Sea Level Rise in the News

Te pikinga o te moana korero

Coastline in Aotearoa New Zealand

Zeespiegelstijging in het nieuws

Coastline in the Netherlands

A comparative study of representations of sea level rise in online news articles from Aotearoa New Zealand and the Netherlands.

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“Life on earth first emerged from the sea. As the polar ice melts and sea levels rice, humans find ourselves facing the prospect that once again we may quite literally become ocean.”

John Luther Adams, Composer

Abstract

Context: Sea level rise is a result of climate change and impacts social and environmental structures the world over. Aotearoa New Zealand and the Netherlands are developed nations exposed to the risk of rising ocean water. The science and impacts are well-known and well-reported with the media having an instrumental role in the knowledge dissemination and public comprehension of sea-level rise science. Yet, there is a limited understanding of how the media represent sea level rise and how this differs between countries. This understanding is necessary as communication about climate change informs the public of the risks, consequences, actions, and solutions. Essentially communication about the climate, particularly in the news, shapes perceptions, values, decisions, and actions at various levels of society, from the policy level to daily life.

Purpose: This research analyses online news articles from New Zealand and the Netherlands, to build an understanding of the sea level rise narrative and to identify key frames and topics in the discourse of the two nations, as well as the differences. Additionally, this study observes the presence of solutions to sea level rise in the news and if the reporting of solutions adheres to solutions journalism characteristics.

Methods: Through a combination of inductive and deductive coding, this manual qualitative media analysis covers 160 news articles, 80 from Aotearoa New Zealand and the Netherlands each, published between January 2021 and June 2022.

Results: The results of the study pinpoint several reoccurring frames and topics in the discourse of both nations, notably *sea level rise impacts, planning for sea level rise adaptation, climate politics* and *supporting scientific evidence* confirming the occurrence of sea level rise. The type of sea level rise impacts differed between countries with *impacts to property* more prominent in New Zealand news discourse while *infrastructure,* and *environmental impacts* were observed more in the Dutch discourse. Differences were also observed with the Dutch articles referencing *sea level rise causes* and *flood protection* more often than the New Zealand articles. Stakeholder differences were also noted. Dutch news discourse frequently cited *environmental and science experts,* but rarely other stakeholder types. New Zealand articles consistently cited a variety of stakeholders in its sea level rise reporting including *public, governmental* and *expert stakeholders.* The study found *specialist climate journalists* cover sea level rise in both countries, but suggests they authored more articles in New Zealand while Dutch news discourse relied more on *environmental expertise* in its reporting. Solutions to sea level rise were observed too, more often in the Dutch articles. Proposed solutions reflected an idea of *ecomodernism* or remedies that rely upon *technological* or *engineering* innovations to reduce the impact of the rising seawater. However, *solutions journalism* characteristics were not consistently found in either country.

Conclusion: Suggestions are made for journalism professionals to critique their reporting practice regarding sea level rise and proceed with caution in reporting that implies the issue can be solved through adaption and human ingenuity alone. It is recommended for the communication of sea level rise and climate change in the news to move beyond the goal of just increasing issue awareness. The media is instrumental in brokering and framing topics, and could have a more progressive and solutions-oriented approach which encourages the public to engage in adaptive, mitigating and sustainable actions to reduce both causes of and consequences from the rising water and climate change. It was concluded that media have a responsibility in framing sea level rise and climate change in a manner that positively encourages action in society to contribute to holistic care and protection of the planet.

Key Words*: sea-level rise, news media, media analysis, solutions journalism, communication, science journalism, science reporting, journalism, New Zealand, the Netherlands.*

Preface

Before moving to the Netherlands in February 2019, I worked as a video journalist covering the Waikato region (a region the size of more than half of the Netherlands, for comparison), in the North Island of Aotearoa (the Māori name for New Zealand, used synonymously). When considering a topic for my thesis I knew I wanted to delve into a topic where I could draw on my journalism experiences and build further practical knowledge for a continued career in communications or journalism. Further, for some time I have been astounded and deeply concerned with the knowledge that for more than a hundred years there has been a known inclination of environmental change due to carbon dioxide and fossil fuel usage (Arrhenius, 1896). Yet here we find ourselves, in 2022, part of a society seemingly oblivious, as we experience and watch parts of our world degrade before our very eyes. With this concern for Papatūānuku (mother earth) and the environment at heart, I knew climate change and its' communication would centre in my research in some form.

Reflecting on my reporting days, I recall several stories relating to flooding, climate change and sea level rise that I covered. The first month on the job, there's a vivid memory of me, poised with my camera, in the pouring rain, filming as the ocean waves ferociously hit the Kaiaua Beach coastline (on the western side of the Firth of Thames). Parts of the road had already disappeared, only remnants of a playground remained, and further down the coast, I spoke with residents, some unphased despite their back being door less than a hundred metres from the waves that had destroyed parts of their garden. From the crashing waves caused by the combination of rising waters and a supermoon, it was about a year later when I covered a conflicting story about the management of mangroves. This story began with residents in the coastal town of Whangamatā (on the southeast coast of the Coromandel Peninsula). Residents were concerned with encroaching mangroves in the estuary close to their homes. The issue was multifaceted, some residents wanted mangroves removed to protect the aesthetic and financial value of their property, and to prevent the reoccurring flooding of the nearby golf course. Then there was the perspective from environmental experts and politicians, divided on the issue, whether local communities should be able to remove the mangroves, or if they should remain to help protect the coastal area and sequester carbon. When researching the issues, there were different opinions and facts that needed to be framed and balanced in the video news story I compiled. Such as the value of private property aesthetics or using nature, the mangroves, as a flood protection defence for the very properties whose ocean views were inhibited. Undoubtedly, this news story, like all news stories, had several ways to frame and present the facts and opinions. That brings me to the current topic: the *internal struggle or conflict journalists have in framing and representing multiple issues in the news to have effective impact*. This got me thinking about the present idea of how the media represents and frames issues, particularly climate change. That, in a nutshell is how this research project idea came to fruition.

With the increasing relevance of sea level rise in New Zealand – my homeland – and the Netherlands – my current place of residence – where sea level rise is more a fact of life, I considered this topic relevant and well connected to my interest area of climate change and communication. Not only interesting and relevant as the world changes around us, but also, I felt it would be important to compare how sea level rise is communicated in one country compared to another and thus contribute to the literature about sea level rise communication. Additionally, this research topic would provide myself with an opportunity to develop a deeper understanding of effective climate change communication strategies paving the way for my next career move – wherever and whatever that may be...

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Kayla! Mum, and Dad, Nan, Grandma and Grandad, the occasional connection to home and farm life at various times has been a welcome respite, always a good laugh alongside your impeding motivation to '*keep chipping away at it'*. Thanks for the familiar blunt reality, *'head down, ass up, knuckle down and get shit done*'. Your straight up assurance that I could and have been able to complete this thesis. See ya soon!

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1 INTRODUCTION

In recent years, global news headlines are increasingly drawing attention to our warming planet with headlines about heat waves, flash floods, droughts, melting glaciers, and rising sea levels. News assuring climate change remains in the public eye. News organisations influence society by setting the topics and themes by framing certain problems in a certain light, effectively shaping public understanding of world issues, including that of our warming planet and rising sea levels.

As the media continues to draw attention to our changing climate, public concern for climate change increases (Sampei & Aoyagi-Usui, 2009). Rightly so, climate change (CC) is one of the most prevalent environmental issues actively threatening life on earth (Boykoff & Boykoff, 2007). Already, the changing climate has impacted and continues to disproportionally impact social and environmental structures globally (Watts et al., 2021). In news media, sea-level rise is often high on the agenda as a newsworthy impact of CC (Rick et al., 2011). If CC continues without intervention, it will further accelerate sea-level rise (IPCC, 2021). And with a rise of just one metre, 145 million people living in coastal areas the world over could be affected (Watts et al., 2021).

While there is an increasing abundance of research about the current and forthcoming sea level rise (SLR), there is limited understanding of how these changes and possible remedies to SLR are communicated to the public via the news media. Especially at a time when there is an increasing amount of negative news and misinformation being spread online there is a need to understand what perspective(s) on SLR the news industry is presenting and how SLR is being *framed* and if *resolutions* are part of the news discourse. Consequently, excess negative news leads to compassion fatigue and reduces public interest (Kinnick et al., 1996; Pottter & Gants, 2000) while news that interweaves solutions can mitigate negative public perceptions (McIntyre, 2017). This thesis therefore intends to observe and compare the *frames*, *themes*, and *solutions* in the reporting of the SLR issue in online articles from New Zealand and the Netherlands

1.1 Context

As an island nation, Aotearoa is surrounded by water and, at worst, SLR could put almost a quarter of a million residents – about 5% of the population – at risk as they live two metres or less above the current high tide mark (Daly, 2019). This can be contrasted to the Netherlands, a low elevated country with a flat topography, where nearly a third of the land is below mean sea level and 60% of the country's land is susceptible to large-scale coastal and river flooding which could affect about 12 million people – or 70% of the population (Bloemen et al., 2019; Haasnoot et al., 2019; Hoeksema, 2007; Ligtvoet & Knoop, 2014). Due to SLR, the frequency of global coastal flooding is said to double in the coming decades (Vitousek et al., 2017). Hence the implications of, and adaption to the effects of SLR, including increasing storm surges, frequent and severe flooding, and erosion, are of importance for coastal island nations like New Zealand (Lawrence et al., 2018) and low-lying countries like the Netherlands (Haasnoot et al., 2019; Vermeersen et al., 2018). As two nations facing distinctive SLR challenges, a comparative media analysis can increase understanding of the media's communication process relating to a worldwide issue – especially at a time when media is becoming more globalised.

1.2 Research Aim & Questions

This research seeks to clarify in what manner SLR is represented in written online news in Aotearoa and the Netherlands. As New Zealand and the Netherlands both are nations facing distinctive SLR challenges, it is interesting to compare the media's communicative and reporting approach towards the global issue. Lessons can be drawn from both countries, that could influence reporting practices. The qualitative study may reveal unique communication frames, topics, patterns, solutions or reporting practices that may shape future SLR reporting or science communication via the media. It contributes to a greater understanding of how two journalism cultures represent SLR and additionally, the presence (or lack) of SLR resolutions and solutions journalism. Solutions journalism is an emerging phenomenon in journalistic practice. Although not new, it is gaining popularity and is a model of reporting that is relevant in framing studies as problem-solution frames have potential to leave readers feeling less negative about the news and contribute to greater public understanding of complex issues (McIntyre, 2017). With the aforementioned in mind, the two research questions and respective sub questions are posed:

1) **How is sea level rise represented in online news in New Zealand and the Netherlands and how does it differ?**
    - What are the key frames, topics and themes portraying sea level rise news discourse?
    - How does the framing of sea level rise differ between countries?
2) **To what extent is solutions journalism present in online articles about sea level rise in New Zealand and The Netherlands?**
    - What solutions to sea level rise are posed?
    - Does the presentation of solutions align with solutions journalism characteristics?

1.3 Relevance

The difficulty with journalism about SLR, and CC, is the disconnect between the science of climate change and public knowledge. Journalism seeks to bridge this gap. Most public knowledge about the science of climate change is attained via mass media, as opposed to scientific publications or one's direct involvement in science (Corbett & Durfee, 2004; Schäfer & Painter, 2020). News media are considered one of the most important sources of CC news information (Guenther, 2020) and play a significant role in raising public awareness and shaping public perceptions or opinions about global warming (Ford & King, 2015; McCombs & Shaw, 1972; Wasserman, 2012; Watts et al., 2021). Consequently, it is through the framing of CC in the news that the media has an important role in information sharing and shaping public trust in climate change science, as well as in debunking associated misinformation and conspiracy theories. News publishers and journalists frame news second-hand as often climate science understanding is beyond the scope of the public's personal experiences or knowledge (Gamson & Modigliani, 1989).

An American-based study by Newman and colleagues (2020) indicated the sources people use to access climate change information are shifting. Whilst television still dominated, respondents indicated websites from major news organisations were an increasingly popular source of climate information – this trend was even stronger for younger respondents (Newman et al., 2020). With the emergence of online news providers, an explosion in social media use and the rise of misinformation online, the importance of online news and understanding how online

news is framed is more relevant than ever. Online news is now a primary medium for people to gain insights into the impacts of climate change and it shapes public perceptions on the topic (Carvalho, 2010). This shift in consumption of online news justifies the research intention to investigate the framing and presentation of SLR news from written online news providers.

There is a need for online news stories to support climate action and adaptation among the public (Universiteit van Amsterdam, 2021; Stecula & Merkley, 2019). As the global environment further declines through changing climate and rising sea levels, it is relevant to understand how the media educates and encourages environmental responsibility among the public (Smyth 1990). Whilst science has provided the evidence and proposed a myriad of solutions to adapt to or reduce the severity of SLR, society and governance systems in some ways appear not to be actively listening or responding and enacting prompt change to reduce future SLR. In the previous 15 years, the media has generally, yet slowly, increased reporting on adaptive strategies concerning CC (Hase et al., 2021; Universiteit van Amsterdam, 2021). Often these news stories follow the news cycle with attention focused on political, scientific, and societal events such as the United Nations Climate Change Conferences (Ford & King, 2015; Hase et al., 2021). Previous studies by Hase et al. (2021)**,** Schäfer (2015) and Vu et al. (2019) have investigated climate change framing in the media more generally, broadly comparing country perspectives or framings of the topic. The Netherlands and New Zealand have featured in some of these studies, but specific comparisons about framing of SLR have not occurred to date. Due to the transnational nature of climate change affecting countries in all corners of the planet, Schäfer (2015) calls for more comparative research to understand varying global perspectives, actors, and systems at play pertaining to the climate change debate as it is presented in the news. Essentially this study contributes to the literature by finding out the reality of what the media in two countries is collectively and currently saying about SLR. This allows for communication theory to be developed that may explain different communication practices in the media and thereafter its impact on public understanding. Important because public knowledge of science, and notably climate change, is largely derived from the media (Shanahan et al., 1997). A framing and content analysis of SLR discourse enables one way to evaluate, comprehend and compare the journalistic work whilst establishing a fundamental understanding of how New Zealand and Dutch media present SLR.

2 THEORETICAL FRAMEWORK

This chapter will lay a framework of existing knowledge and research in the field of climate change communication in news media and will then detail existing theory in journalism and science journalism as a method of communicating climate change to the public. Thereafter the prevalence of solutions journalism and its theory as an emerging field of science communication will be introduced. Then the concluding section of this chapter will set out the gaps in the literature.

2.1 Climate Change Communication

Climate change communication exists in the field of science and environmental communication and refers to the cumulative process of crafting, receiving, collating, and distributing information and facts about global climate issues via various channels and platforms to diverse audiences (Chadwick, 2017; Markowitz & Guckian, 2018). The communication of climate change differs between individuals, groups, and institutions. It is shaped by the way they think about and experience the issue and its solutions, which is influenced by their unique knowledge, mental, cultural, and personal values which shape their understanding of the issue and how they convey that understanding through communicative practice (Leal et al., 2018). More simply, climate change communication refers to the way in which information is presented by and flows between various actors and stakeholders who curate information in a certain manner with certain phrases, words, visuals, or other elements.

As the globe and climate are constantly changing, Moser (2016) says effective climate change communication needs to be adaptive and inclusive involving and reaching people from all disciplines, sectors, and geographical corners of the globe. In doing this, climate change communication is seen as the delivery of climate-related information to people in varied forms. This communication can vary from official information dissemination through proper or non-official sources to communication as simple as the direct oral exchange of knowledge or observations. In this study, climate change communication encompasses all elements of communication of environmental information, extending from the choice of words, sentences, imagery, narratives, the audiences, and the entire process of formally or informally gathering climate change information for transfer between people or societal groups.

All communication about the changing world makes people more aware of the changes in their environment and the science behind it. Climate change communication is not just about the transmission of information – it is a dynamic process of engaging people in what is happening to the planet and having the message of CC shared and transmitted to inspire awareness and ideally action. People can actively interpret and shape their meanings from the information they receive (Chadwick, 2017). In the communication of this information, there is due thought to ensure that the intricate details of climate change science are presented clearly and effectively. Plain and simple language needs to be used so science complexities can be understood easily and without prior expertise or knowledge. There is a need for bridging the gap between climate experts and lay people with limited climate knowledge. In doing so, communication practitioners can use aids such as film, imagery, descriptive language, storytelling narratives, and interactive tools like colours and games, to help communicate climate change to diverse audiences (Schroth, 2014). Coverage of climate change in the media is one way to reach a large variety

of audiences effectively. In recent years, Moser (2016) states the attention in climate change communication research has shifted towards understanding specifically the framing, messaging and language used.

2.2 Media Representation of Climate Change & Sea Level Rise

It is well documented that news media are a central source of CC information for the public and often garner public attention to environmental issues (Guenther et al., 2020). They have a crucial role in translating, interpreting, conveying, and creating meaning to the complexities of climate change science (Moser, 2016). Through the framing of CC issues, the media transmit information and shape peoples' understanding of climate change and plausible solutions for the global issue (Bolsen & Shapriro, 2017). News media are instrumental in helping the public construct a world reality. The public draw on these presentations of reality to recontextualise them against their pre-existing schemas, knowledge, or understandings of the world (Kenix, 2018). Thus, creating their own version of reality from a combination of personal experiences, peers, and media observations (Neuman et al., 1992). Graber's (1988) indicates that the impact media has depends on the salience of specific issues as it relates to news consumers.

Since the mid-2000s, coverage of CC by the media has steadily increased (Schäfer & Schlichting, 2014; Schmidt et al., 2013). Often media coverage of CC fluctuates around events, extremities in the weather, socio-political events, and the release of reports or new research. Over time CC coverage has moved from primarily a science issue to a societal issue with a significant cost and impact (Schäfer, 2015). A recent global study including ten countries looked at how CC is presented in the news and identified the following prominent themes and topics; *climate science, environmental impacts/changes, climate politics, economic impacts,* and lastly *societal/cultural impacts (*Hase et al., 2021). That research further subcategorised *societal/cultural impacts* into *scientific uncertainties, economic developments*, *ecological modernisation*, and *global issues* (Hase et al., 2021).

Between countries, media coverage of CC has been found to differ, for example, in Swedish media an emphasis on the *moral* and *ecologica*l aspects of CC were observed, while German media tended to present CC as a *global issue* (Schäfer, 2015). This European coverage is in contrast with Australian and American media which, in the same study, were found to be more *polarised* in their climate change reporting by representing *sceptical* viewpoints based on the *scientific uncertainty frame* (Schäfer, 2015). In other media studies of CC coverage, the global-warming issue is not mentioned directly, rather it is spoken around, with terms like *historic* and *unprecedented* used to describe the impacts of the phenomena. Guenther (2020) calls this *climate silence*, predominantly found in some American media where CC has previously been denied outright. Generally, American media has been more sceptical of CC science and scientists compared to media in the United Kingdom (Boykoff & Rajan, 2007). Their research stated that the interaction between climate science, media and policy regulations in America has been politicised since the late '80s and has often been funded by carbon-based industries engaged in astroturfing and lobbying which has shaped the media discourse and public policy there.

For the most part, Boykoff & Boykoff (2004) state New Zealand media coverage of CC follows a similar pattern to the Western and European reportage. New Zealand media articles about CC consistently used *political, social progress* and *economic frames* and were in line with the *scientific consensus*, giving little attention to *sceptical*

CC perspectives (Bell, 1991; Chetty et al., 2015). In another study by Bell (1994) about media representation of CC in New Zealand media, it was found that most environmental news had a strong scientific component. The main errors tended to be minor, such as incorrect units or overstated facts as journalists inadvertently reported their own misunderstanding of the climate science. The same study noted the basic scientific facts were for the most part accurate, and often the advance of CC was overstated in contrast to the reality that scientific practitioners presented in their research (Bell, 1994).

In the Netherlands, media representation of CC is often framed in terms of technical solutions, in line with the previously mentioned *ecological modernisation frame* (Schäfer, 2015). In a related Dutch media study of the framing of nuclear energy, two new frames were found: *ecomodernism* and *trade-off* (Vossen, 2020). Ecomodernism is the idea that technological progress and scientific development will bring solutions to reduce environmental impacts allowing humans to exist and flourish alongside a preserved environment (Breewood & Garnett, 2022). In another study, Dutch newspapers were found to exclusively present the view that climate change was driven by *anthropogenic causes* (Dirikx & Gelders, 2010). The Dutch media platform *De Correspondent* has been found to present information to people in a way that they are actively involved, through co-creation where audiences can contribute and verify content in a *Wikipedia-like* way (Hermans & Gyldensted, 2018).

Overall, media representation of CC can shape (inter)national climate policy in positive and negative ways through the routines, norms, knowledge of CC reporting, craftmanship, deadlines as well as limited resources in time, finance, manpower or other pressures that guide journalistic decision-making (Swain, 2021). However, a study of recent graduates of environmental journalism noted that knowledge of mass communication theory was valued disproportionally compared to the applied journalistic skills of reporting on a range of news topics (Takahashi & Parks, 2018). Thus, suggesting an academic emphasis on journalists' understanding of communication theory which conflicts with the reality and pressures of modern-day newsrooms.

2.3 Journalism

Journalism is relevant as a method of communicating global warming to the wider public. Climate change communication (as described in Section 2.1) and journalism share similar goals, with the pursuit of journalism to inform, educate and entertain the public with newsworthy topics. Journalism is a form of communication, existing to inform people about events in communities and the world. More specifically it is the accumulation and curation of news, information, comments, opinions, and events that are edited, synthesised, and presented with context in a truthful and valid manner (Rudin, 2001). The act of news making involves researching, news gathering, interviewing, collating, presenting and distribution of opinions and information. The function of journalism and its actors, including journalists and editorial teams are advocates of worldly discourse (Brosda, 2008) fostering and moderating news events and allowing a constructive debate of relevant issues in the public sphere (Brüggemann, 2017).

Journalism supplies information to people and brings public attention to issues like CC through interpreting, explaining, and conveying collected and verified facts. In this manner, journalism has an influential role among the public and decision-makers through the selection and curation of information that sets the news agenda (Coombs, 2022). These typical definitions of journalism portray the view of the practice in a Western framework, where journalists contribute to a democratic and civic society (Hanitzsch & Vos, 2016). Both New Zealand and the Netherlands are considered Western countries. In the Western world, journalism is often referred to as society's watchdog – the eyes and ears of normal people (Wake & Farrer, 2016).

Journalism norms are fundamental codes of ethical and professional reporting practice. These ethical principles guide the practice of journalism and include truthfulness, accuracy, objectivity, balance, independence, respect, fairness, empathy, transparency, impartiality, and accountability (EJN, 2022; Kille, 2009; NIMCJ, 2019; SPJ, n.d; Stecula & Merkley, 2014). Journalism exists with the public interest in mind serving news, opinion, and facts in an accurate and unbiased way. These fundamental objectives of journalism are equivalent to the core ethical codes in scientific practice, including being critical, objective, autonomous and progressive (Hannis, 2014). Within journalism norms, there are two levels of news conditions according to Boykoff & Boykoff (2007). At the first level, journalism norms relate to personalisation, dramatization, novelty, or influence in human interest stories that typically focus on uncertainties and probabilities sensationally. At the second level, journalism norms pertain to balance and authority, where authoritative perspectives from both sides are presented in a story. The following subsection section discusses some elements of journalistic communication.

2.3.1 Communication Style in News

Journalistic writing is different to other writing styles as it must be clear, concise, and straight to the point, so reader attention is sustained, and information is understandable. A story is usually written in a top-down manner, recounting experiences, events, or the observations of a journalist in order of chronological importance (Cotter, 2010). In journalism, the headline and the opening paragraph of a story use a strong punchline with strong words and phrases that attract attention to the most important and interesting news elements (Cotter, 2010; Higgins & Smith, 2013). This conventional *inverted pyramid* structure of a news story starts with the *who*, *what*, *where when* and *why* news elements, arranged in order of their newsworthiness with supporting quotations and facts, followed by background details in order of decreasing relevance (Cotter, 2010; Rabe, 2008).

Linguists who study the language of journalism view the words and phrases technically, in terms of linguistic features and ideological motivations of word choice. Conversely, the public sees language as transporters of evidence, information, or entertainment and in a similar vein journalists view language as a way of providing news to people to help with decision-making (Cotter, 2010). Bell (1991), a journalist and sociolinguist, says the news is a language genre itself, made up of hard and soft news, features, and special topic stories. But not all news is created equal as sometimes the language is pre-produced and curated in press releases, reports and the like. In those cases, journalists mediate news language from institutions and individuals who use specialist language or have subject expertise (Bell, 1991). While journalists remain the core authors producing news language, they draw on spoken and written input from interviews, public addresses, press releases, prior stories, knowledge, and observations. Often, news language is recycled or tweaked from what a source says or does and language may

also be modified by editorial staff. Editors, layout editors, sub-editors, chief reporters, and proof-readers may modify the language to fit the tone or style and to ensure congruency in meaning by ironing out confusing elements or adding extra information when something is not clear (Bell, 1991). The shaping of news language and word selection often aligns with the news organisations' style guides which dictate standards to ensure news stories have comprehensible flow, and structure, and are accurate. It could be argued that the language of media today passes through fewer editorial controls before publication with news sometimes being written and published directly online, with a minimal editorial review due to staff and financial restrictions, or simply as news is breaking and requires urgent publication.

Journalistic language is dependent on the audience and is written to their comprehension needs. Therefore, *communication accommodation theory* is relevant where decisions about writing tone and vocabulary are made with the reader in mind (Bell, 1991). The language and type of information and words are selected to match comprehension and communication of the intended readers. As a result, the communicative language may change based on the target audience and type of news publication. Often, newspapers with diverse audiences will utilise language that is simple, clear, and understandable for all, whereas specialist publications may use more jargon and niche vocabulary suitable for their target audiences. As a language expert and journalist, Bell (1991) notes one pitfall in many media language studies is the fact that often researchers lack knowledge pertaining to both media practice and linguistic theory.

Journalists tend to use definite language and wording that is clear and aids decision making, whereas the language used by scientists is often less clear, discussing intricate details and addressing uncertainties and probabilities, rather than definite results which are preferred in the news (Boykoff & Rojan, 2007). Nevertheless, science communication can encourage meaning-making for people and is viewed through four cultural perspectives: explaining science through shared experiences, using fiction, identity work and lastly through emotional understanding *(*Davies et al., 2019). The framing of science through identity work explains how people and institutions shape a shared identity through scientific knowledge. Facts on their own do not always have persuasive power. Drawing on fiction narratives in science communication, is another approach to creating a version of the truth which helps audiences to understand science without the need for science literacy. Furthermore, a focus on fiction narratives can be effective in altering attitudes and behaviours by taking people into a conceptual world using more contextual and relatable narrative elements that promote emotional engagement beyond facts alone (Moyer-Gusé & Dale, 2017). Emotional engagement reinforces cultural meaning, by helping people to connect to science through positive or negative emotions (Davies et al., 2019). However, there is a need for caution when using fiction narratives or emotions when reporting science as there is the risk that the emotive or fictional elements may be misinterpreted or taken at face value.

2.3.2 Framing

Framing is how elements of a story or message are presented in a manner that highlights or pushes a certain perspective or viewpoint (Arowolo, 2017). Frame definitions are rooted in Entman's (1993) description that framing shapes a perceived reality and makes some parts more salient to promote a certain element. This definition stipulates framing as the choice of selecting aspects of reality and making them prominent in the communication.

The selection of words and topics that emphasise an issue or perspective shapes reader comprehension. From a communication perspective a frame refers to words, symbols, phrases, or images chosen by the message curator to highlight relevant aspects to aid an audience understanding of an object, issue, or person in a particular way (Druckman, 2001). A news story may focus on possible effects due to climate change, with emphasis on either public health, environmental or economic implications.

In essence, the media has an agenda-setting role by framing topics of importance in the news that are given priority on the public agenda hierarchy (McCombs & Shaw 1972). Although *framing* shows similarities to *agenda setting*, these are not the same. The relationship between the two is that agenda setting determines what issues the media present in the public arena, while framing pertains to the content of the issue or the context of how the issue should be understood. Framing focuses on the presentation of issues within a story, whilst agenda setting is about what issues are selected and presented to the public (Arowolo, 2017; Vreese, 2005; McCombs, 1977). The way news topics are framed has a subsequent impact on public understanding and perception of an issue due to the media's ability to frame news stories and set the topic agenda (Spence & Pidegon, 2010; Brulle et al., 2012). In the most basic manner, framing in news relates to the different observations and perspectives journalists can portray in their stories on the same topic or event through an emphasis on certain elements, at the expense of others (Schuck & Feinholdt, 2014). Tankard (2001) concludes frames are "*a central organizing idea for news content that supplies a context and suggests what the issue is through the use of selection, emphasis, exclusion, and elaboration"*. For example, Fox News may emphasise CC as a natural phenomenon, whereas The New York Times may portray perspectives on how CC is being exacerbated by anthropogenic causes and fossil fuels.

In a comparison study of frames used in CC reporting in Dutch and French newspapers between 2001-2007, common framing lenses found were: *the non-pursuit of action*, *consequences*, *responsibility*, *conflict*, and *human interest* (Dirikx & Gelders, 2010). In a global study of CC news articles, three core framing themes emerged: *ecological*, *scientific,* and *societal* dimension frames (Hase et al., 2021). In a similar yet automated study in 2019, thirty-seven thousand news articles from 45 countries were analysed. The results showed the framing of CC varied per country, dependent on the level of the severity of CC impacts, the economic development and overall governance of the country (Vu et al., 2019). The latter study noted that seven key frames were used: *international relations* was the most common frame, highlighting the significance of the global impact of CC; *economic impacts* was the second most common frame used; followed by *domestic politics and regulations*, *natural impacts*, *scientific evidence*, *social progress,* and *energy*, respectively. Additionally, the authors noted that media from developed nations were less likely to discuss CC from a natural impact or international relations perspective and rather focus on CC as a scientific and political issue affecting policymaking, national security, and elections. Conversely, the media from often poorer and less developed countries that experience CC impacts more severely were more likely to frame CC news through a lens of natural impacts (Vu et al., 2019). The study concluded that GDP is a factor which enabled predictions of how media would frame CC. As often richer and developed nations framed CC as an issue which can be solved through scientific and political intervention.

Controversy and scientific uncertainty were two central frames in CC communication identified by Boykoff & Boykoff (2004). The pair found that American journalistic adherence to balanced reporting led to equal coverage

of the view that CC was either a result of human activities 'or' a natural fluctuation of the planets ecosystem, with both science and factual inaccuracies common in mass media at the time. Their study indicated that it was ineffective to present people that were disinterested in CC with a detailed story with CC information and context, as it was perceived or framed in a way which was too complicated and not at all engaging for a low-involvement audience. If the audience of CC news was kept in mind and appropriate topic framing was used, there is a more positive effect in mediating involvement and understanding of relationships between climate science, policy, and public opinion (Boykoff & Boykoff, 2004). Other prominent studies have noted *disaster*, *fear*, *misery*, and *doom* frames in British tabloids (Boykoff, 2008) alongside frames whereby media emphasises the consequences of *extreme weather* (Painter, 2013). Contrasted to America where *conflict* and *scientific or technical uncertainty* have often been the common frames of its' media (Boenker, 2012).

In recent years, news media generally tends to frame CC in terms of *global doom, local tragedies*, and the newly emerging frame of *sustainable futures* (Guenther, 2020). A review of contemporary media studies looking at CC coverage observed that many of the frames found to reduce people's propensity to support and engage in climate action have been on the decline in the mainstream media whilst frames conducive to such engagement by the public have been on the rise (Stecular & Merkley, 2014). Examples of the former are frames emphasizing potential *economic harms* of *climate mitigation policy* or *uncertainty*, whilst the more conducive frames are for instance those highlighting *economic benefits* or *human benefits* of climate action. Nowadays, news content is more likely to use language emphasizing risk and danger, and to use the present tense, increasing the relevance of media framing for fostering climate action in the public (Stecula & Merkley, 2014). Schäfer (2015), renowned for his research about climate change and environmental issues in the media, expanded on this idea. He noted that in European media, *scientific uncertainty*, a common frame in the early 2000s, has become less prominent as society and mainstream media today generally agree with the scientific consensus regarding CC as a fact. For example, *Covering Climate Now* is a worldwide alliance of publishers (including several news organisations featured in this study) that have signed a treaty committing to the factual coverage of CC and reporting on the realities of global warming and solutions. The *sustainable futures* frame identified by Guenther, (2020) in the media included stories about *ecological* and *technological modernisations* to reduce or mitigate impacts.

The way journalists frame news has long been discussed by academics as a tool for shaping public discourse, world views, policies, and social constructions of the world we live in (Mostovoy, 2019). There is a need for more research about the framing of CC coverage concerning CC mitigation and adaptation solutions, as news stories focused on risk have negative elements and can inhibit public comprehension (Tschötschel et al., 2021). Tschötschel and colleagues (2021) propose solutions to CC and perceptions of self-efficacy and action in response to environmental changes are important leading frames in news coverage in the future, as these frames encourage positive change. With consideration of such positive changes, the *broaden and build theory* could be applied with positive media coverage of climate change action – where positive media coverage of climate action and individuals' actions will inspire and encourage others. This theory explains how people use positive emotions, gained from positive or inspiring stories, to extend their actions and thoughts in an upward cycle of positivity connectivity, and personal resilience (Fredrickson, 2001).

2.3.3 Newsworthiness

News values are aspects of an article or report that are considered relevant for an issue to be in the news. They are the principles that govern journalistic practice and shape or reinforce ideologies that are expressed by news providers (Cotter, 2010; Higgins & Smith, 2013). The news values that make a story newsworthy are not set it stone and newsworthiness is often based on precedents set within a news organisation or the personal skills and experience of the journalist (Bednarek & Caple, 2014; Dominick, 2011).

A non-exhaustive overview of news values was proposed by Galtung and Ruge in 1965 (as cited in Bell, 1991; Dunwoody, 2011; Higgins & Smith, 2013) including; *news frequency*, *threshold*, *unambiguity* or *clarity*, *meaningfulness*, *consonance* or *predictability*, *unexpectedness*, *continuity* (known as the story that keeps giving), *composition* (the light fluffy, feel-good stories balance out the heavier hard-hitting ones), *concentration* or *reference to elite people and nations*, *negativity*, and *person-centred* stories. Nowadays, many of these core news values remain and new newsworthiness factors have arisen or become relevant in modern-day media. Some important factors that make an issue or story newsworthy in conventional media are its *timeliness*, *proximity*, *conflict* or *controversy*, *human interest*, *relevance*, *magnitude* or *significance*, *novelty* or *prominence*, *recency*, *facticity* (the favouring of proven evidence) and *person-centred* (Bell, 1991; Bednarek & Caple, 2014; Dominick, 2011; Eliders, 2006; Rich, 2015; Kepplinger & Ehmig, 2006). Hence, stories on *short-term events* or *exceptional events;* stories that are *unambiguous*, *timely*, *raise tensions* or *include the elite*; or stories with *visual qualities*, *negativity*, *controversy*, and *immediacy* are often headlining the news (Dunwoody, 2008). The word selection and framing of these stories often reflect news value factors, for instance, if the story is negatively framed then the vocabulary and word choice may also be negative to reinforce this (Higgins & Smith, 2013).

The assessment of the newsworthiness of a story strongly relates to personal and professional expertise that journalists and editors bring to the job and apply when determining what is important to write or publish (Bourk et al., 2015). The sense of knowing *what is* and *what is not* a newsworthy story is built over time and becomes part of a journalist's identity and values. Thus, there is difficulty in pinning down a strict definition of newsworthiness due to its subjectivities (Lorenz & Vivian, 1996). A 'nose for news' guides a journalist instinctively, often asking oneself, '*so what?*', '*why does this matter?*', '*why is this news?*' and use news values to reaffirm *why* a story deserves media attention.

