Changing Dynamics in Reporting about Land Change

An analysis of Dutch Newspaper coverage on land change from 1990 to 2020

Bachelor Thesis Global Sustainability Sciences
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Summary

According to the 2019 IPCC *special report on Land*, land use is essential in the combat against climate change. The way humans practice agriculture, deforest land, or protect nature influence how much carbon will be emitted or absorbed. Especially in the Netherlands, tension over land use is ubiquitous. The scarce amount of land is needed for food production, climate mitigation and nature conservation. To study this tension and the human component of land use, this thesis studies the question: *Has Dutch newspaper coverage on change in land use and land cover changed in 1990-2020, and if so, in what way?* A quantitative and qualitative analysis of the top five Dutch national newspapers provides an answer to this. This analysis shows an overall increase in number of publications over time, with a peak of publications published in 2018 and 2019. Topics such as climate change and agriculture follow the same quantitative dynamic, whereas the attention for water and biofuels have unique dynamics. This study explains these quantitative dynamics and link them to the content of the newspaper articles. Furthermore, it explores qualitative dynamics for the topic of food production and consumption to gain insight into the framing of the relation between land use and food. The results show an increase in interest for the topic of land use following national and international politics and academics. Media attention rises with the publication of international reports, national politics or after land change disasters. Frames in the topic of food production and consumption change towards more attention for the impact of eating animal products and other individual lifestyle choices. The framing of biofuels shows a movement from a polarized debate between pro biofuels or against biofuels towards more nuance. The coverage on land changes in the Netherlands is therefore changing and raises an important question for further research: Is mass media influencing the political debate surrounding land change, or is the other way around?

320 words

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1. Introduction

The importance of studying land use and -cover change

In 2019, the IPCC published a special report on the role of land in the climate debate, concluding that agriculture, forestry and other land use account for nearly 25% of the global human anthropogenic emissions (Intergovernmental Panel on Climate Change, 2022). Land use and land cover change (LULCC) are two different factors that account for 'land change' and are both linked to the global climate debate in various ways (Dale, 1997). Land change can influence the amount of greenhouse gasses stored or emitted, impact biodiversity and local hydrological surface properties such as the water retention and availability (Garg et al., 2019; Pongratz et al., 2021). As a result, LULCC could both be part of the solution for climate change, as well as the problem. For example, the way humans practice agriculture (land use) can influence land cover by changing the vegetation from forest to cropland (Pongratz et al., 2021). Land change can thereby influence the ecosystem services that the land provides (Shrestha & Acharya, 2021). This dynamic exists on a local, regional and even global scale (Fulford et al., 2022; Jia et al., 2022; Li et al., 2023). Because of the relation between land use practices and climate change, land use is important to study in the field of sustainable development.

Land use as a social construct

Land change, and especially land use, is related to sociological factors such as human behavior: the way we do agriculture, build cities or deforest land are all human practices (Dale, 1997; Shrestha & Acharya, 2021). Land use practices are influenced by a variety of socio-cultural factors such as policies, laws and demographic processes (Campbell et al., 2005; Long et al., 2020). The preference for which land use policy instruments exist is partially linked to the cultural worldview of citizens, and how they view the problem or solution (Diriye et al., 2022; Kemper et al., 2018). As this worldview is socially constructed, it is important to study the phenomenon of land use in the constructivist perspective (Diriye et al., 2022). This perspective entails that a phenomenon should not be viewed as an objective reality, but in the context of the public perception of the phenomenon (Delclaux & Fleury, 2021). Mass media, such as newspapers, is of great influence on the public perception of an issue due to their ability to decide the narratives that are discussed, and their choices of topics and frames (Delclaux & Fleury, 2021; McCombs & Shaw, 2017; Vossen, 2020). Therefore, to study the public perception of land use, it is important to question in what ways the media coverage on LULCC has changed over time.

Land use in the Netherlands

Public interest regarding land use is especially present in the Netherlands. On the scarce amount of land, there is tension between urbanization, agriculture, nature conservation, green energy development, and our fight with the water (Janssen et al., 2020). This dynamic makes it appropriate to research in what ways the Dutch land use debate has developed over time. There is a clear increase in the quantity of publications regarding land use in Dutch newspapers over the past thirty years. Figures 1 and 2 show this increase. To explore this change, together with qualitative developments, this thesis answers the following research:

Has Dutch newspaper coverage on land use and land cover change changed from 1990 to 2020, and if so, in what way?

This thesis provides an answer to this question by studying 481 articles containing the word land use in a quantitative and qualitative manner. Using thematic analysis, this study explores the changes of topics over time, as well as the way the framing of several of these topics develops. It links these developments to the political and international developments to distill in what ways the debate regarding land use in the Netherlands has changed. Quantitative changes can often be explained through national politics, publication of international reports, and land change disasters. Especially the publication of the IPCC special report on Climate Change and Land and the *nitrogen crisis* can explain the peak in 2019.

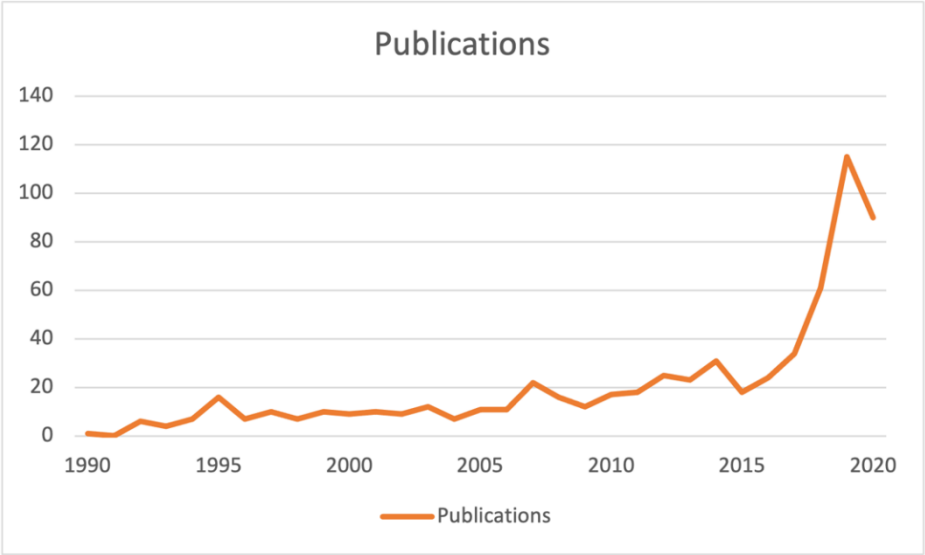

Figure 1. number of publications containing 'land use' per year

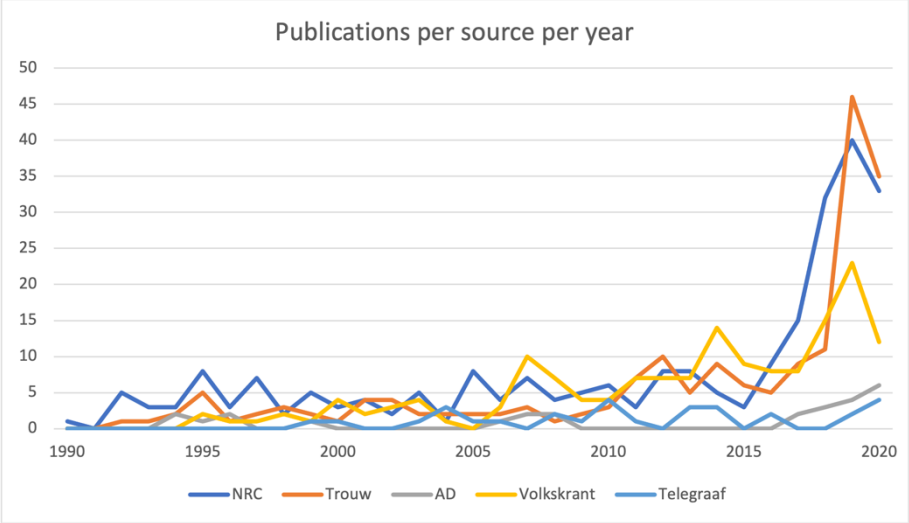

Figure 2. Number of publications containing 'land use' per source per year

2. Theory/ concepts

Defining Land Change

In this thesis, *land use* refers to the way in which humans manage the land and *land cover* refers to the vegetation on the land. LULCC has been a large impacting factor on ecological variables for centuries (Dale, 1997). Land change is not necessarily a positive or negative phenomenon. A different form of land use can be seen as good, for example when it creates more food through

