynamic nature of the field.

Comprehensive Housing and Urban and Rural Developments

Despite the crisis in the Netherlands, housing did not emerge as one of the most significant subjects overall. Nevertheless, students at Radboud University exhibited a significantly greater tendency towards this field in comparison to others. The topic of housing has been a consistent

focus in Dutch spatial planning, primarily due to the country's persistent shortage of housing and the resulting affordability crisis. The housing market's pressure has prompted the implementation of diverse policy measures and planning initiatives to augment housing availability and enhance affordability (Boelhouwer & Priemus, 2014).

Transportation Systems and Mobility

Despite the fluctuations, student interest in mobility remains unchanged, maybe due to evolving challenges and advancements in the business. Its dynamic and transforming character explains why topics related to mobility and transportation (T7) have always attracted the interest of students. The UvA representative discussed *"small-scale experiments, or how to change the urban environment through trial and error, particularly in the mobility field"* at Amsterdam University. These are the creative features that keep drawing the students' interest. Moreover, the RU interviewee mentioned the importance and the need for "*justice in mobility*" within urban space. These concerns highlight the complex character of mobility studies, which include not only technical developments but also socioeconomic and environmental factors which will guarantee that the topics related to mobility and transportation will always be an important and interesting subject of study for students.

Cultural heritage and identity preservation

Topic 8, which is cultural heritage and identity preservation, consistently had the least number of theses. Wageningen University representative, interviewee 4, declared that this area often felt like a "*black box*," but noted that efforts are being made to bring more attention to cultural heritage in spatial planning, reflecting a growing awareness of its importance in urban and regional development. According to Naheed and Shooshtarian (2022), combining cultural heritage with urban planning strategies is needed to foster social cohesion, creativity, and economic sustainability. They acknowledged that cultural heritage plays a critical role in maintaining the identity and historical continuity of urban areas, which is essential for fostering community resilience and general well-being. Furthermore, failing to consider cultural assets in the process of urban planning can result in the disappearance of distinct urban identities and historical associations, which are crucial for preserving the cultural essence of cities. Recognizing the significance of cultural heritage and incorporating it into the wider context of urban sustainability helps improve the social and cultural aspects of urban development, guaranteeing that cities remain lively and inclusive environments for all inhabitants.

Public Health, Well-being, and Social Equity in Urban Spaces

Over time, there has been an increasing focus on Public Health, Well-being, and Social Equity in Urban Spaces (T9), Energy Transition and Renewable Practices (T10), and Community Engagement and Participatory Planning (T11). The prominence of public health and social equity in urban planning research during recent years reflects broader societal concerns, particularly at UvA, highlighting the importance of healthy and equitable urban environments. This highlights the significance of creating urban settings that are both healthy and equitable. Interviewee 5 from UvA highlighted the "*notable trend towards prioritizing social equality and public health in urban planning"*, reflecting the growing societal desire for healthier and more inclusive urban environments.

Energy Transition and Renewable Practices

The significant focus on energy transition and renewable practices aligns with global initiatives towards sustainable energy and combating climate change. Interviewee 2 from UU highlighted that "*our focus on sustainable energy is driven by both academic interest and the pressing global need for renewable energy solutions*.". Similarly, the representative of Groningen University stated that "*the importance of sustainable energy practices has grown, and our students are increasingly focusing their research on how to implement these practices effectively in urban environments*".

Community Engagement and Participatory Planning

There is an increasing emphasis on inclusive and participatory approaches in urban development, which is reflected in the greater attention that is being paid to community participation and participatory planning activities. Radboud University representative emphasized that "*There is a strong push towards engaging communities directly in the planning process, ensuring that their voices are heard and that planning outcomes reflect their needs and aspirations.*" This shift indicates a broader recognition of the value of involving local communities in the planning process to ensure that urban development is more inclusive and responsive to the needs of its residents. The trend towards participatory planning and stakeholder engagement in the study aligns with Davoudi & Cowie's (2013) emphasis on the democratization of spatial planning processes.

General Reflection of Interviewees on Findings

Reflections of interviewees on the topics and clusters suggest that there is widespread consensus regarding the significance of topics, including governance, sustainability, and climate change. Having said that, they also highlighted the importance of further refining and concentrating on particular areas. It was suggested that participatory planning could be treated as a separate strategy or process rather than being considered as a distinct topic category.

Furthermore, it was recommended that public health could be classified as a separate subject from social equity. This recommendation was made to emphasize the growing significance of health considerations within the context of planned activities. There was a strong emphasis placed on the necessity of an explicit cluster on landscape and ecology, particularly in rural localities. This includes linking the urban agricultural topics to broader ecological and landscape considerations.

Regarding the challenges that society faces, there was a notable acknowledgement of the significance of tackling urban sprawl, the difficulties associated with infrastructure and organizing it, and the adaptation to climate change. The dynamics of urban-rural interactions and the shift from rural to urban green areas were also highlighted as one of the areas of focus. This is a reflection of the continuous trends in urbanization and the necessity of developing solutions for sustainable development. The development of study themes revealed a shift away from more conventional subjects such as housing and neighbourhood planning, toward more current concerns such as energy transition, urban food, and governance in different areas of planning.

Additionally, there is a significant demand for a shift towards more quantitative approaches and the integration of tools such as geographic information systems (GIS). This indicates a shift to employing more mixed methods or quantitative technologies in spatial planning.

3.7 Thesis Supervision and Topic Selection

MSc supervisors are generally assigned to students based on their research interests and areas of expertise. Styles and Radloff (2001) describe it as a "common language between a supervisor and a student while conceptualizing a thesis topic." This shared language, or mutual interest, is essential for facilitating effective mentoring and supervision. As a result, to have a different picture of the topics that students typically choose for their theses and analyse the data from a different angle, the names of the first supervisors were extracted from the 2311 thesis files to understand the trends of topics over the years based on the supervisors' interest and expertise.