For CC and SLR stories, the conventional news values may be somewhat limited due to the complexity, ambiguities and the slow pace of CC effects and the lack of journalistic values such as clickability, predictability, celebrity status or entertainment value (Bourk et al., 2015). Consequently, climate change and environmental science stories often end up in the news with a focus on a related topic that is more newsworthy, for instance, the personal human-interest elements or the consequences of CC and the impact it has or will have on society.

2.3.4 Storytelling & Narratives

Journalism uses narratives and storytelling as an effective way to attain attention, explain perplex information and to aid understanding for the public. Storytelling enables cognition and understanding by building connections and identification, with the world and others, through our experiences (Lewis, 2011). Stories connect people through

emotions and help with understanding and opinion forming through presenting information in a recallable manner (Universiteit van Amsterdam, 2021). Science in the news also needs to be relevant and relatable for people, this can be achieved through humanisation and storytelling which attract the reader's attention. For instance, the human element has been pivotal in bringing attention to medical issues and concurrently encouraging audiences to action, as personal stories act as a catalyst of illustrative, inspirational, or sensational example that audiences relate to (Hinnant et al., 2013).

Bell (1991) stresses that news is often structured in a narrative form to aid reader comprehension. This narrative form contrasts with an article which merely presents facts and information, with little or no bigger-picture explanatory context or personal elements that connect to people. Bell (1991) continues to state that narratives tend to have some form of resolution, whereas news stories do not always clearly present results or an outcome. Narratives in the media enable people to contextualise, understand and engage with information especially when speciality or complex information is being communicated to non-expert audiences (Arthur, 2013). Journalistic narratives often have a positive impact on audience engagement and appreciation, as they mediate the relationship between readers and society by linking the two (van Krieken & Sanders, 2019).

There is clearly some interchangeability in defining a narrative and storytelling. In the reviewed literature it was difficult to pinpoint distinct differences as the two terms are often used synonymously. Perhaps where they differ somewhat is in the sense that a story has a plot or sequence of events over time with a start, middle and end, whereas a narrative is more open-ended with multiple perspectives and consists of a broader system or connection between individual stories (Raven & Elahi, 2015). Narratives tend to have a cause-and-effect structure in the recount of a series of related events or experiences, while stories are the individual elements that make up the greater narrative (Arthur, 2013). The overall structure of a story comprises a plot, dialogue dynamics and suspense, and a consequential ending, serving to engage people with curiosity and enable deeper connections with the reader or viewer (Weber, 2016; Chelnokova et al., 2017). For example, there may be two story perspectives regarding climate change – the one spun by the fossil fuel industry and the other by environmentalists aiming to save the planet, together they form a collective narrative (Swain, 2021). Stories within the narratives are the cognitive products and processes that help people create meaning and understanding of the wider narrative (Lewis, 2011). More simply, stories are the mini events within the overall narrative.

Narratives and stories can represent both the real and fictitious worlds, experiences and events that are created and expressed by humans in written, visual, or spoken form (Ryan, 2004). Shen et al. (2015) states that narratives immerse readers in a story by appealing to emotions through a plot or sequence of real or plausible life experiences that have the intention of informing or entertaining. Non-narratives on the other hand use explicit rhetorical persuading arguments and facts (Shen et al., 2015). Metaphors are routinely used in storytelling as metaphorical comparisons can help people understand through dramatization, making issues newsworthy, memorable, and interesting (Anton & McCourt, 1995). Metaphors can be used to address different audiences simultaneously through the representation of complexities in relatable and understandable terms that help people create a picture in their minds or enable common sense thinking (Bucchi, 1998; Conboy & Tang, 2016). Metaphors and analogies in journalism therefore are a tool in the explanation of scientific phenomena to the wider public.

2.4 Science Journalism

Science journalism, as a speciality field of reporting, presents the results of scientific research to a broader audience through the news (Dempster, 2020). Science journalists re-contextualise science from an academic perspective to the real-life world of lay people (Myers, 2003). The disjoint between science and news, is that reporters are limited by time, deadlines, space, and sometimes knowledge where technical details may be sacrificed (Friedman et al., 1988). Science is often newsworthy due to the release of reports, conferences, study breakthroughs, and discoveries or due to its enmeshment between political, economic, and societal worlds (Allan, 2011). In recent times, science journalists are no longer just transmitters of science but often have an interpretive function looking at the process of academic research as curators, explainers, and civic educators who connect and guide readers through the scientific process and what it contextually means for society (Fahy & Nisbet, 2011).

Journalists have a natural inclination to emphasise the human element in news (Ashe, 2013), by selecting key facts and simplifying science in an engaging manner. Climate change is defined as a societal problem affecting economic, politic, philosophical, and physical environments. The news media plays a fundamental role in communicating scientific knowledge about socially important issues, such as CC and SLR, and helps to shape the public understanding and ranking of risk (Ashe, 2013). In news stories, linkages are made between the science of the changing planet with academic reports, weather extremities, governmental policy, and planning changes (Brüggemann, 2017). With increasing polarisation and wavering levels of public trust on controversial topics like Covid-19 and global warming, there is a need for understanding the way science is presented and communicated in news cultures (Dempster, 2020). Scientists are increasingly being called upon to explain or even defend their scientific research to actively appeal to significance and value predispositions in the news (Nisbet and Mooney, 2007). Science journalism intends to accurately portray detailed, specific, and often jargonised information from scientists and academics in a manner that non-experts can understand and appreciate (Angler, 2017). In doing so the application of storytelling techniques and data visualisations helps science journalists communicate complex information in an open dialogue between knowledge experts and the public (Angler, 2017). Avoidance of a top-down, information deficit model is preferred in modern times as it is one-directional with information coming from those with knowledge and power, which tends to increase public hostility towards science and technology information (Dickson, 2005).

Evidence from Peters (2013) suggests scientists want to meet the public in the public arena and see a gap between internal scientific communication and public communication that needs bridging. Thus, visibility in the media and responding to journalist enquires is a duty of the science profession. Nowadays, science communication needs to be more interactive, where experts and lay people can communicate, interact, and share information to increase overall engagement, learning and understanding of science. Despite their best efforts for accuracy and factuality, science reporters are often accused of oversimplifying and sensationalising science news by a failure of engaging audiences in genuine and meaningful ways (Secko et al., 2012). Often the disconnect is the result of perceived complexities and fear of the unknown and thus stories may be dumbed down, despite reporters' best intentions to democratise science by simplifying it without losing the core meaning (Allan, 2011). In the present digital age, with technology and the internet, there is promise of rethinking the way science journalism is practised through innovative implementation of visual, digital, interactive, or other modern communicative manners (Allan, 2011).

Expert sources such as scientists are important in science reporting but there is a growing interest in the inclusion of broader stakeholders such as politicians, public relations spokespeople, corporate companies, the public and non-government organisations being called upon for input and explanatory or contextual information in the communication of science in the news (Schäfer & Painter, 2020).

The concept of false balance has had increasing prevalence in science reporting as it can increase uncertainty perceptions among the public (Dixon & Clarke, 2012). False balance seeks to present a news story with equal weight given to all perspectives, even when the facts are weighted differently (Boykoff & Boykoff, 2004). The equal weighting of all sources potentially gives the illusion of respectability or credibility of fringe views from corporates or minority groups when presented as equivalent to the established scientific consensus (Donald, 2019). This is problematic when journalists give CC scepticism equal weighting to CC facts and is a cause of misinformation and conspiracy thinking (Boykoff & Boykoff, 2004; Stecula & Merkley, 2019). When the science of climate change is presented in the media as an issue up for debate the public can be confused by the reality or actual existence of climate science and CC. While there is journalistic value in reporting information from all sides of the story that does not infer all perspectives deserve equal weight. In the past, it was not uncommon to have views from most climate scientists presented as equivalent to views of just a minority of climatic septics (Boykoff & Boykoff, 2004). Dixon & Clarke (2012) note balance can be achieved if claims for and against are presented in the context of where the strength of evidence lies. There is a fine equilibrium for climate reporting. As some in the field of climate science call for a revolutionary overhaul of the global system to reduce the impeding impacts of global warming and CC, whereas the current media narrative implies a reformist approach with some changes to existing world structures (Boykoff & Roberts, 2007). The latter is perhaps due to the tension between media organisations and their funders (Boykoff & Roberts, 2007). Many media organisations rely on the capitalist systems of commercialisation, consumerism and consumption which is undoubtedly adding to the climate issue.

2.5 Solutions Journalism

The practice of solutions journalism is described as reporting that aims to offer resolutions to societal problems and encourages readers to engage in positive change spurred on by evidence-based, in-depth, solutions-orientated reporting of environmental and societal problems (Benesch, 1998; SJN, 2017). Solutions journalism builds on the idea that the media is socially responsible to inform and encourage healthy public debate and engagement in society (Kovach & Rosenstiel, 2007). Solutions journalism, referred to by some as constructive journalism or solution-based reporting is grounded in the traditional reporting values of truth, accuracy, neutrality, and criticism (Dagan Wood, 2014). It moves beyond just reporting an issue, to a comprehensive exploration of how and why solutions (could) work and seeks to engage readers by offering a blueprint for change while concurrently altering the tone of public discourse by providing people with hope that there is a solution and they too can actively engage in to remedy the societal issue (Lough & McIntyre, 2018; Loizzo et al., 2017; Midberry & Dahmen, 2017; Their, 2016).Essentially solutions journalism explores responses to social and environmental challenges with the aim of creating a better society where the news integrates, explains, and explores plausible or existing solutions and its' limitations, if any (Lough & McIntyre, 2018SJN, 2017).

While the solution-based approach in reporting has only recently started gaining popularity in media practice, it has existed since the late 1990s. The reporting style aims to frame the news in terms of what is right, rather than what is wrong (Benesche, 1988). The usage of solutions journalism has been driven by public dissatisfaction with negative news and thus news reporting is developing in the direction where journalism provides value to readers through articles that tell stories about innovation and constructive approaches to societal problems (Hermans & Gyldensted, 2018). Solutions journalism enacts the same protocols, ethics, and morals of traditional journalism (Rice, 2021). But it goes a further by explicitly focusing on in-depth responses to societal challenges, thus complementing and adding to the media's traditional watchdog and investigative roles (Bornstein, 2011; McIntyre, 2017).

Elements within a solution-based story include an *explanation of causes* and *possible responses* to an issue, *details* of how the resolution could be implemented and *evidence* that verifies the success of the solution (Bansal & Martin, 2015). The reporting should be rigorous, and evidence based. The Solutions Journalism Network (2017) reiterates these requirements and state the journalism style provides readers with greater insight into an issue by including a *response, insight, evidence,* and *limitations*. Solutions in news can have positive effects, readers can feel less negative after reading solution-based news, however readers intention to act, or change was not increased when solutions were present in news according to a study by McIntyre, (2017). In contrast, a more recent study by Overgaard (2021) concluded solutions journalism can increase readers civic engagement as the inclusion of resolutions contributes to a rise in positive feelings, increased self-efficacy, and increased perceived news credibility due to the positive framing effect. Through the evocation of hope the impact of negative news can be reduced (Lazarus, 1999). For example, in a study of the prevalence of solutions journalism across 25 countries during the Covid-19 pandemic, the stories that offered practical advice were found to encourage citizens to be part of the solution or partake in the reported actions (Li, 2021). However, the resolution-based articles failed to fulfil watchdog roles of journalism, where authorities would usually be rigorously critiqued. The study noted concerns about a lack of investigative articles addressing misinformation and political divisions, due to the 'emergency' of the pandemic when journalists had a more civic-orientation duty (Li, 2021).
in the dissemination of information that echoed government interventions. Although sometimes audiences are more risk-averse when positive frames are used (Tversky & Kahneman, 1981). Audiences' pre-existing knowledge has previously been found to mediate the effect of positive or negative framing and counter-effects can result among those overly sceptical of evidently positive or negatively framed messages (Schuck & De Vreese, 2008).

There are some pitfalls to solutions journalism including the potential for individuals or organisations to be spotlighted do-gooders, as opposed to the solution and context of the resolution(s) and how and why it works (Curry et al., 2016; Lough & McIntyre, 2018). Championing someone or something may mean the strength of a solution is diluted and is no longer the core focus of the story (Lough & McIntyre, 2018). Solutions journalism is difficult to achieve in practice as newsworthiness factors of journalism often require a human factor that makes the story relatable and personable. The resolution reporting approach should not be about the who or what, whilst important, the '*how'* is most important (Porter, 2017; Their 2016). Additionally, there is a negative sentiment that solutions journalism may be too positive by promoting or advocating and sensationalising solutions, with

disregard for the negative realities of the world (Sillesen, 2014). For example, over-emphasis in reporting on remedies to reduce coastal flooding may leave news readers perceiving no real risk, if solutions appear 'readily' available. Proponents of solutions journalism say good solutions reporting is well-rounded and critical and explains resolutions and limitations to societal issues in a balanced manner (Benesch, 1998). The characteristics and unnecessary elements of solutions journalism are detailed below.

Table 1: Characteristics of solution-based journalism.

Solutions journalism characteristics	**Unnecessary elements of solutions journalism**
• description and insight of the problem • causes of the problem • description of proposed solution(s) • evidence-based • reports on solution effectiveness • reports on solution limitations • credible information sources	• overemphasis of hero or glorifying a solution, individual or organisation • descriptions of innovations described as 'silver bullet' lifesavers • promotion of an agenda or cause • a solution as an afterthought – no analytical explanations, solution briefly noted • promotion of an individual/company voice or perspective

(Bansal & Martin, 2015; Their, 2016; Porter, 2017)

2.6 Literature Gap

Having reviewed the literature some opportunities for further study clearly exist particularly about the representation of SLR in the media which tends to be clustered as an impact of CC. As newsrooms the world over increase their coverage of global warming issues, simply telling the story of what is really happening in the eyes and minds of the public is no longer enough (Shilpa, 2011). Despite (early) indications and knowledge of the influential role the media plays in shaping public knowledge, there are still gaps in understanding how and what the news media does in the framing of news and information regarding climate change, and SLR specifically. It is relevant to understand the dynamics of the SLR discourse as it is presented in the media due to its information dissemination role. Few academic media studies have focussed primarily on the presentation of SLR in the news media. Therefore, understanding and comparing how SLR news is framed in the news media in different countries may provide insights for future reporting practices and improvements in the way CC science is communicated. Understanding the journalistic communication process and building knowledge of how SLR, and CC, is being communicated contributes to the understanding of current media practices (Vu et al., 2019). This comparative study will build an understanding of differences in framing and presentation of a global issue in the news in two countries prone to the impacts of SLR.

Additionally with the emergence of solutions journalism as one way of positively engaging news audiences when there is a strong negative tone in a lot of the news coverage, this study also addresses the prevalence of solutions journalism in SLR media coverage. The use of solutions journalism in CC communication is a worthy area of study to improve the understanding of how journalists can positively contribute towards society though interweaving constructive solutions and perspectives in their stories. Additionally, there are calls for cross-cultural studies examining the prevalence of solution- and adaptation-based reporting as an emerging style of reporting (Akerlof et al., 2017; Boykoff & Roberts, 2007; Mostovoy, 2019; Universiteit van Amsterdam, 2021).

Transnational and comparative studies of online news and other news media types, especially non-western nations and their respective approach to CC reporting are in need (Schäfer, 2015). This is because studies have previously looked at the framing of CC, predominantly in countries in North America and Europe, for example, studies comparing the United Kingdom, France, or America (Boykoff & Rajan 2007). But no study yet compares media coverage from the smaller, SLR exposed nations of New Zealand and the Netherlands. This research project explores the topics, frames, and presence of solutions journalism in SLR reporting in New Zealand and the Netherlands.

3 RESEARCH METHODOLOGY

In this chapter, the methods chosen for this research are explained. First, the design and reason for a qualitative approach, then the coding procedure and codebook will be introduced followed by an explanation of the intercoder reliability. Finally, this chapter concludes with descriptive details about the article in the corpus.

3.1 Design

A qualitative media analysis of 80 articles per country was completed to answer the research questions. The aim was not to define the reality of SLR discourse, but rather to define a reality of sea level rise discourse, as it was presented at a point in time in the news in Aotearoa and the Netherlands. Currently, a greater proportion of media studies in climate change communication tend to be quantitative (Metag, 2016). However, a qualitative study allows a deeper understanding of communicative phenomena through contextual real-world observations of news discourse (James & Sørensen, 2000). Further, qualitative data analysis can be used in theory building as a way of explaining emerging concepts, due to its open-ended approach. There are no predetermined precise constructs or measures to be followed, thus allowing for an inductive approach that is, flexible, and exploratory with observations and interpretations being understood in a manner pertaining to the author's interpretations (Graebner et al., 2012). In practical terms, this study builds an overview of current framed topics and themes present in the news about SLR.

Prior to data collection, Bell (1991) suggests it is helpful to consider what type of data will be collected and to set limitations for how much data will be collected to avoid overburdening oneself with excess information that may be difficult to process. Additionally, it is best in media studies to compare similar types of media, because comparing the framing of the news from sensationalist outlets and those that are not, or polar left- and right-wing media is difficult as they are too different (Bell, 1991; Semetko & Valkenburg, 2006). Lastly, Bell (1991) acknowledges that sourcing media content for analysis can at times be difficult, as finding articles online or physically that fairly represent reality may not always be possible due to unavailability or inaccessibility. Due to the specificity of the SLR topic, it was anticipated that there may have been a limited number of articles available as CC was expected to be the overarching issue discussed in the media as opposed to SLR.

3.2 Coding Procedure

To enable review and comparison of the articles, they were coded by grouping similar frames, topics and themes expressed in the text. An extensive codebook (see Appendix A. Codebook) was developed using some codes derived from earlier research including the work of Boykoff & Roberts (2007), Boykoff & Boykoff (2004) and Hase et al. (2021) mentioned in Chapter 2. There is a scarcity of procedural guidance and methods for coding in framing theory studies (Olausson, 2009). Thus, with some difficulty the final codebook aggregated themes and frames of some previous studies and other codes were derived from the articles as they were read. Typically, in studies, existing frames in literature are recycled and utilised where researchers often develop a pre-determined codebook of what they are looking for (Painter, 2013). Following a purely deductive coding approach was considered to prematurely limit the research to existing frames and miss recording new emerging frames or themes

in current SLR news discourse. Being open to an inductive approach in this study enabled SLR news discourse frames to be observed without restriction. Some frames found did indeed align with pre-existing codes in the literature and others were more niche or content-specific relating to Aotearoa or the Netherlands. For example, unique codes relating to property or indigenous communities were established in the open-coding process which had not been found in the review of literature.

Many codes were used to identify the article such as source, article type, news style publication date, country, and region(s) represented within the text. News framing codes inspired by Semetko & Valkenburg (2000) including**,** conflict, human interest, economic consequences, and morality were used too. The *storytelling narrative* and *inverted news pyramid* style codes were based on the work of Shen et al. (2015) where a storytelling narrative pertained to a story that appealed to reader emotions whereas a non-narrative, inverted pyramid story presented news in descending order of importance with information and evidence in a less personable or humanising way. To categorise and identify solutions journalism, the criteria outlined in Table 1 (see section 2.5) were used to identify if the article had elements of solutions journalism or not.

The codebook essentially detailed a *category*, *code* and if applicable a *subcode*, plus an *example* and an explanatory *note*. The codebook was like a checklist when reading the articles, but some codes were added throughout the article reading and analysis phase A small sample excerpt of the codebook is inset below, for the full codebook refer to Appendix A. Codebook.

Table 2: Example of Codebook from Appendix A.

Category	**Code:** - Sub-code	**Example:**	**Note:**
NEWS PROVIDER TYPE	Newspaper	Stuff, De Telegraaf	What is the primary publishing platform / medium?
	Online only	The Spinoff, Newsroom, Nu.nl	
IMPACTS OF SLR	Coastal Impacts - Erosion / weak coastline - Low lying coastal flooding - astronomical tide	 Cliff collapse Coastal flooding Unexpected waves	What kinds of SLR impacts?
STAKEHOLDER	Public - minority / indigenous - everyone collectively - owners / residents' union - agricultural/farming sector	 Māori General public Community group	What stakeholders are included or represented within the news article?
	Experts / scientists - climate / environmental - engineers / tech developers - economist, banking, insurance property - IPCC - other	 NIWA / Met Service Tonkin Taylor Lawyer, psychologist	
SOLUTIONS JOURNALISM	Response / solution Mentioned	Floating city, relocation, dykes	What characteristics of Solutions Journalism are present?
	Cause of problem + evidence	Land sink, warming seawater	
	Insight into solutions incl. limitation	Solution evidence / limitations	

There was an excess of overlapping similar codes in the first phases of coding, these double up codes were merged to create the final codebook (Appendix A). The systematic coding procedure was aided by using *Atlas.ti* software, commonly used by researchers and practitioners in various disciplines due to its' ability to create visual interpretations of qualitative data (Friese, 2019). *Atlas.ti* enabled the identification, labelling and storage of text segments which could be ordered and interpreted within the software to observe similar frames and trends as relating to a more general idea about SLR. Additionally, the use of codes was beneficial as it segments similar themes and topics together as they relate to a more generalisable idea and then the codes helped with finding patterns, structuring findings and then the interpretation of results (Boeije, 2010; Berg, 2009).

3.3 Intercoder Reliability

Early in the coding process when 25% of the total corpus had been coded a second coder was engaged to code 16 articles or 10% of the corpus, eight articles from each country. The second coder helped ensure the reliability and consistency of the codebook and coding procedure and allowed the opportunity for dialogue about the original codebook and coding procedure, which was adjusted, and the coding process streamlined. In this first phase of coding, codes were being applied per paragraph, it was time intensive, and some codes reoccurred in multiple paragraphs. The intercoder reliability was calculated when codes had been applied to the paragraphs.

A variation of the percentage agreement calculation known as the Holsti Index (Holsti, 1969) was used to check the intercoder reliability and agreement of codes used. Intercoder reliability is defined as the agreeance about codes among two or more independent coders (Lavrakas, 2008). The Holsti index is a simple and satisfactory measure *commonly used* in communications research where the reliability of categorical or nominal scales is being checked (Mao, 2017). The calculation allows for occurrences when coders may not code precisely the same segments of data, but chance agreements are not accounted (Neuendorf, 2002). Chance agreements are less likely when there are more codes (Lombard, 2002) as was the case when an earlier version of the codebook was being used with more than 210 codes and 47 code categories.

Mathematically the Holsti Index formula is Reliability = 2M/(N1+N2).

'M' is the number of coding decisions where the two coders agreed and 'N1' and 'N2' are respective codes from the primary and secondary coders (Wang, 2011). The percentage agreement was calculated for each of the 16 articles which ranged from 72% at the lowest and 84% at the highest. The combined overall average percentage agreement for the 16 articles coded by the primary and secondary coder was 77.69%. For the most part, the main code categories used by both coders matched but often the specific subcodes varied. Perhaps due to too much similarity between sub codes with differing interpretations by the coders, or multiple codes were considered applicable due to their similarity. Many of the similar codes were later merged or discarded after discussions with the second coder and supervisor and a revision of the codebook which simplified the coding process thereafter. Additionally, it was decided to apply codes across the entire article instead of applying codes per paragraph. This decision was made for the sake of efficiency and as the scope of the study was to analyse the most prevalent frames and perspectives within the news articles rather than finer semantics of paragraphs.

3.4 Corpus

Articles were sourced via multiple search engines including *Google News, Lexis Nexis, Duck Duck Go* plus directly from news publisher websites. Written online news articles were chosen as the type of article based on ease of accessibility and as a significant amount of news is consumed online today (Wilkins et al., 2018). The study sourced more than 160 publicly available news articles (see Appendix D. List of Articles in Comparative Media Analysis) published online between January 2021 and June 2022. These articles provided a snapshot of dominant frames and topics mentioned in SLR news in the previous 18 months. The timeframe allowed for associated news reporting around the release of the 2022 IPCC report as well as two new studies: a New Zealand study about sea level rise and vertical land movement plus a Dutch study indicating accelerating sea levels due to wind and atmospheric pressures. After coding about 60 articles per country, it was evident that a point of saturation of topics had been reached as no new topics, or themes pertaining to SLR were being found. In total, 160 articles, 80 per country were included in the study (Appendix D. List of Articles in Comparative Media Analysis).

3.4.1 Inclusion Criteria

Articles were sought that mentioned sea level rise, coastal surges, or river flooding. Several keywords and phrases were searched, in English and in Dutch. These terms included *sea level rise, coastal flooding, supermoon flooding, sea-threat, flood damage, climate change, rising waters, zeespiegelstijging, broeikaseffect klimaatverandering, overstroming schade, dijkdoorbraak, vloedoverstroming* en *overstroming.* Only English and Dutch language articles were included in the analysis with articles derived from news organisations or writers operating either in New Zealand or the Netherlands. Due to the author's limited Dutch fluency, *Google Translate* was used to aid comprehension of news in the Dutch language. Translate services are considered and proven as a satisfactory standard tool in the analysis of multilingual texts if syntactics and structure are not the core element of analysis (De Vries et al., 2018). This qualitative study only looked at broad themes and topics and contents of the articles but did look at the syntax or formulation of sentences and language used to frame SLR. Only the textual contents of written articles online were analysed and coded. Images, captions, video, podcasts, and other media types embedded in the articles were excluded as a research project of that magnitude was beyond the scope and ability of this exploratory study. When collecting articles, they were screened for relevance to ensure the terms *sea level rise,* or the Dutch equivalent, *zeespiegelstijging*, were present at least twice. Articles with 300 words or less were excluded due to brevity as were stories from unreputable sources like conspiracy blogging and opinion 'news' websites. In some cases, an online story was simply a transcript of a broadcast video or radio item and was deemed irrelevant. Often broadcast news uses the active spoken voice and thus the style of writing is to be listened to, not read.

3.5 Descriptive Details of Corpus

3.5.1 News Providers per Country

Reputable mainstream media organisations which are well-read among the general population were chosen in this study as these news organisations are known to lead the role in boosting public attention on news issues (Langer & Gruber, 2020). Both New Zealand and the Netherlands are democratic nations and share similar generous press

freedoms and independence of operation – in 2022 New Zealand was ranked 11th and he Netherlands ranked 28th on the Press Freedom Index (RSF, 2022a, RSF 2022b).

New Zealand

The news industry in New Zealand collectively boasts itself on a mission of public interest journalism and includes a relatively small mixture of private and public news entities which rely on commercialisation, sponsorship, donations, or government funding to operate. Many news organisations bid for funding from *NZ on Air* – a state-funded organisation that supports media providers in the production of public interest journalism. Articles from *Stuff* and *NZ Herald* were most common in this study, respectively contributing 46% and 19% of the total 80 articles from New Zealand (Table 3). This is not surprising as they dominated in 2020 as the largest print and online news providers in the country – owing to their respective ownership of multiple newspaper mastheads and associated websites that contribute to *Stuff and NZ Herald's* online offerings (Myllylahti et al., 2020). Both companies are commercial news providers relying on advertising as their core income stream. Whilst New Zealand has several prime news providers in newspaper, radio, and television publishing there are several new mainstream online-only news providers including *The Spinoff* and *Newsroom* respectively contributing to the study with 6% and 11% of articles. Both are funded by sponsorships, donations, and commercial ventures. Radio New Zealand (RNZ) is a fully government-funded entity focused on radio broadcasting but has a strong news presence online too. Thirteen per cent of articles were from RNZ, 1% from 1News and 4% from The Guardian (Table 3). The Guardian is headquartered in Britain, but several writers are New Zealand based and write stories from an international perspective while 1News is a state-owned, commercially operated television broadcaster with a more conservative national focus and audience.

Table 3: Publisher of New Zealand articles.

NZ Herald	15	19%
The Guardian	3	4%
Stuff	37	46%
The Spinoff	5	6%
Newsroom	9	11%
1News	1	1%
RNZ	10	13%
Total	**80**	**100%**

The Netherlands

The Netherlands has a variety of publisher mediums including newspapers, magazines, television, and radio or online-only publications which are reflected in the diversity of article sources. As is evident in Table 4 articles came from 24 different news publishers, most articles were from Volkskrant (N=11) and NOS (N=13). However, two Belgian-based companies, *DPG Media* and *Mediahuis* own a significant majority of newspaper masthead brands and associated websites in The Netherlands (Newman et al., 2021) and nearly 50% of articles in the Dutch article analysis came from *DPG media*. Collectively 63% of the articles in the study were from either of these two companies. Most Dutch news organisations today have a core business in either newspaper or magazine publishing and online offerings are complimentary and equally important in today's digital age. *Nu.nl* and

Agraaf.nl which are featured in the present study are one of the few *online-only* news providers in the Netherlands (Bakker, 2017). Although in 2018 Bakker (2018) notes Dutch newspaper provider websites dominated the online market with about five million visitors per month including *AD, Nu.nl, De Telegraaf* and the government-funded television and radio news provider, *NOS.* Other popular news websites among readers were *Trouw, NRC, Volkskrant* and *RTL Nieuws* which had slightly fewer website visits per month (Bakker, 2018). The national newspaper *Volkskrant* had 11 articles in this study while the regional newspaper *Noordhollands Dagblad* had six articles in the study. All other news providers contributed five or fewer articles to the study (Table 4). Most Dutch media is funded through commercial ventures such as advertisements or sponsorship. *NOS* is a public service news organisation with its' main venture in television and radio news alongside its' online offerings. It is funded through a mixture of commercial funding and the Dutch public broadcasting system (NOS, 2021).

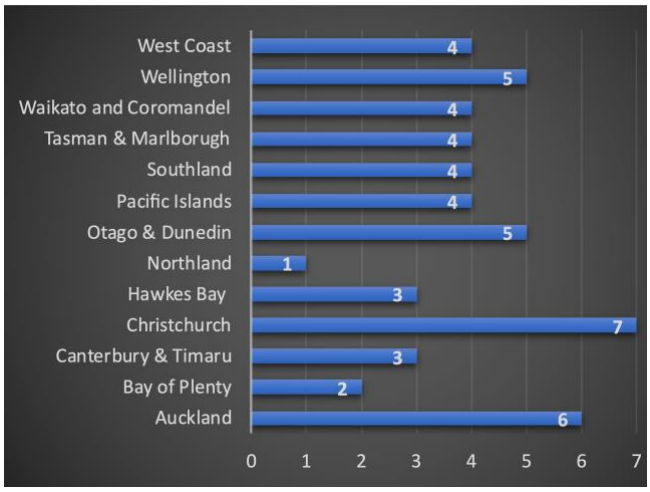
*Table 4: Publisher of Dutch articles. * = news publisher part of the company in bold above.*

DPG MEDIA	**38**	**48%**
Algemeen Dagblad	5	6%
BN DeStem	3	4%
Het Parool	4	5%
NU.nl	10	13%
PZC	1	1%
**Trouw **	4	5%
Volkskrant	11	14%
MEDIAHUIS	**12**	**15%**
De Limburger	1	1%
De Telegraaf	2	3%
* IJmuider Courant*	2	3%
Noordhollands Dagblad	6	8%
Nederlands Dagblad	1	1%
NRC MEDIA GROEP	**5**	**6%**
Friesch Dagblad	3	4%
NRC (Handelsblad)	2	3%
Other	**25**	**31%**
Agraaf	1	1%
De Groene Amsterdammer	1	1%
Een Vandaag	1	1%
NOS	13	16%
Omroep Zeeland	2	3%
Nieuwe Revu	1	1%
Reformatorisch Dagblad	1	1%
RTL	1	1%
Vice NL	1	1%
Vrij Nederland	3	4%
TOTAL	**80**	**100%**

3.5.2 Regional Location of Articles per Country

Now knowing what news organisations from each country are represented in corpus it is worthy to detail the specific regional or city locations that the articles featured. In New Zealand just over half of the news articles about SLR presented the issue from a country-wide perspective (N=43) whereas in the Netherlands 53 articles presented SLR from a country-wide perspective. Populated regions and cities in both nations were frequently mentioned, as to be expected, as SLR in populated areas impacts people residing there. For example, Figure 1 shows populated coastal areas like Auckland (N=6), Christchurch (N=7), Dunedin (N=5), and Wellington (N=5), which were referred to the most in New Zealand news discourse. Whereas less populated regions like the West Coast (N=4), Hawkes Bay (N=3), Northland (N=1), and Southland (N=4), were mentioned less. The Pacific Island nations were mentioned on four occasions indicating the ties and concern local media has for neighbouring island nations that too, are impacted by SLR. In the Dutch news discourse, Zuid Holland, the most populated region of the country featured in 15 articles, as did other population-dense locations like Noord Holland (N=8) and Amsterdam (N=7). Low-lying locations and places exposed to SLR were also frequently mentioned in the Dutch articles including Zeeland (N=11), and the Wadden Islands (N=8). A European perspective on SLR was present in six articles (Figure 1). Overall locations most at risk to rising waters were found the most in the news discourse, often due to population proximity, low-lying geographically sites or places close to or on a coastline.

New Zealand:



The Netherlands:

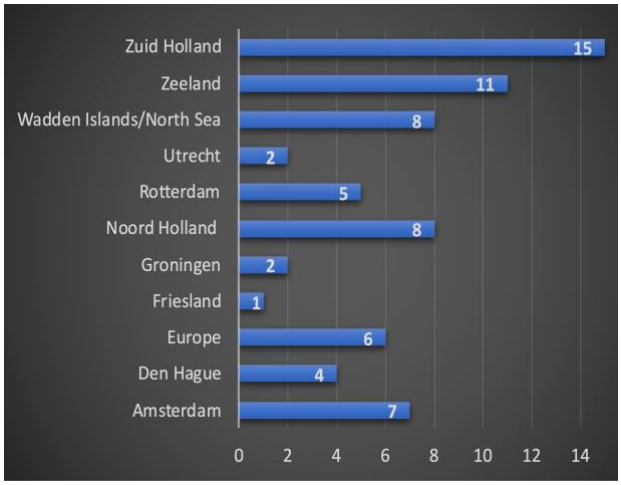
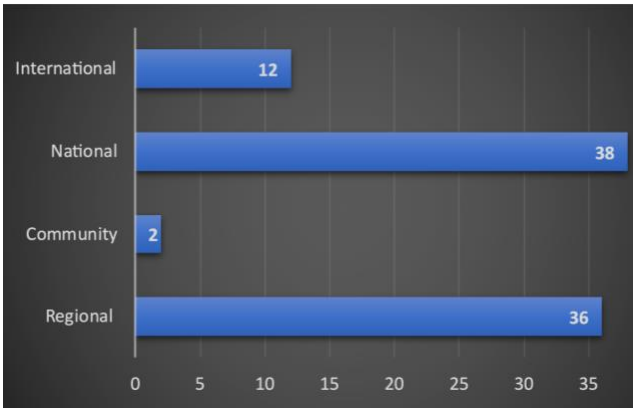


Figure 1: Specific regional location of articles per country.

3.5.3 Geographical Focus

News media from both countries largely framed SLR from the perspective of their own country. Nearly 50% of the New Zealand articles discussed SLR from either a *national* (N=38) or *regional* (N=36) focus. Of the Dutch articles in the study, 66% (N=53) were written from a *national* geographical focus and 19% (N=15) from a *regional* geographical focus. The Netherlands (N=24) had double the number of New Zealand (N=12) articles mentioning SLR from an *international* geographical focus.

New Zealand:



The Netherlands:

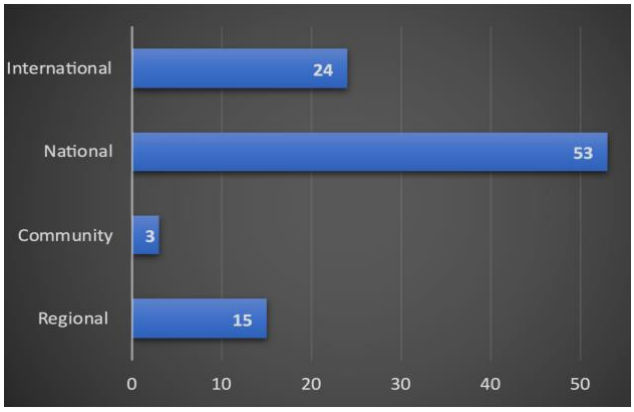
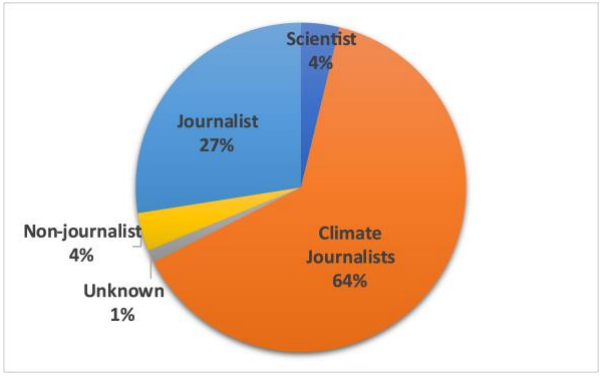


Figure 2: Article geographical focus comparison.