agriculture, when it provides housing or when it captures carbon through for example afforestation (Pongratz et al., 2021; Shrestha & Acharya, 2021). However, these changes can also have negative impacts. For example, when they decrease the biodiversity and ecosystem services by deforestation for the creation of cropland, or when they increase the emission of greenhouse gasses (Pongratz et al., 2021; Shrestha & Acharya, 2021). Whether or not land change is observed as a problem therefore depends on the public perception.

Public Perception

Land use is mostly a human practice, which is influenced by land use policy (Diriye et al., 2022). As policy is influenced by the way citizens view a phenomenon, this thesis studies the public perception of land use in the Netherlands. Public perception is defined as how the public and key actors, such as policy makers, understand a problem (Wester et al., 2022). This thesis uncovers public perception through media analysis of Dutch newspapers.

LULCC and the agenda setting theory

LULCC is considered a social phenomenon as it is mostly a human practice that is influenced by land use policies (Campbell et al., 2005; Diriye et al., 2022). How the problems and solutions are perceived, is constructed based on a process of definition between different stakeholders (Delclaux & Fleury, 2021; Wester et al., 2022). Therefore, the phenomenon of land use should be studied from a constructivist perspective. This can be done based on agenda setting theory (Delclaux & Fleury, 2021). According to this theory, mass media influence the weight that is accorded to these socially constructed problems on the public agenda (McCombs & Shaw, 2017). As media influence the public perception of problems, it could influence the way humanity deals with the ambiguity of the land change phenomenon. This is because media, such as newspapers, are of influence on how the public and policymakers understand a phenomenon (Hameleers & Vliegenthart, 2020; Vossen, 2020; Wester et al., 2022). The framing of phenomena contributes to this understanding(Entman, 1993; Vossen, 2020). Entman (1993) defines framing as to:

> *select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described.*

Frames diagnose problems and causes, make moral judgements, and suggest remedies (Entman, 1993). The way land use is framed, influences the public perception of the phenomenon. Depending on how we perceive land change, it can be used as a solution for climate change or as an issue that needs to be solved. Therefore, this thesis analyzes Dutch newspaper coverage of the phenomenon land use.

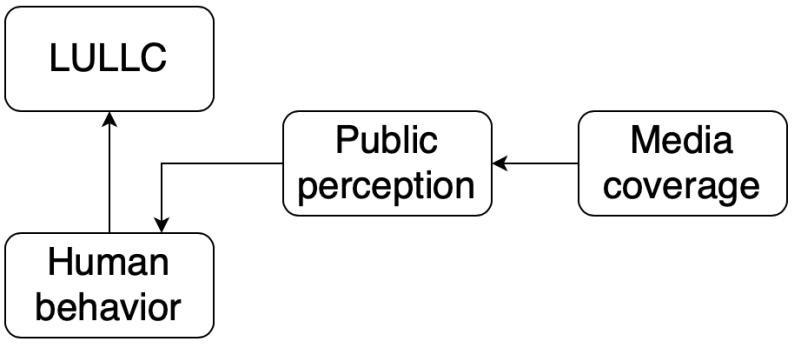

Figure 3. Theoretical framework relation media and LULCC

3. Method

This thesis' dataset consists of newspaper articles from the five largest newspaper sources in the Netherlands. It is analyzed using a process of coding with NVivo.

3.1 The Data

This thesis provides both quantitative and qualitative analysis of media coverage on land change in Dutch newspapers. The data for this analysis consists of articles by the five largest newspapers in the Netherlands: *de Telegraaf, Algemeen Dagblad (AD), NRC Handelsblad, Trouw* and *de Volkskrant*, including their online articles. This selection is based on other newspaper coverage research in the Netherlands (Hameleers & Vliegenthart, 2020). De Telegraaf and AD are more popular newspapers whereas the other three are broadsheet ones (Ibid.).

Those articles are collected through the online newspaper database of LexisNexis and are searched with the term *landgebruik (land use).* This thesis adopts a thirty-year timeframe, from 01-01-1990 to 31-12-2020. This timeframe is chosen because the oldest articles in LexisNexis about this topic emerge in the 1990s. For the word *landgebruik*, 677 articles emerge in this database, of which 273 articles are somehow related to food and 278 are broadly related to the term forest. As shown by the figures in the introduction, there is an increase in publications regarding the topic of land use over time. The concept of *landbedekking (land cover)* yields only 5 articles in the database, therefore this thesis mainly focusses on the term land use.

Double articles and articles that that only mention the term land use whereas the main topic of the article is related to something completely different (for example: a student of tropical land use is interviewed about something not related to land use such as student loans) are filtered out of the data. The decision for double articles is based on the first and last paragraph of the articles, as sometimes the headlines or precise wordcounts are different in LexisNexis. If this occurs with an article that is both published in paper and online, the online article is deleted from the database as this thesis has a focus on print paper. Furthermore, articles that only contain a picture or a graphic without textual context are deleted from the data as well. This process has left a total of 481 newspapers in the database (*N=481)*. Figures 4 and 5 show the data over time after the process of filtering.