The following table presents the frequency of the top 5 supervisors at five selected universities, based on the total number of theses they have supervised from 2009 to 2023. Although there may be little discrepancies in the statistics due to the utilization of publicly available information from each university's repository, the trends are noticeable. The area of expertise for each supervisor was determined by examining their profile information on the universities' websites or their profiles on Scholar, Scopus, or ResearchGate platforms. Additionally, graphs depicting the evolution of topics over the study period across four universities (UU, WUR, RU, and RUG) have been generated based on a manual analysis of 270 theses. These graphs are intended to facilitate a comparison of the results in Table 5 with the graphical data, highlighting any potential relationships. The UvA graph has been excluded due to inconsistencies and lack of available data over certain years.

Top 5 Supervisors of UU based on the Frequency																
Name	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**Total**
Tejo Spit	5	5	18	23	10	3	6	2	2	5	2	3				84
Friedel Filius	6	4	6	12	6											34
Patrick Witte							2	3	7	3	4	4	3	3	2	31
Stan Geertman		1		8	4	8	1	1	2	3	2	1				30
Thomas Hartmann						2	5	1	8	2						18
Top 5 Supervisors of WUR based on the Frequency																
Name	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**Total**
Gerrit-Jan Carsjens	2	1		4	2	4	4	3	1	2	6	1	1	2	2	35
Wim van der Knaap	1	1	4	2	3	7	3	4	1	1	2		2	1	1	33
Arnold van der Valk								3	2	4	4	2	1	3		19
Marleen Buizer					3	4	3	3	4							17
Raoul Beunen										1	4	5	2	1	3	16
Top 5 Supervisors of RU based on the Frequency																
Name	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**Total**
Erwin van der Krabben	1		13	9	6	7	1	4		5	5	5	8	6	1	71
Peter Ache				2	4	10		5	12	2	7	7	3	5	7	64
Sander Meijerink			5	2	3				1	4	5	4	6	5	7	42
Pascal Beckers					1	3		4	2	2	3	8	3	6	3	35

Karel Martens	1		5	7	3	4		3	2	4	3	1	1			34
Top 5 Supervisors of RUG based on the Frequency																
Name	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**Total**
Ferry van Kann	2	4	1			4	7	12	12	14	17	10	7	8	11	109
Terry van Dijk	4	9	7	7	5	4	5	4	4	6	4	3	4	3	4	73
Femke Niekerk	5	3	4	5	8	4	4	3	4	4	3	1	1	1		50
Gert de Roo	3	1	1	1	5	5	3	3	5	2	3	2	5	4	4	47
Johan Woltjer	7	6	9	7	7	5								3		44
Top 5 Supervisors of UvA based on the Frequency																
Name	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**Total**
Tuna Tasan-Kok	-	-	-	-	-	-	-	-	5	2	4		-	3	1	15
Maria Kaika	-	-	-	-	-	-	-	-	2	5	6		-			13
Federico Savini	-	-	-	-	-	-	-	-	5	4	2	1	-		1	13
Marco te Brömmelstroet	-	-	-	-	-	-	-	-	3	5	1		-			9
Richard Ronald	-	-	-	-	-	-	-	-		4	2		-		3	9

Table 5. Names of top five supervisors based on the number of their MSc supervision

Utrecht University

Tejo Spit played a consistent role at Utrecht University, supervising research projects on governance and policy problems, institutional approaches, land use planning, and water management, he had a great impact with a significant increase in his involvement from 2011 to 2013. Friedel Filius's main expertise was on housing, however, during the years from 2009 to 2013, she supervised a wide range of subjects, covering water integration to railway expansion, with the highest level of activity occurring in 2012. Patrick Witte has been routinely supervising theses on themes aligned with his areas of expertise, such as corridor development, infrastructure planning, smart cities, and urban governance, since 2016. Stan Geertman, an expert in planning and decision support systems, smart governance, and socio-spatial analysis, had substantial supervisory involvement in 2012 and 2014 regarding governance and participatory planning. Thomas Hartmann, renowned for his contributions to land policy, flood risk management, and water governance, exhibited notable peaks in 2015 and 2017. Furthermore, significant contributions were provided by supervisors such as Jochen Monstadt, Niki Frantzeskaki, Peter Pelzer, and Fennie van Straalen in the years 2023, 2022, 2019, and 2016, respectively. Their interests encompass a wide range of fields, including infrastructure, nature-based solutions, governance, sustainability, future thinking, and public policy, enriching the academic atmosphere. The institution had faced a noticeable increase in diversity of topics due to the expanding number of supervisors over the years. The graph below depicts the trends of themes in manual analysis that were allocated to students' theses, as indicated in the graph at Utrecht University, it is evident that the topics of T4, T5, and T3 are among the most prominent areas of research. These subjects centre around governance and policies, infrastructure, and economic dynamics within urban settings and the correlation between these topics and the core focus of most frequently engaged supervisors at this university is completely noticeable. However, it could be seen that while certain supervisors had their peaks at different times, there has been a general trend towards increased diversity in research topics and supervisors' areas of expertise, particularly in recent years.