3.5.4 Author Type

The authors of articles written by *journalists* greatly outweighed those authored by *non-journalists* (Figure 3). In New Zealand, *specialist climate, science or environmental journalists* wrote 64% (N=51) of the articles while 27% (N= 22) of the articles were authored by *general journalists*. In the Netherlands, it was the other way around, with just more than half of the articles written by *general journalists* (55%; N=44) and 41% (N=33) of the articles were written by a *general journalist specialist climate, science, or environmental journalist*. Three New Zealand articles were written by *non-journalists*, two of which were members of the public, and one author was a politician, whereas the one Dutch article written by a *non-journalist* was authored by an astronomy expert who speculated if climate change and sea level rise would exist without humans existing on earth (Appendix D, Article #117).

New Zealand:



The Netherlands:

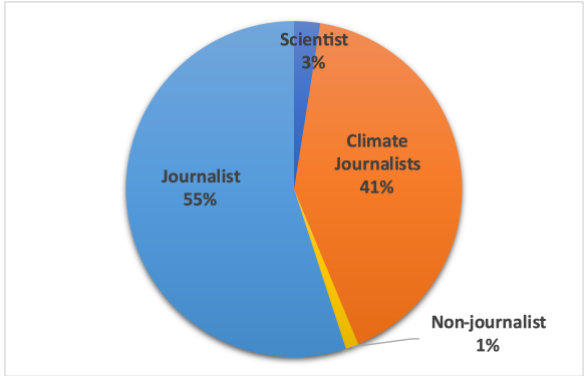


Figure 3: Author type comparison.

3.5.5 Publication Type

Nearly two-thirds of the articles analysed were from *newspaper* publications, with 65% (N=52) for New Zealand and 59% (N=47) for the Netherlands (Figure 4). The remaining New Zealand articles came from, in descending order, *online* (N=17), *radio* (N=10), and *television* (N=1) publisher type organisations. In the Netherlands, more of the articles were from *television* news providers (N=15), followed by *online* providers (N=11), *magazines* (N=4) and *radio* (N=3).

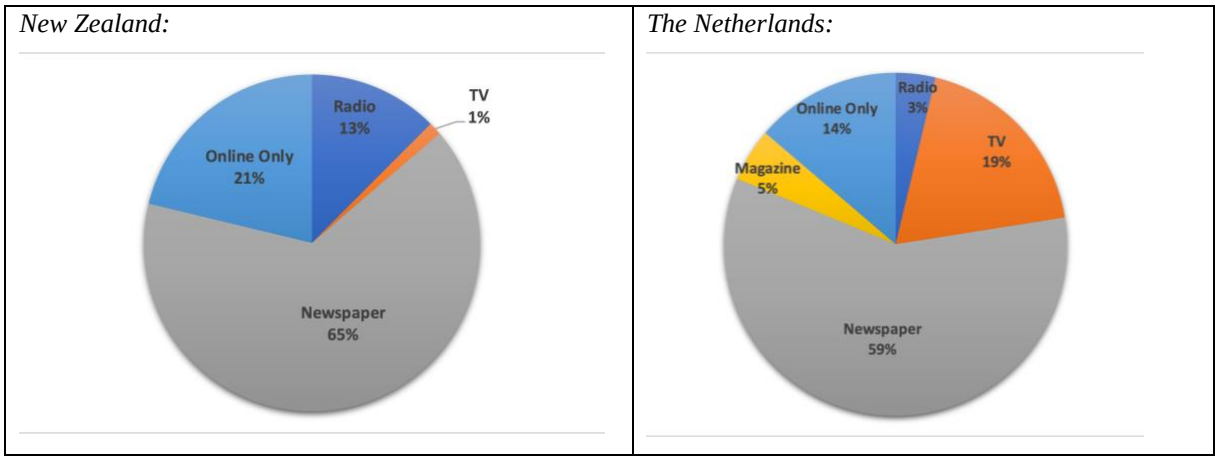


Figure 4: Publisher type comparison.

3.5.6 Season of Publication

The articles in this study were published between January 2021 and June 2022. Articles were coded per season instead of per month, as weather patterns in both countries are vastly different per month. The results in Figure 5 indicate some similarities in the season of publication with *Autumn* accounting for around 40% of articles from both New Zealand (N=34) and the Netherlands (N=31). However, the results differed between countries for articles published in *Winter*, *Summer* and *Spring* with more Dutch articles being published in *Winter* (N=21) and *Summer* (N=19) than in New Zealand's *Winter* (N=15) and *Summer* (N=15). In the Netherlands (N=9) *Spring* was the season with the least number of articles published whereas in New Zealand (N=16) there was 7 more.

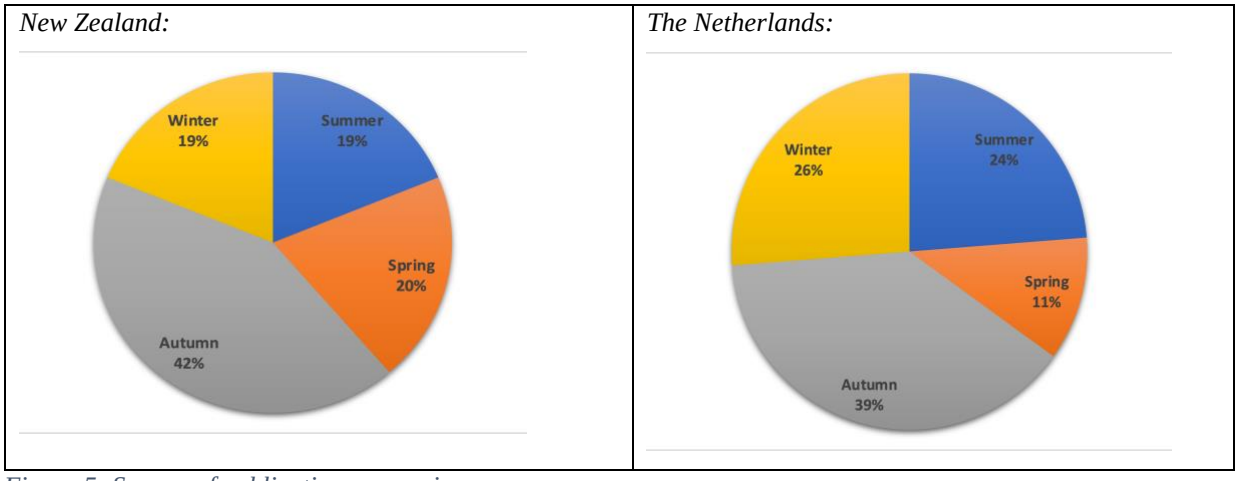
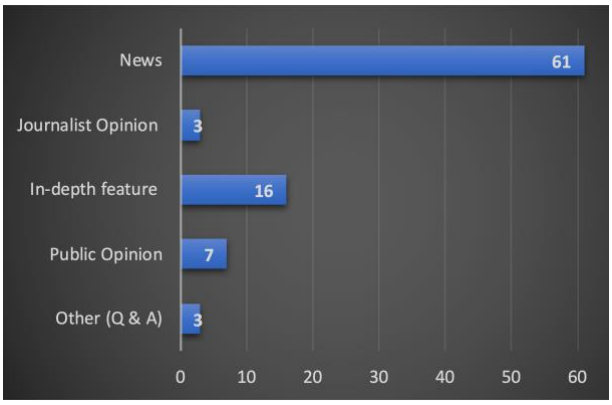


Figure 5: Season of publication comparison.

3.5.7 Article Type

The articles analysed in this study included *news articles*, *in-depth features*, and *opinion pieces* by journalists or contributing authors. The bar graph (Figure 6) shows that 76% (N=61) of the 80 New Zealand articles were *news stories* compared to 68% (N=54) from the Netherlands. Respectively, 6% (N= 5) and 8% (N=6) of the Dutch articles were a *question and answer* and *journalist opinion* article type. Similarly, from the New Zealand articles, both *question and answer* and *journalist opinion* had an occurrence of 4% (N=3). There was nearly the same number of *in-depth feature* articles from New Zealand (N=16) and the Netherlands (N=17).

New Zealand:



The Netherlands:

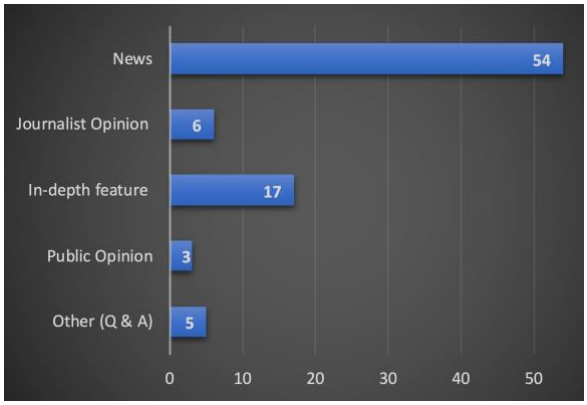


Figure 6: Article type comparison.

4 RESULTS

This chapter will present comparative results from both countries with illustrative excerpts from the media articles. Due to the explorative nature and open coding style with excess *category codes* plus *subcodes*, not all results from the coding procedure are presented. An entire breakdown of all results are presented in a table overview in Appendix B. Codebook Results. Unless otherwise stated, the occurrence frequencies, and percentages are out of 80, the total number of articles per country. The results are presented in the following order: story style, newsworthiness factors, sea level rise frames, impacts, likelihood, perspectives, evidence, stakeholders and causes of SLR. Lastly, results about the prevalence of solutions journalism will be noted alongside the solution types observed in the media analysis.

4.1 Story Style

More than two-thirds of the news articles from New Zealand (N=55) and the Netherlands (N=58) featured an *inverted news style* in the presentation of the SLR issue (Figure 7), while the *storytelling narrative style* was less dominant with 17 New Zealand and 14 Dutch articles found. For both nations, just eight articles had a combination *mixed story style*.

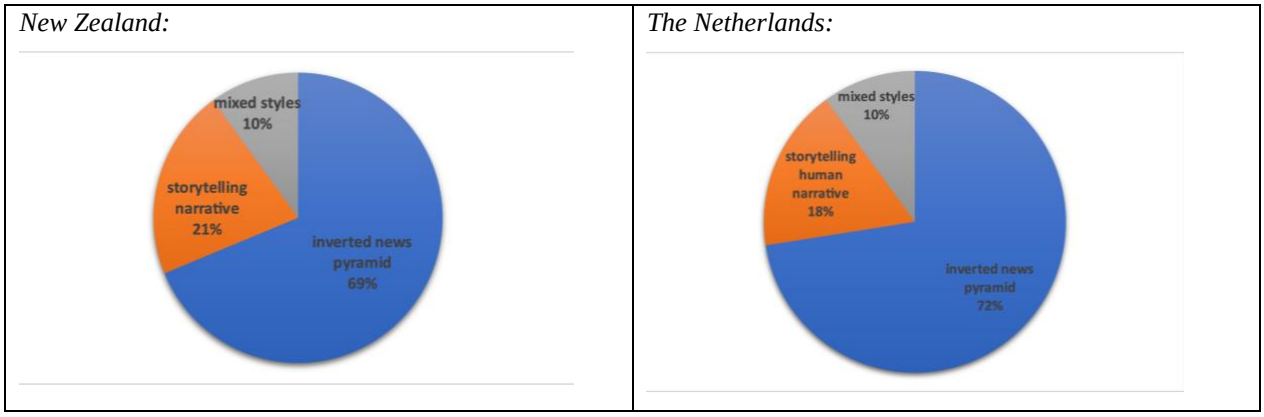


Figure 7: Story style comparison.

The storytelling narrative applied to articles in the study that had a dominant human or personable perspective interweaved in or expressed throughout the news article. For example, one New Zealand article from *The Spinoff* started like this:

> *Down at the end of Happy Valley Road sits Ōwhiro Bay. "I tell you what. There's nowhere in the world I'd rather be," says Eugene Doyle. A resident and community organiser, he's lived in the south coast suburb for "about a dozen years", which makes him a "new boy" in the community of about 2,000 people. "It's got that incredible combination of being a stunningly beautiful, dramatic place, 365 days of the year…Ōwhiro Bay, which stares down the southerlies and surf that rip in from Cook Strait, has become something of a poster child for new research laying bare the scale of sea-level rise expected in the coming decades around Aotearoa. The findings from the NZ Sea Rise project, published yesterday with accompanying maps, show that the estimations are understated. When you chuck vertical land movement data into the mix alongside climate-driven changes, it is suddenly, shockingly clear how much closer the tide really is. In parts of the country, the water is climbing twice as fast as previously thought* (Appendix D. Article # 40, New Zealand).

Clearly, this descriptive personal narrative draws the reader in emotionally and enables people to draw connections to Doyle's experience of the rising sea in his community. This example is contrasted with the storytelling narrative presented in Dutch articles, where the writing was often less personable and more formal:

> *…The wind roared around restaurant Grevelingen near Bruinisse, the foam cups stood on the water of the Oosterschelde. Urgenda, the organization that aims to make the Netherlands sustainable, could not have picked a better time and place for a discussion meeting about flood safety. During the last stop in Zeeland - last night - in the four-day regional tour through the southwest of the Netherlands, the weather gods seemed to want to reinforce the threatening words of the experts* (Appendix D. Article # 98, The Netherlands*).*

4.2 Newsworthiness Factors

There were six newsworthiness factors identified in this study, only five were identified in New Zealand articles, while all six were identified in the Dutch articles (Table 5).

4.2.1 New Zealand Newsworthiness Factors

Politics/regulation was the most occurring newsworthiness frame in 61% (N=49) of New Zealand articles and 33 of those articles specifically regarded *law planning* pertaining to SLR. Of those articles, 15 referenced the need for *different political decision-making*, 14 gave reference to the need for *SLR consultation* and just three mentioned *actual policy or law change.* One of those three articles was published by *Newsroom* and detailed a national governmental law change ensuring "*prospective buyers do not have their heads in the sand" (*Appendix D, Article #18, New Zealand) with local governments now required to disclose natural hazards risks on public property records. Another article identified with *politics /regulation* references detailed the government's first enforced 'managed retreat' for an entire village in the North Island of New Zealand.

> *…After more than a decade of legal and political battles, the remaining residents have become squatters on what was once their own land, furious at what they say is an involuntary eviction. For experts and politicians watching the settlement closely, Matatā provides a bleak preview of battles and challenges that could, in the coming decades, play out across New Zealand and around the world,* (Appendix D. Article #165, New Zealand).

Fifty-three per cent (N=42) of New Zealand articles were newsworthy due to a *new research, report or study* being published (Table 5). Of those, 28 articles were specifically a *national/regional study*, a further 9 were *international studies/ reports* and seven were *university research / studies. Natural disaster* was a newsworthy factor in 36% (N=29) of the New Zealand articles, with 15 of those noting *coastal erosion*, 9 referencing *extreme weather* not directly related to SLR and 9 also referencing *water surges* including tidal flooding.

4.2.2 The Netherlands Newsworthiness Factors

In the Netherlands, the most occurring newsworthiness frame was *new research, report, or study* with 54% (N=43) of the articles (Table 5). Like New Zealand, a *national/regional study* was the most common (N=17) sub-category newsworthiness factor, followed by *international* (N=15) and *university* (N=13) research/studies. Another 46% (N=37) of Dutch articles were newsworthy due to *politics/regulation* and 34% (N= 27) were newsworthy due to the presentation of a *natural disaster*. Of the latter articles, 14 covered *low-lying land floods*, 10 gave reference

to *extreme weather* and there were two articles for each of the subcategory's *contamination, coastal erosion* and *other*. The Dutch excerpt below shows the newsworthy factor *low-lying land floods*.

> *… In the Netherlands, we seem to have the attitude that we will solve the problems by means of adaptation. That's a misunderstanding. Glaciologist and lecturer in climate change Michiel Helsen also calls for a public debate on the issue: 'Is living below sea level still a responsible option? In the long run, we may not be able to save the west of the Netherlands. It seems sensible to me for society to discuss which parts of the Netherlands we're prepared to defend, and at what cost.* (Appendix D. Article # 73, The Netherlands).

The *moral* newsworthiness frame was only found in the Netherlands, in just 3 articles. It was used to identify articles which referred to moral, ethical, or religious perspectives in relation to SLR. An article presented a comment from prime minister Mark Rutte saying politics had an obligation to move the country towards a climate transition, which was contrasted alongside comments from the Christian Union party leader who stated, 'cleaning up the planet was about being good stewards, that must take better care of the created planet' – a subtle symbolic moral opinion, (Appendix D. Article #124, The Netherlands).

Table 5: Newsworthiness frames used in the news articles.

	NEW ZEALAND				THE NETHERLANDS			
	FREQUENCY		PERCENTAGE		FREQUENCY		PERCENTAGE	
	TOT	SUB	TOT	SUB	TOT	SUB	TOT	SUB
NEW RESEARCH, REPORT, STUDY	**42**		**53%**		**43**		**54%**	
- *International study (IPCC)*		*9*		*21%*		15		*35%*
- *National / Regional Study*		*28*		*67%*		17		*40%*
- *University Study*		*7*		*17%*		13		*30%*
POLITICS / REGULATION	**49**		**61%**		**37**		**46%**	
- *Actual law change*		*3*		*6%*		1		*3%*
- *Consultation*		*14*		*29%*		2		*5%*
- *Different decision making*		*15*		*31%*		23		*62%*
- *Law planning*		*33*		*67%*		18		*49%*
NATURAL DISASTER	**29**		**36%**		**27**		**34%**	
- *Coastal erosion*		*15*		*52%*		2		*7%*
- *Low-lying, water surge, flood*		*9*		*31%*		14		*52%*
- *Contamination*		*2*		*7%*		2		*7%*
- *Extreme weather (non-SLR)*		*9*		*31%*		10		*37%*
- *Other*		*2*		*7%*		2		*7%*
CONFLICT	**17**		**21%**		**19**		**24%**	
- *Adaption doesn't work*		*5*		*29%*		2		*11%*
- *Disagree about risk existence*		*11*		*65%*		2		*11%*
- *Undervalued opinion*		*7*		*41%*		7		*37%*
- *SLR science*		*2*		*12%*		10		*53%*
HUMAN-INTEREST	**13**		**16%**		**15**		**19%**	
MORAL	**0**		**0%**		**3**		**4%**	

TOT = category total occurrence, SUB = sub-category occurrence. Percentages for category totals are out of the 80 articles from that country, sub-category percentages are out of the category total.

4.2.3 Comparing Country Newsworthiness Factors

Comparing overall newsworthiness frames deployed in news media, New Zealand (N=49) had 12 more articles that were newsworthy for political reasons. In other words, 61% of New Zealand articles had political newsworthiness, compared to 46% of the Dutch articles. Of the 37 Dutch articles about political regulation, 23 noted *different political decision-making*, 8 articles **more** than New Zealand and 18 noted *law planning* – 15 **fewer** articles than New Zealand (Table 5). It was observable in New Zealand news discourse that *law planning* particularly gave reference to protecting coastal assets. Dutch articles discussed predictions of SLR in relation to *law planning* for defending the entire population and country from the water. An article from NOS detailed plans to 'double up' on protection:

> *… Double dikes can also limit flood damage enormously. Crowded low places such as around Rotterdam and Gouda, which are now protected by one dike, should be given two. "With double dikes, you are now safe and in the long run, you can extend living in the Randstad for a few hundred years. You buy time." But eventually, he says, more people will have to move to the higher eastern parts of the country.* (Appendix D, Article #79, the Netherlands)

The newsworthiness of *natural disasters* accounted for 36% (N=29) of the New Zealand and 34% (N=27) of the Dutch articles. Of these New Zealand articles, 15 noted the sub-category *coastal erosion* while just two Dutch articles noted *coastal erosion*. *Low-lying land flood* was noted more in the Dutch news discourse.

Conflict was the second-least newsworthiness frame in both countries, when it was observed in the news discourse it mostly related to power struggles and tension between individuals or groups and organisations. Seventeen articles from New Zealand and 19 from the Netherlands were observed to have conflict present, respectively 21% and 24%. Looking at the sub-categories within conflict, 2 New Zealand articles mentioned conflict regarding the *existence or level of risk of SLR*, compared to 10 Dutch articles. There were 7 New Zealand and Dutch articles which noted the conflict about *undervalued SLR opinions*. For example, New Zealand articles included opinions from residents and SLR experts who feel that their views about SLR were being ignored by authorities or the notion that residents considered local government regulations had gone either too far, or in another article, not enough was being done the local government. The below examples aptly illustrates the role media has in collating various newsworthy opinions and perspectives from different stakeholders.

> *Two young activists say the local council's reluctance to take action will doom the town, while the Thames-Coromandel mayor argues "what more can we do" to prepare for D-day*, (Appendix D, Article # 45, New Zealand).

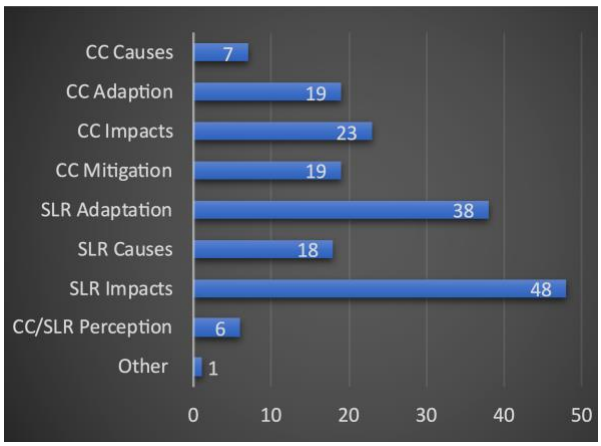
> *…The NIOZ published a report on Monday concluding that alternating polders are a viable and affordable option, in any case a lot less expensive than continuing to raise the dikes. One method is being pushed Philipp Keller, daily director of the Scheldestromen water board, calls the plea one-sided. "We are not completely against it, but pure depoldering is not a solution for Zeeland. An attempt is made to push one method at the expense of other important and effective solutions…" …Keller mainly sees opportunities in front of the dike, also in the Western Scheldt. "In recent years we have found various solutions there, such as salt marshes, mud flats and breakwaters. By making room for this, we have increased flood risk management and created more nature…* (Appendix D, Article #106, the Netherlands).

4.3 Framing of Sea Level Rise

4.3.1 Climate Change & Sea Level Rise Frames

The most reoccurring overall main topic frame (Figure 8) in the analysis of the New Zealand articles was *sea level rise impacts* (N=48) followed by *SLR adaptation* (N=38). *Climate change impacts* (N=23), *CC adaption* (N=19) *CC mitigation* (N=19) and *SLR causes* (N=18) was found in 29%, 24%, 24% and 23% of the New Zealand articles, respectively. The figure of results from the Netherlands follows a similar pattern to those of New Zealand. *Sea level rise impacts* were mentioned slightly **less** in Dutch articles, being present in just 44 Dutch articles, while *sea level rise adaptation* (N=43) and *climate change impacts* (N=30) were mentioned respectively in 5 and 7 **more** Dutch articles. Adaptation in this study was defined as adjusting to the current impacts of SLR and was more commonly referenced in the news course than mitigation, or the prevention or reduction of further climate change or sea level rise.

New Zealand:



The Netherlands:

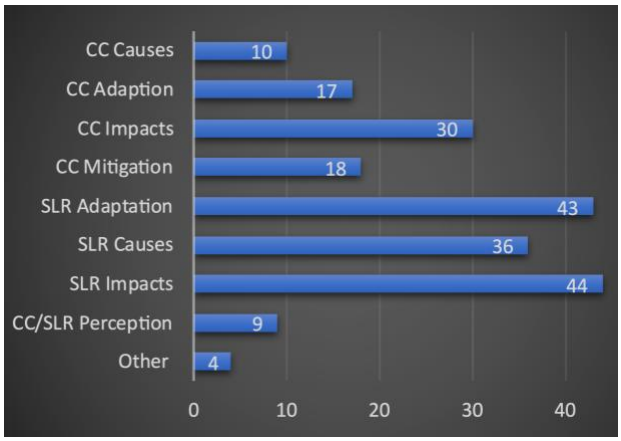


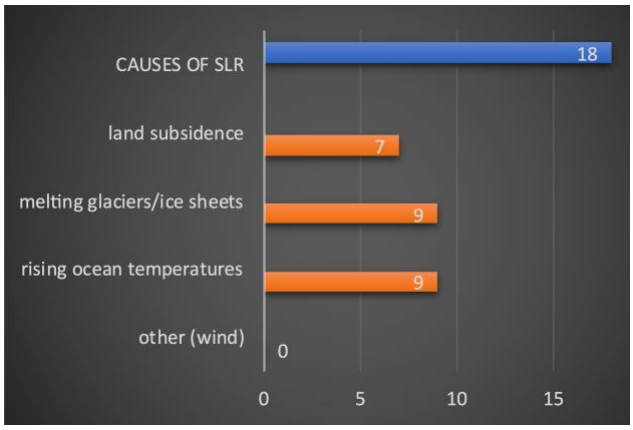
Figure 8: Climate change and sea level rise main topic frames comparison.

As the primary focus of this research was SLR, it is understandable that *climate change adaption, mitigation, causes*, and *impacts* were less reoccurring main topics. However, SLR is a consequence of CC and thus there was sometimes overlap with CC sometimes being referred to as the overall issue within the articles. Comparatively, the biggest difference in the main topic frames between countries was that of *SLR causes*, *SLR adaptation*, and *CC impacts*. The Netherlands had 18 more articles than New Zealand where the news article noted *causes of SLR*. In the Dutch news, there were 5 **more** articles about *SLR adaptation* and 7 **more** articles addressing *CC impacts*.

4.3.2 Causes of Sea Level Rise

In the New Zealand articles, only 23% mentioned a cause of sea level rise whereas 45% of the Dutch articles mentioned a cause of sea level rise. Of these causes, *melting glaciers* and *ice sheets* were cited the most, respectively in nine New Zealand articles and 27 Dutch articles followed by *rising ocean temperatures* for New Zealand (N=9) and Netherlands (N=20) while *land subsidence* occurred in 7 New Zealand articles and for the Netherlands (N=14) it was double that (Figure 9). Evidently, the Netherlands articles significantly referenced SLR causes more than the New Zealand articles did.

New Zealand:



The Netherlands:

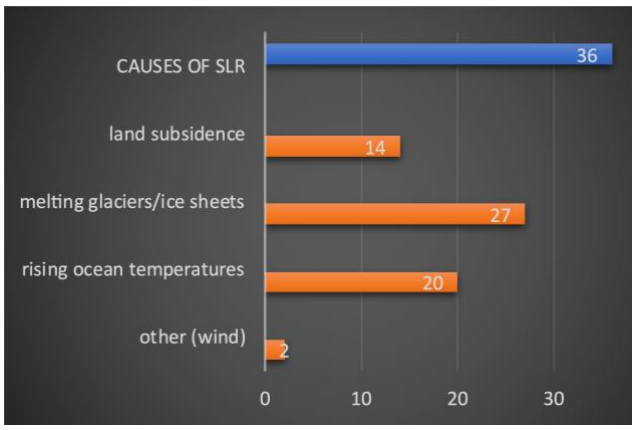


Figure 9: Cause of sea level rise comparison Main category printed in upper case (blue); subcategories printed in lower case (orange).

The causes of SLR were discussed in New Zealand media sparingly. In one NZ Herald article about flooding in Christchurch the causes of SLR were described as a co-occurrence of events including extreme weather, the warming climate, and a supermoon high tide, all at a time when the region was recovering from a drought (Appendix D, Article #39, New Zealand). Some of the other articles noted the warming planet, moon wobbles plus oceanic and atmospheric pressures, melting ice sheets or glaciers and sinking land as causes of SLR. It is affirming that the mentioned causes of SLR in the news align with agreed scientific causes. Land subsidence was a theme that only became prevalent in the New Zealand news articles from May 2022, due to the publication of a study which collated sea level rise predictions with vertical land-movement data across the country's entire coastline. One such article was published by Newsroom and quoted the lead researcher like this.

> *"Being a New Zealander, we know that the land goes up and the land goes down as we have earthquakes," Tim Naish, a paleoclimatologist at Victory University's Antarctic Research Centre and one of the leads of the new SeaRise project. "So, we certainly expected that, by the time we put these vertical land movements into the sea level predictions, they would have an effect. But I think we were quite stunned by the magnitude of that effect and how much it really mattered in the very near term, in the coming decade. "Globally, the sea level is going up at about 3.5 millimetres per year. If the land is going down at that rate, as it is right here, it essentially doubles the amount of sea-level rise we will get… we're going to get sea-level rise a lot sooner than we thought."* (Appendix D, Article #80, New Zealand)

Similarly, Dutch media noted the same causes of SLR being as well as *melting ice*, *land movements*, *land subsidence*, and additionally *wind* presented itself as a contributing factor as was identified in two Dutch articles following the release of new research from TU Delft and KNMI.

> *According to the KNMI, the wind in particular has had a major influence on sea level rise along the Dutch coast. In a strong westerly wind, the sea is pushed up against the land, just as it happens when you blow into a cup of tea. There appears to be a recurring pattern, Iris Keizer established in her master's research at the KNMI. By filtering these wind variations from the measurements, it turned out that the local sea level has indeed risen faster and faster*. (Appendix D, Article #109, The Netherlands.)

Causes of SLR detailed in the news in Aotearoa and the Netherlands often were often attributed to climate experts with a curation of vocabulary from the expert, and words chosen by the journalist that explained why and how the water is rising.

4.3.3 Sea Level Rise Impacts

While there are many ways of framing SLR impacts, the ten topics summarized in Figure 10 were the most dominant topics observed in SLR news discourse. The topics were categorised into a further 50 subcategories, these results are outlined in Appendix D. In New Zealand articles, the topic of *property impacts* was observed the most in 61% (N=49) of the 80 articles. This was followed by *coastal impacts* present in 59% (N=47) of articles and *infrastructure risk* in 49% (N=39) of the New Zealand articles. *Climate politics* was observed in 45% (N=36) of the New Zealand articles, followed by *economic impacts* (N=33), *environmental impacts* (N=25), *inequality* (N=20) and *human impacts* (N=18). In the Dutch articles, *coastal* and *environmental impacts* were equally the most dominant topic observed in 55% (N=44) of the 80 articles, closely followed by *infrastructure risk/ impacts* in 53% (N=42) of the articles. Thereafter, in descending order of occurrence were *climate politics* (N=33), *economic impacts* (N=32), *property impacts* (N=31), *human impacts* (N=24) and lastly *research about SLR or CC* (N=26).

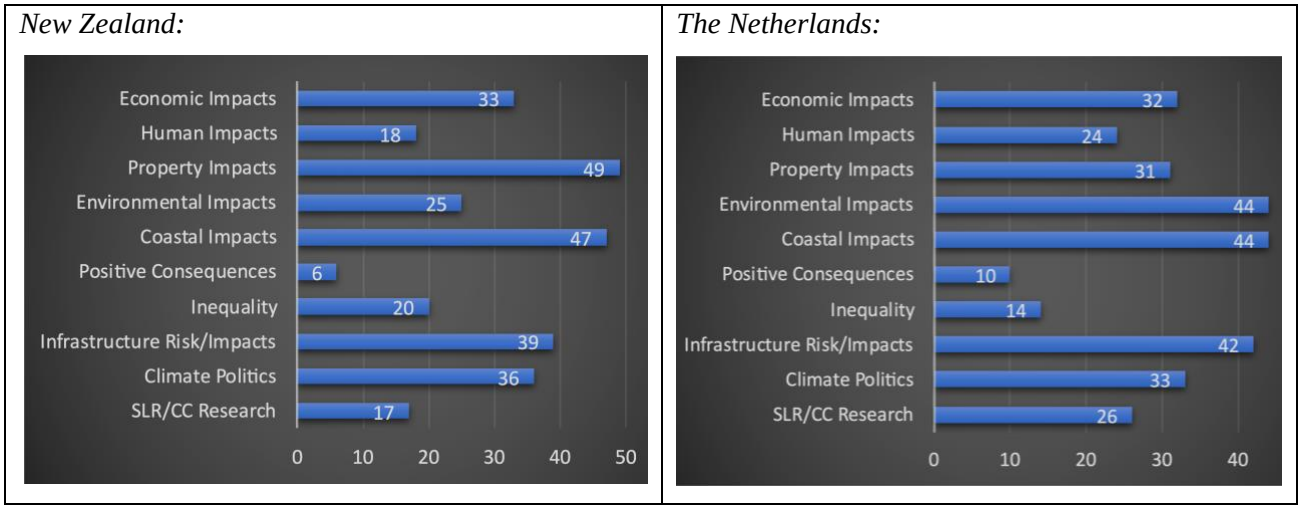


Figure 10: Sea level rise impacts' main topic frames comparison.

Comparatively, *property impacts* were a prominent frame in New Zealand articles, mentioned in 18 **more** New Zealand articles. Often property impacts were mentioned relating to private homes at risk, building restrictions, property valuation stability, and continued construction in areas at risk of inundation due to storm surges or flooding. The following excerpts illustrate *coastal*, and *property impacts* in the discourse of both nations.

> *…Storey and her colleagues were curious to know what happens when a street of houses is given a fairly solid end-date…, she worked out roughly how many years each property had left, based on its distance from the cliff's edge and projected erosion... Many coastlines, including Wellington's southern waterfront, have properties that are likely to be uninsurable within two decades. Yet the houses hold their value surprisingly well… One place had sold in 2016 for almost $600,000, despite having less than two decades left. (*Appendix D, Article #46, New Zealand).

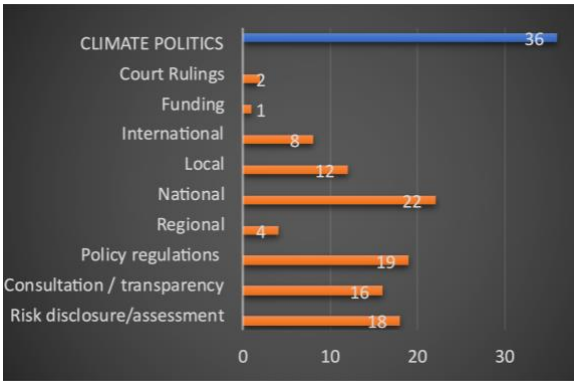
> *Of the nearly one million homes to be built in the next ten years, two thirds are planned in low-lying areas. These homes will be located in the Randstad conurbation and are therefore at or below sea level… "We have so much knowledge of how and where you can build climate-proof. We must also apply that when building for the long term." National policy is needed, the experts say. "Building in that one location is not the problem," says Hekman. "But if we do this at all those locations, the water will have nowhere to go."* (Appendix D, Article # #150, The Netherlands).

Environmental impacts were most prominent in the Dutch articles, observed in 19 **more** Dutch articles. There were also 9 **more** Dutch articles with a *SLR/CC research* frame, 6 **more** Dutch articles about *human impacts* and 4 **more** articles about *positive consequences*. Lastly, 6 **more** New Zealand articles noted the aspect of *inequality* in SLR impacts. The differences in the remaining main topic frames between New Zealand and the Netherlands were minimal, with a difference of only 1-3 articles (Figure 10).