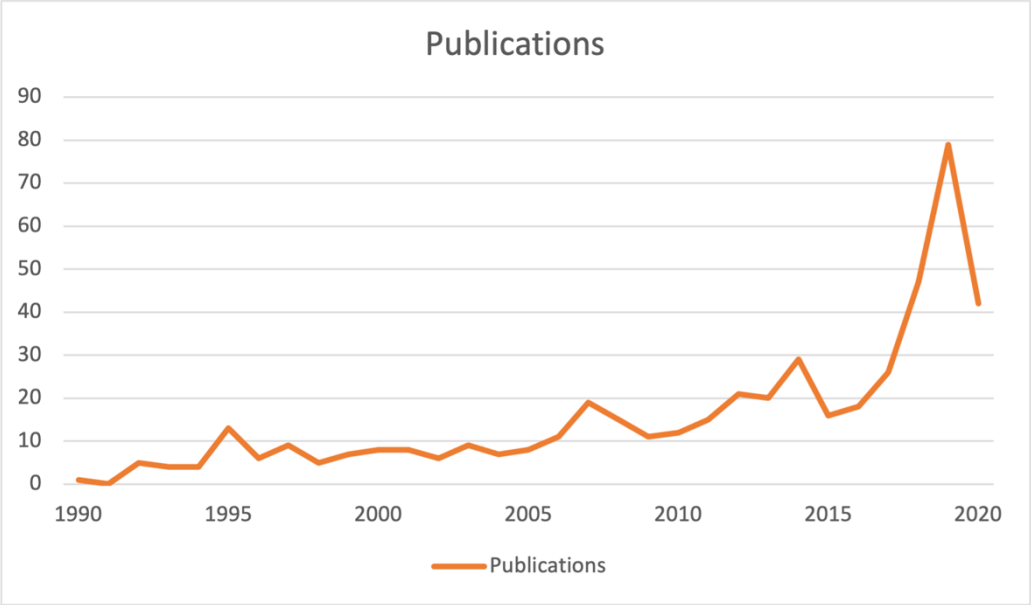

Figure 5. number of publications over time filtered

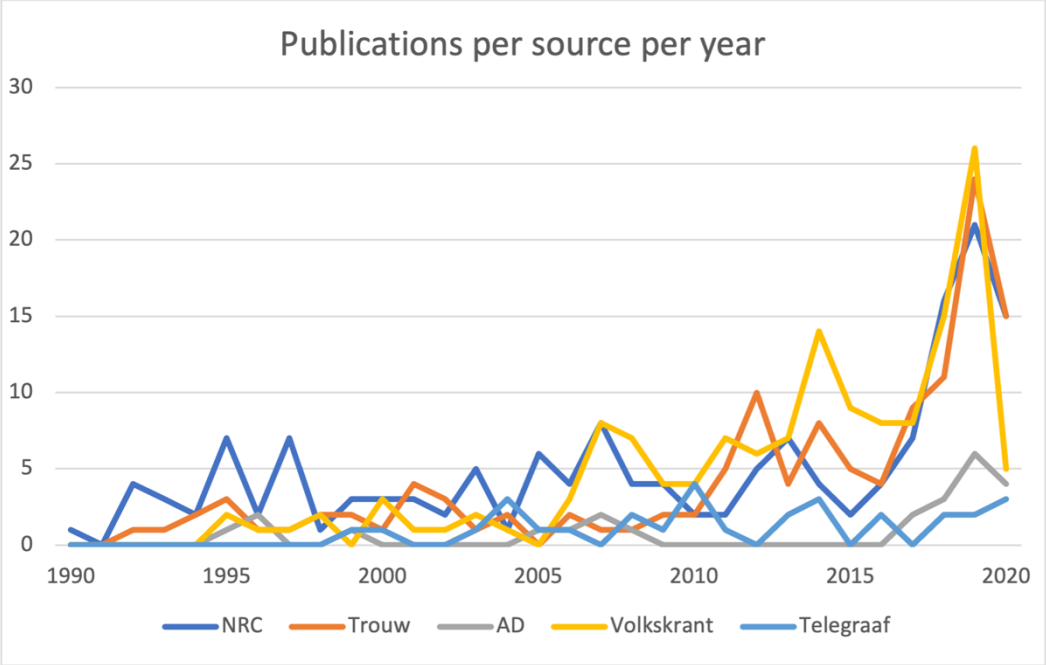

Figure 4. number of publications per source, filtered

3.2 The Method

After downloading, the researcher analyses these newspaper articles through a process of coding in NVivo. In this program for qualitative analysis, the research makes codes to track emerging themes and topics. These codes relate to different sub questions in order to research the changes in newspaper coverage. The process of coding is based on the Strauss and Corbin approach as described in the book *social research methods* (Bryman, 2016).

This approach suggests three rounds of coding. It starts with a round of *initial coding*, to see which themes emerge. A second round of coding, *axial coding*, links these emerging codes to the context of the articles. After this, a third round of coding, *selective coding*, can be adopted. In this round, the researcher tests emerging results and theories against other data. For this thesis, I will only be doing the first two rounds, because the research question can be answered without testing the emerging theory against other data, as this thesis does not aim to find a grounded theory.

For the initial coding, the researcher organizes the articles by source, year and main topic (for example: *NRC, 1991, food production)*. This is done to see which topics emerge. Files are named after the year in which the article is publicized and classified by newspaper source. If an article is related to multiple topics within land use, the researcher codes it to all the themes it relates to. In the second round, the articles are analyzed in a more in-depth manner. The references within codes are read again to see which developments emerge within a topic. This is done to explore the framing within topics as a qualitative analysis, but also to see what is of influence on the quantitative developments.

This helps by answering different sub questions, such as:

- *Is there a changing quantity over time?*
- *What different topics are reported about within LULCC and are these changing?*
- *What is of influence on the changing topics?*
- *What frames emerge and are these frames different over time?*

4. Results

Quantitative results from the analysis in NVivo are shown in the figures below. The articles are analyzed both in a quantitative and qualitative manner.

4.1 Quantitative Results

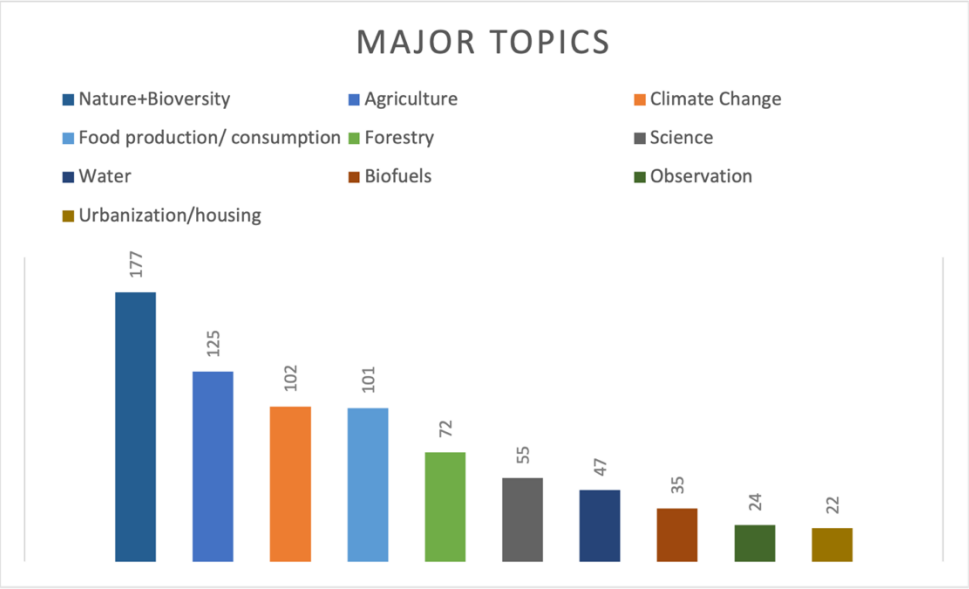

Figure 6. Number of articles for the 10 major topic categories.

The figure above shows the number of articles for the ten major topic categories. It is shown in total number of publications related to the topics. Most articles related to land use discuss either *nature and biodiversity* (N=177), *agriculture* (N= 125), *climate change* (N=102) or *food production/ consumption* (N=101). As multiple articles contain several topics, the total number of topics mentioned is larger than the total number of articles collected in the database. Nature + biodiversity is a combined category of articles that were first either categorized as nature or biodiversity.