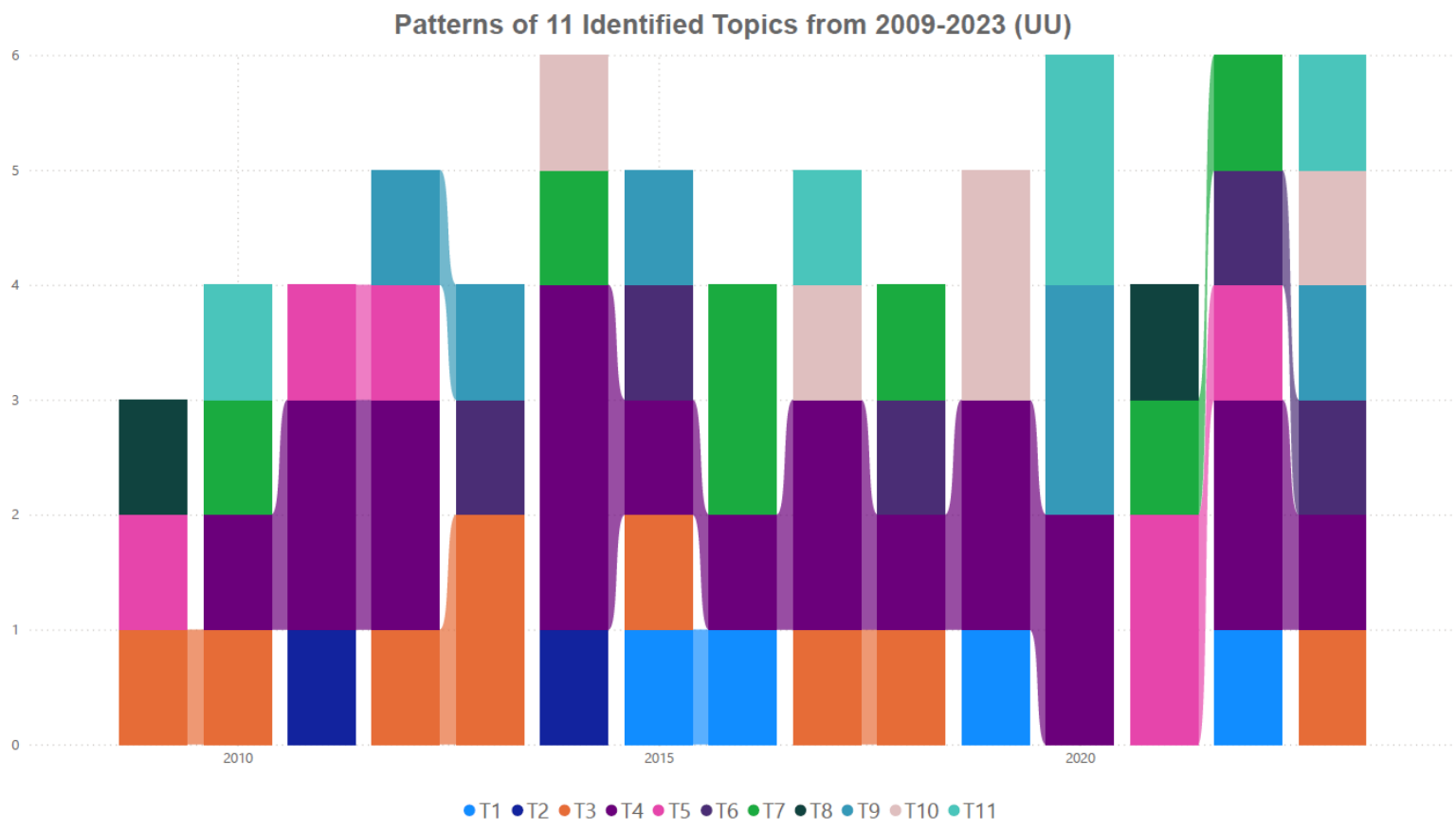
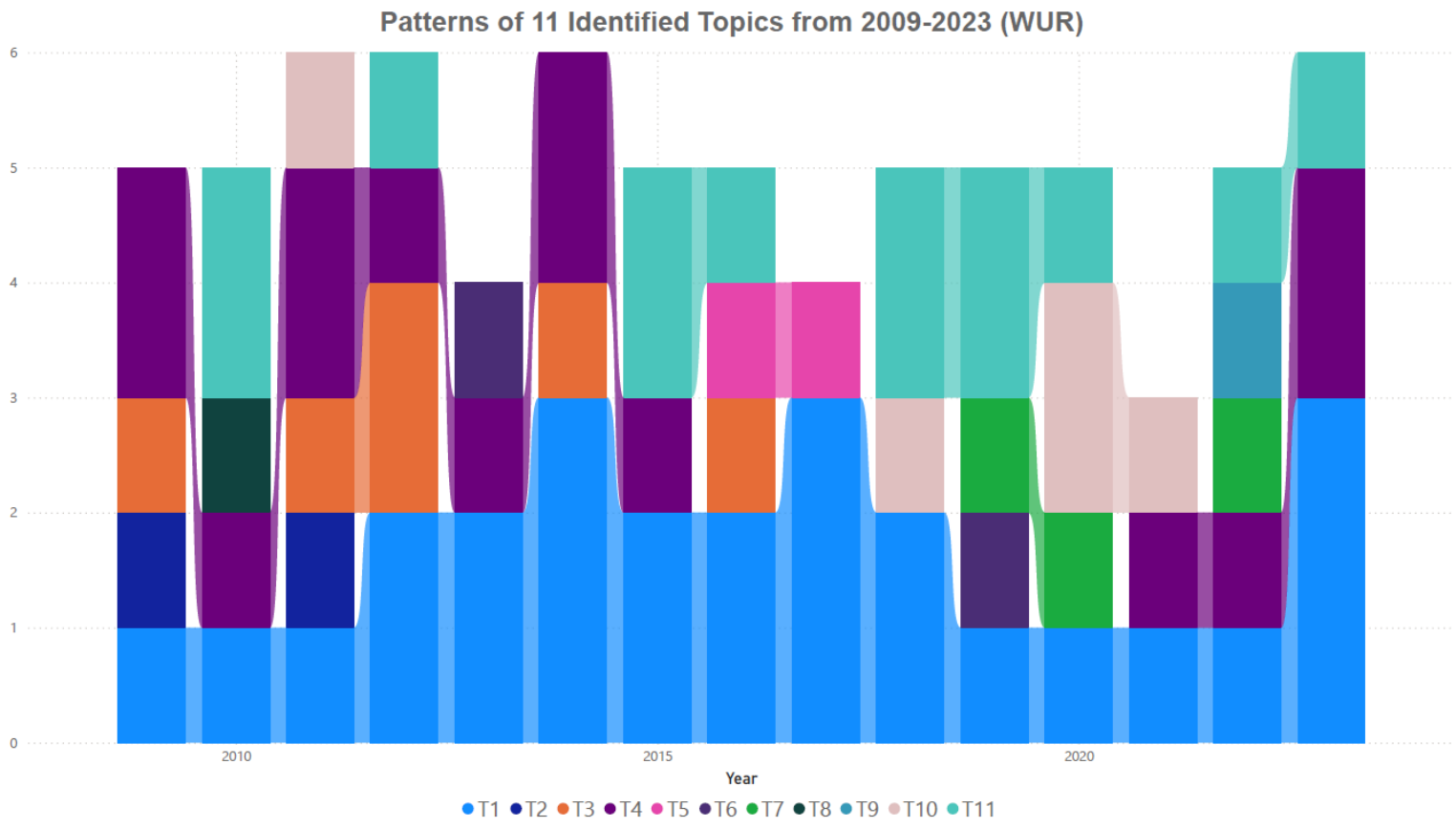