4.3.4 Climate Politics

The *climate politics* frame was addressed almost equally with 45% (N=36) occurrence in New Zealand articles and 41% (N=33) in Dutch articles (Figure 11). Looking at the sub-category codes (in orange) of climate politics *national politics* was the **most** common political focus for New Zealand (N=22) and the Netherlands (N=27). When SLR was being presented in the news as a political issue, it was presented from a *national political perspective*. *Policy regulations* was the second most reoccurring topic for New Zealand (N=19) and the Netherlands (N=26). *Consultation/transparency* was presented in 16 New Zealand articles, 11 **more** than in the Netherlands. *Risk disclosure/ assessment* was present in 18 New Zealand articles, 8 **more** than the Dutch.

New Zealand:



The Netherlands:

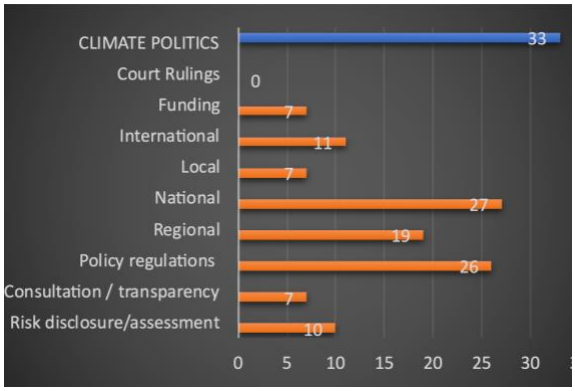


Figure 11: Climate politics and subcategory topics/themes comparison. Main category printed in upper case (blue); subcategories printed in lower case (orange).

The *regional climate politics* frame was **more** frequent in the Netherlands (N=19) than in New Zealand (N=4). Often the regional politics in the Netherlands would give reference to the waterboards responsible for water management and risks for housing, people and infrastructure or reference to municipalities that *'should stop building homes in the floodplains of rivers, because this is not climate-proof,* (Appendix D, Article, #150) among others regional political references which were made.

> *…Glass argues that especially now that municipalities and housing corporations are under great pressure to build homes, the government should introduce a more compelling 'water test' for construction projects through legislation and regulations. "Involve municipal sewer managers and people who are responsible for water storage and drainage at the water board in building plans.* (Appendix D Article #132, The Netherlands).

In New Zealand, *political transparency* was addressed in 16 articles, more than double the Dutch. The references underlining the local need for more political engagement with the public in relation to SLR. One article illustrated this idea, reporting on the disagreements between residents and the local council about how much the water would rise and shows how the media framed the conflict from both perspectives.

> *…A major issue residents took with the report was a disconnect between their own experiences of the coast, and the 50- to 100-year predictions. Resident Warwick Wyatt, a retired surveyor, took matters of science into his own hands when he began measuring the accumulation of sand on the dunes at the bottom of his property in 1976 – which by his measurements over 45 years are growing at a rate of about 0.5m each year. The report the council used for its proposed district plan suggested that the opposite of accumulation, erosion, would along the coast at rate of 0.8m per year for the next fifty years – something Wyatt just could not believe,"* (Appendix D, Article # 9, New Zealand).

4.4 Types of Impacts from Sea Level Rise

Of the differing impacts due to SLR, outlined above in Figure 10, these impacts were broken into a few sub-categories, presented below in Table 6. A lot of SLR impacts are interconnected with the news discourse presenting multiple overlapping issues and themes within the one article.

4.4.1 New Zealand Sea Level Rise Impacts

The most prominent *property impacts* were sub-categorised, with impacts on *property and land generally* occurring most (N= 35), followed by *private property* (N=21) and *commercial property* (N=4). Of relevance for

New Zealand was the observation of *historic and cultural property* which was observed 4 times. In some articles, assets, or the cultural value of these assets, were mentioned in connection to Māori, the indigenous people of Aotearoa, with the prospect of losing culturally significant sites such as marae (meeting house), papakainga (housing on ancestorial land) and urupā (cemeteries) in low-lying areas prone to flooding. Often these articles about Māori infrastructure were framed in relation to the *human impacts* of SLR in relation to a research paper which detailed the impacts of CC on Māori.

Overall, the reoccurring narrative about the impact of SLR on property perhaps dominates in New Zealand news due to a significant proportion of the population living on or near coastal areas (Daly, 2019). When SLR impacts on property were noted, often it was in relation to predictions of populated areas that may soon be inundated with sea water (such as some suburbs in Timaru), properties at risk in low-lying coastal cities (Christchurch, Wellington, Dunedin), council plans to restrict building in risky locations, or stories detailing homes and property that have or may soon crumble into the ocean (Port Waikato, Matatā and some Auckland suburbs). Some excerpts illustrating these property impacts are below.

> *…Auckland has 3200 km of coastline, and as sea levels rise and cliffs erode, some 17,600 of the region's homes lie in harm's way (Appendix D, Article # 1, New Zealand)*

> *As the seas rise, the climate changes, and waters creep ever closer to some of our housing stock, the Government is moving to ensure prospective home buyers do not have their heads in the sand. Councils will be required to disclose a wider range of natural hazard risks to prospective home buyers, under a law change to be introduced to Parliament later this year. (Appendix D, Article # 18, New Zealand)*

> *…Invercargill appears to be in the firing line when it comes to climate change with more than 1200 homes and 13 critical facilities in Invercargill and Bluff already at risk of rising sea levels. Local Government New Zealand says councils have to take climate change seriously as they future proof, (Appendix D, Article # 169, New Zealand)*

Often property was mentioned in conjunction with political aspects such as proposed political changes or building restrictions or the debate of constructing sea wall defences to protect land and homes. Furthermore, it was not uncommon for *property* and *economic impacts* to be in mentioned together regarding the cost of protection and/or adaptation. Other details occurrent in the news discourse included stability in housing prices and valuation despite the risk of coastal erosion, plus the need for certainty if government or insurance companies will bailout people owners of properties in risk areas. The following excerpts highlight these.

> *…New Zealanders love a good beach house, whether as a bolthole, a home, or a marker of status. But for all but the wealthiest beach-house owners, these buildings are repositories of life savings. Yet many of us appear willing to risk it, in the face of scientific projections…* (Appendix D, Article # 46, New Zealand).

> *… After some severe flooding events, property prices in those flood-prone areas had a short-lived decrease in the first six months after controlling for coastal amenities; however, such a discount fades over time. Research also revealed that most home buyers care more about coastal amenities than some intangible risk of flooding in the distant future, particularly when the information on flood risks is not clearly available. Coastal amenities such as a stunning water view from a flood-prone property can generate a feeling of affection or the "affect heuristic" that leads a potential homebuyer to overvalue a house price…* (Appendix D, Article #37, New Zealand).

Financial impacts and property impacts are not the only consequences of an imminently rising ocean, *infrastructure impacts* (N=39) were also observed frequently (Table 6). There is a variety of infrastructure along coastlines in New Zealand at risk of rising sea levels. *Transport infrastructure* (N=10) including roads, railroads, airports, and ports was noted most frequently within these articles. Interestingly, *waste management infrastructure* was noted 6 times in articles following the release of a national report which identified more than 300 landfills and toxic dumpsites that could be exposed to the sea as it erodes land across the country (Appendix D, Article #32, #40, #30, New Zealand).

Human impacts were addressed in 28% (N=22) of the New Zealand articles (Table 6). There was an intrinsic relationship between property and human mental health impacts due to rising waters that may force people to relocate. The *mental health and wellbeing impacts* (N=12) of SLR were most dominant, above *migration* (N=7) and *cultural/spiritual impacts* (N=5). Article noted the stress and anxiety caused by the unknown, as well as impacts to mental health wellbeing following potential forced separation from culture and land.

> *…David Higgins grew up in Moeraki, where he is now Upoko of Te Rūnanga o Moeraki. He hopes Moeraki will be his final resting place… He talks about the difficult decisions facing his community, due to climate change, and the potential for this to cause hurt, pain and dislocation from culture. "Losing our urupā (cemetery) will have a huge impact on our hapū, mentally and emotionally. Imagine the stress and strain knowing you are burying your whānau and there is no guarantee that within the next decade their burial site won't be swamped by the sea." (Appendix D, Article #20, New Zealand).*

Loss of food resources due to SLR was a subcode observed in 3 New Zealand articles (Table 6). In these articles the loss of food was presented with reference to Māori, following the release of research about the impact's climate change would have on them. An excerpt from *The Spinoff* summarises how SLR affects food security.

> *…Acidification of the ocean is also harmful to organisms that rely on calcification, like molluscs, starfish and sea urchins. Kina in particular hold significant social and cultural value for whānau, hapū and iwi. In low-lying areas, climate change-induced sea level rise may permanently submerge estuaries, tidal marshes and wetlands, destroying sources of mahinga kai (food). Increased flooding will also contaminate waterways with trash and debris, as has been seen on the East Coast. Awatere says that failures to sustain cultural keystone species will have consequences for Māori values, both spiritually and culturally. The loss in species will also be mirrored by a loss in mātauranga Māori as the connections between whakataukī, reo and the natural world fray. Depleted stocks are likely to have an effect on customary fishing rights – non-commercial quotas allocated to Māori for the gathering of kai – a context by which tangata whenua engage with the sea physically and metaphysically. And although customary harvests cannot be sold, they nevertheless have economic impacts for Māori communities as important sources of food that would otherwise require purchase to feed wanau and for large events like tangihanga." (Appendix D, Article #4, New Zealand).*

Table 6: Impacts of sea level rise comparison.

	NEW ZEALAND				THE NETHERLANDS			
	FREQUENCY		PERCENTAGE		FREQUENCY		PERCENTAGE	
	TOT	SUB	TOT	SUB	TOT	SUB	TOT	SUB
COASTAL IMPACTS	**47**		**59%**		**44**		**55%**	
- *erosion/weak coastline*		*31*		*66%*		6		*14%*
- *coastal flooding/low-lying area*		*28*		*60%*		37		*84%*
- *astronomical tide*		*3*		*6%*		2		*5%*
ENVIRONMENTAL / ECOSYSTEM / NATURAL IMPACTS	**25**		**31%**		**44**		**55%**	
- *wildlife impact (animals)*		*4*		*16%*		9		*20%*
- *contamination / pollution*		*4*		*16%*		2		*5%*
- *saline groundwater*		*3*		*12%*		25		*57%*
- *loss of ecosystems/change in physical environment*		*21*		*84%*		23		*52%*
- *marine environment impact*		*7*		*28%*		3		*7%*
POSITIVE CONSEQUENCES	**6**		**8%**		**10**		**13%**	
- *visual aesthetic improved*		*1*		*17%*		4		*40%*
- *living together*		*1*		*17%*		2		*20%*
- *coastal growth/environment adapts to SLR*		*5*		*83%*		9		*90%*
HUMAN IMPACTS	**22**		**28%**		**24**		**30%**	
- *physical health*		*4*		*18%*		4		*17%*
- *mental health and wellbeing*		*12*		*55%*		5		*21%*
- *migration (retreat /displacement)*		*7*		*32%*		16		*67%*
- cultural/spiritual (connection to the land)		*5*		*23%*		2		*8%*
INEQUALITY	**20**		**25%**		**14**		**18%**	
- *disproportionate effect*		*12*		*60%*		6		*43%*
- *not relevant for me*		*2*		*10%*		4		*29%*
- *repeated occurrence of SLR*		*6*		*30%*		6		*43%*
PROPERTY IMPACTS	**49**		**61%**		**31**		**39%**	
- *private property*		*21*		*43%*		14		*45%*
- *business/ commercial property*		*4*		*8%*		1		*3%*
- *property/land (generally)*		*35*		*71%*		28		*90%*
- *historic, cultural, spiritual sites*		*4*		*8%*		0		*0%*
INFRASTRUCTURE RISK	**39**		**49%**		**42**		**53%**	
- *infrastructure generally*		*18*		*46%*		20		*48%*
- *transport infrastructure*		*10*		*26%*		18		*43%*
- *public spaces / assets*		*6*		*15%*		3		*7%*
- *cemeteries*		*3*		*8%*		0		*0%*
- *waste management*		*6*		*15%*		2		*5%*
- *flood protection*		*5*		*13%*		27		*64%*
- *water, power, drainage*		*6*		*15%*		9		*21%*
- *other (communications)*		*2*		*5%*		3		*7%*
ECONOMIC IMPACTS	**33**		**41%**		**32**		**40%**	
- *cost of protection/ adaptation*		*25*		*76%*		25		*78%*
- *tourism & travel*		*1*		*3%*		3		*9%*
- *agriculture/food resources loss*		*3*		*9%*		5		*16%*
- *no economic consequences*		*5*		*15%*		1		*3%*
- *cost of disaster/damage*		*10*		*30%*		7		*22%*

TOT = category total occurrence, SUB = sub-category occurrence. Percentages for category totals are out of the 80 articles from that country, sub-category percentages are out of the category total.

4.4.2 Dutch Sea Level Rise Impacts

In the Netherlands, the *coastal impact* observed most frequently was that of *coastal flooding / inundation to low-lying areas* (N=37) whereas *erosion to coastlines* was observed in just 6 articles and *astronomical tidal* coastal impacts were present in just 2 articles (Table 6). The discourse in the news tended to talk about how the entire country may be impacted, rather than specific regional impacts predictions, or how the lowlands may be protected from impeding water:

> *…If a second, lower dike is built behind the sea dike, as is already happening in the north of the country, the damage can be limited completely. Vellinga showed with a map that it is possible to construct such a system of double dykes along almost the entire coastal strip of Zeeland, including the Eastern and Western Scheldt. The intermediate area could be used by farmers for saline crops. And if you also let water in, you could slowly let that in-between area silt up. (Appendix D, Article #98, The Netherlands).*

Of the *environmental and ecosystem impacts* that were observed, the sub-category *saline groundwater* was found in 25 Dutch articles. This environmental impact referred to the sea water penetrating the soil and the consequences of salty soil for agriculture and water supply, as the excerpt below highlights.

> *…In some polders, the seawater is already starting to enter through the subsoil, which makes the soil salinize and makes it no longer suitable for agriculture. Or take Gouda, where the surface water is now almost equal to the street. If a lot of rain is forecast, the city will pump out water in advance to be able to collect the rainwater. Cellars quickly flood here. Those are annoying things that are going to play out in more and more places in the Netherlands, (Appendix D, Article #125, The Netherlands).*

There were 23 articles that referred to *loss of ecosystems/ changes to the physical environment*, another sub-category of *environmental and ecosystem impacts*. Changes observed included the loss of ice sheets on land and at sea, changing biodiversity dynamics in the marshlands of the North Sea and sinking land as below.

> *In the more distant future, sea level rise will mainly depend on the extent to which we manage to limit CO2 emissions and what will happen as a result to the ice sheets of Greenland and especially Antarctica. (Appendix D, Article #109, The Netherlands).*

> *…In case of strong warming, the water in the North Sea will eventually rise several meters, according to the new IPCC report. This also applies to the water in the Rhine and Maas. At the same time, behind the dikes of the Groene Hart, the soil sinks deeper. And we want one million extra homes by 2030. But where? (Appendix D, Article #120, The Netherlands).*

Out of the 24 Dutch articles that noted *human impacts*, two of those articles gave reference to *cultural/spiritual human impacts* and four noted *physical impacts* to humans due to SLR while five noted *mental health and wellbeing* impacts specifically, (Table 6). Sixteen of the 25 *human impacts* articles referred *to migration or retreating from the water*, such as the possibility that people in the future will need to retreat to the East or into Germany, while other articles were unique in detailing an alternative future for people living in the Netherlands aboard a floating city, or inside the fortress city of Amsterdam (Appendix D, Article #176, Article, 128, the Netherlands). The below excerpts outline how *retreat and migration* were represented with an outlook for how a Dutch person's life could change.

...So, the Netherlands has to choose between two things that we would rather not hear: do everything we can to reduce global greenhouse gas emissions as sharply as possible or recognize that in the long run we will have to say goodbye to the lowest-lying parts of our country and invest in a future on the higher grounds in the south and east. (Appendix D, Article #120, The Netherlands).

*...A floating city of 100,000 homes requires a water surface of approximately 5 by 5 kilometres. And although building on water is about 10 to 15 per cent more expensive, living there is actually cheaper, De Graaf expects. 'The fact that houses are so expensive is due to the price of land. You solve that problem on the water…Loose, floating units, with a specific building or functionality on it: floating restaurants and shops, a floating mosque, even a beach, a golf course and entire parks on pontoons. (*Appendix D, Article #128, The Netherlands).

Regarding *economic impacts* in the Netherlands (N=32) the sub-category observed most was *cost of protection* (N=25), followed by *cost of disaster* (N=7), *cost for agriculture(N=5), tourism and travel* (N=3). The subcode *no economic consequences* was mentioned in 1 article which presented SLR as an opportunity for technological solutions that could be developed by Dutch experts and then the knowledge could be 'exported' to other countries where as below, a property expert was quoted reinforcing the *no economic cost* mentality:

...Estate agent Arjen Noordam is active in the Delft and Midden-Delfland area. "We are in a lower area, but potential buyers are not asking about it. The homes are still in good condition, and it may also be a far-from-their-bed show. The water boards are doing everything they can too, I don't expect that homes will decrease in value. This is where the money is earned, people want to live here because there is a lot of work and I expect that to continue." (Appendix D, Article #123, The Netherlands).

4.4.3 Comparing Country Sea Level Rise Impacts

The biggest difference in *SLR impacts* between both nations was the differences between *environmental/ ecosystem/ natural impacts* and *property impacts. Environmental/ ecosystem/ natural impacts* were observed in 44 Dutch articles, 19 **more** than in New Zealand. Looking at the subcategories of *environmental/ ecosystem/ natural impacts*, *saline groundwater* (N=25) was noted in 22 **more** Dutch articles as was *wildlife impacts(N=9),* in 5 **more** and *loss of ecosystem /change in physical environment (N=23), noted in* two **more** while *contamination / pollution* was in 2 Dutch articles, 2 **less** than New Zealand. The following excerpts contrast how *saline groundwater* was presented in the news discourse of both nations.

...Havelock infrastructure is at risk... sea level rise could increase the chance of saltwater getting into the Havelock's fresh water supplies. "If you raise the water pressure in the sea by rising the sea level, that creates a pressure on the aquifer. If you then throw in drawing water from the aquifer from bores, you lower the pressure in the aquifer, and that potentially allows seawater to draw up into the aquifer." Higher temperatures caused by climate change could also encourage residents to water their gardens more, putting "greater pressure" on the aquifer, Rooney said. Salt water got into Havelock's drinking water about three years ago due to low water levels in the Kaituna River and a large amount of water being drawn around town, (Appendix D, Article #55, New Zealand).

...This will have far-reaching consequences for a country such as the Netherlands, which is largely below sea level. The dikes have to be raised, both along the coast and along the rivers. The salt water will advance, with unpleasant consequences for drinking water supply, the fertility of the land and agriculture. And the Wadden will be flooded, causing a unique nature reserve to be lost. A billion-dollar mega-operation hangs over our heads, in which the Delta Works will dwarf, (Appendix D, Article #160, The Netherlands).

Additionally, *marine impacts*, a subcategory of *environment / natural ecosystem* was observed in 4 **more** New Zealand articles than in Dutch (Table 6). The following snippets illustrate how *marine impacts* were presented in relation to CC and SLR which was interrelated with other issues including agriculture.

> *…The changing habitat drives movements in the distribution of native species and creates prolific conditions for the establishment of invasive pests and diseases. Following a marine heatwave that stretched across 2017 and 2018, the complete loss of rimurapa (bull kelp) was recorded on reefs around Lyttelton. The native kelp was quickly replaced by an invasive pest species of kelp which caused a loss in the mussel population. On the Otago Peninsula, warming seas are leading to a decline in hoiho (yellow-eyed penguin) survival rates due to the reduction in size and quality of the fish stock on which they feed. Elsewhere, sightings of tropical and warm water fish, alien to New Zealand, have increased, while the reproduction of important commercial and customary species such as pāua and hoki has declined. Acidification of the ocean is also harmful to organisms that rely on calcification, like molluscs, starfish, and sea urchins. Kina in particular hold significant social and cultural value for whānau, hapū and iwi. In low-lying areas, climate change-induced sea level rise may permanently submerge estuaries, tidal marshes, and wetlands, destroying sources of mahinga kai. The loss in species will also be mirrored by a loss in mātauranga Māori as the connections between whakataukī, reo and the natural world fray,"* (Appendix D, Article *#4, New Zealand).*

> *… The problem is that there is currently too much silt in the estuary. Large areas around the Ems-Dollard have been reclaimed in recent centuries. As a result, there are few or no natural transition zones between land and water in the coastal zones. Those 'soft transitions' are essential for the unique nature in the estuarine area. The sludge cannot settle with hard transitions at the edges and it actually grinds around in a kind of bathtub, because it has nowhere to go. The water becomes cloudy, which means that less life is possible. Not good for biodiversity. In short: it is important for the health of the estuary that sludge is removed from the system. 'If we make an opening in the dyke, the silt can drain from the estuary and settle here in the salt marsh area between the dykes,' says Vermaak. The idea is that you remove the sludge once in a while. The next question is what to do with all that sludge. 'The best way to get rid of the sludge is to create demand. Then it becomes a kind of mineral.' For example, after treatment you can spread it over fallen agricultural land, but you can also make clay from it, for example, which you can use to strengthen dikes again…* (Appendix D, Article. #151, the Netherlands).

Property impacts were observed in 49 New Zealand articles, 18 **more** than in the Netherlands. All subcategories of *property impacts* were mentioned **more** in New Zealand with 7 **more** articles for *private property* and *land generally* while *business/ commercial property* was in 3 **more** and *historic /cultural/spiritual sites* were not mentioned at all in the Netherlands but were present in 4 New Zealand articles.

Two more Dutch articles noted *human impacts* (N=24) and of those, 16 specifically noted *migration/retreat*, 9 **more** than New Zealand. The subcategory *mental health/wellbeing* (N=12) was present in 7 **more** New Zealand articles and *cultural/spiritual* impacts was observed in slightly more New Zealand (N=5) articles than Dutch (N=2), (Table 6). *Inequality* in New Zealand (N=20) was observed in 6 **more** articles than in the Netherlands with the subcategory *disproportionate effects* observed in 12 New Zealand articles. The mention of *disproportionate effects* in the news discourse referred to differing impacts of SLR experienced by for example. future generations having to face the cost of current SLR negligence, minority groups like the poor or indigenous and underdeveloped and developed nations. The following excerpt highlights the idea that Dutch SLR expertise is superior to other nations.

The Dutch adaptation approach has long been an international leader. Dutch engineers and dredgers are active all over the world, protecting metropolises such as New York, Jakarta and Guangzhou from the sea. And Bangladesh set up its own Delta Plan with Dutch help, in which the livelihoods of the rural population are central, in addition to coastal protection and river management. Nevertheless, the Netherlands should not turn the top into sales pitches, says Piet Dircke of Arcadis. 'That is not appreciated internationally. It is now about the poor countries where the biggest blows fall,' (Appendix D, Article. #151, The Netherlands).

4.5 Sea Level Rise Likelihood

Sixty-three percent of New Zealand articles (N=50) and 55% of Dutch articles (N=44) predicted SLR as an event that *would occur in the future* while 45% of New Zealand (N=36) articles and 21% of Dutch (N=17) articles referenced SLR was *happening now* (Figure 12). Dutch articles tended to determine the likelihood of SLR using *definite language* more than New Zealand articles did.

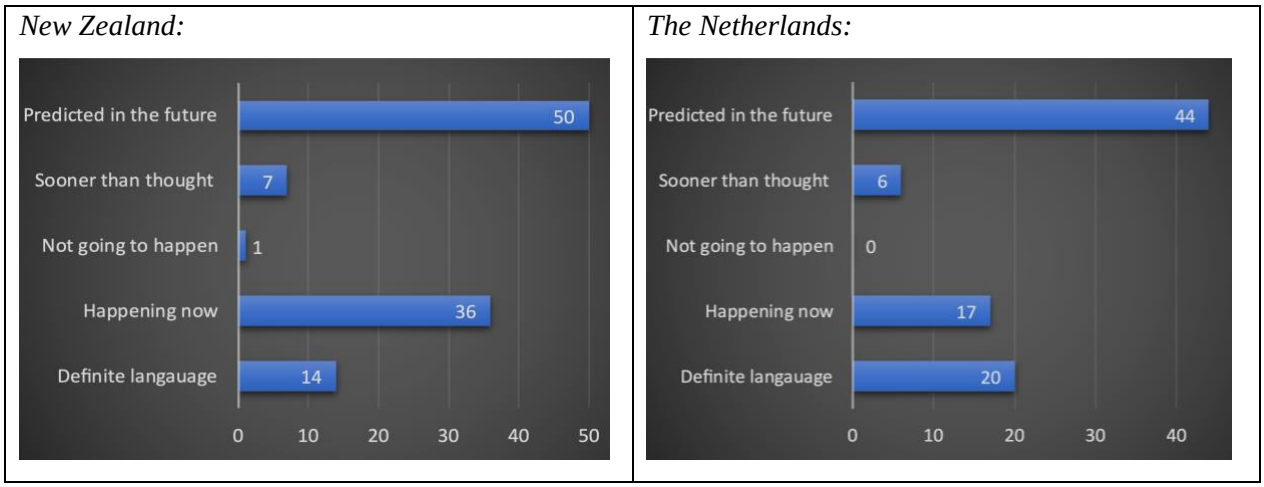


Figure 12: Likelihood of sea level rise.

The following examples illustrate how the likelihood of SLR was presented in the news, the first two examples note both *predictions in the future* and the use of *definite language* while the last example from New Zealand illustrates an alternative viewpoint that SLR is *not going to happen*.

... The KNMI estimates that the sea level will rise to 1.20 meters in 2100. That is twenty centimetres more than the plans from the Delta Program were calculated on. For the first time, there is also a scenario in which an increase of up to two meters is not excluded, (Appendix D, Article #89, the Netherlands.)

...As the sea continues to rise, so too will the frequency, duration, and extent of coastal flooding. "Today's 100-year event will occur more and more often as sea level rises," she said. "With a 30cm sea level rise by 2030, in eight years' time, there is a probability that we'll see a storm like we did in January 2018 every four years, not every 100 years, (Appendix D, Article #45, New Zealand).

...It prompted lively discussion including on the impact of ground water increasing with a projected 1m sea-level rise, which the new protection scheme has to incorporate in order to qualify for government funding. West Coast Regional Council chairman Allan Birchfield again expressed his doubt about the government prediction. "The sea level is not going to rise so don't worry about it," Birchfield said, (Appendix D, Article #25, New Zealand).

4.6 Perspective on Sea Level Rise

Overwhelmingly more than 80% of New Zealand (N=66) and Dutch (N=65) news articles presented SLR with a perspective of *scientific certainty or expertise*. New Zealand articles presented an *environmentalist* perspective in 13 articles, eight more than in the Dutch discourse (N=5). Whereas *denialist/disagreement* and *alternative thinking* perspectives were found in more Dutch than New Zealand articles (Figure 13). Lastly, a *minority/ indigenous* perspective was more common in the New Zealand (N=12) than in the Dutch (N=2) articles.

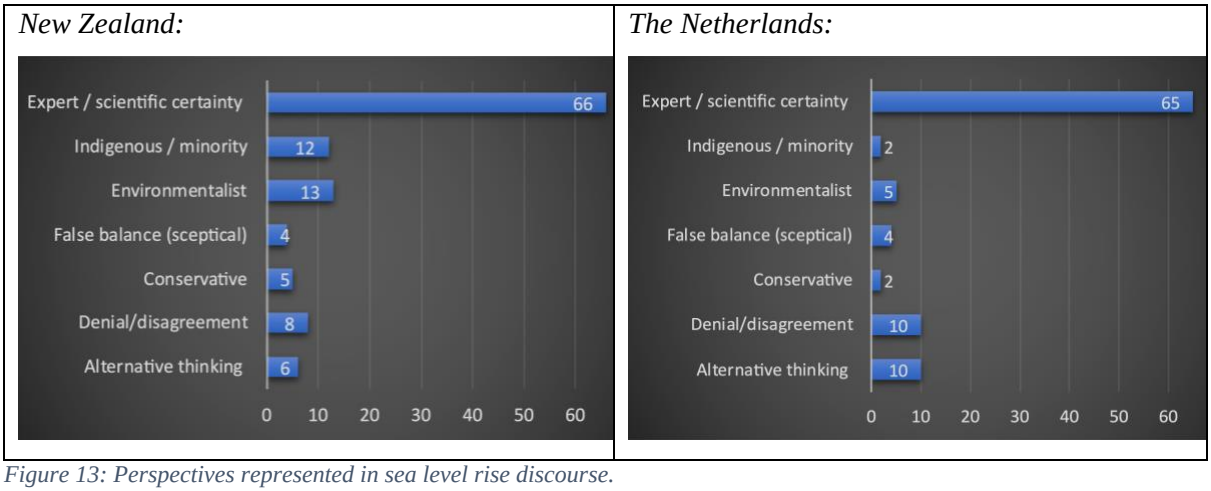


Figure 13: Perspectives represented in sea level rise discourse.

Looking at the figure of results official expertise was well and truly integrated into the reporting of SLR. The attributed experts were typically academics presenting their respective organisation or institute findings, opinions and understanding of SLR. Other experts included *politicians*, *economists*, *officials* from local governments and others with specialist knowledge or responsibilities in environmental, construction or water management, planning and development. The following excerpts provide a glimpse of how the expertise perspective was presented in the analysed articles.

> *…Experts have for some time expressed concerns about existing and new property developments in areas at risk of flooding, coastal erosion or other hazards, exacerbated by the effects of climate change…The package of changes will introduce a statutory responsibility for regional councils to provide natural hazard information and support to local authorities, and creating a power for ministers to set national directions for natural hazard information. Property owners would still be able to take legal action against councils for failing to include information about natural hazards, but the legal protection would make it easier for councils to disclose relevant risks.*
> (Appendix D, Article #18, New Zealand).

> *…Two hundred and thirty-four scientists from around the world contributed to the report. Slangen, together with climate scientist Robert Kropp from the United States, was responsible for the chapter with the latest insights on sea level rise. 'We have been helped by other scientists. We were part of a writing team of eighteen authors with a focus on oceans, glaciers, and polar caps. I have been working on it since June 2018. Sometimes I was continuously working on it all week, at other times it was quieter when we had sent reports to the co-readers.'* (Appendix D, Article #9, The Netherlands).

When comparing differences between the perspectives portrayed in both countries, the biggest difference was the representation of *indigenous and minority* perspectives with the Netherlands having 10 **fewer** minority

perspectives than New Zealand. In the Netherlands, the minority perspective was presented in two articles about local municipalities and 'isolated' communities by the Wadden Sea that need to be included in the decision-making process for adaptation or protection from rising water.

> *… Termunterzijl is a cute old village that is full of tourists in the summer…. Last September, during a large residents' meeting, the majority of residents were open to the plans. Support is important because there is currently no urgent social reason to force change. 'Of course, there are always a few people who are against everything. They are a minority, but they do make a lot of noise. What I say emphatically is: if you're against everything, fine. Then nothing goes through. But then you run the risk of in ten- or twenty-years' time, if by now it has become compelling social reasons, when the sea level has really risen considerably, you will have much smaller room for influence than now. Now you have a chance to talk, pick up that glove. It will come, I guess.' The conversations are now at a standstill due to corona and Van Dijken will leave it that way for a while. 'These are not people you should plan digital sessions with.'* (Appendix D, Article #151, The Netherlands).

Whereas in New Zealand the minority perspective was that of local community groups and or Māori, and how they would be impacted by SLR. These articles were typically longer-form and used a *storytelling narrative style* in the presentation of the indigenous perspectives on SLR such as the spiritual and customary connection to land and accessibility to kaimoana (seafood) as the following excerpts show.

> *… Back in 2017, Ngāti Whātua Ōrākei's urupā (cemetery) near Okahu Bay was flooded after Cyclone Debbie. The same thing happened a couple of years before. Hawke says the council installed a larger water pump in 2017, which has kept the urupā from flooding again. However, Hawke says she doesn't expect the water pump to work forever as climate change takes hold… The urupā has been on its current site since before 1840, Hawke says, and there's still a lot of resistance from the iwi's kaumatua (elders), who wish to be buried beside their ancestors and relatives.* (Appendix D, Article #1, New Zealand).

> *…The report, produced by a multidisciplinary Māori research team working across 10 research institutions, considers the effects of climate change on everything from Māori business to the preservation of tikanga Māori in the face of global warming. It calls for the development of Māori cultural indicators and values for assessing the health of ecosystems on land and in the sea, and from the macro to the micro. The effects of climate change can already be seen in the coastal marine area, the largest ecological domain in Aotearoa, the report finds. These ecosystems, comprising harbours, estuaries, and the open ocean, are showing signs of damage including rising sea levels, water temperature and increasing ocean acidity,* (Appendix D, Article #4, New Zealand).

4.7 Evidence of Sea Level Rise

As shown in Figure 14, 83% of New Zealand (N=66) articles presented supporting SLR evidence compared to 65% of the Dutch articles (N=52). Looking at the subcategories of supporting evidence *expert predictions* was by in large the most reoccurring evidence type with respectively 53 New Zealand and 48 Dutch articles. Supporting SLR evidence from *government/council data* (N=14) and *public observation* (N=12) in New Zealand was observed more than in the Netherlands, respectively *government/council data* (N=3) and *public observation* (N=5). For *opposing evidence of SLR* there was 16% of Dutch articles (N=13) compared to 6% from New Zealand (N=5). *Scientific uncertainty* was the most cited type of *opposing SLR evidence* respectively in 13 Dutch and 5 New Zealand articles.

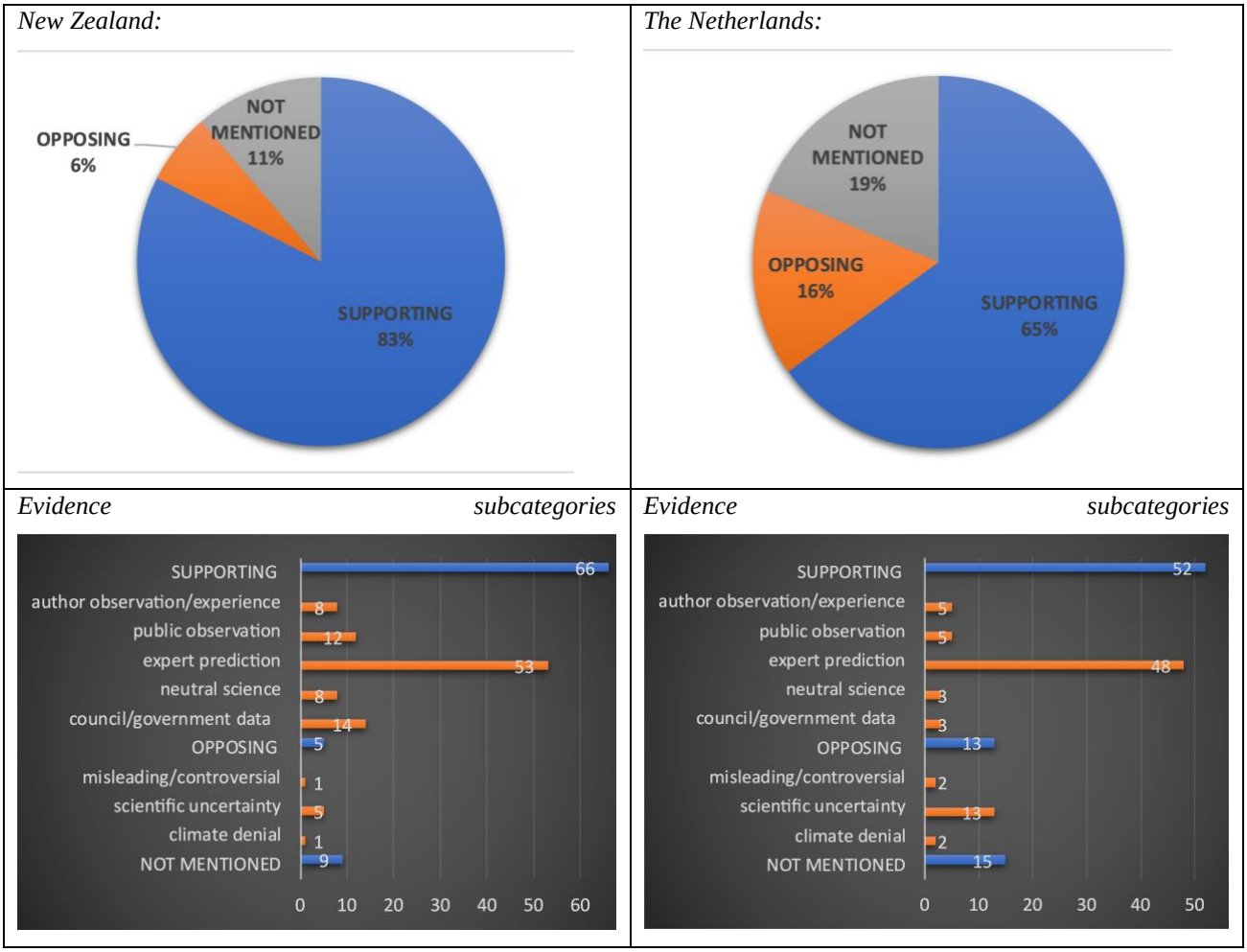


Figure 14: Evidence of sea level rise comparison. Main category printed in upper case (blue); subcategories printed in lower case (orange).