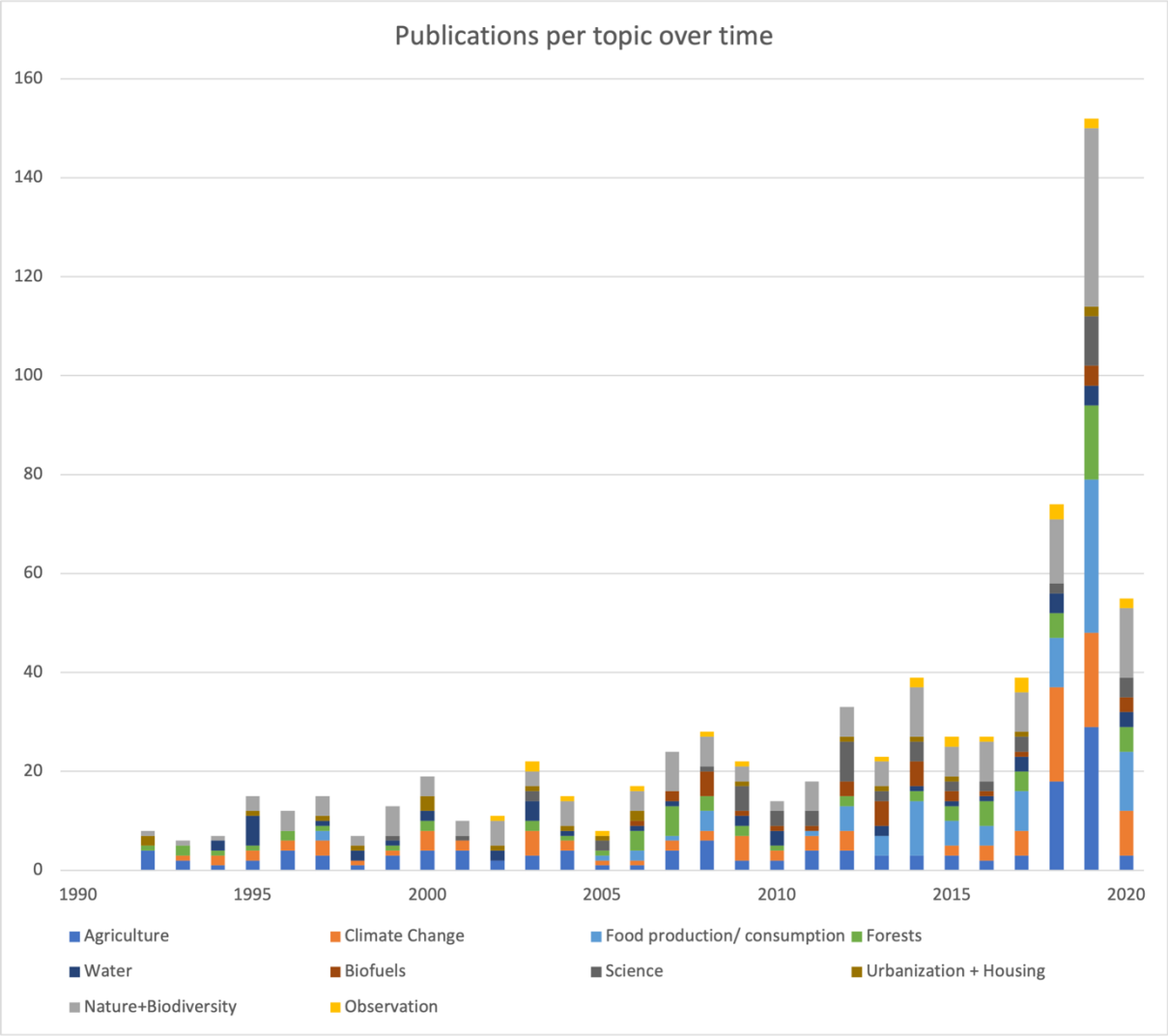

Figure 7. Number of publications per topic over time

Figure 7 contains the spread of those articles over time. It shows a continuity of reporting about both agriculture and nature and biodiversity, but also the up- and downfall of interest in other topics such as biofuels. Reporting about biofuels shows a spike in 2008 and 2013/2014. In the year 2018, a relatively large number of articles contains agriculture, climate change or both as topic. For agriculture, this is 18 of the total 47 articles and for climate change this is 19 of the 47 articles.

Interpretation quantitative results

Nature and Biodiversity

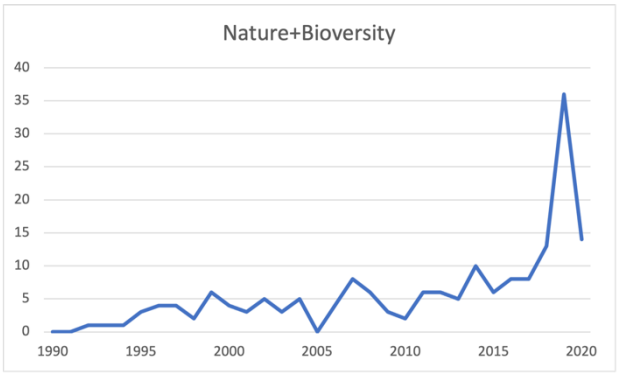

Figure 8. Number of articles about Nature + Biodiversity over time

As can be seen in figures 7 and 8, there is a general increase for the number of articles about nature and biodiversity in relation to land use, with a peak in 2019. This peak can mostly be explained by the publication of the IPCC special report on land in this year, which made the relationship explicit between agriculture, forestry and other land use in relation to climate change (Intergovernmental Panel on Climate Change, 2022). Most newspaper sources paraphrase this report as nature being a form of land use that is needed to combat climate change, whereas agriculture increases emissions.

In addition to the IPCC report, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) published their global assessment report on biodiversity and ecosystem services that year (IPBES, 2019). In this report, land use changes were linked to loss of biodiversity due to habitat degradation. This relationship gained attention from both *de Volkskrant* and the *NRC.*

Another explanation could be the so-called *nitrogen crisis* which peaked in 2019. This crisis revolves around a directive of the European Union to protect nature areas which overruled national legislation on nitrogen emission permits at the end of 2018. This caused an administrative crisis in the Netherlands, as the ruling of the Court of Justice of the European Union demanded a significant decrease of nitrogen emissions in order to conserve protected nature areas (Erisman, 2021). Policies to accomplish this caused national disruption by protesting farmers (van der Ploeg, 2020). This crisis was picked up by the Dutch media, as it sparked an increase in (opinionated) articles about the relation between agriculture and nature preservation.

Climate Change

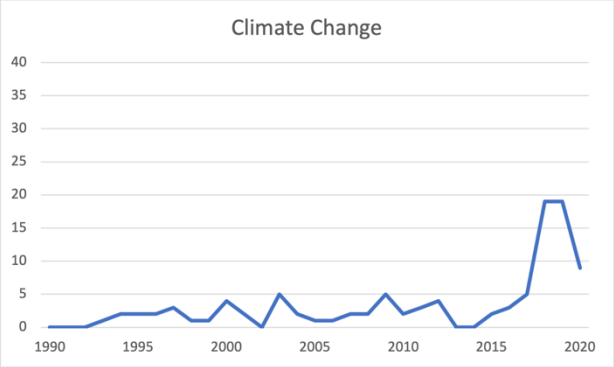

Figure 9. Number of articles about Climate Change over time

As follows from figures 7and 9, climate change is an especially large topic in 2018 and 2019. Although there has been attention on this topic within the frame of land use since 1993, many articles were published in 2018 and 2019. In these two years combined, 37,25% of the total number of articles about land use and climate change were published. There are two factors that explain this sudden increase.

First, the Dutch government decided in 2018, to construct *klimaattafels (climate tables)* in preparation for the national climate agreement. They were constructed to discuss six different topics related to climate change with relevant stakeholders of those fields in the so called. One of these 'tables' was the table for *landbouw en landgebruik (agriculture and land use)*. As this thesis analyzes all articles with the word *landgebruik*, a lot of newspaper articles emerged in LexisNexis that contained the topic climate change within the land use frame. This explains the similar quantity of articles about agriculture as well.

In addition to the national attention on the relation between climate change and land use in 2018, there was an increase in international attention for this topic in 2019. In august of that year, the IPCC published a special report called *Climate Change and Land* (Intergovernmental Panel on Climate Change, 2022). This report explicitly states the impact of land use on climate change and gained attention in the major Dutch newspapers. Four of the five analyzed newspapers (Volkskrant, Trouw, AD, NRC) wrote articles about the publication of the report. All five newspaper sources have articles in 2019 that mention the report.

Agriculture

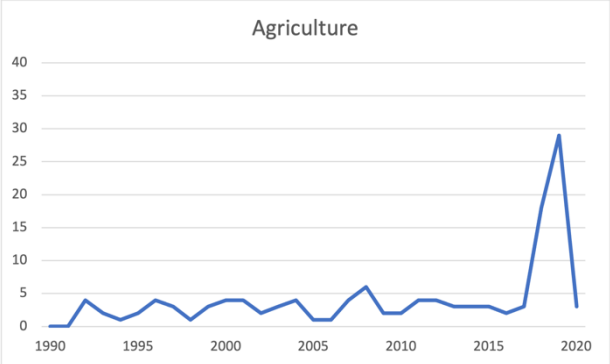

Figure 10. Number of articles about Agriculture

For the past thirty years, there has been continuous attention for agriculture within the context of land use. Figures 7 and 10 show that the exceptions to this continuity, however, are the years 2018 and 2019. These years account for 37,6% of the total amount of coverage on agriculture and land use. This could partly be explained by the same causes that are described in the above section about climate change and land use. This is because the Dutch climate table on land use included the term agriculture as well, resulting in an increase of attention for the relation of the two topics. Furthermore, agriculture was explicitly mentioned in the articles about the IPCC report on Climate Change and Land.