Figure 12. Patterns of 11 identified topics at Utrecht University (2009-2023)

Wageningen University

At Wageningen University, Gerrit-Jan Carsjens has provided regular supervision for theses for over 15 years, with a particular emphasis on land use, urban food, and environmental impact assessment, at its highest point in 2019. Wim van der Knaap has consistently provided supervision from 2009 until 2023, with a major focus in 2014 on issues including climate change, urban planning, and GIS. Arnold van der Valk has been providing consistent supervision from 2016 to 2022, focusing specifically on community food systems. Marleen Buizer demonstrated a notable rise in her level of supervision between 2013 and 2017, with a particular emphasis on the fields of politics, public administration, and biocultural diversity. Raoul Beunen, who has been actively engaged in recent years with notable periods of high activity in 2019-2020, specializes in the study of governance and policy, specifically in the context of natural resource governance. Over 15 years, the WUR has had a variety of supervisors. In addition, there were supervisors such as Thomas Hartmann who supervised 8 students in his field of expertise in 2011, Martha Bakker who supervised 5 students in 2017, and Wendy Tan who supervised 4 students in 2013. Although they made significant contributions in those specific years, they were not ranked as the most frequent supervisors.

As illustrated in Figure 14, Wageningen University's primary focus areas are T1 and T4. These areas are also the main focus of the university's supervisors. Notably, among the top five most frequented supervisors, the expertise of four of them is mainly on environmental sustainability, encompassing diverse themes such as food, natural resources, and land use, among many others. The exception to this trend is Marleen Buizer, whose expertise lies in politics, governance, and sociology within the realm of urban planning. The graph clearly indicates that the most debated topics are T1 and T4, the latter concerning urban governance and policies. This alignment between the university's focus areas and the expertise of its supervisors highlights the significant influence faculty members have on shaping students' research interests. The strong correlation between supervisors' research domains and students' thesis topics underscores the pivotal role of faculty in guiding academic inquiry.



T1: Environmental Sustainability, Urban Agriculture, and Resilience

T2: Water Resource Management

T3: Economic Resilience, Market Dynamics, and Urban Economics

T4: Governance and Policy Innovation

T5: Infrastructure and Digital Technologies in Urban Planning

T6: Comprehensive Housing and Urban–Rural Developments

T7: Transportation Systems and Mobility

T8: Cultural Heritage and Identity Preservation

T9: Public Health, Well–being, and Social Equity in Urban Spaces

T10: Energy Transition and Renewable Practices

T11: Community Engagement and Participatory Planning

Figure 13. Patterns of 11 identified topics at Wageningen University (2009-2023)

Radboud University

Erwin van der Krabben has been actively involved at Radboud University, particularly from 2011 to 2014 and 2021-2022, with a specific focus on land and real estate markets, smart governance, and area development. His significant supervision during these periods may explain why this university has excelled in housing-related topics, specifically in the areas of land use and housing, surpassing other universities. Peter Ache has continuously supervised theses about governance and strategic planning since 2012, with notable increases in 2014 and 2017, and a consistently strong contribution in recent years. Under the guidance of Sander Meijerink, the focus of supervision has been on water management, climate adaptation, and sustainability, with increased input on these areas in recent years. Meijerink has extensive experience in supervising projects for a longer period on topics related to water management, sustainability and climate adaptation. Pascal Beckers specializes in the fields of migration, urban studies, and economic geography, having its highest supervision in the year 2020. Karel Martens has demonstrated expertise in transport justice and sustainable mobility, particularly from 2011 to 2012the period of 2011-2012, under significant supervision.

Throughout the past 15 years, the university has witnessed a notable degree of variety of supervisors. However, the initial two years of the study exhibited a lower level of diversity, possibly attributable to the limited availability of data in 2009 and 2010. Supervisors including Arnoud Lagendijk, Linda Carton, Sander Lenferink, Kevin Raaphorst, and Iulian Barba Lata, among others, made noteworthy contributions in 2011, 2018, and from 2020 onwards, with a focus on economic geography, land use planning, collaborative planning, mobility, socio-political issues in cities, and transformative practices. Figure 15 represents an evolution of topics over a span of 15 years at Radboud University, emphasizing that T4, T3, T6, and T7 gained noteworthy interest among RU students. These themes are clearly associated with the five supervisors who have supervised most frequently at the university, as indicated in Table 5. More specifically, T4 corresponds mostly to the specialized knowledge of Peter Ache, T3 to Pascal Beckers, T6 to Erwin van der Krabben, and T7 to Karel Martens. Although these supervisors seem to have a significant impact in certain fields, it is plausible that other variables or supervisors also have a role in fostering the students' enthusiasm for these subjects. However, a strong connection between the popular themes and these supervisors can be seen.