4.8 Stakeholders

Stakeholders in this study were any individual, group or organisation that had a vested interest in SLR and were either a newsmaker or an affected party. In both countries, *experts* were the most common stakeholder type with 96% of Dutch articles (N=77) and 86% of New Zealand articles (N=69) referencing an expert (Table 7). Of these, *climate/environmental experts* were observed most in both countries, more in the Netherlands (N=64) than New Zealand (N=55). Dutch articles (N=33) also had more *technology and development expertise* than New Zealand (N=17). *Financial and insurance* expertise was observed in more New Zealand articles (N=21).

Dutch articles overall interweaved expertise in eight more, or 10% more, than New Zealand articles. Dutch articles had a heavy reliance on *environmental / climate* and *technology/ engineering expertise* much more than any other stakeholder type while New Zealand had a more diverse mix of stakeholders in its' coverage of SLR such as *public*, *government* and *expert* stakeholders. New Zealand did have *environmental / climate* and *technology/ engineering* expertise, but these perspectives were more predictive and discussed the modelled and anticipated impacts of SLR while in the Netherlands engineering expertise was presented regarding ideas about preventing the rise of water through carbon capture technology or switching to greener energy or innovative solutions for adapting and defending the water as the following excerpts annotate.

…The idea eventually turns the North Sea into the North Lake. With a dam of 161 kilometres between France and England. And a northern part in two pieces over 476 kilometres between Norway and Scotland…. It would immediately protect 25 million citizens and coastal cities such as The Hague, Copenhagen, Hamburg, and St. Petersburg from flooding… The dams also offer opportunities for energy generation and new forms of sea farms. For the time being, despite the great depth near Norway, not a single engineer has said 'this is not possible," (Appendix D, Article #147, The Netherlands).

…The tool, which uses the latest data from a Coastal Hazard Assessment report by environmental and engineering consultancy Tonkin and Taylor, allows residents to select different scenarios to see how coastal flooding, erosion and groundwater levels could affect their properties from now until 2150. About 25,000 properties in coastal and low-lying areas across the city and Banks Peninsula are at risk of flooding or erosion due to predicted sea level rise over the next 120 years, according to the assessment, (Appendix D, Article #8, New Zealand).

Governmental stakeholders were the second most dominant stakeholder type occurring in 76% of New Zealand (N=61) and in 48% of the Dutch (N=38) articles (Table 7). *National government* as a stakeholder was referenced a similar amount of times in both nations while New Zealand articles noted *regional/local government* and *politicians/councillors* more frequently than the Dutch articles. *International government* was however represented slightly more in the Dutch articles (N=7) than the New Zealand articles (N=2).

Table 7: Stakeholder comparison.

	NEW ZEALAND				THE NETHERLANDS			
	FREQUENCY		PERCENTAGE		FREQUENCY		PERCENTAGE	
	TOT	SUB	TOT	SUB	TOT	SUB	TOT	SUB
Business & developers	**12**		**15%**		**13**		**16%**	
Emergency services	**1**		**1%**		**0**		**0%**	
Other (media)	**3**		**4%**		**6**		**8%**	
EXPERTS	**69**		**86%**		**77**		**96%**	
- *Environmental/climate researcher*		*55*		*80%*		64		*83%*
- *Economists/banking/insurance*		*21*		*30%*		4		*5%*
- *Engineers/tech developers*		*17*		*25%*		33		*43%*
- *Other (law, psychology)*		*3*		*4%*		5		*6%*
- *IPCC*		*9*		*13%*		11		*14%*
GOVERNMENT	**61**		**76%**		**38**		**48%**	
- *International gov*		*2*		*3%*		7		*18%*
- *National gov*		*26*		*43%*		25		*66%*
- *Regional/ local gov*		*43*		*70%*		19		*50%*
- *Politician/councillor*		*26*		*43%*		11		*29%*
PUBLIC	**60**		**75%**		**28**		**35%**	
- *Agricultural/farming*		*3*		*5%*		9		*32%*
- *General public/everyone*		*40*		*67%*		19		*68%*
- *Minority indigenous*		*12*		*20%*		2		*7%*
- *Owner/resident/community*		*22*		*37%*		8		*29%*

Main categories printed in upper case; subcategories printed in lower case below. TOT = category total occurrence, SUB = sub-category occurrence. Percentages for category totals are out of the 80 articles from that country, sub-category percentages are out of the category total.

Public stakeholders were represented in 35% of Dutch articles and in more than double that, or 75% of New Zealand articles. Of the public stakeholders the *general public/everyone* was represented the most in both New Zealand (N=40) and the Netherlands (N=19). *Owners, residents and community groups* were represented in 22 New Zealand articles compared to eight Dutch articles where *minority/indigenous stakeholders* too were in more New Zealand (N=12) than Dutch articles (N=2). In the analysis, it was evident that Dutch articles rarely presented a public perspective on SLR reaffirming that Dutch news discourse focussed on expertise.

However agricultural stakeholders were present in more Dutch (N=9) than New Zealand (N=3) articles (Table 7). While both countries have large agricultural sectors it was interesting to observe how references were made to the farming sector in both nations. In the Netherlands the agricultural sector is referenced more regarding the impact SLR would have on the farming sector which is in places low-lying and at risk to rising waters and intrusion of salt. There was also reference to farming stakeholders in Netherlands pertaining to the hesitation farmers have in terms of depoldering solutions or changing agricultural practices. Whereas New Zealand articles referenced aqua or marine agricultural impacts or noted the negative impacts farming has in contributing to CC and effectively SLR. The following excerpts illustrate how agriculture was referenced in the discourse.

> *New Zealand's large agricultural sector means methane plays a significant role in our emissions profile. A greater focus on tackling methane emissions could mean greater requirements on farmers to reduce their farm emissions. (Appendix D, Article #2, New Zealand).*

> *...Most common crops do not grow in saline soil. Moreover, farmers will not be itching to 'give away' valuable agricultural land to the sea. It was time for creative thinking. Vermaak calls it 'searching for linking opportunities. "We went to see how we could return value to the land"... Other preliminary studies, such as the Raising Agricultural Grounds pilot, have shown that many farmers are interested in moving the sludge that would be collected between the dikes onto their fields. 'Sludge is extremely suitable for enriching the soil. Due to subsidence and peat oxidation, much soil is becoming less usable. If you can put a meter of this sludge on top of that, then that soil is future-proof again. The sludge is of course salty initially, but you can leach or rinse it out. We are now investigating how best to do that,'* (Appendix D, Article #151, The Netherlands).

One stakeholder group unique to New Zealand was the *indigenous/ minority* group, who were referenced in relation to the impacts SLR could ultimately have for Māori. The excerpt details how blue carbon storage in a Nelson estuary, has significance for Māori and their involvement in research to reduce CC and SLR impacts.

> *...Ngāti Apa ki te Rā Tō's Taiao advisor to the project, ecologist Jen Skilton, said the iwi was fortunate to be approached by Walker about taking part in the project, early on in the process. "For Ngāti Apa ki te Rā Tō it is a really important for whānau, aimed at building ecosystem resilience and potentially limiting the impact that climate change will ultimately have on our iwi members, hapū and 54hanau. "We were drawn to the kotahitanga approach of all working together, to ensure that we do all we can to protect the environment within our rohe, for our tamariki, for our future generations," (Appendix D, Article #38, New Zealand).*

4.9 Solutions to Sea Level Rise

4.9.1 Solutions Journalism

With the characteristics of solutions journalism outlined in Section 2.5, the present study was able to observe some elements of solutions journalism in the content analysis from both nations. In 65% of the Dutch (N=52) and 30% of New Zealand (N=24) articles a *solution to SLR* was detailed while the *causes of SLR (*a characteristic of solutions journalism) were mentioned in 45% of Dutch (N=36) and 23% of New Zealand (N=18) articles. Solutions did exist in the news discourse, but the inclusion of all characteristics of solutions journalism (outlined in Table 1) was not consistently met. Just 11% of New Zealand (N=9) and 10% of Dutch (N=8) articles provided an an-in-depth explanation of the solution and its limitations.

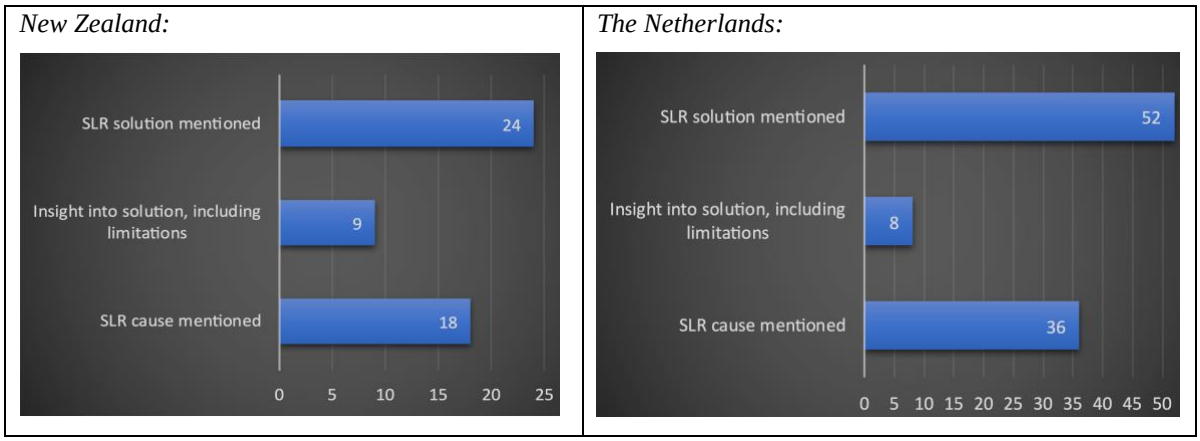


Figure 15: Prevalence of solutions journalism and solutions journalism characteristics.

4.9.2 Planning for Adaptation

Going into detail about the type of solutions observed, 84% of Dutch (N=67) and 80% of New Zealand (N=64) articles gave reference to *SLR adaptation planning*. Of the subcategories for adaption planning the *plan phase* was most occurring in New Zealand (N=47) and the Netherlands (N=38). More Dutch articles (N=35) discussed the *SLR predictions* than in New Zealand (N=22) while *practical information for people* occurred more in New Zealand (N=25) than in Dutch (N=10) articles.

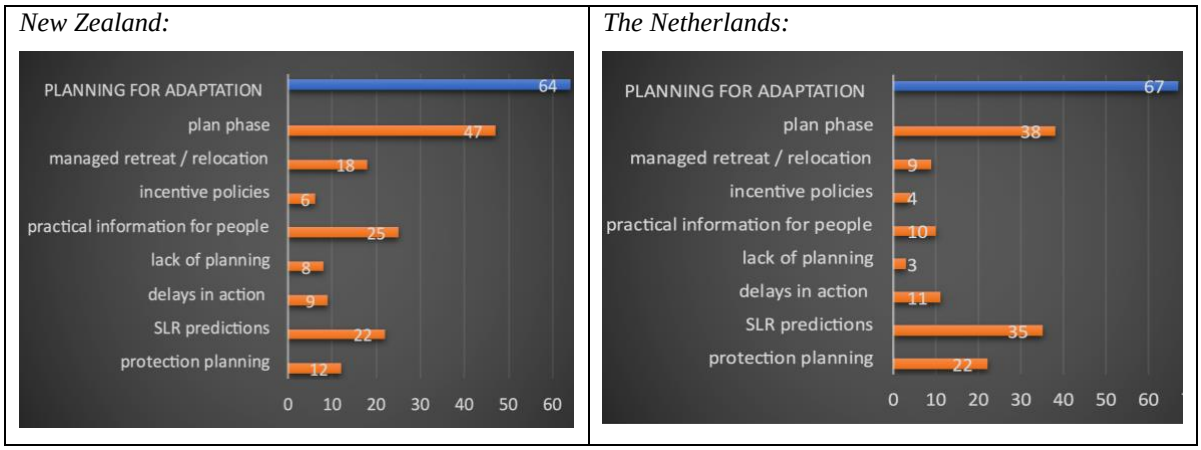


Figure 16: Planning for adapting to sea level rise comparison. Main category printed in upper case (blue); subcategories printed in lower case (orange).

4.9.3 Ecomodernism & Solution Themes

Solutions were observed in 65% of the Dutch (N=52) and 30% of the New Zealand (N=24) articles. Looking at the specific solution themes present, both New Zealand (N=16) and the Netherlands (N=36) had a common notion that an adaptive solution was to *engineer our way out of SLR and CC. Technology and science to help reduce SLR* was also observed frequently, in 28 Dutch articles compared to just four from Aotearoa.

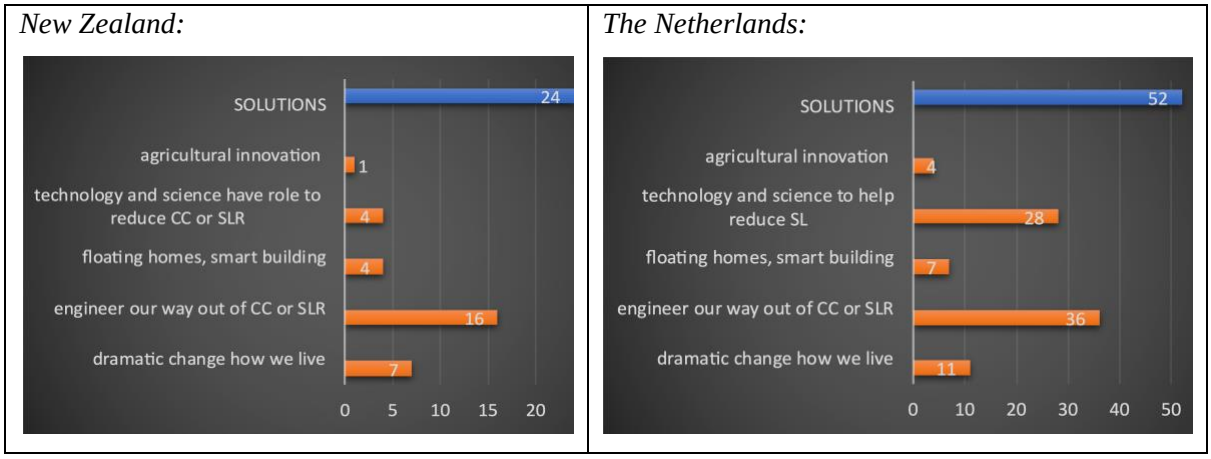


Figure 17: Ecomodernism & solution type comparison. Main category printed in upper case (blue); subcategories printed in lower case (orange).

Common examples of solutions often gave reference to the idea of ecomodernism – the idea that technology, engineering, and science can help reduce environmental impacts. The notion that humans can outdo the sea or climate change observed in the discourse is rooted in historic Dutch mentality as the nation has always contended with water. The articles reflected this mentality as some excerpts below highlight.

> *The Netherlands is the greatest juggler in dealing with water. We owe our country and prosperity to it. Our pitfall is complacency and thinking that we can make everything our own. In a time of extremes, that's downright stupid. We can remain the safest and leading delta if we think unorthodox about spatial investments… Thinking a century ahead makes it possible to grow with the rise in sea level. In the short term, for deep polders and floodplains, this means abandoning or at least changing buildings. No Ijburg but Drijfburg. No terraced houses with gardens, but timber construction on stilts with a direct view of mangrove-like nature,* (Appendix D, Article #107, the Netherlands).

> *…The researchers are concerned with further developing the technology, so that you don't get seasick all the time, for example, but also with the psychology behind floating living. "Do people dare to live on larger floating elements? You can already see houses, but not in larger clusters explains. It's also an idea that people have to get used to, "We are making land out of the water, and we have been doing that for hundreds of years. Making land out of water based on floating structures is the next step,"…* (Appendix D, Article #118, the Netherlands).

Solutions in New Zealand news discourse too gave reference to engineering solutions in terms of coastal protection – but in contrast, solutions were often closely related to prevention of SLR impacts or the political processes needed to implement adaptative solutions. Too there tended to be an underlying tone referencing working with the natural environment – reflective of the country's affinity with the environment and kaitiakitanga – a notion of ethical and spiritual responsibility, protection, and guardianship for the land. Of course, politics and policy were important in these solutions as the following excerpts illustrate,

New flood protection infrastructure will need to plan for sea level rise of at least 1.35 metres, according to guidance proposed by the Greater Wellington Regional Council, as it plans to update its flood protection policy. The Ministry for the Environment recommends all new infrastructure take into account the sea-level rise of approximately 1.35m by the year 2121 (a 100-year horizon), and a projected increase in rainfall of up to 30 per cent by 2120 in some catchments. (Appendix D, Article #10, New Zealand).

…It's impossible to know how much the houses would be worth without erosion – Port Waikato is one of Auckland's cheaper beach towns, possibly partly because of erosion problems. And the council says people can demolish their houses and build new ones further back, so long as the new buildings can be put on a truck and moved later, (Appendix D, Article #46, New Zealand).

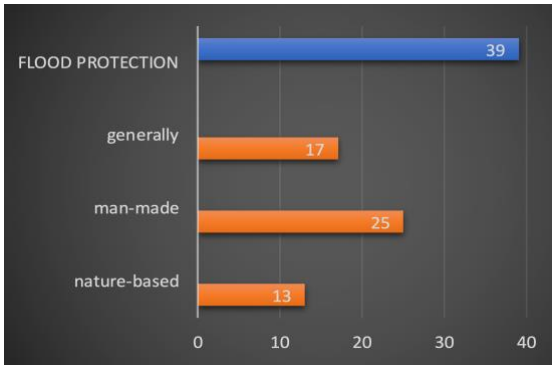
4.9.4 Flood Protection

Flood protection solutions arose in the news discourse too, observed in 49% of the New Zealand (N=39) and 59% of the Dutch (N=47) articles. Most of the flood protection solutions discussed referred to *man-made flood protection*, with 25 occurrences in New Zealand and 38 in Dutch articles (Figure 18). The following examples illustrate some of the references made in the news discourse pertaining to man-made flood protection.

…Instead, the marae was turned into a water-tight fortress. As it is situated on low-lying whenua, floodgates and specialised pump systems have been installed to quickly drain water from the marae grounds, and the perimeter is fortified with concrete and breakwaters. Even still, the increasing severity of flooding and the accompanying slash events concerns Horomia. "I really worry about another flood. I'm always at the marae checking it." (Appendix D, Article #4, New Zealand).

'We also have a problem with the Ijsselmeer. Now the water there flows naturally into the sea at low tide. But when the sea level rises, we need huge pumps to get all that water into the sea. Or we should let the Ijsselmeer rise along with it. But then all dikes also have to be higher. You can, but it costs a lot of money and space. 'Finally, the storm surge barriers. They are not designed for sea level rise. We need to replace them sooner. That is also very expensive. (Appendix D, Article #85, the Netherlands).

New Zealand:



The Netherlands:

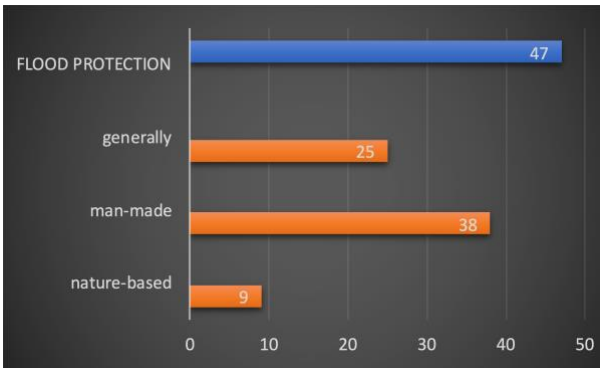


Figure 18: Flood protection comparison Main category printed in upper case (blue); subcategories printed in lower case (orange).

In some cases, flood protection was written about in more *general* terms with some of the news discourse referencing both *man-made* and *natural protection* solutions. However, *nature-based* flood protection solutions were observed in more New Zealand articles (N=13) than Dutch articles (N=9). In New Zealand, reference was made to mangroves and wetlands, contrasted to the Netherlands where natural protection solutions involved sand dunes or the salt marshes in the Wadden sea, as the following excerpts indicate.

> *Potential remedies for St Clair include the removal of redundant infrastructure from the sea wall, which includes old stairways and piles, and new dune fencing and planting. In the longer term, an offshore structure remains a possibility, and while that would provide a more sheltered wave climate while reducing sand loss, it would affect the popular surfing spot, the report said. Short-term plans for Middle Beach include stockpiling sand for dune remediation, as well as removing contaminated material from dunes. St Kilda Beach did not require substantial management action in the coming years, the report noted, but dune resilience through planting and the control of public access would help,* (Appendix D, Article #53, New Zealand).

> *…We need two new approaches to flood resilience in New Zealand… One is to embrace nature-based solutions, which can see ecosystems restored, human infrastructure better protected, and greenhouse gas emissions reduced. "Nature-based solutions – such as wetlands, rain gardens and swales, and green roofs and walls – can be effective for addressing flood risk," the draft NAP noted. It also said that nature-based approaches to urban infrastructure can counteract the urban heat effect and reduce the risk from extreme heat. Healthy coastal or riverside wetlands can soak up excess water, reducing the peak water level and protecting communities from inundation,* (Appendix D, Article #161, New Zealand).

> *…A trial with planting seagrass in the Wadden Sea is unexpectedly successful. Scientists speak of a breakthrough, because the plants spontaneously spread to (far) beyond the trial area near Griend, between Harlingen and Vlieland and Terschelling. "The field is now expanding. Also beyond our test plots," says Laura Govers of the University of Groningen at Omrop Fryslân . "That is a fantastic development. We now want to see whether it can now also sustain itself without sowing extra seeds." Scientists have been trying for years to get the seagrass back in the Wadden Sea. The plant used to be ubiquitous but disappeared…The plants dampen the waves and loose seagrass can protect the island from storms. "And last but not least, seagrass fields serve as a storage place for CO2,* (Appendix D, Article #155, the Netherlands).

5 DISCUSSION

The outcomes of this research provide an insight into different frames and representations of SLR in New Zealand and Dutch written online news. In this chapter, the results presented in Chapter 0 will be discussed. First, the research questions will be answered with an explanation of the core findings, with connections made with the reviewed literature set out in Chapter 2. Thereafter, the implications and recommendations of this study's core findings about sea level rise communication in the news will be detailed. Finally, this chapter closes with the limitations of the present research and potential directions for future research.

5.1 Key Findings & Relevance

5.1.1 Sea Level Rise Framing, Themes & Topics in the News

The first research question in this study asked: ***How is sea level rise presented and framed in online news in New Zealand and the Netherlands?*** Below, the answers to this question are outlined holistically and these will be elaborated upon in the sections thereafter.

Climate journalists and *general journalists* authored 94% of the 160 articles from both countries (Figure 3). 88% of the analysed articles were *news, features, or question-and-answer* style news stories and the remaining 12% were *opinion piece stories* (Figure 6). The geographical focus of the SLR discourse was largely on the *national* scale in both countries, but New Zealand also had an equal focus on the *regional perspective* of SLR in the analysed articles (Figure 2). *Planning for adaptation* was a frequently used frame, observed almost equally in both countries as it concerns the response to the threat of SLR. The Dutch adaptive solutions to SLR pertained more to an ecomodernist approach, reflecting the ongoing fight against the water. New Zealand news discourse focused heavily on the impacts, particularly *property impacts* (N=41) and *coastal impacts* (N=47) such as *erosion/weakening coastlines* (N=31). SLR impacts were cited slightly less in the Dutch news discourse. The impacts cited the most in the Netherlands included *environmental impacts* (N=44), *coastal impacts (*N=44), for *flooding prone low-lying areas* (N=37) and *infrastructure impacts* (N=42). In terms of the style of stories, the New Zealand discourse presented a more personal narrative, often interweaving personal perspectives from people within the articles, whereas the Dutch articles were more direct fact-and-figure-based about the SLR predictions or proposed solutions. The newsworthiness factors of the articles were often related to politics and new research topics, contrary to typical news values such as negativity, dramatization and conflict (Bell, 1991). The SLR articles presented overall lots of evidence to indicate SLR will occur which was supported greatly with expertise. Nevertheless, New Zealand articles presented a greater variety of stakeholder perspectives from the *public, government* and *experts* while Dutch articles mainly presented expertise input, particularly from *climate and environmental experts*.

Newsworthiness Factors

Politics/regulation and *new research/report/study* were the most reoccurring *newsworthiness* factors, with more than 45% of the articles from both countries having these newsworthy frames present. The traditional news values of timeliness, meaningfulness, proximity, and recency (Bell, 1991; Bednarek & Caple, 2014; Dominick, 2011) most probably contributed to the newsworthiness of many of the articles in the study that featured *politics* or *new*

research. Furthermore, it is possible that *politics/regulation* was a leading newsworthiness factor as SLR impacts political systems in terms of decision-making, law changes and plans needed to prepare for its impacts. *Politics* and *research* are interconnected. The newsworthiness of *new research* effectively shapes the *regulatory* and *political* process, and such information is useful, for example, in helping governments regulate where urban development is safe and sensible. Journalists, as communicators of the science of SLR, have an important role in ensuring that newsworthiness factors such as politics, regulation and new research are elevated in their coverage. As Stecula & Merkley (2019) have previously stated, journalists as communicators have a choice in emphasising or downplaying the complexity of science, through the framing of politics and research.

The theoretical framework (Chapter 2) had suggested that conventional news values may not be as relevant in the reporting of CC, due to science lacking the newsworthiness values from a human-interest perspective such as that of entertainment value, click-ability or personable relatability (Bourtk et al., 2015). While previous studies comparing climate change news articles have found *conflict*, *human-interest*, *non-pursuit of action*, *consequences*, and *responsibility* as newsworthy factors (Dirikx & Gelders, 2010). This research only identified two of these, *conflict* and *human-interest*. The *human-interest* newsworthy factor was one of the least reoccurring newsworthiness factors, only present in 17% of the 160 articles. The newsworthiness of *conflict* was present in 22% of the 160 articles. Instead, many news stories focused on the science of SLR, and, in fact, environmental *science expertise* contributed to 83% of the Dutch and 80% of the New Zealand articles. Implying that SLR is presented as a reality fact in New Zealand and Dutch news discourse.

Vu et al. (2019) found that more developed countries tend to frame CC as an issue to be solved through scientific and political interventions. Their study compared media in developed and underdeveloped countries in the Global North and Global South, while this study compares two developed nations in the Global North. The articles in that automated study dated from 2006 to 2018 and differences between an automatic and manual analysis may explain some discrepancies between their study and the current one. Vu et al. (2019) noted that media from developed nations were less likely to frame CC from a natural impacts' or international relations perspective and were more likely to highlight scientific solutions (Vu et al., 2019). The present study did indeed observe scientific perspectives. Additionally, *natural impacts to the environment* because of rising seawater was noted in 55% of the Dutch and 31% of the New Zealand articles. The observance of environmental impacts in the current study could indicate changes over time in the way media is framing SLR as natural impacts materialise. Barkemeyer (2017) disputes that a country's level of development and its GDP is an accurate measure to explain levels of climate change coverage in the media. Based on the results from this SLR study it seems more likely that media coverage is determined by SLR impacts on a nation.

Framing of Sea Level Rise

Of all SLR related topics, *SLR impacts* and *adaptation* were two topics presented the most, in 58% and 51% of the 160 articles, respectively. To a lesser extent *causes of sea level* rise, *climate change impacts*, *climate change mitigation* and *climate change adaptation* were other main topics present in the news discourse. Between both countries, there was a similar pattern of the most commonly reoccurring CC and SLR topics, albeit with slightly different frequency counts (Figure 7). Dutch media articles cited *SLR causes* more than twice as much as New

Zealand articles. However, New Zealand articles were mostly authored by *specialist environmental journalists*, as opposed to the Dutch articles, raising the expectation of more science knowledge being communicated in the New Zealand stories. A possible explanation could be that Dutch articles cited more *environmental and climate expertise* than the articles from New Zealand, pointing in the direction of language recycling or the manner that journalists mediate the language of the environmental experts (Bell, 1991) in the Netherlands.

With reference to the causes of SLR presented in the news discourse, *ice* and *glacier melting* were the most cited in both nations' analyses (Figure 9). This finding reflects the scientific consensus that melting glaciers and thermal expansion of the ocean water are leading causes of rising sea levels (Fox-Kemper et al., 2021; Mengel et al., 2016). Perhaps the *melting of land ice and glaciers* was observed more frequently as a cause for SLR than *land subsidence* or *warming ocean temperatures* because it is simpler to explain and understand. The work of Yaros (2006) supports this idea, stating that contextual information, for example causes and consequences, is useful in building reader comprehension. The media have often been criticised for their misrepresentation or oversimplification of science through either purposeful or inadvertent exclusion of important contextual science information (Pellechia, 1997; White, 2013; Guenther, 2019). Journalists are tasked with explaining specialised topics to lay people. Contending with these challenges and limitations ensuring reader interest (Murcott & Williams, 2013) could be an explanation as to why not all causes of SLR were consistently present in the news discourse.

SLR Impacts

Overall, *SLR impacts* were addressed nearly equally in both countries, with 60% and 55% of New Zealand and Dutch articles, respectively. However, there were different types of impacts framed in the news discourse in both countries. News stories on impacts have relevancy and immediacy for the audience (Dunwoody, 2008), as it is informative and aids people in their personal decision-making and risk assessment. New Zealand had a much stronger focus on *property impacts* (61%) alongside *coastal erosion impacts* (39%), compared to the Netherlands which focussed more on *environmental* (55%) and *coastal impacts* for *low-lying areas* (47%) at risk. This high occurrence of the framed impacts in the present study is affirmed by another climate change media analysis by Hase et al. (2021) who found impacts on the environment, economy, society, and culture as prominent. Portrayal of the impacts is important to audiences as (the way media frames the information of) these consequences inform them of the news and shapes readers' perceptions regarding the magnitude and relevance of the event (Pitt et al., 2017). In this light, it is somewhat disheartening that in the New Zealand media the impact of SLR on *humans* (N=18), *inequality* (N=20) and the *environment* (N=25) were not observed as frequently as the impacts of SLR on *property* (N=47) and *economics* (N=33).

Innovative & Adaptive Solution Frames

Solutions to SLR were observed in 48% of the 160 articles, with a focus on *innovative solutions* and *planning for sea level rise*. The solutions to SLR were typically framed from a point of view that clean energy, science, engineering, and technology can contribute significantly to reducing SLR or preventing its impacts. This notion relates to the idea of ecological modernisation, where science and technology can contribute to life on earth and the reduction of CC, and too SLR. In a 2020 study by Vossen, emerging frames relating to CC were *technology*,

eco-modernism, and *trade-off*. In the present study, similar phenomena were observed through the identification of *adaptive solutions* with subcategories including *technology* and *science* having a role, *floating homes / smart building*, and *engineering our way out of CC* and *SLR impacts*. These frames were consistently present in the Dutch news discourse. Additionally, the *ecological modernisation* frame has been identified to have rising prominence in the news discourse pertaining to CC issues (Schäfer, 2015). The representation of this eco-modernist frame in the news shows how the news media provide value and evoke hope with their constructive framing towards the societal problem (Hermans & Gyldensted, 2018). This positivity of solutions contrasts with the stark reality of negative *impacts* that were frequently mentioned in the studied articles which perhaps provides optimism for readers.

Vocabulary & Language

One finding of this study was the commonality of language and words in both countries with the most frequently used words in the news discourse being simple, easy-to-understand commonly known words that describe the SLR phenomena. The use of simple language aids comprehension and consequently decision-making by audiences (Boykoff & Rojan, 2007). Word vocabulary in the discourse of both nations also showed an overlap of terminology, perhaps due to the specificity of words that can be used to describe and discuss SLR. In the Dutch articles a lot of technical language was evident alongside specific flood protection terminology that only has relevance in the Netherlands for example dikes, depoldering and delta. At the same time, words referencing cultural and spiritual connections and guardianship towards the environment (often in Te Reo Māori - the language of Māori) were only present in the discourse of New Zealand articles. These language distinctions were not visually evident and are shown in Appendix C. Vocabulary Comparisons.

Often, newspapers with large diverse audience groups utilise universal language that is simple, clear, and understandable for all, whereas specialist publications may use more niche language and vocabulary suitable for their target audiences (Bell, 1991). The results of this study tend to lean toward the former. Media reporting on CC was also found more likely to use language reiterating risk and danger with present tense commonly being used (Stecula & Merkley, 2014). The *likelihood of sea level rise* was a topic that arose frequently in the study, with 59% of the 160 articles *predicting SLR in the future*, effectively indicating the real risks of rising seas. In the observation of the *likelihood of SLR* in both countries risk and danger language was more present-tense oriented. The observation that SLR is *happening now* was common, in 45% of New Zealand and 21% of the Dutch articles. The words and language used in the media emphasized the pending danger or risk to people and property, and these observations of the present study reiterate the findings of the study by Stecula & Merkley (2014). The notion of *definite language* was addressed in fewer articles, in only 18% of New Zealand articles and 25% of Dutch articles. This observation could indicate that the use of definite language to describe the occurrence of SLR is still needed to convince readers of the likely impacts of SLR. However, while fear appeal messages such as the use of *definite language* and *happening now* frames are known for attracting attention to messages – particularly for climate change communication, fear is generally an ineffective tool for encouraging genuine personal engagement or behaviour change in the long term (O'Neill & Nicholson-Cole, 2009). If the authors are actively deciding not to use fear or scaremongering tactics for this or other reasons cannot be determined.

A difference between the two countries was observed regarding the integration of personal story narratives, with a slightly greater occurrence in New Zealand (N=17) than in the Netherlands (N=14). The New Zealand articles integrated more personal story narratives or explanations of impacts from a personable perspective. In some of the news, personal narratives of people's experience of SLR were used to explain or prove the SLR reality, making stories relatable for people through personal narratives. The Dutch, in contrast, are known for their direct communication style, and the news articles reflected this as scientific SLR predictions and facts were often presented in the articles directly, rather than through human experiences or explanations.

Whilst simplified, the language journalists use is often shaped by the language of science. Murcottt & Williams (2013) introduce the idea that language in the news is more frequently shaped by communication specialists and public relations firms that supply news to the media. It is becoming more common for science reporters to use that language for ease, rather than rewriting the press releases in their own way. It was observable, particularly in the Dutch articles, that some of the news articles, even from different media companies, indeed utilised identical phrasing and structure for the news stories. This could indicate that the news stories were not original works of reporters and had been repurposed from press releases. However, from the present analysis, one cannot determine if the analysed articles were indeed written in part, or fully sourced from press releases with the curated language of communication specialists.

5.1.2 Cross-National Differences

The second part of the first research question sough to identify ***how the framing and presentation of sea level rise in New Zealand and Dutch news differed.*** This section starts with an explanation of the main cultural and geographic differences that contributed to how SLR news is framed, followed by a discussion of the main differences observed in the overall presentation of SLR in the news in both countries.