In addition to this, agriculture as a form of land use was mentioned in the publications about the IPBES report in 2019 and the effects of nitrogen on nature and biodiversity that have been explained in the previous sections.

Food production and/or consumption

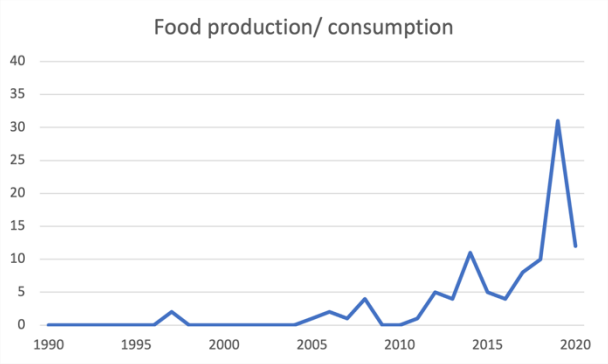

Figure 11. Number of articles about Food Production/ - Consumption over time

The total amount of articles about the topic food production and or consumption is 101. These articles either discuss the impact of food production on land use, or the impact of certain diets on land use. See section 4.2 for the qualitative analysis into the frames of this theme. It emerges in 2005, rises from 2012 and peaks in 2019. This peak in 2019 is mostly attributed to the IPCC report on climate change and land (Intergovernmental Panel on Climate Change, 2022).

Forests

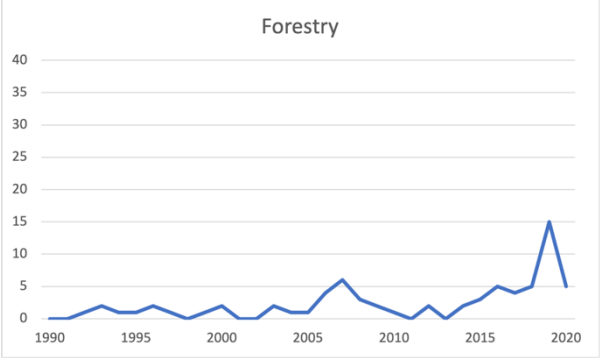

Figure 12. Number of articles about Forests

The topic of forests entails all articles that relate land use to forests. It has a total number of 72 publications. This includes articles on forest fires which could partly explain the increase in

2007, as there is more attention in the newspapers for the forest fires that ravaged the European continent in the early 21st century (Bento-Gonçalves & Vieira, 2020). However, this is not the biggest theme within the relationship between land use and forests in the Dutch media. Attention for deforestation has gained attention since Brazil protected a large area of the Amazon rainforest in 1996. Deforestation in these articles is both related to forestry for biofuels as well as clearing land for agriculture. The peak in 2019 is mostly attributed to the IPBES and IPCC report, as deforestation is linked to biodiversity loss and afforestation could be a way of compensating for carbon emissions.

Science

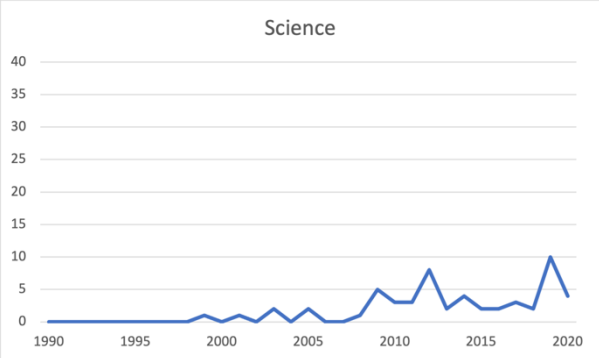

Figure 13. Number of articles about Science over time

A total number of 55 articles mention the publication of scientific research and reports or scientific studies that are being done. Overall, there is an increase, with a peak of 8 articles in 2012 and 10 articles in 2019. The articles in 2012 mostly report about different studies, such as a comparison between biofuels and fossil fuels, about the difference in impact between organic chicken versus free-range or about which form of funeral industry is most sustainable. The common factor in all research from this year is what (post-)lifestyle is most sustainable in terms of land use for the individual. Only the *NRC*, *de Volkskrant* and the *Trouw* published about these studies.

A common theme in scientific research in 2019 is the impact of land use on biodiversity. Newspapers report about studies done into the observation of biodiversity, the extinction of animals and the impact of human consumption on the decreasing biodiversity. Only the *NRC* and *de Volkskrant* related these scientific publications to land use.

Water

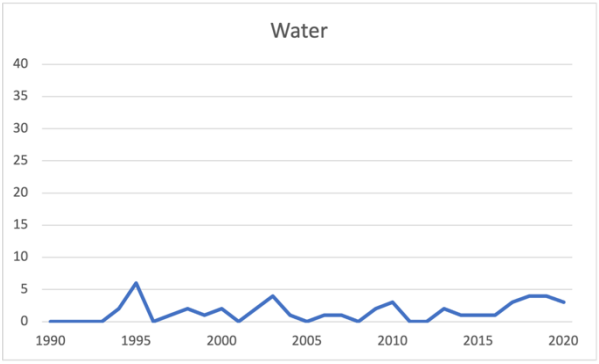

Figure 14. Number of articles about Water over time

The quantitative changes in articles about land use related to water differ from the other topics. Attention for this issue is less increasing and more fluid, as figure 15 shows. One spike of attention, the peak in 1995, can be explained by the flooding of the Meuse. The others are related to either disasters with less attention than the Meuse (extreme rainfall in Asia, 2010 and floodings in Bangladesh, 2018) or general relations between land use changes and the impact is has on the water system, such as the publications of reports and articles about climate change.

Biofuels

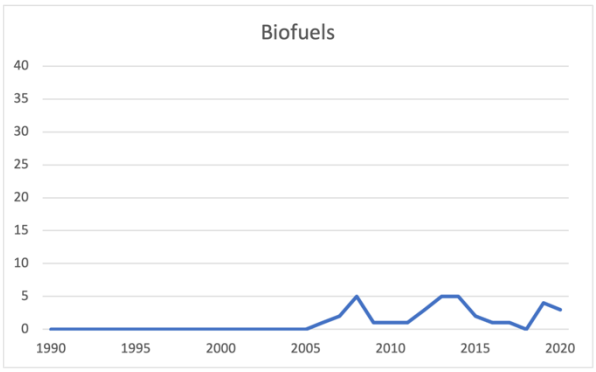

Figure 15.Number of articles about Biofuels over time

Figures 7 and 15 show that the quantity of articles about biofuels in the relation to land use has three peaks. One in 2008, one in 2013/2014, and one in 2019. The first one is explained by the publication of a report from the Dutch environmental planning agency on the sustainability criteria of the European Commission on biofuels (Eickhout et al., 2008). This report sparked discussion through opinionated articles in Dutch newspapers in 2008. In 2013, the European Parliament voted on the sustainability criteria for biofuels, which created attention for both sides of the debate. The articles published in 2019 are either concerned with the IPCC special report on land, or the publication of the Dutch national Climate Agreement. Both mention biofuels as a potential solution for the reduction of fossil fuel use. Section 4.2 describes a qualitative analysis of the biofuels debate.