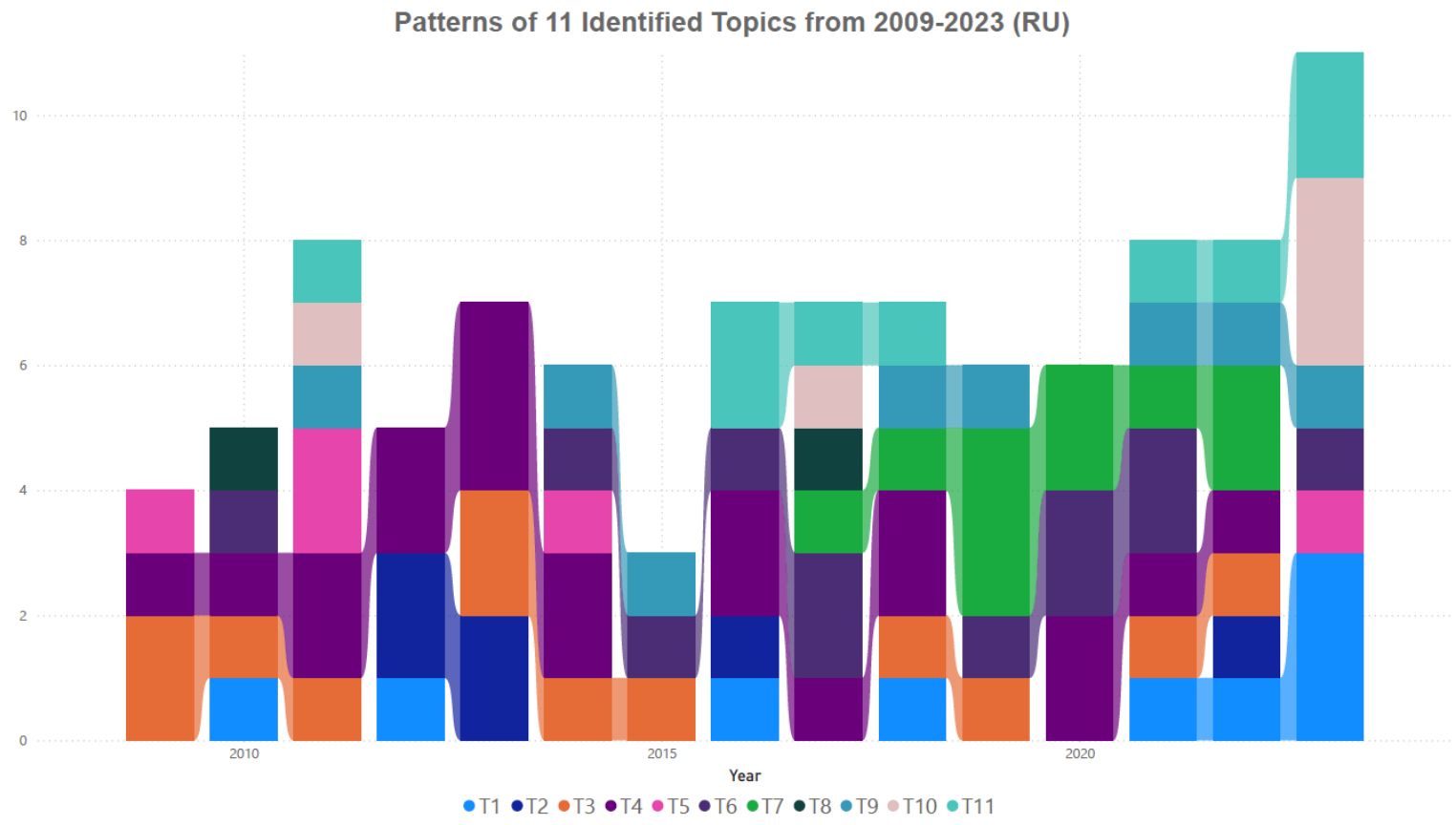
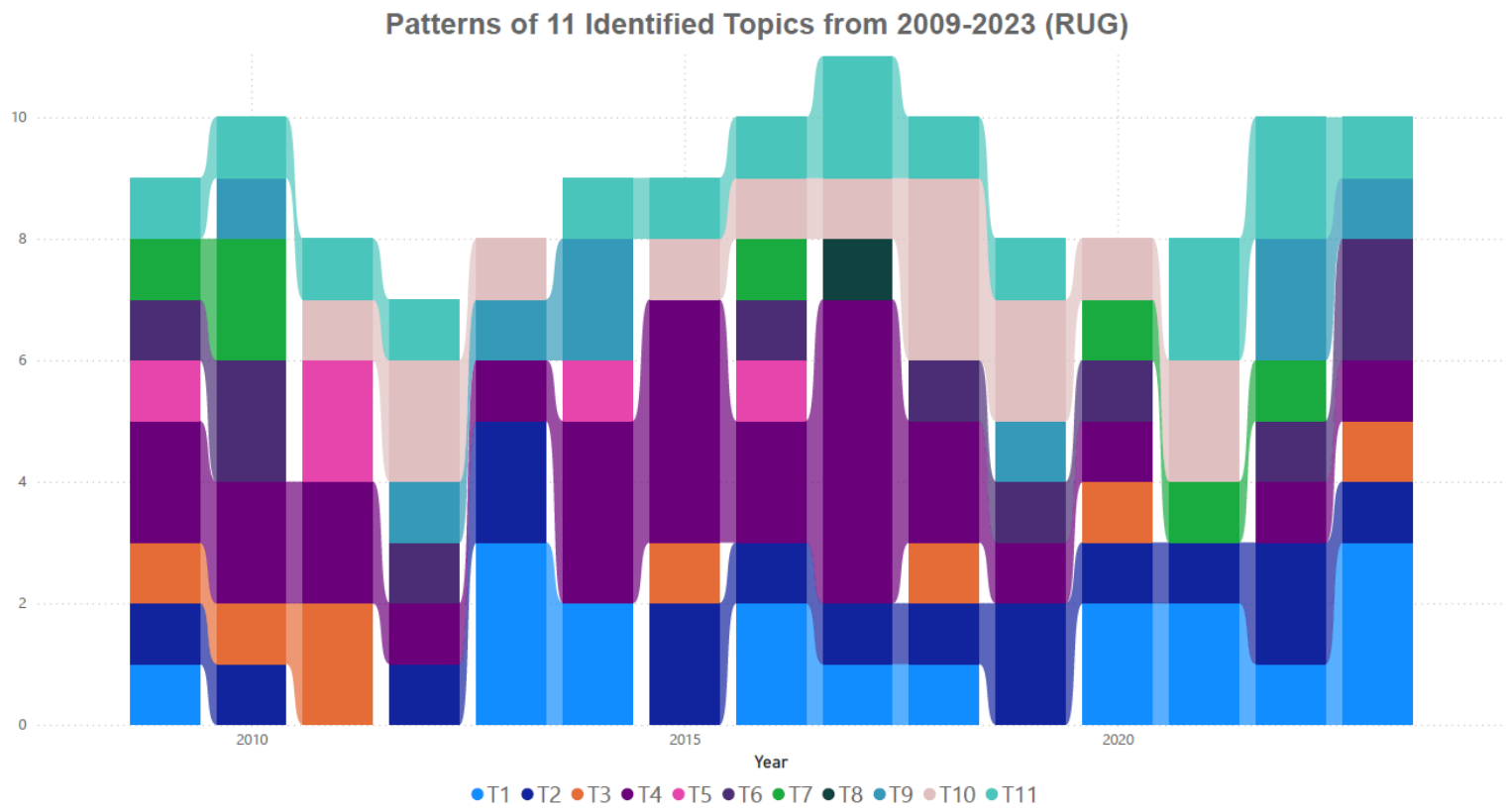