Cultural differences

In both countries, water and the ocean are an important part of the national identity and way of life. They both are unique in their history, cultural makeup, and ethnographic features, which shape differing values in reporting practice. New Zealand has a masculine culture. The indigenous cultural climate in Aotearoa values the ancestorial significance on flora and fauna, as well as moana and whenua (sea and land) and this entwinement between culture and the environment is reflected in how the ocean is valued. Because of the large presence of indigenous culture and values, in the news discourse there was a strong sense of attachment to the land and its *spiritual and intangible* (N=5) value, either in terms of land or defending property and livelihoods. Additionally, New Zealanders value the ocean, and their connections to it are strong for reasons including recreation, food resources, spiritual well-being, and residence with 75% of the country's population living within 10km of the coast (O'Callaghan et al.,2019).

In contrast, the Netherlands has a feminine culture, and the Dutch are renowned for their directness. Dealing with water and the sea plays a crucial role in Dutch history due to its geographical location and reclamation of lakes and the sea. The Netherlands places great importance on the water as the nation has for centuries faced a constant

battle with water and the sea, either through its reclamation, water management and recurrent floods. Hence the nuances of SLR have been present in the country's history and reflected in the media for a long time. Therefore, Dutch news about SLR is reported in a fashion of business as usual, and thus was more framed in reflection of what solutions and management practices will or are being implemented to protect the 70% of the population exposed to SLR related risks (Bloemen et al., 2019; Haasnoot et al., 2019).

While both countries are culturally and geographically different, yet they are economically developed and are both facing the consequences of sea level rise in different manners. It is useful to ascertain if the news is representing the reality of current scientific sea level rise knowledge. The Netherlands has a formal, direct, and detail-orientated communication style, whereas Aotearoa is more personable and informal with its indirect communication approach. Both communication styles come across or are presented in written communication too, thus consideration or reflection of these factors needs consideration in journalistic writing. While the Dutch discourse had an emphasis on the environment and nature regarding the consequences of sea level rise, New Zealand media focused more on impacts on the coastline and coastal properties. Often the framing of SLR by Dutch media reflected a strong scientific and technological perspective in continuing to battle the water to protect the country holistically. For New Zealand, the protection from the sea is a topic that has had less prevalence until rapid global changes and CC effects have become more tangible in recent years. Interestingly *working with nature* as a coastal defence was not frequently cited in either nation but did occur less in the Dutch news discourse (N=9) compared to New Zealand (N=13).

Publication Seasons

In general, most studied articles were published in *Autumn*, when storms can be stronger and storm surges are higher. However, there were some differences between the number of articles published in *Winter*, *Summer*, and *Spring*. It is hypothesized that reporting of SLR events is associated with weather patterns and other natural phenomena or different warming/cooling cycles in different seasons. Oceans warm and expand in the summer, and cool then contract in winter resulting in higher sea levels in summer and early Autumn and lower sea levels in Winter and early Spring as some more water is stored on land (Church et al., 2013). Additionally, ocean-atmosphere systems like El Niño and La Niña, which cause significant sea level changes in the Pacific and eastern Indian Ocean, add to the inter-annual variance of sea levels, and may too be reflected in the more frequent reporting of SLR-related stories in New Zealand in Winter and Summer. Because El Niño and La Niña cycles last multiple years, they can contribute to climate extremes in different seasons. In the Netherlands, where ocean-atmosphere systems like La Niña are not commonplace, the more equal share of articles published in these three seasons may be explained as SLR is an ongoing issue year-round, regardless of season, due to a large part of the country being below sea level and needing constant protection.

Lastly, it is necessary to note that the study focussed on articles published across an 18-month period, therefore articles from two Dutch seasons of Winter and Spring plus articles from two New Zealand seasons of Summer and Autumn were included in the study. This too may partially contribute to differences in the number of articles published per season in each country. Lastly, the differences in publication season may purely be coincidental and may relate more to specific SLR news events and newsworthiness factors that occurred during the study period.

Geographical focus

A significant difference was observed in the geographical focus of the article content between New Zealand and the Netherlands. Within the New Zealand articles the geographical focus mostly pertained to impacts on specific regions and cities, while the Dutch articles generally focussed on the bigger picture of SLR predictions and how the whole country could be impacted. The regional focus of SLR in the New Zealand media may be determined by the fact that in some regions the population can be impacted by the water more than other regions. Consequently, New Zealand news media had a representation of stories in areas where people live. In a previous study about news reporting of natural disasters, it was found that regions where populations were impacted the most would receive more coverage (Kwak & An, 2014). This supports the above observation where populated regions and cities in both countries (Figure 1) received more news coverage relating to SLR compared to less populated areas. Additionally, coastal locations in New Zealand or low-lying areas in the Netherlands were found to receive more media coverage than inland or geographically elevated areas. This finding agrees with a study by Barkemeyer and colleagues (2017), who note a country's direct exposure to CC impacts, its climate policy history and the measures taken to combat CC impacts influences media attention to the issue.

The *international geographic focus* on SLR was present in 15% of the New Zealand articles and in 30% in the Dutch articles. The countries' geographical location may explain this difference – as New Zealand is geographically isolated from the rest of the world, international perpetuities are not as relevant. To the contrary, the Netherlands is closely connected to other nations by proxy of location. While international perspectives on SLR are undeniably important, it is perhaps somewhat less relevant for news audiences within New Zealand as the national or regional impacts of SLR are much more pertinent. In the past, media studies have found that international or Eurocentric views have often been, and continue to be, dominantly represented in the media (Wilke et al., 2012). In other words, the media is often focused on Europe in its coverage of issues. As the Netherlands is part of Europe this too could be why the international focus is detected more in the Dutch articles.

Types of Sea Level Rise Impacts

There were some differences between the types of SLR impacts reported on in New Zealand and the Netherlands. One evident difference was between the coastal impact types, where in New Zealand there were 31 articles specifically identifying *erosion / weak coastline* compared to only 6 Dutch articles. Meanwhile, it was found that *coastal flooding / low-lying area* impacts were more prominent in the Dutch articles (N=37) than in the New Zealand articles (N=28). These differences are likely explained by the variety in topographical features of both nations and the consequent SLR risks. In New Zealand, there is an extensive 15,000 km of diverse coastline, representing the world's coastlines from steep cliffs, rocky headlands, fiords, and sandy beaches all exposed to the extremities of the ocean in distinctive manners (Bell & Gibb, 1996). This contrasts to the Netherlands, which has just 432km of coastline, 75% of which consists of sandy shores and dunes (some naturally occurring or modified), 15% is hard structures like sea walls, dykes or barriers and 10% consists of tidal flats and river inlets (Ministerie van Verkeer en Waterstaat, 2000; Van Heuvel & Hillen,1994). Moreover, the Netherlands is a low-lying country, with a third of the country below sea level and two-thirds of the country protected by flood protection infrastructure. In New Zealand, SLR impacts more related to smaller-scale local coastal erosion, affecting different parts of the country in various ways. Related to the country's low elevation and more

widespread exposure to SLR, *natural/environmental impacts* were observed in the news discourse more in the Netherlands (N=44) than in New Zealand (N=25). Similarly, *saline water* intrusion was present in 23 more Dutch articles.

Further significant differences between the articles of both nations were observed in the reporting on impacts of SLR on infrastructure, particularly impacts on *transport infrastructure* (N=10 in New Zealand, N=18 in the Netherlands) and *flood protection infrastructure* (N=5 in New Zealand, N=27 in the Netherlands) were observed much more in the Netherlands. This is self-explanatory, as the Netherlands has a huge system of man-made waterways and flood protection infrastructure. In New Zealand flood protection infrastructure is not as prevalent and waterways are for the most part naturally occurring and rarely modified. The reporting reflected these realities. The media analysis unexpectedly also observed some impacts from SLR on *waste management* infrastructure (in 6 New Zealand and 2 Dutch articles) and *cemeteries* (N=3 in New Zealand and N=0 in Dutch articles). It was particularly interesting to see that cemeteries were more often mentioned in New Zealand, Likely because cemeteries and traditional burial sites in New Zealand are commonly located near the water.

Property impacts between New Zealand and the Netherlands also varied, with more impacts to property due to SLR mentioned in New Zealand (N=49) than Dutch (N=31) news media. The emphasis on property perhaps is due to most New Zealand urban areas being in coastal areas. Also, for many New Zealanders, (coastal) property is a significant financial asset. Concluding, populations in both nations live in areas at risk of SLR and this is where media attention was focussed.

Flood Protection & Solution Differences

The solutions to SLR were presented in 28 more Dutch articles (N=52) than New Zealand ones (N=24) . Solution types emphasised *technology*, *science*, and *engineering*, particularly in the Dutch discourse. Additionally, there was more of an emphasis in some Dutch articles on a *dramatic change to society*. The difference is likely explained by solutions to SLR already being proposed and implemented in the Netherlands. The Netherlands has a long-standing history with flood defences and is scientifically innovative and developed in terms of its defence against the water. It could also be argued that Dutch media is more progressive and holistic in its reporting approach of SLR solutions. The lower number of New Zealand articles regarding SLR solutions perhaps indicates New Zealand still has some way to go in finding solutions to SLR, or maybe the media still must establish their role to ensure reporting about solutions for SLR. In this light, it also makes sense that the political *law planning phase* in relation to SLR was more dominant in New Zealand. New Zealand is still in the phase of planning and finding solutions to SLR as it is a 'new problem' the country faces. Therefore, a future study could consider a longer period to identify if the coverage of SLR solutions in New Zealand also increases over time.

With respect to *flood protection*, in both New Zealand (N=25) and Dutch news (N=38), *man-made flood protection* was dominant. This indicates that in both nations' media SLR is treated as an issue that can be solved through man-made interventions. Man-made flood protection has been the prevailing method of flood protection for the Netherlands for millennia. In New Zealand, the current situation presented in the media seeks to find solutions to balance environmental responsibility in line with the protection of livelihoods and assets in locations

prone to rising sea levels. For example, in New Zealand *nature-based* solutions are a common flood protection mechanism, as reflected in the results with *nature-based* solutions observed slightly more in New Zealand news discourse (N=13) than in the Dutch media (N=9). In the Netherlands, the news discourse did interweave some ideas about using *nature-based* solutions to protect the country and areas prone to flooding, but *man-made flood protection* was more prominent in the articles overall. This reflects the ideology that the Dutch have and will continue their battle with the water with innovative technological ideas like floating cities, or damming the North Sea, as cited in the analysed articles.

Evidence & Stakeholder Perspectives

Both countries reported on sea level rise with *scientific certainty*, 82% of the 160 articles in the study referenced the idea that the water *is* predicted to rise due to global warming. The supporting evidence in the news was derived from *experts, author observations*, *public observations* and *council/government data.* Since 2018, there has been an observed shift in media framing of climate change, in terms of uncertainty and economic consequences, to highlight national and global policies (Stecula & Merkley, 2019). The scientific uncertainty of CC and SLR is becoming less prominent in European mainstream media as it usually agrees with the scientific consensuses (Schäfer, 2015). New Zealand media reciprocates the reportage style of European media (Boykoff & Boykoff, 2004), in line with scientific consensus and giving little attention to sceptical climate change perspectives (Bell, 1991; Chetty et al., 2015). Results from the present study reinforce this observation as *climate denial* and *scientific uncertainty* were only found in 13% of the 160 articles analysed.

In contrasting the observations from both countries, it was noted that New Zealand articles referenced a greater range of stakeholders while Dutch articles had a heavy reliance on environmental and science expertise in their SLR coverage. The Dutch articles referenced some type of *expert* in 96% of the analysed articles, compared to 86% of the New Zealand articles. However, *government stakeholders* were observed in 76% of the New Zealand articles, 28% more than in the Netherlands. *Public stakeholders* were mentioned in 75% of the New Zealand articles, which was more than double the occurrence of the Netherlands. The range of stakeholders in New Zealand news discourse could be explained by the articles being written to be inclusive of a variety of views and perspectives to explain how and why people are affected, related to different issues in multiple regions across the country. Conversely, the official narrative and impacts of SLR in the Netherlands are much more consistent across the whole country. The variety of stakeholders found in the New Zealand news discourse agrees with sentiments from Schäfer & Painter (2020) who note science perspectives are indeed important, but there is a growing interest in the inclusion of broader stakeholders such as the public, politicians, public relations spokespeople, corporate companies, and non-government organisations being utilised in science journalism for explaining the real-world context of an issue. As climate change and its multiple implications are not easily perceivable, many learn about it from the media (Schäfer & Schlichting, 2014). The presentation of complex information from various input stakeholders can help information comprehension (Gupta, 2010).

Looking at the type of stakeholders, *climate/environmental experts* were represented the most in both nations, but more so in the Dutch news discourse. Among public stakeholder subcategories, the biggest differences were between *owners/residents/communities* with 22 occurrences in New Zealand and just 8 in Dutch articles.

Likewise, *minority/indigenous* stakeholders were mentioned in 12 New Zealand and just 2 Dutch articles. This could perhaps be explained by cultural makeup differences. Due to New Zealand's colonial history and the exclusion of indigenous and minority groups in the past, there is now more of a societal shift to ensure the inclusion of minority groups. Especially in the mainstream media, this is becoming more prominent. In previous times, Māori have been underrepresented in the New Zealand media (McGregor & Comrie, 1995; Moewaka Barnes et al., 2005) but in the last decade, this underrepresentation is shifting with more Māori representation in the news as part of the country's national identity (Middleton, 2021). Other public stakeholder observations included the identification of *agricultural* stakeholders, more often observed in Dutch news (N=9) compared to New Zealand (N=3). In the Netherlands, these stakeholders were mostly referred to for the loss of agricultural land and how SLR would impact or change farming in the Netherlands. In New Zealand, agricultural and farming stakeholders were referenced mostly with respect to aquaculture and marine farming, or the dairy sector being blamed for its' contribution to climate change. This blame was not as strongly expressed in the analysed Dutch media and may be due to farmers having a strong political representation.

5.1.3 Solutions Journalism Presence

The second research question asked: **To what extent is solutions journalism present within the written online reporting of SLR in New Zealand and the Netherlands?** Indeed, solutions were identified in the news discourse in this study, in 30% of the New Zealand and 65% of the Dutch articles. However, true solutions journalism was found to be much less common.

The definition of solutions journalism outlined by SJN (2019) stipulates the reporting style as rigorous, in-depth coverage of responses to social problems, including four qualities: a *response* to a social problem, *evidence-based results* of a solution, *broader insight of the functionality* of a solution, and its' *limitations*. The present study contextualised this definition through three codes relating to sea level rise: *SLR cause mentioned, SLR solutions* and *insight into solutions including limitations* (Section 2.5). *SLR causes*, however, were only observed in 18 New Zealand and 36 Dutch articles and *insight into solutions including limitations* only were present in 9 New Zealand and 8 Dutch articles. *SLR solutions* were more frequent in the Dutch (N=52) than the New Zealand discourse (N=24) but the consistent and regular presentation of the underlying reasons for the social problem and a critical examination of efforts to address SLR were generally lacking in the news articles, particularly those from New Zealand. Consequently, it could be argued that the analysed news articles did not fully adhere to the defined characteristics of solutions journalism. As solutions journalism is a relatively new branch of science journalism, this could explain why some characteristics are missing. Furthermore, not all news providers included in this study actively participate in a solutions journalism style of reporting and the observed findings may be more coincidental. If so, news organisations may wish to consider if solutions journalism is a form of news reporting that they would like to actively practice in their reporting of climate change, in order to positively contribute to the coverage of the issue and aid in change.

In an earlier study by Moser and Boykoff (2013) of news articles about climate change adaptation, the observed presence of solutions was limited. The present study differs with adaptation planning and solutions to SLR very much evident in the news discourse. The increasing prevalence of SLR solutions in the news discourse is a step

forward. The solutions that were observed in the news discourse included: *agricultural innovations, technological and science developments, floating homes / smart building, engineering solutions, dramatic changes in society, planning phases of adaptation, managed retreat/relocation, protection planning,* and *practical information for people.* Some of the most cited proposed solutions (*planning phase, practical information, technology/science,* and *engineering solutions*) have clear links to frames investigated in previous studies. For example, *technology/science* and *engineering solutions* are associated with the ecological modernisation frame discussed in a Dutch media study of climate change representations (Schäfer, 2015). In agreeance, this study has also observed the eco-modernist concept that science, technology, and engineering will contribute in some way to save humanity from sea level rise.

The practice of the constructive approach of solutions journalism has been driven by previous dissatisfaction with negative news discourse. Consequently, news reporting is developing in the direction where journalism provides value to readers through articles that inform audiences about innovation and constructive approaches to societal problems (Hermans & Gyldensted, 2018). As such, solutions are a new spin, constructively framing negative news with hope and efficacy for news audiences. This idea aligns with the broaden-and-build theory (Frederickson, 2001) which provides some insight for interpreting how the positive elements of solutions journalism draw on positive psychology to encourage resiliency and coping mechanisms. This approach is useful when people are faced with the often negatively charged realities of SLR impacts. Hermans & Prins (2020) add that news with solutions contributes to societal well-being, as positive emotions broaden individuals' awareness of reality and encourage people to pursue positive actions and thoughts. In a study on the impacts of solutions journalism in a local community, results suggested residents would respond positively to solutions in journalism with participants from focus groups stating they would have an increased likelihood to engage and share stories that helped them envision a way to be personally involved in community problem solving (Wenzel et al., 2016). Constructive news articles that offer solutions to CC have also been found to increase positive emotions due to the elements that promote hope and action (Hermans & Prins, 2020). Preliminary results from a study about trust in news also found that news stories that included solutions were more trusted than those that were problem-orientated, particularly if the solution stories included sources of the solutions presented (Their et al., 2019). In this way, solutions journalism may boost one's own physical, intellectual, and social resources creating an upward cycle of positivity, as per the notion of the broaden-and-build theory.

Overall, there seemed to be an apparent complacency towards SLR, with SLR often being presented in a way that there is nothing that can be done about it apart from adapting to the effects and impacts. The impression from the reporting about SLR was that there was apparently no great sense of urgency in trying to reduce or stop the sea levels from rising in the first place. As such, *mitigation* of CC or SLR only arose in less than 25% of both country samples. Also, previous research stated that developed nations tend to report on climate change as a *political issue* and consequences are usually framed in economic terms such as the economic cost of a natural disaster or loss of life (Vu et al., 2019). The Netherlands and New Zealand are both ranked considerably high on the human development index, respectively 10th and 13th position (UNDP, 2022), and both countries did indeed frame SLR as a political issue that required financial and adaptative intervention.

5.2 Implications & Recommendations

This study was relevant in providing an overview of frames, themes and topics presented in New Zealand and Dutch news about SLR. The study addresses commonalities, differences, and inconsistencies in the media's current manner of framing SLR and the use of solutions journalism as a reporting style. This section presents implications from this research for media and communication professionals and research

The current study highlighted how media in both countries focussed on the impacts of SLR and adaptations that need to be made. However, the presentations of solutions did not always align with the full characteristics of solutions journalism. There is a need for the news to consistently indicate the causes of SLR and to explain and investigate the solutions to SLR and their limitations. In both New Zealand and the Netherlands, the observed news discourse reflected several themes and topics including an emphasis on *planning for adaption* regarding *political plans* and interventions from *science and technology* to solve the SLR crisis. This indeed shows that both countries are preparing to adapt to the impacts of SLR. However, the media are often discussing how adaptation to SLR is being planned or will occur, the next step is for the communication of successful (or unsuccessful) adaptations to SLR to be more consistently and convincingly reported in the media. The reportage of these successes may provide a feedback loop of positivity, hope, resiliency, and efficacy (Frederickson, 2001) for news readers experiencing SLR or CC now or in the foreseeable future. Hence, journalists and editorial staff need to reflect on how SLR coverage can progress to encourage societal change, following the influential role the media has in shaping public understanding and the news agenda (Brulle et al., 2012).

Another challenge for communication specialists tasked with the communication of SLR and CC is to be more inclusive of minority voices, or to ensure that minority or alternative perspectives on these issues are presented in the news. Care is necessary however to not just report about these groups, but to include them in the reporting process, to speak to these people and hear their concerns. On this matter, Dutch media could be more consistent in their inclusion of a variety of stakeholders in a way that affirms balance and scientific certainty in the news discourse. Expertise heavy news, as observed in the Dutch discourse, may lead to underestimation of SLR risks and even to scepticism of SLR or CC. The inclusion of a greater variety of stakeholders can contribute to being more inclusive of different impacts and effects of SLR and can contribute to the explanation and comprehension of SLR. Particulalry in the Netherlands, there is room for the coverage of climate change to define the problem in a more localised and personally relevant manner beyond just impacts, politics and actions (Swain, 2021). Therefore, if wishing to engage in the constructive practices of solutions journalism, newsrooms should ensure solutions are presented with evidence and underlying reasons for the social challenge and examining critically efforts to address the problem (Wenzel, Gerson & Moreno, 2016).

While solutions to CC are often rooted in science, technology, research, and organisational change, societies also need to be motivated and empowered to adopt solutions that reduce the impact of climate change (Shome, et al., 2009). That is where the communication of climate change has a role, and the media specifically are instrumental in communicating about those adaptations to the public to engage and encourage citizen uptake, and involvement of solutions. In the communication of climate change, Shome et al. (2009) state that words need to be curated with care for targeted audiences, as different word choices can be less or more effective depending on the recipient.

Thus, it is important to consider the use of preventative or promotion focussed vocabulary to be inclusive of different audience needs or to cater messages to specific readers. Words that have a prevention focus may regard reducing risk or losses while promotion vocabulary has an innovative outlook (Shome et al., 2009). For example, words such as *safety, security* and *defence* have a preventative focus, while terms like *advance, add, support* and *inspire* are promotion-focused words (Shome et al., 2009). There was an overemphasis on scientific solutions, with an engineering and technology focus in the Netherlands. Other alternatives solutions to SLR adaptation like nature-based protection, and mitigating CC impacts were missed in the news discourse and are called for.

Like word choice, the framing of SLR impacts from a geographical location can help make a message in the news more relatable for news audiences (Shome et al., 2019). In the news articles from The Netherlands, SLR was often portrayed from a national perspective while New Zealand had an equal representation of SLR from both regional and national levels. While the New Zealand media is already well on the way to balancing the framing of SLR from an equal national and regional perspective, however, they could follow the Dutch lead on including international views in its coverage of the SLR issue. The media in both nations perhaps can frame SLR or CC from a regional or national perspective which helps grab reader attention, and where and if applicable the international context can be later in the story providing audiences with the localised perspective firstly before zooming out and looking at the bigger global context.

The reporting styles between the two countries also showed differences in terms of the relevance of personal narratives. The inclusion of a range of stakeholders was common in New Zealand but not so much in the Netherlands. The New Zealand articles were also identified to emphasise the human element in news, as Ashe (2013) notes is a typica practice of journalists, however the Dutch news discourse rarely expressed the human element. For example, New Zealand was consistent with the *storytelling and personal narratives* story style. In the future, Dutch media could give more attention to ensuring a range of stakeholder voices are presented when the SLR issue is being written about. Dutch media could also trial if *personal narratives* about SLR or CC are more effective for audiences' comprehension. This perhaps also opens itself to theoretical opportunities in studying the effect of changing reporting styles in how SLR is framed and what style is effective for audiences of differing cultural and societal backgrounds. Additional recommendations from this research can be made concerning how scientists, science communicators and media can collaborate for the collective goal of effective climate change communication by identifying specific frames that present sea level rise or climate change problems in a personally relevant significant and understandable way for public audiences.

As Painter (2019) states 'ecomodernist journalists' have a role as knowledge, policy, and dialogue broker by representing a variety of solutions to CC and SLR. However, often media and journalists support an ecomodernist approach and do not question the dominant economic and social structures (Painter, 2019) which are at the root of the sea level rise and global warming problem. As such, media can contribute an indispensable role in the 'business as usual' rhetoric. The limited attention for CC mitigation efforts observed in the media analysis confirms this phenomenon. However, media do have a role in being critical of solutions to SLR and CC and should indeed challenge the business as usual and incorporate mitigation in its reporting of solution possibilities

as mitigation is an important factor in reducing global footprint due to fossil fuel output. In this sense, the challenge is not that the media need to cover climate change issues more, at least in Anglosphere countries, but that the way journalism frames the issue and the way it promotes audience response needs to be more critical (Painter, 2019).

5.3 Limitations

This study provides an overview of the current discourse of frames and themes present in SLR reporting in both New Zealand and The Netherlands. While the articles under scrutiny were from two different countries, making for different cultural and reporting contexts, all articles were treated similarly in their interpretation. Consequently, deeming the reporting of SLR in one country or the other as stronger or better is not possible based on the results of this study, as there are different dynamics and contexts for why and how SLR was presented in the news. Additionally, the articles from both countries were sourced from multiple news organisations, whilst differences in the communication style of news organisations were not accounted for. In some cases, there were also similar articles about the same issue or topic which lead to topic or theme repetition. Additionally, only publicly available articles were sourced and studied, content behind paywalls was excluded. Paid content could have contributed to differing results, for example with more in-depth reporting or specific niche topics and frames presented which may not have been found in the freely available content. Regardless, this study has been able to provide a thematic glimpse of SLR discourse in online news media in the time period of January 2021 to June 2022. Reflecting on this timeframe, a distinction between articles from seasons in 2021 and 2022 was not made. As the study included articles from an 18-months period, it is possible that articles from some seasons could be overrepresented. The small period limited the study whereas a longer study period could have been completed to track news discourse as it varies over different seasons.

The research focussed on written online news resources. Headlines, subtitles, images, captions, video, or complimenting audio in the online articles were excluded from analysis as a research project of that magnitude was beyond the scope of this study which was focussed on the framing and topics within the body text. Most information about SLR is conveyed in the main text, but a study including the other elements in the online article would have benefited the study as the visuals, tittles and graphs also contribute to the public understanding and overall framing of the SLR issue in the news. Considering other visual elements and tittles could have contributed to the holistic understanding of how SLR is framed in online news. There is possibility for future studies to observe all aspects of online written news resources to understand how other article elements contribute to the framing and presentation of an issue.

The coding scheme of the present study was primarily inductive, developed in the process of reading the news articles. This resulted in an excess number of codes pertaining to themes and frames, initially showing some overlap. The methodical procedure was constrained by an extensive number of codes and subcategories which was at times difficult to keep track of all different sub-topics and themes in the coding process and perhaps some categories or subcodes in the articles were missed for that reason. Perhaps the applied coding procedure was not as robust as it could have been if a more simplistic coding-scheme had recommended and attended to from the onset of the research. Additionally, some of the themes and frames could have had different names that matched

more in line with those found in previous literature regarding SLR news discourse, to enable more comparisons with previous research. Nevertheless, it is believed that the observations regarding the media content of both nations were comprehensive and representative.

Lastly, the present analysis was limited to English language content and English-translated Dutch content. This may have been a limitation for overall comprehension of the content. Additionally, search capabilities were limited to the researcher's basic Dutch language ability, meaning that some Dutch articles may have been missed in the search phase. The research and conclusions are of a qualitative empirical nature and therefore limited to the author's subjective interpretations of the framed topics and themes and how textual elements were categorised and coded. As Bell (1991) has noted, there is a pitfall in many media language studies as often researchers lack knowledge on both media practice and linguistic expertise. It must be acknowledged that the researcher has a background as a journalist and was limited linguistically to extending the study.

5.4 Future research

This study was developed based on previous studies that were often specifically about the framing of climate change in the media. This study, instead, looked specifically at SLR communication in New Zealand and Dutch media and provides some useful insights to shape the way for future studies into the observed frames, the contribution of solutions journalism and the perception of these frames and solutions for SLR in the news media. This result extends the prior research which was limited in its scope to frames existent in news discourse pertaining to climate change in general.

This study focused on two developed countries facing sea level rise and their differences in the communication in the news about the issue. The coverage of climate change in the media has been well-researched, particularly in the developed world. However, Vu et al. (2019) indicated differences in climate change coverage in relation to economic development. Hence, there are opportunities for studying how the media in developing countries frame climate change and for comparative studies between countries of different development levels (Mittun et al., 2015). There is room for further studies that particularly look at difference between developed and developing countries like smaller island nations such as Fiji, Samoa, or those in the Caribbean, given that these nations are at the forefront of impacts of rising waters.

Another avenue for further research could be to extend this study with interviews with journalists and media professionals to gain insight into their rationale and work process of collating news stories about SLR and CC issues. This could be combined with a quantitative or qualitative study regarding the perceptions and responses of readers of SLR news further investigating audiences' perceptions and understanding based on the media's communication of SLR and CC topics. This type of study would be necessary to ascertain what type of framing communication styles are effective for different audience groups. With this study having established a qualitative overview of current news discourse pertaining to SLR, future studies can go further by assessing the effectiveness of these frames on audience understanding. Effectively, a future study could follow the entire communication process of sea level rise messages from the source (the scientist) through the information transmission process where the SLR messages are communicated to the media (including their process of message framing), and then

through to the perceptions and impact of news media to the public through framing and communication dynamics of SLR information. This approach would provide a full circle study including quantitative and qualitative methods to provide greater insights and further understanding of how SLR messages flow from source to recipient and how the dynamics of this flow affect audience uptake and follow-up.

There is a need for understanding how reporters can effectively and easily interweave solutions with in-depth explanations, evidence and limitations of solutions in the SLR and CC stories. This creates a need for future studies to build an understanding of the effectiveness of solutions journalism (in different countries) and how reported solutions contribute to changing attitudes and behavioural actions regarding climate change perceptions and actions. A follow-up study could look specifically at the effects of solutions journalism on audiences by comparing solutions journalism with other reporting story styles. This kind of study could investigate how newsrooms can apply solutions journalism and could help develop a best practice guideline for reporters when covering climate change issues and explaining climate change solutions. Future studies could address the impact of different framing topics on reader perceptions through interviews and quantitative surveys, distinguishing between readers of news stories with clearly different frames to test the effectiveness of framing SLR and CC topics in the news. Further studies on the effectiveness of solutions presented in the media coverage regarding climate change are needed to improve understanding of solutions journalism and if its implementation is effective. Findings of such a study would be beneficial for journalism professionals to understand how to most effectively frame and present climate change and sea level rise stories for reading comprehension and understanding

Based on this study another plausible venue for further research is about the use of storytelling in the media and how to balance engagement and understanding without being detrimental to the essence of scientific information. Van Krieken & Sanders (2019) state that there is an ongoing debate regarding the tension between the ethics and aesthetics of fact and fiction, objectivity and subjectivity and the way in which information in a news narrative format may not be a true representation of CC realities. This is due to journalism practice norms where facts and structure of complexities of science may be misrepresented due to the interweaving of personal, emotional, and occasional fiction elements. While enabling human understanding, such elements may inadvertently exaggerate the reality of climate change science (Glaser et al., 2009; Schäfer et al., 2016). Adding to this, it would be interesting to further study if the overemphasis of the scientific perspective on solutions and ecomodernism changes audience perception and understanding of the issue. A follow-up study could investigate if the media does indeed contribute to human overreliance on science and engineering to solve SLR and CC problems. However, the future research would be needed to determine and compare the relationship between audience trust ascertained from solutions-based articles about CC or SLR.

6 CONCLUSIONS

The aim of this research was to contribute to the field of climate change communication by examining the framing of sea level rise in the news. The first research question asked **how sea level rise was framed in online news in New Zealand and the Netherlands and how it differed between the countries** while the second research question sought to observe **to what extent solutions journalism was present in the news discourse.** Through media analysis, this research provided an overview of how sea level rise was framed and presented in New Zealand and Dutch media in the period from January 2021 to June 2022. This study sought to determine how SLR is presented in the news at a point in time, while concurrently comparing the differences in the news discourse and the use of solutions journalism between two nations facing the threat of rising seawater. The focus of the study was not on pursuing an understanding of the technical aspects of SLR, but rather to build an understanding of the holistic communication and issues presented pertaining to **Sea Level Rise in the News.**

It was observed that *planning for adaptation* and *impacts of sea level rise* were some of the most prominent topic frames in both countries. Of the impacts, *property impacts* and *coastal impacts* were observed most in Aotearoa New Zealand, in contrast to *environmental impacts* and *impacts to low-lying land* that were more prominent in the Dutch news discourse. *Human impacts* were not frequently cited in the news of either country and it was concluded that the media perhaps need to be more attentive towards including a *human impacts* perspective in reporting. Particularly, a minimal representation of minority stakeholder perspectives such as indigenous groups or isolated communities was observed. The Dutch news discourse consistently relied on science and environmental expertise and rarely incorporated other perspectives, while the stakeholder coverage from New Zealand was generally broader. Hence, especially for the Netherlands it is suggested for the media to be more attentive and inclusive of a variety of stakeholders in its reporting. Whilst there is a balance in framing SLR perspectives from various stakeholders without giving credit or overemphasis to views from climate change sceptics, sceptical views can still be given space without purporting false views.

Adaption to SLR through ecomodernist solutions was often referenced in the Netherlands, specifically solutions relating to *science, engineering,* and *technology*. This was concluded to perhaps contribute to public trust, whereby SLR has been an issue the Dutch have 'solved' in the past and will continue to be 'successfully' solving in the future. However, there needs to be a balance when media foreshadow the notion that humans can 'fight sea level rise' as it may cause a false sense of hope and rather the framing needs be constructive and realistic highlighting the threat and need for action. Moreover, it was suggested for the media to proceed with caution in framing that SLR can be solved through adaption and human ingenuity alone. Instead, a combination of efforts is required, suggesting that a more prominent framing is needed of mitigation strategies that reduce continued sea level rise support and motivate action.

Solutions to sea level rise were present and often referenced in the news as *planning for the future*, *coastal protection through man-made structures*, and occasionally *nature-based flood protection* infrastructure. Adaptation strategies were described and heavily reflected the idea of ecomodernism, or *science and engineering* being able to find a resolution. This ecomodernist framing approach of climate change and sea level rise has increasingly been found in recent media analysis studies from the previous five years too. The discourse frequently

mentioned the idea of defending the land from the rising sea, with futuristic visions of floating cities or other innovative solutions to combat impending floods. However, although SLR solutions were prominent in both countries, particularly the Netherlands, news articles were lacking critical reflections on causes and solutions, both key characteristics of solutions journalism.

Given the influence the media have on shaping public perceptions and on framing issues of priority, there is a valid reason for journalists to pay close attention to various factors in the communication and framing of SLR and CC. Bringing together and contrasting observations from New Zealand and The Netherlands, allowed for a comprehensive comparison of both countries' SLR reporting approaches. This study elaborates on reasons for and ways of engaging the public in presenting solutions to societal and environmental challenges. Adhering to the explanatory and rigorous definitions of solutions journalism can aid journalists to critically reflect on and improve the communication of climate change in the news. The communication of sea level rise and climate change in the news needs to move beyond the goal of just increasing public concern and highlighting pressing issues. If the world has any chance of saving itself from the rising water and significant climate change consequences, media is instrumental in informing, inspiring and motivatinge the public to engage in planet saving sustainable actions.

For Papatūānuku (our earth) is breathing, and is an intergenerational asset, it needs preserved and protected to sustain humanity. As before too long, without action, parts of earth may soon, again merge with the sea. The media industry, like all of humanity and society, too have a responsible role in contributing to the care and protection of our earth. Following the recommendations of this study, the media has influence to responsibly represent and frame the discourse of *sea level rise in the news*.

REFERENCES

Akerlof, K., Covi, M. & Rohring, E. (2017). Communicating Sea Level Rise. *Oxford Research Encyclopedia of Climate Science*. https://doi.org/10.1093/acrefore/9780190228620.013.417

Allan, S. (2011). Introduction. *Journalism*, 12(7), 771–777. https://doi.org/10.1177/1464884911412688

Angler, M. W. (2017). *Science Journalism : An Introduction.* London: Routledge. DOI:10.4324/9781315671338

Anton, T. & McCourt, R. (1995). *The New Science Journalists*. New York: Ballantine Books.