Observation

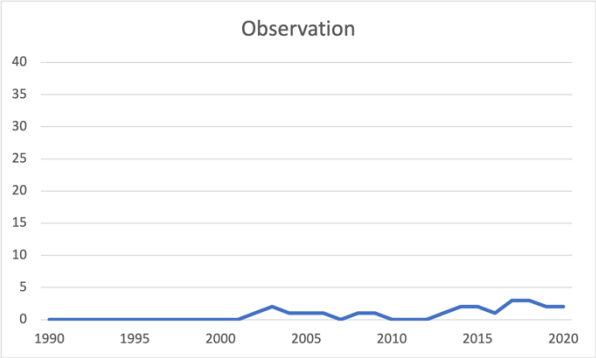

Figure 16. Number of articles about Observation over time

Within land use reporting, 24 articles consider the observation of land use. An example for this topic category is when there is a new satellite exploring LULCC changes, or a new website that publishes rainforest deforestation data. Articles are mostly examples of new technology to observe land use. Figure 16 shows a continuous spread with a slight overall increase in the third decade.

Urbanization and/ or Housing

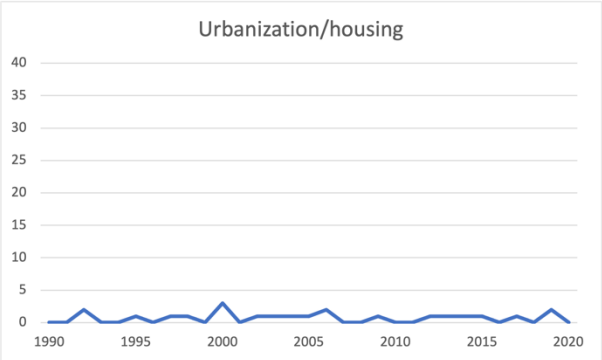

Figure 17. Number of articles about Urbanization/ Housing over time

Articles containing this theme all report on urbanization and/ or housing in relation to land use. A total number of 22 articles were published with this explicit relation, fluctuating continuously over thirty years' time. However, compared to the increasing attention for other land use topics, urbanization and housing have become relatively less important in reporting on land use.

3.2 Qualitative Results

To gain more knowledge of the public perception of land use topics, a qualitative analysis can be done into the different framings of the issue. This is done for the topics food production/ -consumption and biofuels.

Framing of food production/ consumption

Within the topic category of food production and consumption, five subcategories emerged in a second round of coding. These are in decreasing quantitative amounts: *animal products*, *sustainable food consumption, food efficiency, food production vs. nature,* and *impact of food production on the climate*.

Animal Products
In all newspapers, there is attention for the impact of the consumption and production of animal products on land use. NRC mentioned in an article on 05-02-1997 that there has been an increase in human consumption of animal products. In this same article a relationship was stated between food production and climate change. The dominant frame within other articles about animal products, is that the consumption and production of animal products is way less efficient than eating plant based. There is one dissident in this frame, an article by the Telegraaf in 2008, which states that animals are the most efficient in food production when calculating land use.

Sustainable food consumption
This frame emerges in 2012 and includes articles that are concerned with what the impact is of what the individual consumes. This can be done more sustainably by eating seasonal fruits and vegetables, waste less food and/ or eat less meat and other animal products. It gains dominance over time. This frame gains explicit attention after the IPCC special report on land. Most newspaper sources (Volkskrant, Trouw, AD and NRC) reiterate that in order to slow down climate change, the consumer must eat less animal products and waste less food. As one opinionated piece in *de Volkskrant* states:

> *"Opvallend is hoe snel de Nederlandse media de oplossingen die het rapport aandraagt, hebben weten te versimpelen tot 'Wij consumenten moeten minder vlees eten.'"*
> - Nathalie van Haren & Stefan Schüller, de Volkskrant 16-08-2019

Translated: it was remarkable how fast Dutch media simplified the report to "we as consumers need to eat less meat". This same critique to the quick framing of the special report as being only about eating less meat was also found in de Telegraaf on 17-08-2019.

Food efficiency
The dominant question within this frame is: *How can we use are scarce land as efficient as possible?* It is about the distribution of land and food worldwide. The frame develops out of a focus on food distribution and innovation to keep up with a growing world population, to a more specific focus on which foods are more efficient in land use. This change starts in 2014, when more studies are done into specific food products, and the effects of animal food production compared to plant based products.

Food production versus nature
All articles in this frame state that agriculture is a main driver for the loss of nature. Especially the logging of rainforest is linked to the production of soy for animal food. If food production could be more efficient and sustainable, the scarce land could also be used for other functions such as conservation of biodiversity or reforestation for mitigating climate change. Articles within this frame occur since 2012 and have increasing attention, especially with the climate table in 2018 and the special report on land in 2019.

Impact of food production on climate
Comparable to the framing of sustainable food consumption is the framing of the impact of food production on the climate. This is the flipside of consumer patterns, the production that

can do harm to the environment. Articles within is frame are framed within both sustainable food consumption and the balance between food production and nature. Most of the time the impact of greenhouse gasses that are emitted to produce food due to logging are explicitly stated. Most articles in this frame are related to the special IPCC report on land in 2019.

Framing of Biofuels

There has been a debate on the use of biofuels as a solution for the climate crisis. There are three frames that occur the most: *Displacement effect of biofuels will result in more deforestation*, *biofuels needed as alternative to fossil fuels* and *nuanced point of view regarding biofuels.* Overall, the more nuanced frame gained dominance over time against the other two framings.

Displacement effect of biofuels will result in more deforestation
The dominant frame in the discussion surrounding biofuels as a sustainable way of energy production, is that it will cause a displacement effect. This entails that land that is first used for agriculture, will be used to produce biofuel crops like palm oil and corn. To produce food, new land is needed for agriculture, which could lead to more deforestation in tropical rainforest to clear land. This framing therefore does not consider biofuels as a sustainable solution. This frame is present in almost all articles in the database and gains special attention with the publication of the Dutch national climate agreement. An opinion article in Trouw about this drafted agreement is critical about the positive stance of the Dutch government towards the increase of biomass importation. It iterates that besides the climate gains, risks exist towards food production in the biomass exporting nations.

Biofuels needed as alternative to fossil fuels
This frame first emerges in an article of the NRC on June 17th of 2008 and contains an in-depth interview with a bioethanol producer in Brazil. It mostly shows the positive effects and debunks the framing of the displacement effect. In further years, this frame also adopts phrases as: "Biofuels are a cheap alternative for expensive gasoline". In addition to this, biofuels are cleaner transport fuels for airplanes and freighters than kerosine. Furthermore, they are not only useful for transport, but also needed as an alternative for the petrochemical industry. It states that a sustainable future needs a diverse energy mix including biofuels. This frame also entails that the discussion sparked by the environmental movement against biofuels will mostly profit the fossil fuel industry.

Nuanced point of view regarding biofuels
This frame regards biofuels as not the best, but still part of the solution. It iterates that we need to keep all possible green solutions for transport in mind, including biofuels. According to this frame, biofuels could potentially reduce emissions, except for when calculating land use losses within first generation biofuel plantations. This frame discusses biofuels in a context of multiple interests that need to be weighed in order to draw conclusions about the sustainability. It might be an alternative for fossil fuels but could potentially harm food production or forest protection.

5. Conclusion

The research question that is studied in this thesis: *Has Dutch newspaper coverage on land use and land cover change changed from 1990 to 2020, and if so, in what way?*

For the period of 1990-2020 there has been a quantitative increase in number of articles about land use that are published in the five major newspapers in the Netherlands. Land use is a broad term, which entails a variety of topics such as climate change, agriculture, nature, food production and water. Each year shows a different mix of these topics. These quantitative differences between the topics can often be explained by developments in both national and international politics and scientific research. Most of the articles mentioning land use that have been studied, refer either to political or academic developments. Especially the publication of reports by international institutions such as the IPCC or UN spark discussion. Publication of such reports cause a rise in both the number of news articles and opinion pieces.