Figure 14. Patterns of 11 identified topics at Radboud University (2009-2023)

Groningen University

Ferry van Kann has continuously made valuable contributions through supervising in the majority of the past few years, particularly since 2016. His main areas of expertise and interests are environment and infrastructure planning, energy landscapes, and governance. Terry van Dijk has continuously supervised MSc theses at the University of Groningen for the past 15 years, with a special focus on the years 2010 to 2012. His areas of expertise include interaction, society, space, and the influence of design on planning processes. Femke Niekerk has mostly concentrated on sustainable mobility and creating cities that are child-friendly, with a gradual decline in emphasis over time. Throughout the years, Gert de Roo has regularly overseen decision-making, complexity, and planning, so contributing to the widespread acceptance of theories such as complexity among students at this university. Johan Woltjer, who held the highest level of supervision from 2009 to 2014, focuses on urban geographies, international planning, and regional development. Tan W.G.Z. was the most closely monitored supervisor in the field of transportation and infrastructure planning in 2015, out of all the supervisors. Based on the evolution of topics at Groningen University, as shown in Figure 16, certain relationships between supervisors' interests and notable trends can be identified. To be specific, T4, T1, T2, and T10 have emerged as the most popular topics, which align with the expertise of the top five most frequented supervisors. Precisely, Ferry van Kann focuses on governance and energy water, while Johan Woltjer specializes in water, which could be an explanation for why students at this particular university have exhibited a greater inclination towards choosing disciplines about energy transition and water management, compared to the other universities included in this study. This indicates that, at Groningen University, the emphasis placed by supervisors and faculties influences students' choices and interests.



T1: Environmental Sustainability, Urban Agriculture, and Resilience

T2: Water Resource Management

T3: Economic Resilience, Market Dynamics, and Urban Economics

T4: Governance and Policy Innovation

T5: Infrastructure and Digital Technologies in Urban Planning

T6: Comprehensive Housing and Urban–Rural Developments

T7: Transportation Systems and Mobility

T8: Cultural Heritage and Identity Preservation

T9: Public Health, Well-being, and Social Equity in Urban Spaces

T10: Energy Transition and Renewable Practices

T11: Community Engagement and Participatory Planning

Figure 15. Patterns of 11 identified topics at Groningen University (2009-2023)

Amsterdam University

At the University of Amsterdam, several supervisors have made noteworthy contributions in recent years, covering diverse fields. Supervisors such as Tuna Tasan-Kok, Maria Kaika, Federico Savini, Marco te Brömmelstroet, and Richard Ronald have been prominent in areas like urban governance, political ecology, environmental planning, urban mobility, and housing systems. Their guidance has significantly impacted research in these domains. Additionally, other influential supervisors, including Jochem de Vries, David Evers, and Mendel Giezen, have also contributed extensively to urban and regional planning, European policy, and urban environmental governance. Despite incomplete data in the university's repository, it is evident that many supervisors have played substantial roles in advancing various aspects of urban studies. (see appendix 7)

It should be noted that variations can occur each year due to the supervisors' schedules and availability, which may not always correlate with students' growing interest in a subject. Furthermore, fluctuations in the supervisor's supervision do not necessarily indicate a shift in students' topic interests; other faculty members listed in the appendix who have similar research interests can also act as supervisors for students interested in related subjects and topics, thereby compensating for the loss. Moreover, supervisors who contribute the most in a year are not necessarily group leaders and despite their significant activity, do not rank among the top five. This proves that the table of the top five supervisors offers a trustworthy performance indicator; nonetheless, there are various ways to examine and analyse the distribution of supervisors' data.

4. Discussion

This chapter delves into the study's findings, aiming to understand the patterns observed in MSc theses and assess the impact of societal changes on these trends. By analyzing MSc theses of five Dutch universities over the past fifteen years, the chapter seeks to clarify how future planners in academia respond to real-world concerns. The literature consistently highlights the crucial role universities play in serving their societies. On the other hand, universities are recognized for their "fourth mission," which emphasizes their responsibility as long-term collaborators in achieving sustainable societal outcomes (Frank & Sieh, 2016). Additionally, "the academic institutions that teach planning are changing, just as the society in which planners will need to operate. Universities are facing growing pressure to enhance the use of limited resources and to demonstrate their achievements through measurable targets. Outside academic institutions, the world in which planners will operate is also changing" (Bertolini et al., 2012). This highlights the significant role of universities in equipping students for an uncertain and constantly changing future. To better understand this, a combination of text mining techniques and manual analysis was utilized to investigate various characteristics in the theses of 2311 students.

4.1 Reflection on Methodology, Theory and Case Study

The results revealed a significant inclination towards qualitative research methodologies among students, mostly through the use of interviews. The use of qualitative methods aligns with the nature of spatial planning, which frequently involves complex, context-specific problems that demand thorough investigation. Nevertheless, the interviews with experts revealed a general agreement regarding the need to incorporate additional quantitative methodologies.

Participatory planning and transition theory were the most frequently employed among the various theories. Complexity theory was a prominent theory mostly utilised at Groningen University, where a prominent supervisor specialised in this topic. An illustrative instance that underscores the significant influence of academic mentorship on research direction is the prioritization of supervisory proficiency in students' choice of theories.

The substantial percentage of national case studies demonstrates a robust outlook within national Dutch spatial planning research. With having the international scope as the second which indicates that students are being equipped to tackle both urban and rural difficulties, not

just in the Netherlands, but also in many foreign settings and the prominence given to environmental sustainability in all case studies highlights its crucial significance in modern urban and rural planning education.

4.2 Reflection on Trends of Identified Topics

The most noticeable patterns of the eleven identified topics were that governance and policy topics consistently ranked among the top two areas of interest across all five universities. Notably, more than two out of the top 5 supervisors of the selected universities consistently showed interest in the domains of governance and policies. This could be another contributing factor to the prevalence of this topic. Environmental sustainability topics were similarly prominent, often competing with governance as the top focus area. At Wageningen University, the environmental sustainability cluster frequently topped the list over the timeframe of the study, while at the other four universities, it closely followed governance. This trend highlights the increasing significance of incorporating environmental considerations into urban development. The pressing necessity to tackle climate change has prompted significant transformations in urban planning education, placing a strong focus on sustainable urbanization and climate adaptation (Van den Bosch & Rotmans, 2008).