Archila, P.A., Molina, J. & Danies, G. (2021). Providing Undergraduates with Opportunities to Explicitly Reflect on How News Articles Promote the Public (Mis)understanding of Science. *Science & Education*, 30, 267–291. https://doi.org/10.1007/s11191-020-00175-x

Arowolo, S. O. (2017). Understanding Framing Theory. ResearchGate. DOI: 10.13140/ RG.2.2.25800.52482

Arrhenius, S. (1896). On the influence of carbonic acid in the air upon the temperature of the ground. *The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science*, 41(251), 237–276. https://doi.org/10.1080/14786449608620846

Arthur, M. (2013) *Colloquium of the National Academy of Sciences, "The Science of Science Communication II,"* held September 23–25, at the National Academy of Sciences in Washington, DC. Retrieved from www.nasonline.org/science-communication-II.

Ashe, T. (2013). *How the media report scientific risk and uncertainty: a review of the literature. Reuters Institute for the Study of Journalism*. University of Oxford.

Bakker, P. (n.d.). *Netherlands*. Media Landscapes. Retrieved 20 June 2022, from https://medialandscapes.org/country/netherlands

Bansal, S. & Martin, C. (2015). *The Solutions Journalism toolkit*. Soltuions Journalsim Network. Retrieved from: https://reedkath.files.wordpress.com/2017/04/new-sjn-toolkit-20162.pdf

Barkemeyer, R., Figge, F., Hoepner, A., Holt, D., Kraak, J. M. & Yu, P.S. (2017). Media coverage of climate change: An international comparison. *Environment and Planning C: Politics and Space*, 35(6), 1029–1054. https://doi.org/10.1177/0263774X16680818

Bednarek, M. & Caple, H. (2014). Why do news values matter? Towards a new methodological framework for analysing news discourse in critical discourse analysis and beyond. *Discourse & Society*, 25(2): 135–158. https://doi.org/10.1177/0957926513516041

Bell, A. (1991). *The Language of News Media* (1st ed.). Wiley-Blackwell.

Bell, A. (1994). Media (mis)communication on the science of climate change. *Public Understanding of Science*, 3(3), 259–275. https://doi.org/10.1088/0963-6625/3/3/002

Bell, S. & Gibb, J. G. (1996). *Public Access to the New Zealand Coast: Guidelines for Determining Legal and Physical Constraints*. New Zealand: Department of Conservation.

Benesch, S. (1998). The rise of solutions journalism. *Columbia Journalism Review*, 36(6). https://link.gale.com/apps/doc/A20426245/AONE?u=anon~9110e5f&sid=googleScholar&xid=386fc9ba

Berg, B. L. (2009) *Qualitative Research Methods for the Social Sciences*. 7th ed., San Francisco: Pearson Education, Inc

Bloemen, P. J. T. M., Hammer, F., van der Vlist, M. J., Grinwis, P. & van Alphen, J. (2019). DMDU into Practice: Adaptive Delta Management in The Netherlands. *Decision Making under Deep Uncertainty*, 321–351. https://doi.org/10.1007/978-3-030-05252-2_14

Boeije, H. R. (2009). *Analysis in Qualitative Research* (1st ed.). SAGE Publications Ltd.

Boenker, K. (2012). *Communicating Global Climate Change: Framing Patterns in the US 24-Hour News Cycle, 2007-2009*. University of Washington.

Bolsen, T. & Shapiro, M. A. (2017). The US News Media, Polarization on Climate Change, and Pathways to Effective Communication. *Environmental Communication*, 12(2), 149–163. https://doi.org/10.1080/17524032.2017.1397039

Bornstein, D. (2011). *Why 'Solutions Journalism' Matters, Too*. Opinionator. https://opinionator.blogs.nytimes.com/2011/12/20/why-solutions-journalism-matters-too/?ref=opinion&_r=0

Bourk, M., Rock, J. & Davis, L. S. (2015). Mediating the Science: Symbolic and Structural Influences on Communicating Climate Change Through New Zealand's Television News. *Environmental Communication*, 11(6), 821–839. https://doi.org/10.1080/17524032.2015.1058289

Boykoff, M. (2008). The cultural politics of climate change discourse in UK tabloids. *Political Geography*, 27(5), 549–569. https://doi.org/10.1016/j.polgeo.2008.05.002

Boykoff, M. & Boykoff, J. (2004). Balance as bias: global warming and the US prestige press. *Global Environmental Change*, 14(2), 125–136. https://doi.org/10.1016/j.gloenvcha.2003.10.001

Boykoff, M. & Boykoff, J. (2007). Climate change and journalistic norms: A case-study of US mass-media coverage. *Geoforum, 38*(6), 1190–1204. https://doi.org/10.1016/j.geoforum.2007.01.008

Boykoff, M. & Rajan, S. R. (2007). Signals and noise. *EMBO Reports*, 8(3), 207–211. https://doi.org/10.1038/sj.embor.7400924

Boykoff, M. & Roberts, T. (2007). *Media Coverage of Climate Change: Current Trends, Strengths, Weaknesses*, Human Development Occasional Papers (1992-2007) HDOCPA-2007-03, Human Development Report Office (HDRO), United Nations Development Programme (UNDP).

Breewood, H. & Garnett, T. (2022). *What is ecomodernism?*, TABLE Explainer Series. TABLE, University of Oxford, Swedish University of Agricultural Sciences and Wageningen University & Research. Retrieved from https://tabledebates.org/building-blocks/ecomodernism

Brosda, C. (2008). *Diskursiver Journalismus, Journalistisches Handeln zwischen kommunikativer Vernunft und mediensystemischem Zwang.* Wiesbaden: VS Verlag für Sozialwissenschaften.

Brüggemann, M. (2017). Shifting Roles of Science Journalists Covering Climate Change. *Oxford Research Encyclopedia of Climate Science*. https://doi.org/10.1093/acrefore/9780190228620.013.354

Brulle, R. J., Carmichael, J. & Jenkins, J. C. (2012). Shifting public opinion on climate change: an empirical assessment of factors influencing concern over climate change in the U.S., 2002–2010. *Climatic Change*, 114(2), 169–188. https://doi.org/10.1007/s10584-012-0403-y

Bucchi, M. (1998). *Science and the Media*. Alternative Routes in Scientific Communication, London and New York: Routledge.

Canter, L. (2014). The Reuters Institute for the Study of Journalism: Digital News Report 2014. *Digital Journalism*, 3(1), 137–139. https://doi.org/10.1080/21670811.2014.987545

Carvalho, A. (2010). Media(ted)discourses and climate change. A focus on political subjectivity and (dis)engagement. *WIREs Climate Change*, 1(2), 172–179

Chadwick, A. E. (2017). "Climate Change Communication". *Oxford Research Encyclopedia of Communication*. doi:10.1093/acrefore/9780190228613.013.22. ISBN 978-0-19-022861-3. Retrieved 2020-04-13.

Chen, K., Molder, A. L., Duan, Z., Boulianne, S., Eckart, C., Mallari, P. & Yang, D. (2022). How Climate Movement Actors and News Media Frame Climate Change and Strike: Evidence from Analyzing Twitter and News Media Discourse from 2018 to 2021. *The International Journal of Press/Politics*. https://doi.org/10.1177/19401612221106405

Chetty, K., Devadas, V. & Fleming, J. (2015). The framing of climate change in New Zealand newspapers from June 2009 to June 2010. *Journal of the Royal Society of New Zealand*, 45(1), 1–20. https://doi.org/10.1080/03036758.2014.996234

Climate Change Evidence: How Do We Know? (n.d.). *Climate Change: Vital Signs of the Planet*. https://climate.nasa.gov/evidence/#:%7E:text=In%201896%2C%20a%20seminal%20paper,Earth's%20atmosphere%20to%20global%20warming.

Conboy, M. & Tang, M. (2016). Core Blighty? How Journalists Define Themselves Through Metaphor. *Journalism Studies*, 17(7), 881–892. https://doi.org/10.1080/1461670x.2016.1173521

Coombs, C. (2022). *5 Functions of Journalism*. Retrieved October 3, 2022, from https://medium.com/@cjcwriter04/five-functions-of-journalism-29dc413e4e11

Corbett, J. & Durfee, J. (2004). 'Testing Public (Un)Certainty of Science', *Science Communication*, 26(2), 129–51.

Cotter, C. (2010). *News Talk: Investigating the Language of Journalism* (Illustrated). Cambridge University Press.

Curry, A. L., Stroud, N. J. & McGregor, S. (2016). *Solutions journalism and news engagement*. Retrieved from https://engagingnewsproject.org/wp-content/uploads/2016/03/ENP-Solutions-Journalism-News-Engagement.pdf

Dagan-Wood, S. (2014). *The positive future of journalism.* [Video] YoutTube. Retrieved from https://www.youtube.com/watch?v=zPy0xnymGR0

Daly, M. (2019). *Homes of 240,000 Kiwis in way of worst case 2100 sea level rise, study indicates.* Stuff. https://www.stuff.co.nz/environment/climate-news/117013714/homes-of-240000-kiwis-in-way-of-worst-case-2100-sea-level-rise-study-indicates

Davies, S. R., Halpern, M., Horst, M., Kirby, D. & Lewenstein, B. (2019). Science stories as culture: experience, identity, narrative and emotion in public communication of science. *Journal of Science Communication*, 18(05), A01. https://doi.org/10.22323/2.18050201

De Vries, E., Schoonvelde, M. & Schumacher, G. (2018). No Longer Lost in Translation: Evidence that Google Translate Works for Comparative Bag-of-Words Text Applications. *Political Analysis*, *26*(4), 417–430. https://doi.org/10.1017/pan.2018.26

Dempster, G. (2020). The communication of scientific research in news media: Contemporary challenges and opportunities. *Journal of Science Communication*, 19(03), C06. https://doi.org/10.22323/2.19030306

Dickson, D. 2005. *The Case for a 'deficit model' of science communication*. Science and Development Network.

Dirikx. A. & Gelders. D., (2010). To frame is to explain: a deductive frame-analysis of Dutch and French climate change coverage during the annual UN conferences of the parties. *Public Understanding Science*, 19, 732–742.

Dixon, G. N. & Clarke, C. E. (2012). Heightening Uncertainty Around Certain Science. *Science Communication*, 35(3), 358–382. https://doi.org/10.1177/1075547012458290

Dominick, J.R. (2011*). The Dynamics of Mass Communication: Media in Transition*. 11th ed., New York, NY: McGraw-Hill.

Donald, R. (2019). *The climate crisis is a story for every beat*. Columbia Journalism Review. Retrieved 24 July 2022, from https://www.cjr.org/covering_climate_now/climate-change-beats-photos-narrative-capture.php

Druckman, J. N. (2002) The implications of framing effects for citizen competence, *Political Behavior*, 23(3), 225-256. Retrieved from: https://faculty.wcas.northwestern.edu/jnd260/pub/Druckman%20Political%20Behavior%202001.pdf

Dunwoody, S. (2008). *Science journalism*. In M. Bucchi & B. Trench (Eds.), Handbook of public communication on science and technology (pp. 15-26). Oxford, England: Routledge

Eilders, C. (2006). News factors and news decisions. Theoretical and methodological advances in Germany. *Communications*, 31(1), 5–24. https://doi.org/10.1515/commun.2006.002

EJN [Ethical Journalism Network]. (2022). *Who We Are*. https://ethicaljournalismnetwork.org/who-we-are

Entman, R. M. (1993). Framing: Toward Clarification of a Fractured Paradigm. *Journal of Communication*, 43(4), 51–58. https://doi.org/10.1111/j.1460-2466.1993.tb01304.x

Fahy, D. & Nisbet, M. C. (2011). The science journalist online: Shifting roles and emerging practices. *Journalism*, 12(7), 778–793. https://doi.org/10.1177/1464884911412697

Federici, S. & Galluzzi, G. (2010). The treatment of land use, land use change and forestry in the post-2012 climate agreement: a perspective from non-Annex I Parties. *iForest - Biogeosciences and Forestry*, 3(3), 56–58. https://doi.org/10.3832/ifor0533-003

Ford, J. D. & King, D. (2015). Coverage and framing of climate change adaptation in the media: A review of influential North American newspapers during 1993–2013. *Environmental Science & Policy*, 48, 137–146. https://doi.org/10.1016/j.envsci.2014.12.003

Fox-Kemper, B., Hewitt, H. T., Xiao, C., Aðalgeirsdóttir, G., Drijfhout, S. S., Edwards, T. L. & Golledge, N.R. (2021). "Chapter 9: Ocean, Cryosphere, and Sea Level Change" (PDF). *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate*. Cambridge University Press. Executive Summary.

Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American Psychologist*, 56(3), 218–226. https://doi.org/10.1037/0003-066x.56.3.218

Friedman, S. M., Dunwoody, S. & Rogers, C. L. (1988). Scientists and Journalists: Reporting Science As News. American Associationn for the Advancement of Journalism.

Friese, S. (2019). *Qualitative Data Analysis with ATLAS.ti* (Third). SAGE Publications Ltd.

Fünfgeld, H. & McEvoy, D. (2011). *Framing Climate Change Adaptation in Policy and Practice: Working Paper 1*. Victorian Centre for Climate Change Adaptation Research.

Gamson, W. A. & Modigliani, A. (1989). Media discourse and public opinion on nuclear power: A constructionist approach. *American Journal of Sociology*, 95(1), 1-37.

Glaser, M., Garsoffky, B. & Schwan, S. (2009). Narrative-based learning: Possible benefits and problems. *Communications*, 34(4), 429–447. https://doi.org/10.1515/comm.2009.026

Graber, D. A. (1988). *Processing The News: How People Tame The Information Tide*. Longman Publishing Group.

Graebner, M. E., Martin, J. A. & Roundy, P. T. (2012). Qualitative data: Cooking without a recipe. *Strategic Organization*, 10(3), 276–284. https://doi.org/10.1177/1476127012452821

Grimes, D. R. (2019). A dangerous balancing act. *EMBO Reports*, *20*(8). https://doi.org/10.15252/embr.201948706

Guenther, G. (2020). *Communicating the climate emergency: imagination, emotion, action*. In: Henry C. & Rockstram J. & Stern No. (ed.), Standing up for a Sustainable World, 401–408. Edward Elgar Publishing. https://doi.org/10.4337/9781800371781.00071

Guenther, L. (2019). *Science Journalism*. Oxford Research Encyclopedia of Communication. https://doi.org/10.1093/acrefore/9780190228613.013.901

Guenther, L., Brüggemann, M. & Elkobros, S. (2021). From global doom to sustainable solutions: International News Magazines' multimodal framing of our future with climate change. *Journalism Studies*, 23(1), 131–148. https://doi.org/10.1080/1461670x.2021.2007162

Gupta, J. (2010). A history of international climate change policy. *WIREs Climate Change*, 1, 636–653. doi:10.1002/wcc.67

Haasnoot, M., Kwadijk, J., van Alphen, J., le Bars, D., van den Hurk, B., Diermanse, F., van der Spek, A., Essink, G. O., Delsman, J. & Mens, M. (2019). Adaptation to uncertain sea-level rise; how uncertainty in Antarctic mass-loss impacts the coastal adaptation strategy of the Netherlands. *Environmental Research Letters*, 15(3), 034007. https://doi.org/10.1088/1748-9326/ab666c

Hanitzsch, T. & Vos, T. P. (2016). Journalism beyond democracy: A new look into journalistic roles in political and everyday life. *Journalism*, 19(2), 146–164. https://doi.org/10.1177/1464884916673386

Hannis, G. (2014). *Intro: A Beginner's Guide to Journalism in 21st-Century Aotearoa/New Zealand*. New Zealand Journalists Training Organisation.

Harrison, L. (2020). *Navigating radical change in NZ's media landscape*. Convergence PR. https://conv.co.nz/recent-work/navigating-radical-change-in-nzs-media-landscape/

Hase, V., Mahl, D., Schäfer, M. & Keller, T. R. (2021). Climate change in news media across the globe: An automated analysis of issue attention and themes in climate change coverage in 10 countries (2006–2018). *Global Environmental Change*, 70, 102353. https://doi.org/10.1016/j.gloenvcha.2021.102353

Hermans, L. & Gyldensted, C. (2018). Elements of constructive journalism: Characteristics, practical application and audience valuation. *Journalism*, 20(4), 535–551. https://doi.org/10.1177/1464884918770537

Hermans, L. & Prins, T. (2020). Interest matters: The effects of constructive news reporting on Millennials' emotions and engagement. *Journalism*, 23(5), 1064–1081. https://doi.org/10.1177/1464884920944741

Higgins, M. & Smith, A. (2013). *The Language of Journalism: A Multi-genre Perspective*. Bloomsbury Academic.

Hinnant, A., Len-Ríos, M. E. & Young, R. (2013). Journalistic use of exemplars to humanize health news. *Journalism Studies*, 14(4), 539–554. https://doi.org/10.1080/1461670x.2012.721633

Hoeksema, R. J. (2007). Three stages in the history of land reclamation in the Netherlands. *Irrigation and Drainage*, 56(S1), S113–S126. https://doi.org/10.1002/ird.340

Holsti, O. R. (1969). *Content analysis for the social sciences and humanities*. Reading, MA: Addison-Wesley.

IPCC (2021). *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge, United Kingdom. doi:10.1017/9781009157896.

James, J. B. & Sørensen, A. (2000). Archiving Longitudinal Data for Future Research. Why Qualitative Data Add to a Study's Usefulness. Forum Qualitative Sozialforschung / Forum: *Qualitative Social Research*, 1(3). https://doi.org/10.17169/fqs-1.3.1040

Kenix, L.J. (2008). Framing Science: Climate Change in the Mainstream and Alternative News of New Zealand. *Political Science*, 60(1), 117-132.

Kepplinger, H. & Ehmig, S. (2006). Predicting news decisions. An empirical test of the twocomponent theory of news selection. *Communications*, 31, 25-43. https://doi.org/10.1515/COMMUN.2006.003

Kille, L. W. (2009). *Code of ethics of the Society of Professional Journalists*. The Journalist's Resource. https://journalistsresource.org/home/code-of-ethics/

Kovach, B. & Rosenstiel, T. (2007). *The Elements of Journalism: What Newspeople Should Know and the Public Should Expect*. New York, NY: Three Rivers Press.

Kua, E., Reder, M. & Grossel, M. J. (2004). Science in the News: A Study of Reporting Genomics. *Public Understanding of Science*, 13(3), 309–322. https://doi.org/10.1177/0963662504045539

Kwak, H. & An, J. (2014). *Understanding News Geography and Major Determinants of Global News Coverage of Disasters*. Computation+Jounalism Symposium '14, New York, USA.

Langer, A.I. & Gruber, J.B., (2020). Political Agenda Setting in the Hybrid Media System: Why Legacy Media Still Matter a Great Deal. *The International Journal of Press/Politics* 26, 313–340. https://doi.org//10.1177/1940161220925023.

Lavrakas, P. J. (2008). *Encyclopedia of Survey Research Methods* (1st ed.). SAGE Publications, Inc.

Lawrence, J., Bell, R., Blackett, P., Stephens, S. & Allan, S. (2018). National guidance for adapting to coastal hazards and sea-level rise: Anticipating change, when and how to change pathway. *Environmental Science & Policy*, 82, 100–107. https://doi.org/10.1016/j.envsci.2018.01.012

Lazarus, R. S. (1999). Hope: An Emotion and a Vital Coping Resource Against Despair. *Social Research*, 66(2), 653–678. https://www.jstor.org/stable/40971343

Leal F., W., Manolas, E., Azul. A.M., Ulisses. A.M. & McGhie, H. (2018). *Handbook of Climate Change Communication*. Vol. 1, Theory of Climate Change Communication.

Lecheler, S., Schuck, A. R. T. & de Vreese, C. H. (2013). Dealing with feelings: Positive and negative discrete emotions as mediators of news framing effects. *Communications - the European Journal of Communication Research*, 38(2). https://doi.org/10.1515/commun-2013-0011

Lewis, P. J. (2011). Storytelling as Research/Research as Storytelling. *Qualitative Inquiry*, 17(6), 505–510. https://doi.org/10.1177/1077800411409883

Li, Y. (2021). Assessing the Role Performance of Solutions Journalism in a Global Pandemic. *Journalism Practice*, 1–20. https://doi.org/10.1080/17512786.2021.1990787

Ligtvoet, W. & Knoop, J., (2014). *Kleine kansen - grote gevolgen. Slachtoffers en maatschappelijke ontwrichting als focus voor het waterveiligheidsbeleid*. Planbureau voor de Leefomgeving.

Loizzo, J., Watson, S. L. & Watson, W. R. (2017). Examining Instructor and Learner Experiences and Attitude Change in a Journalism for Social Change Massive Open Online Course: A Mixed-Methods Case Study.

Journalism & Mass Communication Educator, *73*(4), 392–409. https://doi.org/10.1177/1077695817729586

Lombard, M., Snyder-Duch, J. & Bracken, C. C. (2002). Content Analysis in Mass Communication: Assessment and Reporting of Intercoder Reliability. Human Communication Research, 28(4), 587–604. https://doi.org/10.1111/j.1468-2958.2002.tb00826.x

Lorenz, A. L. & Vivian, J. (1996). *News: Reporting and Writing*. Allyn and Bacon.

Lough, K. & McIntyre, K. (2018). Visualizing the solution: An analysis of the images that accompany solutions-oriented news stories. *Journalism*, 20(4), 583–599. https://doi.org/10.1177/1464884918770553

Mao, Y. (2017). *Intercoder reliability techniques: holsti method*. In M. Allen (Ed.), The sage encyclopedia of communication research methods, 741-743. SAGE Publications, Inc, https://dx.doi.org/10.4135/9781483381411.n258

Markowitz, E. M. & Guckian, M. L. (2018). Climate change communication. *Psychology and Climate Change*, 35–63. https://doi.org/10.1016/b978-0-12-813130-5.00003-5

McCombs, M. (1977). Agenda setting function of mass media. Public Relations Review, 3(4), 89–95. https://doi.org/10.1016/s0363-8111(77)80008-8

McCombs, M. E. & Shaw, D. L. (1972). The Agenda-Setting Function of Mass Media. *Public Opinion Quarterly*, 36(2), 176. https://doi.org/10.1086/267990

McGregor, J. & Comrie, M. (1995). *Balance and fairness in broadcasting news 1985-1994*. Palmerston North: Massey University.

McGuire, B. (2022). *Whether you're a climate 'doomer' or 'appeaser', it's best to prepare for the worst*. The Guardian. https://www.theguardian.com/commentisfree/2022/aug/22/climate-emergency-doomer-appeaser-precautionary-principle

McIntyre, K. (2017). Solutions Journalism. *Journalism Practice*, 13(1), 16–34. https://doi.org/10.1080/17512786.2017.1409647

Mengel, M., Levermann, A., Frieler, K., Robinson, A., Marzeion, B. & Winkelmann, R. (2016). Future sea level rise constrained by observations and long-term commitment. *Proceedings of the National Academy of Sciences*, 113(10), 2597–2602. https://doi.org/10.1073/pnas.1500515113

Metag, J. (2016). *Content Analysis in Climate Change Communication*. In: Oxford Research Encyclopedias, edited by E. C. Tandoc and N. Eng. Oxford: Oxford University Press.

Midberry, J. & Dahmen, N. (2017). *Picturing the solution? An analysis of visuals in solutions journalism*. In: Newspaper & online news division, annual conference of the association for education in journalism and mass communication, Chicago, IL.

Middleton, A. (2021). Māori-Language Journalism in Aotearoa New Zealand: Balancing Cultural Values, Journalistic Norms and the Constraints of the National-Language Revitalisation Agenda. *Palgrave Studies in Journalism and the Global South*, 197–214. https://doi.org/10.1007/978-3-030-76163-9_11

Ministeries van Verkeer en Waterstraat (2003). *3e Kustnota, Traditie, Trends en Toekomst*. Retrieved from https://puc.overheid.nl/rijkswaterstaat/doc/PUC_43195_31/

Moewaka B, A., Gregory, M., McCreanor, T., Nairn, R., Pega, F. & Rankine, J. (2005). *Media and Te Tiriti o Waitangi 2004*. Auckland: Kupu Taea.

Moser, S. C. (2016). Reflections on climate change communication research and practice in the second decade of the 21st century: what more is there to say? *WIREs Climate Change*, 7(3), 345–369. https://doi.org/10.1002/wcc.403

Moser, S. & Boykoff, M. (2013). *Successful adaptation to climate change: Linking science and policy in a Rapidly changing world*. New York: Routledge. p. 238

Mostovoy, S. (2019) *Sea Level Rise in Mainstream Media*. Retrieved from: https://www.researchgate.net/publication/336318509_Sea_Level_Rise_in_Mainstream_Media

Moyer-Gusé, E. & Dale, K. (2017). *Narrative Persuasion Theories*. The International Encyclopedia of Media Effects, 1–11. https://doi.org/10.1002/9781118783764.wbieme0082

Murcott, T. H. L. & Williams, A. (2013). The challenges for science journalism in the UK. *Progress in Physical Geography: Earth and Environment*, 37(2), 152–160. https://doi.org/10.1177/0309133312471285

Myers, G. (2003). Discourse studies of scientific popularization: Questioning the boundaries. *Discourse Studies* 5(2), 265–279.

Myllylahti, M. & Treadwell, G. (2020). *Trust in news in New Zealand*. AUT research centre for Journalism, Media and Democracy (JMAD). Available: https://www.aut.ac.nz/study/studyoptions/communication-studies/research/journalism,-media-and-democracy-research-centre/projects

Neuendorf, K. A. (2016). *The Content Analysis Guidebook* (Second). SAGE Publications, Inc.

Neuman, R. W., Just, M. R. & Crigler, A. N. (1992). *Common Knowledge: News and the Construction of Political Meaning (American Politics and Political Economy Series)* (1st ed.). University of Chicago Press.

Newman, N., Fletcher, R., Schulz, A., Andi, S., Robertson, C.T. & Nielsen R.K. (2021). *Reuters Institute digital news report 2021*. Reuters Institute for the study of Journalism. Retrieved from https://reutersinstitute.politics.ox.ac.uk/sites/default/files/2020-06/DNR_2020_FINAL.pdf

NIMCJ [National Institute of Mass Communication & Journalism] (2019). *What are the Core Principles of Journalism*. Retrieved 24 September 2022, from https://www.nimcj.org/blog-detail/what-are-the-core-principles-of-journalism.html

Nisbet, M. C. & Mooney, C. (2007). Framing Science. *Science*, 316(5821), 56–56. https://doi.org/10.1126/science.1142030

NOS (2021). *About NOS*. Over NOS. https://over.nos.nl/organisatie/about-nos/#:%7E:text=It%20operates%20independently%20from%20the,by%20the%20revenue%20of%20commercials.

O'Callaghan J., Stevens C., Roughan M., Cornelisen C., et al. (2019). Developing an Integrated Ocean Observing System for New Zealand. *Frontiers in Marine Science*, 6:143. doi: 10.3389/fmars.2019.00143

O'Neill, S. & Nicholson-Cole, S. (2009). "Fear Won't Do It." *Science Communication*, 30(3), 355–379. https://doi.org/10.1177/1075547008329201

Overgaard, C. S. B. (2021). Mitigating the consequences of negative news: How constructive journalism enhances self-efficacy and news credibility. *Journalism*, 0(0). https://doi.org/10.1177/14648849211062738

Painter, J. (2013). *Climate Change in the Media: Reporting Risk and Uncertainty* (RISJ Challenges) (1st ed.). I.B. Tauris.

Painter, J. (2019). Climate Change Journalism: Time to Adapt. *Environmental Communication*, 13(3), 424–429. https://doi.org/10.1080/17524032.2019.1573561

Pellechia, M. G. (1997). Trends in science coverage: a content analysis of three US newspapers. *Public Understanding of Science*, 6(1), 49–68. https://doi.org/10.1088/0963-6625/6/1/004

Pester, P. (2021). *When did scientists first warn humanity about climate change?* Livescience.com. Retrieved from: https://www.livescience.com/humans-first-warned-about-climate-change

Peters, H. P. (2013). Gap between science and media revisited: Scientists as public communicators. *Proceedings of the National Academy of Sciences*, 110, 14102–14109. https://doi.org/10.1073/pnas.1212745110

Pitt, F., Green-Barber, L. (2017). *The Case for Media Impact: A Case Study of ICIJ's Radical Collaboration Strategy*. Columbia University Libraries. Retrieved from: https://academiccommons.columbia.edu/doi/10.7916/D85Q532V

Porter, A. E. (2018). *Discovering Solutions: How are Journalists Applying Solutions Journalism to Change the Way News is Reported and What Do They Hope to Accomplish?* Denton, Texas.

Potter, D. & Walter G. (2000). *Bringing Viewers Back to Local TV*. NewsLab survey 21. http://www.newslab.org/research/bringback.htm.

Rabe, R. A. (2008). *Inverted Pyramid*. In: Encyclopedia of American Journalism, edited by Stephen L. Vaughn, 223–225. New York: Routledge.

Raven, P. G. & Elahi, S. (2015). The New Narrative: Applying narratology to the shaping of futures outputs. *Futures*, 74, 49–61. https://doi.org/10.1016/j.futures.2015.09.003

Rice, J. (2021). *A new era in Climate Change Coverage: Can applying Solutions Journalism Alter Auedience Attitdes?* [Unpublished Honors Thesis].

Rich, C. (2015). *Writing and reporting the news: A coaching method*. (8th Ed.). Belmont, CA: Wadsworth Publishing Company

Rick, U, Boykoff, M. & Pielke Jr, R. A. (2011). Effective media reporting of sea level rise projections: 1989–2009. *Environmental Research Letters*, 6(1), 014004. https://doi.org/10.1088/1748-9326/6/1/014004

RSF [Reporters Sans Frontières] (2022a). *New Zealand*. Reporters without Borders. https://rsf.org/en/country/new-zealand

RSF [Reporters Sans Frontières] (2022b). *The Netherlands*. Reporters without Borders. https://rsf.org/en/country/the-netherlands

Rudin, R. & Ibbotson, T. (2002). *Introduction to Journalism: Essential techniques and background knowledge* (1st ed.). Focal Press.

Ryan, M. (2004). *Narrative across Media: The Languages of Storytelling (Frontiers of Narrative)*. University of Nebraska Press.

Sampei, Y. & Aoyagi-Usui, M. (2009). Mass-media coverage, its influence on public awareness of climate-change issues, and implications for Japan's national campaign to reduce greenhouse gas emissions. *Global Environmental Change*, 19(2), 203–212. https://doi.org/10.1016/j.gloenvcha.2008.10.005

Li, S.C.S. & Huang, L. M. S. (2020). Fear appeals, information processing, and behavioral intentions toward climate change. *Asian Journal of Communication*, 30(3–4), 242–260. https://doi.org/10.1080/01292986.2020.1784967

Schäfer, M. (2016). Social Science in Society. *Public Understanding of Science*, 25(3), 394–396. https://doi.org/10.1177/0963662515600850

Schäfer, M. & Schlichting, I. (2014). Media Representations of Climate Change: A Meta-Analysis of the Research Field. *Environmental Communication*, 8(2), 142–160. https://doi.org/10.1080/17524032.2014.914050

Schäfer, M. & Painter, J., (2021). Climate journalism in a changing media ecosystem: Assessing the production of climate change-related news around the world. *Wiley Interdisciplinary Reviews: Climate Change*, 12. https://doi.org/10.1002/wcc.675

Schäfer, M. (2015). *Climate Change and the Media*. In: International Encyclopedia of the Social & Behavioral Sciences. https://doi.org/10.1016/B978-0-08-097086-8.91079-1

Schmidt, A., Ivanova, A. & Schäfer, M. (2013). Media attention for climate change around the world: A comparative analysis of newspaper coverage in 27 countries. *Global Environmental Change*, 23(5), 1233–1248. https://doi.org/10.1016/j.gloenvcha.2013.07.020

Schroth O, Angel J, Sheppard S. & Dulic A. (2014). Visual climate change communication: from iconography to locally framed 3D visualization. *Environment Communication*, 8(4), 413-432, https://doi.org/10.1080/17524032.2014.906478

Schuck, A. R. T. & De Vreese, C. H. (2008). The Dutch No to the EU Constitution: Assessing the Role of EU Skepticism and the Campaign. *Journal of Elections, Public Opinion and Parties*, 18(1), 101–128. https://doi.org/10.1080/17457280701858656

Schuck, A. R. & Claes, H. (2008). Reversed Mobilization in Referendum Campaigns. *The International Journal of Press/Politics*, 14(1), 40–66. https://doi.org/10.1177/1940161208326926

Schuck. A. & Feinholdt, A. (2014). *News Framing Effects and Emotions: Research Trends and Developments*. In: Robert Scott and Stephen Kosslyn (eds.), Emerging Trends in the Social and Behavioral Sciences, Hoboken, NJ: John Wiley and Sons.

Secko, D. M., Amend, E. & Friday, T. (2013). Four models of science journalism. *Journalism Practice*, 7(1), 62–80. https://doi.org/10.1080/17512786.2012.691351

Semetko, H. A. & Valkenburg, P. M. (2000). Framing European politics: a content analysis of press and television news. *Journal of Communication*, 50(2), 93-109. https://doi.org/10.1111/j.14602466.2000.tb02843.x

Shanahan, J., Morgan, M. & Stenbjerre, M. (1997). Green or brown? Television and the cultivation of environmental concern. *Journal of Broadcasting & Electronic Media*, 41(3), 305–323. https://doi.org/10.1080/08838159709364410

Shen, F., Sheer, V. C. & Li, R. (2015). Impact of Narratives on Persuasion in Health Communication: A Meta-Analysis. *Journal of Advertising*, 44(2), 105–113. https://doi.org/10.1080/00913367.2015.1018467

Shome, D., Marx, S., Appelt, K., Arora, P., Balstad, R., Broad, K., Freedman, A., Handgraaf, M., Hardisty, D., Krantz, D., Leiserowitz, A., LoBuglio, M., Logg, J., Mazhirov, A., Milch, K., Nawi, N., Peterson, N., Soghoian, A. & Weber, E. (2009). *The psychology of climate change communication: a guide for scientists, journalists, educators, political aides, and the interested public*. Center for Research on Environmental Decisions. http://www.cred.columbia.edu/guide/downloads.html

Shove, E. (2010). Beyond the ABC: Climate Change Policy and Theories of Social Change. *Environment and Planning A: Economy and Space*, 42(6), 1273–1285. https://doi.org/10.1068/a42282

Sillesen, L. B. (2014). *Good news is good business, but not a cure-all for journalism*. Columbia Journalism Review. Retrieved from http://archives.cjr.org/behind_the_news/good_news_is_good_business_but.php

SJN [Solutions Journalism Network] (2017). *Impact*. Retrieved 23 January 2022, from https://www.solutionsjournalism.org/impact

SJN [Solutions Journalism Network] (2019). *Basic Toolkit*. Retrieved from: https://learninglab.solutionsjournalism.org/en/courses/basic-toolkit/introduction/welcome

Smyth, J.C. (1990). Communicating Conservation and Sustainable Development. *The Environmentalist*, 10(3), 222-224.

Spence, A. & Pidgeon, N. (2010). Framing and communicating climate change: The effects of distance and outcome frame manipulations. *Global Environmental Change*, 20(4), 656–667. https://doi.org/10.1016/j.gloenvcha.2010.07.002

SPJ [Society of Professional Journalists] (n.d.). *SPJ Code of Ethics*. Society of Professional Journalists. Retrieved from: https://www.spj.org/ethicscode.asp

Stecula, D. A. & Merkley, E. (2019). Framing Climate Change: Economics, Ideology, and Uncertainty in American News Media Content From 1988 to 2014. *Frontiers in Communication*, 4. https://doi.org/10.3389/fcomm.2019.00006

Swain K.A. (2021) *Media Framing of Climate Change Mitigation and Adaptation*. In: Lackner M., Sajjadi B., Chen WY. (eds) Handbook of Climate Change Mitigation and Adaptation. Springer, New York, NY. https://doi.org/10.1007/978-1-4614-6431-0_6-3

Takahashi, B. & Parks, P. (2018). Journalists and Communicators' Perceptions of Their Graduate Training in Environmental Reporting: An Application of Knowledge-Based Journalism Principles. *Frontiers in Environmental Science*, 5. https://doi.org/10.3389/fenvs.2017.00094

Tankard, J. W. (2001). *The Empirical Approach to the Study of Media Framing*. In J. W. Tankard. Framing Public Life (1st ed), Routledge: New York.