Most of the articles that have been studied either discuss the publication of international reports, scientific studies or land use related to political developments. This dynamic mainly explains the rise in 2018 and 2019: one of the Dutch climate tables, for emission reductions in preparation for the Dutch climate agreement, was linked to agriculture and land use, creating media attention for the relation between land use and climate change. Furthermore, the IPCC special report in 2019 on Climate Change and Land was discussed by all newspaper sources reiterating the relation between Climate Change and Land Use. In addition to this, the nitrogen crisis in 2019 caused attention for land use in Dutch print media. Special attention was thereby given to the effects of big agriculture on protected nature areas.

Furthermore, there is an increase in attention for individual behavior in the land change debate. In the qualitative analysis on food production and consumption, a frame for more sustainable food consumption emerged in 2012. This frame gained increasing attention and peaked with the publication of the IPCC special report on land. It is seen in articles about scientific publications on the sustainability of certain diets and other lifestyle frames. Examples hereof are studies into the sustainability of animal product consumption, and the sustainability differences of funeral possibilities. Dominant in this type of framing is the impact the individual consumer has on largescale land change processes.

Other qualitative analysis on the debate surrounding biofuels projects a movement towards more nuance and complexity. The debate starts with dominant proposing and opposing points of view but gains more attention for the complexity. This nuance does not necessarily regard biofuels a good alternative or recipe for disaster. It pleads for a nuanced discussion about the tension and competition it has with other land uses, but also possibilities it provides as an alternative to fossil fuels.

To conclude, Dutch newspaper coverage on land use and land cover change has changed for the period of 1990 to 2020. It has increased, especially in the attention for land use in relation to biodiversity, climate change, agriculture and food production and consumption. Developments in international academics and national politics explain this increase. Qualitative analysis on the food production/ consumption topic shows the emerging dominance of a framing focused on individual behavior and lifestyle choices. Reporting about biofuels has become slightly more nuanced over time. Is the media influencing our political behavior or works the agenda setting theory the other way around? So much for sharp investigative journalism on the most important topic of our time.

6. Discussion

Even though there are clear results in the analysis of print media reporting on land change, this research has its limitations and possibilities for further research.

One limitation for this research is that the newspaper articles were only read by one reader. Results in qualitative research depend largely on the interpretation of the researcher. As there is only one reader of the 481 newspaper articles, to make results more precise and replicable, the process of coding needs to be done by larger team of readers. This would also enhance the certainty in the allocation of topics, as it also means an iteration of the process. Reiteration of the process links codes that emerge later in the process of analysis to articles of the earlier years. In addition, an iteration of the process needs to filter categories that have combined at the end of the process, because of the possibility that articles that had been coded for both categories are now counted double in the quantitative results. This is the case for the category's nature and biodiversity, urbanization and housing and forests. Due to time and resource limitations, this thesis does not include a third round of coding and coding by multiple. Further research would therefore be necessary to create a more objective definition of the results.

In addition to this limitation, the time and resources limitation also influence the amount of qualitative analysis done. Because of these limitations, not all major topics are analyzed qualitatively. Interesting topics for further research would therefore be a qualitative analysis of the major topics 'nature and biodiversity', agriculture and climate change. If there is a qualitative analysis of more categories, it provides more information about the changes in reporting about land use by print media.

The narrow scope of this research only searches the term land use. However, there could exist a variety of articles about LULCC that exclude the word land use. Further research needs to collect more articles by widening this scope. In addition to this, it is interesting to do research into the term *ruimtelijke ontwikkeling* (*spatial development).* Historically seen, the Netherlands has been strong in its spatial planning and development, having this also ingrained in the governmental structures until 2010 (Gerrits et al., 2012). Until 2010 there were three ministries that dealt with land use: the Ministry of Housing, Spatial Development, and Environment (*Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer*), the Ministry of Agriculture, Nature, and Food Quality (*Miniterie voor Landbouw, Natuur en Voedselkwaliteit*), and the Ministry of Public Works and Infrastructure (*Ministerie van Verkeer en Waterstaat*). In 2010, these were merged into the Ministry of Infrastructure, and Environment (*Ministerie van Infrastructuur en Milieu*), and the Ministry of Economic Affairs, Agriculture and Innovation (*Ministerie van Economische Zaken, Landbouw en Innovatie*) (Ibid.). As there used to be a special Ministry dedicated to land use in the form of Housing, Spatial Development and Environment, it is possible that there are more articles from 1990 to 2010 about land use that contain the word *spatial development* rather than *land use*.

Another suggestion for further research is to include articles of regional newspapers as well as national newspapers. The data for this thesis only includes national newspaper articles. However, the database of LexisNexis shows many land use articles in more regional journals. This is especially the case for the *Algemeen Dagblad*, as that newspaper has both national and regional branches. It is a relevant addition to the current research to analyze both national and regional newspaper articles, in order to examine if the quantitative dynamics and qualitative frames differ.

Moreover, further research into the wording articles use is essential. Especially interesting to see is if, and how this differs for the different newspaper sources and what influences that has on the framing. This can be complemented by analysis of the connotation the articles have. Do they adopt a positive or negative stance regarding the topic? Is the newspaper article more agenda setting, or does it follow the set agenda by other actors? As land change is essential in solving the climate crisis, it requires more studies into the public perception of the phenomenon.

References

Bento-Gonçalves, A., & Vieira, A. (2020). Wildfires in the wildland-urban interface: Key concepts and evaluation methodologies. *Science of the Total Environment*, *707*. https://doi.org/10.1016/j.scitotenv.2019.135592

Bryman, A. (2016). *Social Research Methods* (5th ed.). Oxford University Press.

Campbell, D. J., Lusch, D. P., Smucker, T. A., & Wangui, E. E. (2005). Multiple methods in the study of driving forces of land use and land cover change: A case study of SE Kajiado District, Kenya. *Human Ecology*, *33*(6), 763–794. https://doi.org/10.1007/s10745-005-8210-y

Dale, V. H. (1997). The Relationship Between Land-Use Change and Climate Change. In *Studies of Climate Change 753 Ecological Applications* (Vol. 7, Issue 3).

Delclaux, J., & Fleury, P. (2021). Medium-term evolution in French national newspaper coverage of the interrelations between biodiversity and agriculture. *Conservation Science and Practice*, *3*(3). https://doi.org/10.1111/csp2.140

Diriye, A. W., Jama, O. M., Diriye, J. W., & Abdi, A. M. (2022). Public preference for sustainable land use policies – Empirical results from multinomial logit model analysis. *Land Use Policy*, *114*. https://doi.org/10.1016/j.landusepol.2022.105975

Eickhout, B., van den Born, G. J., Notenboom, J., van Oorschot, M., Ros, J. P. M., van Vuuren, D. P., & Westhoek, H. J. (2008). *Local and global consequences of the EU renewable directive for biofuels Testing the sustainability criteria*.

Entman, R. M. (1993). Framing: Toward Clarification of a Fractured Paradigm. In *Journal of Communication* (Vol. 43, Issue 4).