Water-related topics have consistently attracted significant attention, particularly at Groningen University, which was a pioneer in the number of theses related to this field. The steady interest in water management highlights its ongoing relevance in Dutch spatial planning, given the country's unique geographical challenges. Over the fifteen years of the study, there has been a noticeable increase in the number of theses on energy-related topics in all five universities, which reflects the global emphasis on energy transitions and the move towards sustainable energy practices. Groningen University demonstrated the largest number in this field, and it is important to point out that the most frequent supervisor at RUG University had expertise in energy, which could act as a guide for students towards this topic.

Topics linked to housing generated a moderate level of attention, although the Netherlands is currently confronting urgent housing challenges. Nevertheless, Radboud University demonstrated a greater prevalence of theses centred around housing, suggesting a specific and concentrated commitment to tackling this pressing matter. The Master's program at Radboud Univeristy program offers specialisation in Planning, Land and Real Estate Development, and

one of its top five supervisors specializes in housing which could all be the reasons for the higher contribution.

Over time, the public health cluster has gained more attention among universities. It signifies the increasing recognition of the important role of integrating health factors into urban development. The COVID-19 pandemic has emphasized the need for adaptable and resilient urban planning, emphasizing the crucial importance of public health in urban design (Tu & Reith, 2023). The University of Amsterdam has the highest number of theses in this discipline, potentially because the program is hosted by the Faculty of Social and Behavioural Sciences, which has a stronger focus on social sciences compared to other universities.

Theses related to infrastructure, mobility, and participatory planning continuously attracted interest, displaying variations but there were no noticeable patterns among universities. These topics continue to be essential in urban planning, demonstrating an enduring emphasis on creating effective and inclusive urban systems. Topics linked to urban cultural heritage and identity preservation within urban contexts gained the least attention over the timeframe, suggesting a potential area for future research. During the early years of the research, there was a greater focus on economic subjects, which were shaped by the aftermath of the 2008 financial crisis. The popularity of this attraction has declined, indicating a change in focus towards other rising urban concerns. Nevertheless, the enduring impact of these economic challenges underscores the necessity of addressing them within the framework of urban planning. This shift in focus also highlights the importance of evolving planning strategies to meet new and emerging realities, ensuring they remain adaptable and resilient in the face of dynamic urban conditions (Newton et al., 2023).

4.3 Implications of Findings

The analysis revealed that courses, curricula, supervisors' expertise, and societal challenges significantly influence thesis topics in spatial planning programs. Generally, the alignment of thesis topics with global and local issues, such as resilience and sustainability, shows that students in spatial planning address substantial societal needs. However, the hypothesis that spatial planning solely reflects societal changes is not entirely accurate. The study indicates that university curricula, course guides, and supervisors' expertise also influence these topics.

The research landscape is shaped by academic structures and supervisory guidance as well, ensuring that student research is methodologically rigorous and grounded in established theories. Although this connection is beneficial, it raises questions regarding the right balance between academic direction and student creativity. Schmitt and Magnusson (2024) analyze the difficulties associated with the process of designing educational plans for future planners. They raise the question, "Should we educate planners as ‘objective bureaucrats’ or as ‘change agents?" (p. 14). This question has a profound impact on the roles that we train our students for. To prepare future planners as change agents, it is necessary to go beyond technical rationality and instead focus on critical thinking to tackle the wider social implications in different planning situations (Schmitt & Magnusson, 2024).

While a regulated academic atmosphere promotes efficiency, it may restrict the development of alternative or innovative approaches to urban planning difficulties. Davoudi's (2020) concept of prefigurative planning is particularly relevant in this scenario. Prefigurative planning prioritizes the act of seeing and implementing alternative futures in the current moment. It involves rejecting the existing state of affairs and promoting imaginative and new approaches. This approach is in line with the increasing demand for educational programs that stimulate innovative and analytical thinking for the future of urban areas and regions (Davoudi, 2020). Therefore, the future trajectory of spatial planning education necessitates achieving a harmonious equilibrium between thorough methodological rigour and a strong theoretical foundation, all the while fostering ingenuity and analytical thinking.

By integrating curricula with worldwide sustainability objectives and integrating transformational, decolonial, and prefigurative approaches, planning education may provide future professionals with the necessary skills and knowledge to tackle the urgent urban challenges of our era. Currently, there is a prevailing perception that the implementation of radical policies and actions required for a shift towards sustainable development is typically considered impractical and unattainable. This situation necessitates a fundamental and profound shift in society, where existing social structures, practices, and cultures that hinder progress towards sustainability must be replaced with conditions that facilitate environmentally and socially sustainable paths (Naess, 2020). Therefore, it is essential to incorporate these viewpoints into planning education to promote the circumstances required for sustainable urban growth.

5. Conclusion

This final chapter answers the main research question, which is "*How has Dutch spatial planning research responded to societal developments over the past 15 years, as reflected in MSc thesis research?*" The chapter is structured to first respond to the three sub-questions, then the main question, and finally provides recommendations for future research.

5.1 Research Questions

Sub-questions

1. *What are the predominant topics in recent theses, and how do they align with contemporary societal challenges*?

By using text mining techniques, specifically Latent Dirichlet Allocation (LDA), and manual analysis, eleven topics or clusters were identified based on the theses that students have written from 2009 to 2023. The results showed that the most popular topics are environmental sustainability, urban agriculture, resilience and governance and policy in general. These topics match with the current societal challenges of climate change, urban resilience and the need for policies and governance in both urban and rural areas. The focus on these areas also shows how spatial planning research is responding to global and environmental issues through policy frameworks. In addition to the most popular topics, energy and health-related topics are growing in interest. This growth reflects the increasing urgency of transitioning to renewable energy sources and addressing public health concerns, both of which are critical in the context of sustainable development and climate change mitigation. In contrast, economic subjects are experiencing a decline in popularity, which may suggest a transition to more comprehensive and integrative planning strategies that focus on environmental and social factors.

While societal challenges are a significant factor in the development of thesis topics, the study revealed that other factors also have an impact on these decisions. Faculty expertise and institutional priorities are among many other factors that influence the direction of research.

2. *What are the key developments in methods and theories within MSc theses in Spatial Planning over the past 15 years, as revealed through longitudinal content analysis*?

In the past fifteen years, there has not been a significant diversification in research methodology, with qualitative methodologies being the primary ones. Furthermore, students identified interviewing as the most effective method for conducting their research. However, there has been a gradual tendency to adopt mixed methods by integrating techniques such as GIS.

Theories of participatory planning have been prominent over the years, and transition theory has also seen increased focus, reflecting a shift towards more inclusive and adaptive planning practices. Multi-level perspective and complexity theory are also among the top theories, for managing complicated planning dynamics. It is noteworthy to mention that the results face some differences depending on the university.

3. *What are the observable differences in planning approaches between the five chosen Dutch spatial planning schools?*

The five Dutch spatial planning schools have common research themes, particularly in the areas of governance and sustainability. Utrecht, Groningen, Amsterdam, and Radboud universities highlight governance and policy frameworks as essential areas of focus, acknowledging their significance in tackling organizational and social difficulties. In line with global sustainability goals, WUR focuses on environmental sustainability and urban agriculture. All universities focus on energy transition, participatory planning, public health, and water management as key themes. Overall, RUG, UU, and RU students are more drawn into infrastructure-related themes than WUR and UvA. Moreover, research on housing, urban and rural developments, and economic issues is more prevalent at the University of RU. Mobility and transportation clusters attracted consistent interest across all universities. Although there are some small differences, the results show that students at selected universities address all the issues of the current time through their theses.

Main Question

How has Dutch spatial planning research responded to societal developments over the past 15 years, as reflected in MSc thesis research?

Over the past 15 years, Dutch spatial planning research has undergone a significant transformation, as evidenced by the MSc theses produced at five major universities: Utrecht University (UU), Wageningen University (WUR), Radboud University (RU), University of

Amsterdam (UvA), and University of Groningen (RUG). Students' theses collectively paint a nuanced picture of how the field has responded to societal changes and global challenges.

One of the most striking trends is the shift in thesis language towards English. This change reflects the increasing internationalization of academic research, facilitating global knowledge dissemination and highlighting the growing importance of international perspectives in spatial planning. A detailed topic analysis of these theses revealed several emerging focus areas. In recent years, there has been a strong emphasis on public health, well-being, and social equity in urban spaces. This shift indicates a response to societal concerns such as the impact of the COVID-19 pandemic and the recognition of the need for healthy and inclusive urban environments. Despite the pressing housing crisis in the Netherlands, housing-related topics have not dominated the research landscape. Instead, the focus has shifted towards energy transition and environmental sustainability, reflecting global societal impacts and challenges.

The research landscape is likewise influenced by the interests of supervisors besides the specific academic focus of each university and the course guide. For instance, RUG has a notable emphasis on water and energy issues, aligned with its institutional strengths. UU, with its strong focus on governance, have published many theses related to this area. WUR's course guide and supervisor interests are mostly oriented towards urban agriculture and ecology, resulting in related research topics. RU's specialization in real estate is reflected in its numerous theses on housing, while UvA's focus on health and social equity besides governance and policies stems from its program within the Social and Behavioral Sciences faculty.

This alignment between academic guidance and research outputs highlights the dual influence of societal needs and institutional planning on the field of spatial planning. The structured academic environment ensures that student research is systematically robust and aligned with current academic standards. However, there is a crucial need to balance this structured guidance with fostering student-driven exploration and innovation. Encouraging creative thinking and the pursuit of new ideas will equip graduates with the skills and mindset necessary to develop innovative solutions for future urban challenges.

In conclusion, Dutch spatial planning research, as reflected in MSc theses, has evolved to address a wide range of societal developments. The increasing focus on sustainability, governance, public health, and the integration of diverse methodologies demonstrates a responsive and adaptive approach to the changing needs and challenges of society. While the research landscape is also shaped by institutional planning and supervisor expertise, the field

needs to continue reinventing itself. This approach ensures that spatial planning remains relevant and capable of addressing both current demands and future uncertainties, ultimately benefiting society as a whole.

5.2 Future Research Recommendations

For future research work, more universities could be included as case studies in the analysis to bring more diversity and capture more perspectives and approaches. The long-term impact of thesis topics on students' professional careers and their contributions to the field would also be interesting to see how academic research affects career paths and practical applications in the urban planning profession. Furthermore, obtaining access to additional data, such as theses that are not accessible through online repositories would improve the findings. The inclusion of the earliest years of spatial planning programs would also broaden the scope and offer a more comprehensive understanding of the evolution of research topics. Moreover, conducting interviews with a larger number of supervisors and professors would add more qualitative depth, offering nuanced insights into the academic and societal influences on research trends. This would provide valuable insights into how academic research influences career trajectories and practical implementations in urban planning.

The integration of AI into Python programs would result in more precise and superior results during the text-mining phase. The quality and profundity of the research would be enhanced through interdisciplinary collaboration with AI and data science experts. These recommendations will enable future research to gain a more comprehensive and dynamic understanding of the field, thereby guaranteeing that spatial planning education and research remain forward-thinking and pertinent.

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7. Appendix 1

Interview Questions

Interview Questions	
1	In your opinion, what are the most important societal developments in the context of spatial planning? and how would you define its scope?
2	Reflecting on the past decade, how have you observed the evolution of research themes (topics) in spatial planning in response to societal changes?
3	How have global or local events, such as the 2008 economic crisis, shaped the research topics chosen by spatial planning students?
4	Can you tell me how educational programmes are organized? Are they based on the needs of society and in what ways are current educational programs preparing students?
5	Could you discuss the major changes in theories and methodologies applied in spatial planning theses over recent years?
6	What do you think about integrating more interdisciplinary methods or courses in spatial planning?
7	The reflection of the interviewee on the quantitative results of the study.
8	Are there any other relevant topics to look for? If yes, I would love to know that.
9	In your perspective, in what ways have career perspectives and choices of internship placements influenced spatial planning research trends by students?
10	What are the benefits and challenges of aligning Dutch national planning education with broader European trends and standards?