Erisman, J. W. (2021). Setting ambitious goals for agriculture to meet environmental targets. *One Earth*, *4*(1), 15–18. https://doi.org/10.1016/j.oneear.2020.12.007

Fulford, R. S., Russell, M., Myers, M., Malish, M., & Delmaine, A. (2022). Models help set ecosystem service baselines for restoration assessment. *Journal of Environmental Management*, *317*. https://doi.org/10.1016/j.jenvman.2022.115411

Garg, V., Nikam, B. R., Thakur, P. K., Aggarwal, S. P., Gupta, P. K., & Srivastav, S. K. (2019). Human-induced land use land cover change and its impact on hydrology. *HydroResearch*, *1*, 48–56. https://doi.org/10.1016/j.hydres.2019.06.001

Gerrits, L., Rauws, W., & de Roo, G. (2012). Dutch spatial planning policies in transition. In *Planning Theory and Practice* (Vol. 13, Issue 2, pp. 336–341). https://doi.org/10.1080/14649357.2012.669992

Hameleers, M., & Vliegenthart, R. (2020). The Rise of a Populist Zeitgeist? A Content Analysis of Populist Media Coverage in Newspapers Published between 1990 and 2017. *Journalism Studies*, *21*(1), 19–36. https://doi.org/10.1080/1461670X.2019.1620114

Intergovernmental Panel on Climate Change. (2022). *Climate Change and Land*. Cambridge University Press. https://doi.org/10.1017/9781009157988

IPBES. (2019). *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. https://doi.org/10.5281/ZENODO.6417333

Janssen, D. N. G., Ramos, E. P., Linderhof, V., Polman, N., Laspidou, C., Fokkinga, D., & E Sousa, D. de M. (2020). The climate, land, energy, water and food nexus challenge in a land scarce country: Innovations in the Netherlands. *Sustainability (Switzerland)*, *12*(24), 1–27. https://doi.org/10.3390/su122410491

Jia, S., Yang, C., Wang, M., & Failler, P. (2022). Heterogeneous Impact of Land-Use on Climate Change: Study From a Spatial Perspective. *Frontiers in Environmental Science*, *10*. https://doi.org/10.3389/fenvs.2022.840603

Kemper, N. P., Popp, J. S., Nayga, R. M., & Kerr, J. B. (2018). Cultural worldview and genetically modified food policy preferences. *Food Policy*, *80*, 68–83. https://doi.org/10.1016/j.foodpol.2018.09.003

Li, Y., Liu, W., Feng, Q., Zhu, M., Yang, L., Zhang, J., & Yin, X. (2023). The role of land use change in affecting ecosystem services and the ecological security pattern of the Hexi Regions, Northwest China. *Science of The Total Environment*, *855*, 158940. https://doi.org/10.1016/j.scitotenv.2022.158940

Long, H., Qu, Y., Tu, S., Zhang, Y., & Jiang, Y. (2020). Development of land use transitions research in China. *Journal of Geographical Sciences*, *30*(7), 1195–1214. https://doi.org/10.1007/s11442-020-1777-9

McCombs, M. E., & Shaw, D. L. (2017). The agenda-setting function of mass media1 2. *The Agenda Setting Journal*, *1*(2), 105–116. https://doi.org/10.1075/asj.1.2.02mcc

Pongratz, J., Schwingshackl, C., Bultan, S., Obermeier, W., Havermann, F., & Guo, S. (2021). Land Use Effects on Climate: Current State, Recent Progress, and Emerging Topics. *Current Climate Change Reports*, *7*(4), 99–120. https://doi.org/10.1007/s40641-021-00178-y

Shrestha, M., & Acharya, S. C. (2021). Assessment of historical and future land-use–land-cover changes and their impact on valuation of ecosystem services in Kathmandu Valley, Nepal. *Land Degradation and Development*, *32*(13), 3731–3742. https://doi.org/10.1002/ldr.3837

van der Ploeg, J. D. (2020). Farmers' upheaval, climate crisis and populism. In *Journal of Peasant Studies* (Vol. 47, Issue 3, pp. 589–605). Routledge. https://doi.org/10.1080/03066150.2020.1725490

Vossen, M. (2020). Nuclear Energy in the Context of Climate Change: A Frame Analysis of the Dutch Print Media. *Journalism Studies*, *21*(10), 1439–1458. https://doi.org/10.1080/1461670X.2020.1760730

Wester, J., Turffs, D., McEntee, K., Pankow, C., Perni, N., Jerome, J., & Macdonald, C. (2022). Agriculture and downstream ecosystems in Florida: an analysis of media discourse. *Environmental Science and Pollution Research*. https://doi.org/10.1007/s11356-022-22475-1

Appendices

Appendix 1. Number of publications per source per year, filtered

Year	Publications	NRC	Trouw	AD	Volkskrant	Telegraaf
1990	1	1	0	0	0	0
1991	0	0	0	0	0	0
1992	5	4	1	0	0	0
1993	4	3	1	0	0	0
1994	4	2	2	0	0	0
1995	13	7	3	1	2	0
1996	6	2	1	2	1	0
1997	9	7	1	0	1	0
1998	5	1	2	0	2	0
1999	7	3	2	1	0	1
2000	8	3	1	0	3	1
2001	8	3	4	0	1	0
2002	6	2	3	0	1	0
2003	9	5	1	0	2	1
2004	7	1	2	0	1	3
2005	8	6	0	1	0	1
2006	11	4	2	1	3	1
2007	19	8	1	2	8	0
2008	15	4	1	1	7	2
2009	11	4	2	0	4	1
2010	12	2	2	0	4	4
2011	15	2	5	0	7	1
2012	21	5	10	0	6	0
2013	20	7	4	0	7	2
2014	29	4	8	0	14	3
2015	16	2	5	0	9	0
2016	18	4	4	0	8	2
2017	26	7	9	2	8	0
2018	47	16	11	3	15	2
2019	79	21	24	6	26	2
2020	42	15	15	4	5	3
	481					

Appendix 2a. Number of publications per topic a

Year	Agriculture	Climate Change	Nature	Biodiversity	Food production/ consumption
1990	0	0	0	0	0
1991	0	0	0	0	0
1992	4	0	1	0	0
1993	2	1	1	0	0
1994	1	2	1	0	0
1995	2	2	3	0	0
1996	4	2	4	0	0
1997	3	3	4	0	2
1998	1	1	1	1	0
1999	3	1	4	2	0
2000	4	4	3	1	0
2001	4	2	2	1	0
2002	2	0	3	2	0
2003	3	5	2	1	0
2004	4	2	2	3	0
2005	1	1	0	0	1
2006	1	1	3	1	2
2007	4	2	7	1	1
2008	6	2	5	1	4
2009	2	5	1	2	0
2010	2	2	1	1	0
2011	4	3	4	2	1
2012	4	4	4	2	5
2013	3	0	2	3	4
2014	3	0	4	6	11
2015	3	2	3	3	5
2016	2	3	6	2	4
2017	3	5	5	3	8
2018	18	19	7	6	10
2019	29	19	8	28	31
2020	3	9	5	9	12
	125	102	96	81	101

Appendix 2b. Number of publications per topic b

Year	Forestry	Water	Biofuels	Science	Urbanization/ housing	Nature/ Bioversity	Observation
1990	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0
1992	1	0	0	0	2	1	0
1993	2	0	0	0	0	1	0
1994	1	2	0	0	0	1	0
1995	1	6	0	0	1	3	0
1996	2	0	0	0	0	4	0
1997	1	1	0	0	1	4	0
1998	0	2	0	0	1	2	0
1999	1	1	0	1	0	6	0
2000	2	2	0	0	3	4	0
2001	0	0	0	1	0	3	0
2002	0	2	0	0	1	5	1
2003	2	4	0	2	1	3	2
2004	1	1	0	0	1	5	1
2005	1	0	0	2	1	0	1
2006	4	1	1	0	2	4	1
2007	6	1	2	0	0	8	0
2008	3	0	5	1	0	6	1
2009	2	2	1	5	1	3	1
2010	1	3	1	3	0	2	0
2011	0	0	1	3	0	6	0
2012	2	0	3	8	1	6	0
2013	0	2	5	2	1	5	1
2014	2	1	5	4	1	10	2
2015	3	1	2	2	1	6	2
2016	5	1	1	2	0	8	1
2017	4	3	1	3	1	8	3
2018	5	4	0	2	0	13	3
2019	15	4	4	10	2	36	2
2020	5	3	3	4	0	14	2
	72	47	35	55	22	177	24