Thier, B. K. (2016). *Remix: How and Why to Teach Solutions Journalism*. MediaShift. Retrieved 24 September 2022, from https://mediashift.org/2016/09/remix-teach-solutions-journalism/

Thier, K., Abdenour, J., Walth, B. & Dahmen, N. S. (2019). A narrative solution: The relationship between solutions journalism, narrative transportation, and news trust. *Journalism*, 22(10), 2511–2530. https://doi.org/10.1177/1464884919876369

Tschötschel, R., Schuck, A., Schwinges, A. & Wonneberger, A. (2021). Climate change policy support intended behaviour change, and their drivers largely unaffected by consensus messages in Germany. *Journal of Environmental Psychology*, 76, 101655. https://doi.org/10.1016/j.jenvp.2021.101655

Tuchman, B. W. (1978). *Making News: A Study in the Construction of Reality*. Free Press.

Tversky A. & Kahneman D. (1981). The framing of decisions and the psychology of choice. *Science*, 211(4481), 453-8. https://doi.org/10.1126/science.7455683.

UNDP [United Nations Development Programme] 2022. *Human Development Report 2021-22: Uncertain Times, Unsettled Lives: Shaping our Future in a Transforming World*. New York.

UNFCC, [United Nations Framework Convention on Climate Change]. (2003). *Reporting On Climate Change: User Manual for the Guidelines on nNational Communications from Non-Annex I Parties*. Retrieved from: https://unfccc.int/resource/userman_nc.pdf

Universiteit van Amsterdam (2021). *Why we might need more solutions journalism about climate change*. University of Amsterdam. https://www.uva.nl/en/shared-content/faculteiten/en/faculteit-der-

maatschappij-en-gedragswetenschappen/news/2021/11/sustainability-why-we-might-need-more-solutions-journalism-about-climate-change.html?cb

Van Heuvel, T. & Hillen, R. (1994). *Coastline management with GIS in the Netherlands*. In: EARSeL Workshop on remote sensing and GIS for coastal zone management, pp. 155–164. Delft.

Van Krieken, K. & Sanders, J. (2019). What is narrative journalism? A systematic review and an empirical agenda. *Journalism*, 22(6), 1393–1412. https://doi.org/10.1177/1464884919862056

Vermeersen, B. L., Slangen, A. B., Gerkema, T., Baart, F., Cohen, K. M., Dangendorf, S., Duran-Matute, M., Frederikse, T., Grinsted, A., Hijma, M. P., Jevrejeva, S., Kiden, P., Kleinherenbrink, M., Meijles, E. W., Palmer, M. D., Rietbroek, R., Riva, R. E., Schulz, E., Slobbe, D. C. & van der Wegen, M. (2018). Sea-level change in the Dutch Wadden Sea. *Netherlands Journal of Geosciences*, 97(3), 79–127. https://doi.org/10.1017/njg.2018.7

Vitousek, S., Barnard, P. L., Fletcher, C. H., Frazer, N., Erikson, L. & Storlazzi, C. D. (2017). Doubling of coastal flooding frequency within decades due to sea-level rise. *Scientific Reports*, 7(1). https://doi.org/10.1038/s41598-017-01362-7

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

Vreese, C. H. (2005). News framing. *Identifying Information and Tenor in Texts*, 13(1), 51–62. https://doi.org/10.1075/idjdd.13.1.06vre

Vu, H. T., Liu, Y. & Tran, D. V. (2019). Nationalizing a global phenomenon: A study of how the press in 45 countries and territories portrays climate change. *Global Environmental Change*, 58, 101942. https://doi.org/10.1016/j.gloenvcha.2019.101942

Wake, A. & Farrer, G. (2016). What is Journalism For? Call for Journalism Educators to Think beyond Industry Practice. *Asia Pacific Media Educator*, 26(2), 163–174. https://doi.org/10.1177/1326365x16671777

Wang, W. (2011). *A Content Analysis of Reliability in Advertising Content Analysis Studies*. East Tennessee State University. Retrieved from. https://core.ac.uk/download/pdf/214065441.pdf

Wasserman, H. (2012). The challenge of climate change for journalism in Africa. *Ecquid Novi: African Journalism Studies*, 33(1), 1–2. doi:10.1080/02560054.2012.656985

Watts, N., Amann, M., Arnell, N., Ayeb-Karlsson, S., Beagley, J., Belesova, K., Boykoff, M., Byass, P., Cai, W., Campbell-Lendrum, D., Capstick, S., Chambers, J., Coleman, S., Dalin, C., Daly, M., Dasandi, N., Dasgupta, S., Davies, M., di Napoli, C. & Costello, A. (2021). The 2020 report of The Lancet Countdown on health and climate change: responding to converging crises. *The Lancet*, 397(10269), 129–170. https://doi.org/10.1016/s0140-6736(20)32290-x

Weaver, D. A., Lively, E. & Bimber, B. (2009). Searching for a Frame. *Science Communication*, 31(2), 139–166. https://doi.org/10.1177/1075547009340345

Weber, P. (2016). *Narrative Journalism*. Dfjv Deutsches Journalistenkolleg Gmbh. Berlin. Retrieved from https://www.journalistenkolleg.de/documents/10157/161315/Narrative+Journalism.pdf/8b330d5b-2892-4a3c-8375-3a823c9a0f11

Wenzel, A., Gerson, D. & Moreno, E. (2016). *Engaging Communities Through Solutions Journalism*. Retrieved September 30, 2022, from https://www.cjr.org/tow_center_reports/engaging_communities_through_solutions_journalism.php

White, J. (2013). Translating Science, Health and Technology: Reporters as Knowledge Transfer Intermediaries. *Online Journal of Communication and Media Technologies*, 3, 227-252.

Wilke, J., Heimprecht, C. & Cohen, A. (2012). The geography of foreign news on television. *International Communication Gazette*, 74(4), 301–322. https://doi.org/10.1177/1748048512439812

Wilkins, E. J., Miller, H. M., Tilak, E. & Schuster, R. M. (2018). Communicating information on nature-related topics: Preferred information channels and trust in sources. *PLOS ONE*, *13*(12), e0209013. https://doi.org/10.1371/journal.pone.0209013

Xiaoquan Z, Anthony A. L., Edward W. M. & Connie R.R (2011) Attention to Science/Environment News Positively Predicts and Attention to Political News Negatively Predicts Global Warming Risk Perceptions and Policy Support, *Journal of Communication*, 61(4), 713–731. https://doi.org/10.1111/j.1460-2466.2011.01563.x

Yaros, R. A. (2006). Is It the Medium or the Message? Structuring Complex News to Enhance Engagement and Situational Understanding by Nonexperts. *Communication Research*, *33*(4), 285–309. https://doi.org/10.1177/0093650206289154

Appendix A. Codebook

Category	Code: - **Sub-code**	Example:	Note:
COUNTRY	NZ - Region/City	Canterbury/Auckland	Is it a national or specific regional/ city perspective and what perspective is the story written from?
	NL - Province/ City - Europe	Groningen/Amsterdam	
GEOGRAPHICAL FOCUS	International (worldwide issue)		What geographical focus is represented in the article?
	National (country wide issue)		
	Regional / Provincial / City		
	Community issue (town, rural)		
PUBLISHER	Publisher	NZ Herald	Which organisation(s) published the article?
		NOS	
PUBLISHER MEDIUM	Newspaper	Stuff, De Telegraaf	What is the primary publishing platform / medium?
	Radio	RNZ	
	TV	NOS, Newshub	
	Magazine	Vrij Nederland	
	Online only	Newsroom, Spinoff	
PUBLICATION SEASON PS	***Summer*** *(NL June21 – Sept21, NZ Dec – Feb)* ***Autumn*** *(NL Oct21- Dec20, NZ March – May)* ***Winter*** *(NL Dec21 – March19, NZ June- Aug)* ***Spring*** *(NL March20 – June20, NZ Sep – Nov)*		What season was the story published?
AUTHOR	Environmental/climate/ science reporter		Who is the main author(s)?
	Journalist		
	Contributing writer (non-journalist)		
	Climate Expert (scientist, commentator)		
	Unknown author		
ARTICLE TYPE	News		Breaking or current events
	In-depth / feature / analysis (internal)		Long form factual news about news topic
	Journalist opinion / editorial (internal)		Opinion within organisation
	Column / opinion (external)		Interpretative / explanatory
	Other / Mixed Styles (Question Answer)		None of the above
STORY STYLE	inverted news pyramid / non-narrative		Argument and fact-based news
	storytelling / narrative message style		emotive or personal elements
	mixed styles		
MAIN TOPIC	CC Causes	Fossil fuels, manufacturing,	What is the general main topic of the *entire* article? (coded as it associates to CC or is it more in reference to SLR specifically)
	CC Consequences / Impacts	Hotter temps, severe storms, drought, ocean warming, ecosystem and animal loss, food & water scarcity, displacement, health impacts	

	CC Adaptation	*adaptation* addresses the impacts of CC or SLR through response to current and future effects	
	CC Mitigation	*mitigation* regards making impacts of CC less severe by prevention or reduction of GHG in atmosphere	
	Other	Wave type effects erosion	
	Politics	(court rule, funding, international, local, national, proposed policy, public consultation, risk disclosure	
	SLR Consequences/Impacts		
	SLR Adaptation	Planning for SLR retreat/ adaptation relocation	
	SLR Causes		
	SLR / CC Research		
	Human perception of CC/ SLR		
SLR CAUSES	- Land subsidence - Melting glaciers / ice - Rising Ocean temps - Other (wind)		
IMPACTS OF SLR	Coastal Impacts - Erosion / weak coastline - Coastal flooding / inundation / low lying area / storm surge - astronomical tide	Coastal flooding occurs when water level rises above the normal tidal level, not include waves	*What kinds of SLR impacts?*
	Environmental / ecosystem / natural impacts - wildlife / biodiversity impact (animals) - contamination / pollution - Saline groundwater - loss of ecosystems / change in physical coastal environment - marine environment impact	 extinction landfill /chemicals in sea after SLR Saltwater intrusion Water rises into environment/ marshes wetlands ice loss Coral bleaching	
	Positive Consequences - visual aesthetic improved - living together - coastal growth / environment adaptability to SLR - new way of living coping	*Note eample code and category* For example impacts	

	Human Impacts - Physical health - Mental health and wellbeing - Migration (retreat & displacement) - Cultural/spiritual (connection to land)	 disease, death, physical fear, anxiety, stress loss of traditional sites/customs/ way of life	
	Inequality - disproportionate effect - not relevant for me (only affect others) - repeated occurrence of SLR	 smaller nations, council, Not a first-time event	Effects some groups or people more than others.
	Property Impacts - Private property (home, house, land) - Business/ commercial property - Property/land (generally) - Historic / cultural / spiritual	 Residential buildings If not specified church marae, monument, statue, lighthouse	
	Infrastructure RISK/ Impacts - infrastructure generally (all) - transport infrastructure - Public spaces / assets - cemetery - waste management - flood protection - water, power & drainage - other	 bridges, airports, roads land, air, sea, canals, parks, halls, beaches landfill dykes, SLR barriers sewage, electricity, comms	

NEWSWORTHY FRAMES	New research, report, or study - Scientific Study (academic/ university) - International (IPCC, COP, NASA) - National/Regional Research / plan or Report Project (NZ Sea Research)	 New tool for tracking SLR	Overall, why is this story being told?
	Political change/regulation - Law planning - Actual law change - Consultation - Different decision making encouraged (alternative approach)	Property development restriction, consultation/feedback, LIM, District/ Long Term Plans Rethink status quo	
	Natural Impacts (Vu et al., 2019) - Extreme weather - Coastal flood surge (wind, tides) - Coastal Erosion (cliff or beach) - Contamination - Other (ice melt)	 Not SLR related supermoon, king tide	
	Conflict / Blame Shifting (Semetko and Valkenburg, 2000) - Undervalued opinion - Adaptation solution doesn't work - SLR risk (conflict about the existence of risk)	 Loss of faith Ruin beach, wall failure, relocation resistance	

	- SLR science (with the amount predicted – science crtic science)	Disagreement with the science about the risk	
	Human-interest (Semetko and Valkenburg (2000),	Emotive or human perspective present	
	Moral (Semetko and Valkenburg 2000)	Moral or religious perspective about SLR i.e., human rights or freedoms inhibited, god will solve it	
CLIMATE FRAMES	Economic consequences *(Semetko & Valkenburg 2000, Vu et al., 2019))* - cost of protection/ adaptation - agriculture / food resources loss - tourism & travel - no economic consequences - cost of disaster / damage	i.e cost protect property property values stable	What foreseen economic costs/gains are mentioned because of SLR e.g., loss of fishing area, species change has economic impact
	Climate Politics - Court rulings - Funding - International politics - Local politics - National politics - Regional politics - Risk disclosure / assessment - Consultation / transparency - Policy regulations		
	Ecomodernism & Innovation / Solutions - agricultural innovation - technology and science have role to reduce CC or SLR / protect / find out - floating homes, smart building - Engineer our way out of CC or SLR impact - Dramatic change how we live - Natural impacts		
PLANNING ADAPTATION	- planning for adaptation (plan phase) - managed retreat / relocation - incentive policies - practical information for people - lack of planning - delays in action - talk about what is the prediction - protection planning		
LONGEVITY OF ADAPTION SOLUTIONS	- long term solution - temporary solution - solutions already exist - existing solution limitation/ failure carbon offset won't work		

FLOOD PROTECTION	- Man -made - Flood protection generally - Nature-based		
SENTIMENT	Positive	Hopeful, constructive, or optimistic outlook related to SLR. i.e., emissions can be reduced, SLR is a reality but there are plans to reduce SLR risk	What is the overall tone of the article towards the SLR issue?
	Ambiguous (equal perspectives represented in news article)	Both positive and negative SLR information. Unclear if SLR is avoidable i.e., maybe we must move, maybe we don't	
	Negative	Doom and gloom or lack of hope, SLR relocation must or will happen	
	Neutral (none of them)	Neither strongly positive nor negative information related to SLR	
	Unknown		
PERSPECTIVE	Expert / truth / objective/ scientific certainty	Council or other	What perspective is presented overall in the article?
	Majority / public perspective		
	False balance (sceptical)	Presented multiple perspectives of the SLR debate as equally credible, despite unequivocal evidence of SLR reality	
	Indigenous / minority	Māori	
	Environmentalist		
	Conservative	Promotion/preservation of status quo operations like fossil fuel use. SLR predictions/ adaptations are excessive	
	Denialist / dissent / disagreement	SLR not existent or going to happen or disagree to what extent protection needed	
	Alternative Perspective	Floating homes, or building a dike across the ocean.	
LIKELIHOOD	Predicted in future (impact not yet)	In the 20-50 years	
	Happening now	Running out of time / evidence	
	Sooner than thought		
	SLR not going to happen		
	Definite language	Powered words "It will / won't rise"	

EVIDENCE	Supporting - authors observation / experience - public / citizen observation - Valid proven science / expert prediction (Antilla, 2005) - Neutral science - council / govt data evidence Opposing - misleading/ contradictory/ controversial (Antilla, 2005) - scientific uncertainty (Antilla, 2005) - climate denial Not Mentioned		*What kind of evidence is referenced in the article to prove or deny SLR?* not sceptical, authors research as a source Non contentious science. Fact based with no attribution. Including rhetoric from climate sceptics with FF ties
SOCIAL ATTITUDE	Increasing SLR concern / conscientious	greener living	
	Ignorance – build and live anyway		
	Environmental awareness & education	World Planet Day, events	
	Protest & activism	call for action	
	Planning goes too far		
	Human overestimation of SLR		
	Human underestimation of SLR	SLR sooner than thought	
	Rethink SLR approach / Behaviour change	New approach needed	
STAKEHOLDER	Public - minority / indigenous - everyone collectively - owners / residents' union - agricultural/farming sector	 Māori Community group	What stakeholders are included or represented within the news article?
	Government - international government - national government - local/regional/city government - political party/politician		
	Experts / scientists - climate / environmental (weather) - engineers / tech developers - economist, banking, insurance property - IPCC - other (law, psychology)	 NIWA Tonkin Taylor	
	Company/ business /developers		
	Emergency services		
	Other (Media)		
SOLUTIONS JOURNALISM	- Response / Solution Mentioned - Cause of problem + evidence - Insight into solutions incl. limitation		
	-		

Appendix B. Codebook Results

*Table 8: Results as frequency count and percentages *TOT = category total occurrence, SUB = sub-category occurrence. Percentages for category totals are out of the 80 articles from that country, sub-category percentages are out of the category total.*

		NEW ZEALAND				***THE NETHERLANDS***			
		FREQUENCY		PERCENTAGE		FREQUENCY		PERCENTAGE	
		TOT	SUB	TOT	SUB	TOT	SUB	TOT	SUB
Total number of articles per country		**80**				**80**			
Author	Scientist	3		4%		2		3%	
	Climate Journalists	51		64%		33		41%	
	Unknown	1		1%		0		0%	
	Non-journalist	3		4%		1		1%	
	Journalist	22		28%		44		55%	
Publisher Medium	Radio	10		13%		3		4%	
	TV	1		1%		15		19%	
	Newspaper	52		65%		47		59%	
	Magazine	0		0%		4		5%	
	Online Only	17		21%		11		14%	
Publication Season	Summer	15		19%		19		24%	
	Spring	16		20%		9		11%	
	Autumn	34		43%		31		39%	
	Winter	15		19%		21		26%	
Geographical Focus	International	12		15%		24		30%	
	National	38		48%		53		66%	
	Community	2		3%		3		4%	
	Regional	36		45%		15		19%	
Article Type	News	61		76%		54		68%	
	Journalist Opinion	3		4%		6		8%	
	In-depth feature	16		20%		17		21%	
	Public Opinion	7		9%		3		4%	
	Other (Q & A)	3		4%		5		6%	
Story Stye	inverted news pyramid	55		69%		58		73%	
	storytelling human narrative	17		21%		14		18%	
	mixed styles	8		10%		8		10%	
Sentiment	Positive	26		33%		21		26%	
	Neutral	15		19%		15		19%	
	Negative	6		8%		7		9%	
	Ambiguous	33		41%		37		46%	
Newsworthiness Frames	**NEW RESEARCH, REPORT, STUDY**	**42**		**53%**		**43**		**54%**	
	- *International study (IPCC)*		*9*		*21%*		15		*35%*
	- *National / Regional Study*		*28*		*67%*		17		*40%*
	- *University Study*		*7*		*17%*		13		*30%*
	POLITICS / REGULATION	**49**		**61%**		**37**		**46%**	
	- *Actual law change*		*3*		*6%*		1		*3%*

	- *Consultation*		*14*		*29%*		2		*5%*
	- *Different decision making*		*15*		*31%*		23		*62%*
	- *Law planning*		*33*		*67%*		18		*49%*
	NATURAL DISASTER	**29**		**36%**		**27**		**34%**	
	- *Coastal erosion*		*15*		*52%*		2		*7%*
	- *Flooding, tides, water surge*		*9*		*31%*		14		*52%*
	- *Contamination*		*2*		*7%*		2		*7%*
	- *Extreme weather (non SLR)*		*9*		*31%*		10		*37%*
	- *Other*		*2*		*7%*		2		*7%*
	CONFLICT	**17**		**21%**		**19**		**24%**	
	- *Adaption doesn't work*		*5*		*29%*		2		*11%*
	- *Disagree about risk existence*		*11*		*65%*		2		*11%*
	- *Undervalued opinion*		*7*		*41%*		7		*37%*
	- *SLR science*		*2*		*12%*		10		*53%*
	HUMAN-INTEREST	**13**		**16%**		**15**		**19%**	
	MORAL	**0**		**0%**		**3**		**4%**	
Main Climate Topic	CC Causes	7		9%		10		13%	
	CC Adaption	19		24%		17		21%	
	CC Impacts	23		29%		30		38%	
	CC Mitigation	19		24%		18		23%	
	Other	1		1%		4		5%	
	SLR Adaptation	38		48%		43		54%	
	SLR Causes	18		23%		36		45%	
	SLR Impacts	48		60%		44		55%	
	Human perception of CC/SLR	6		8%		9		11%	
General Main Topic Themes	Economic Impacts	33		41%		32		40%	
	Human Impacts	18		23%		24		30%	
	Property Impacts	49		61%		31		39%	
	Environmental Impacts	25		31%		44		55%	
	Coastal Impacts	47		59%		44		55%	
	Positive Consequences	6		8%		10		13%	
	Inequality	20		25%		14		18%	
	Infrastructure Risk/Impacts	39		49%		42		53%	
	Climate Politics	36		45%		33		41%	
	SLR/CC Research	17		21%		26		33%	
Climate Politics	**CLIMATE POLITICS**	**36**		**45%**		**33**		**41%**	
	- *Court Rulings*		*2*		*6%*		0		*0%*
	- *Funding*		*1*		*3%*		7		*21%*
	- *International*		*8*		*22%*		11		*33%*
	- *Local*		*12*		*33%*		7		*21%*
	- *National*		*22*		*61%*		27		*82%*
	- *Regional*		*4*		*11%*		19		*58%*
	- *Policy regulations*		*19*		*53%*		26		*79%*
	- *Consultation / transparency*		*16*		*44%*		7		*21%*
	- *Risk disclosure/assessment*		*18*		*50%*		10		*30%*
Impacts of SLR	**COASTAL IMPACTS**	**47**		**59%**		**44**		**55%**	

	- *erosion / weak coastline*		*31*		*66%*		6		*14%*
	- *coastal flooding / inundation / low lying area*		*28*		*60%*		37		*84%*
	- *astronomical tide*		*3*		*6%*		2		*5%*
	ENVIRONMENTAL / ECOSYSTEM / NATURAL IMPACTS	**25**		**31%**		**44**		**55%**	
	- *wildlife impact (animals)*		*4*		*16%*		9		*20%*
	- *contamination / pollution*		*4*		*16%*		2		*5%*
	- *saline groundwater*		*3*		*12%*		25		*57%*
	- *loss of ecosystems / change in physical environment*		*21*		*84%*		23		*52%*
	- *marine environment impact*		*7*		*28%*		3		*7%*
	POSITIVE CONSEQUENCES	**6**		**8%**		**10**		**13%**	
	- *visual aesthetic improved*		*1*		*17%*		4		*40%*
	- *living together*		*1*		*17%*		2		*20%*
	- *coastal growth / environment adapts to SLR*		*5*		*83%*		9		*90%*
	HUMAN IMPACTS	**22**		**28%**		**24**		**30%**	
	- *physical health*		*4*		*18%*		4		*17%*
	- *mental health and wellbeing*		*12*		*55%*		5		*21%*
	- *migration (retreat /displacement)*		*7*		*32%*		16		*67%*
	- cultural/spiritual (connection to land)		*5*		*23%*		2		*8%*
	INEQUALITY	**20**		**25%**		**14**		**18%**	
	- *disproportionate effect*		*12*		*60%*		6		*43%*
	- *not relevant for me (only other people/country)*		*2*		*10%*		4		*29%*
	- *repeated occurrence of SLR*		*6*		*30%*		6		*43%*
	PROPERTY IMPACTS	**49**		**61%**		**31**		**39%**	
	- *private property*		*21*		*43%*		14		*45%*
	- *business/ commercial property*		*4*		*8%*		1		*3%*
	- *property/land (generally)*		*35*		*71%*		28		*90%*
	- *historic, cultural, spiritual sites*		*4*		*8%*		0		*0%*
	INFRASTRUCTURE RISK	**39**		**49%**		**42**		**53%**	
	- *infrastructure generally*		*18*		*46%*		20		*48%*
	- *transport infrastructure*		*10*		*26%*		18		*43%*
	- *Public spaces / assets*		*6*		*15%*		3		*7%*
	- *Cemeteries*		*3*		*8%*		0		*0%*
	- *waste management*		*6*		*15%*		2		*5%*
	- *flood protection*		*5*		*13%*		27		*64%*
	- *water, power, drainage*		*6*		*15%*		9		*21%*
	- *other (communications)*		*2*		*5%*		3		*7%*
	ECONOMIC IMPACTS	**33**		**41%**		**32**		**40%**	
	- *cost of protection/ adaptation*		*25*		*76%*		25		*78%*
	- *tourism & travel*		*1*		*3%*		3		*9%*
	- *agriculture / food resources loss*		*3*		*9%*		5		*16%*
	- *no economic consequences*		*5*		*15%*		1		*3%*
	- *cost of disaster / damage*		*10*		*30%*		7		*22%*
Causes of SLR	**CAUSES OF SLR**	**18**		**23%**		**36**		**45%**	
	- *Land subsidence*		*7*		*39%*		14		*39%*
	- *Melting Glaciers / Ice Sheets*		*9*		*50%*		27		*75%*

	- *Rising Ocean temperatures*		*9*		*50%*		20		*56%*
	- *Other (wind)*		*0*		*0%*		2		*6%*
Flood Protection	**FLOOD PROTECTION**	**39**		**49%**		**47**		**59%**	
	- *Generally*		*17*		*44%*		25		*53%*
	- *Man-made*		*25*		*64%*		38		*81%*
	- *Nature-based*		*13*		*33%*		9		*19%*
Planning for adaption	**PLANNING FOR ADAPTION**	**64**		**80%**		**67**		**84%**	
	- *plan phase*		*47*		*73%*		38		*57%*
	- *managed retreat / relocation*		*18*		*28%*		9		*13%*
	- *incentive policies*		*6*		*9%*		4		*6%*
	- *practical information for people*		*25*		*39%*		10		*15%*
	- *lack of planning*		*8*		*13%*		3		*4%*
	- *delays in action*		*9*		*14%*		11		*16%*
	- *talk about what is the prediction*		*22*		*34%*		35		*52%*
	- *protection planning*		*12*		*19%*		22		*33%*
Adaptive Solution	**ADAPTIVE SOLUTION**	**24**		**30%**		**52**		**65%**	
	- *agricultural innovation*		*1*		*4%*		4		*8%*
	- *technology and science have role to reduce CC or SLR*		*4*		*17%*		28		*54%*
	- *floating homes, smart building*		*4*		*17%*		7		*13%*
	- *Engineer our way out of CC or SLR impact*		*16*		*67%*		36		*69%*
	- *Dramatic change how we live*		*7*		*29%*		11		*21%*
Longevity of Solutions	long term solution	8		10%		14		18%	
	temporary solution	6		8%		4		5%	
	solutions already exist	3		4%		17		21%	
	existing solution limitation/ failure	7		9%		12		15%	
SLR likelihood	Predicted in the future	50		63%		44		55%	
	Sooner than thought	7		9%		6		8%	
	Not going to happen	1		1%		0		0%	
	Happening now	36		45%		17		21%	
	Definite language	14		18%		20		25%	
Social Attitude	Increasing SLR concern	30		38%		21		26%	
	Ignorance	5		6%		10		13%	
	Environmental awareness & education	13		16%		10		13%	
	Protest & activism	4		5%		4		5%	
	Planning goes too far	2		3%		0		0%	
	Human underestimation of SLR	11		14%		23		29%	
	Human overestimation of SLR	1		1%		5		6%	
	Rethink SLR approach / behaviour change	12		15%		19		24%	
Perspective	Expert / scientific certainty	66		83%		65		81%	
	Indigenous / minority	12		15%		2		3%	
	Environmentalist	13		16%		5		6%	
	False balance (sceptical)	4		5%		4		5%	
	Conservative	5		6%		2		3%	

	Denial/disagreement	8		10%		10		13%	
	Alternative thinking	6		8%		10		13%	
Evidence	**SUPPORTING**	**66**		**83%**		**52**		**65%**	
	- *author observation/experience*		*8*		*12%*		5		*10%*
	- *public / citizen observation*		*12*		*18%*		5		*10%*
	- *expert prediction*		*53*		*80%*		48		*92%*
	- *neutral science*		*8*		*12%*		3		*6%*
	- *council / government data*		*14*		*21%*		3		*6%*
	OPPOSING	**5**		**6%**		**13**		**16%**	
	- *misleading/ contradictory/ controversial*		*1*		*20%*		2		*15%*
	- *scientific uncertainty*		*5*		*100%*		13		*100%*
	- *climate denial*		*1*		*20%*		2		*15%*
	NOT MENTIONED	**9**		**11%**		**15**		**19%**	
Stakeholders	Business & developers	12		15%		13		16%	
	Emergency services	1		1%		0		0%	
	Other (media)	3		4%		6		8%	
	EXPERTS	**69**		**86%**		**77**		**96%**	
	- *Environmental/climate (scientist/researcher)*		*55*		*80%*		64		*83%*
	- *Economists/banking/insurance*		*21*		*30%*		4		*5%*
	- *Engineers/tech developers*		*17*		*25%*		33		*43%*
	- *Other (law, psychology)*		*3*		*4%*		5		*6%*
	- *IPCC*		*9*		*13%*		11		*14%*
	GOVERNMENT	**61**		**76%**		**38**		**48%**	
	- *International gov*		*2*		*3%*		7		*18%*
	- *National gov*		*26*		*43%*		25		*66%*
	- *Regional/ local gov*		*43*		*70%*		19		*50%*
	- *Politician/councillor*		*26*		*43%*		11		*29%*
	PUBLIC	**60**		**75%**		**28**		**35%**	
	- *Agricultural/farming*		*3*		*5%*		9		*32%*
	- *Everyone*		*40*		*67%*		19		*68%*
	- *Minority indigenous*		*12*		*20%*		2		*7%*
	- *Owner/resident/community*		*22*		*37%*		8		*29%*
Solutions journalism	SLR solution mentioned	24		30%		52		65%	
	Insight into solutions incl. limitation	9		11%		8		10%	
	SLR cause mentioned	18		23%		36		45%	

Appendix C. Vocabulary Comparisons

There were no significant differences between vocabulary used between countries of between authors.

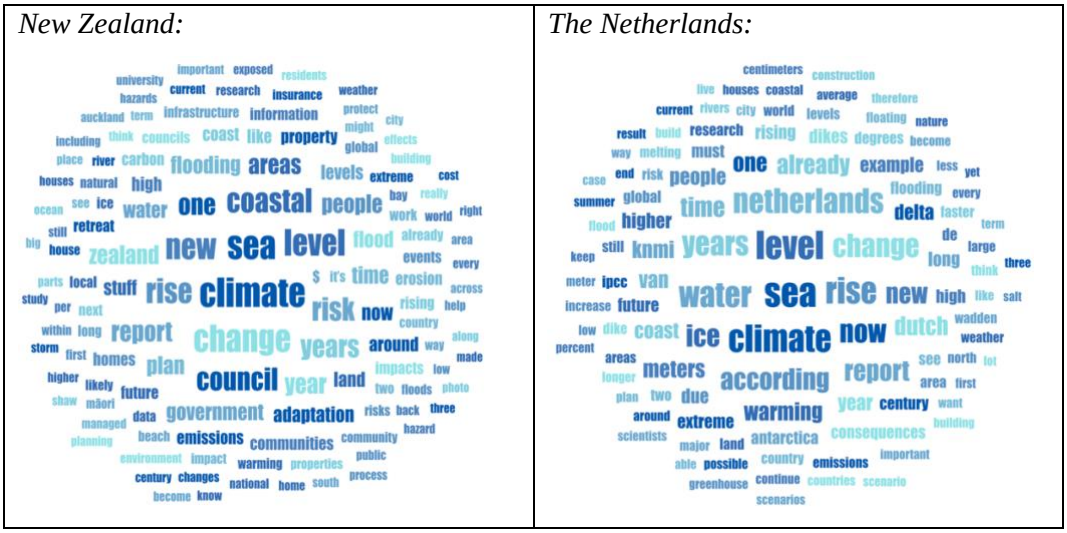


Figure 12: Word content comparison between New Zealand and the Netherlands.

Figure 20: New Zealand author type vocabulary.

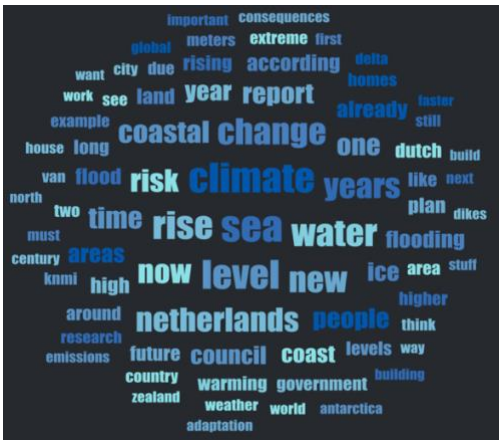
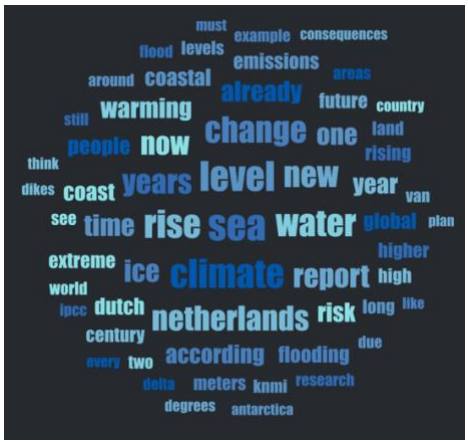
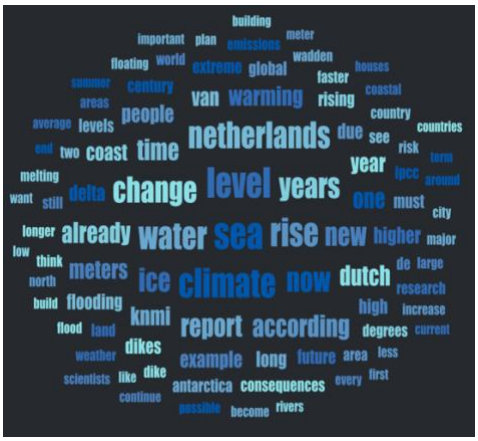
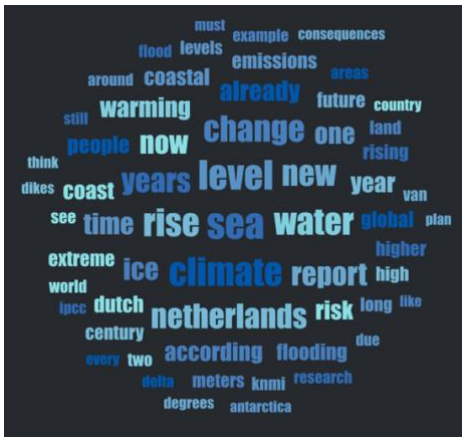
Journalists	Climate Journalists
	
Scientists	**Non-Journalists**
	

Figure 21: The Netherlands author type vocabulary.

Appendix D. List of Articles in Comparative Media Analysis

Article ID (as appears in Atlas.ti)	*Title*	*Link*
NEW ZEALAND ARTICLES		
1	A Shore Thing: The 17,600 coastal Auckland homes at risk from sea level rise	https://www.stuff.co.nz/environment/climate-news/300471576/a-shore-thing-the-17600-coastal-auckland-homes-at-risk-from-sea-level-rise#:~:text=Auckland%20has%203200%20km%20of,to%20hold%20back%20the%20ocean.
2	'Human civilisation has never existed in a climate this hot'	https://www.newsroom.co.nz/human-civilisation-has-never-existed-in-a-climate-this-hot
3	Climate crisis: Many Kiwis misunderstand sea level rise	https://www.nzherald.co.nz/nz/climate-crisis-many-kiwis-misunderstand-sea-level-rise/MTPLPXKO73SM3GR3K3T6DNSC3Y/
4	A threat to our identity: The impact of climate change on Māori	https://thespinoff.co.nz/nga-pae-o-te-maramatanga/21-12-2021/a-threat-to-our-identity-the-impact-of-climate-change-on-maori
5	The way I see it, North must accelerate shift to clean energy	https://advance-lexis-com.ezproxy2.utwente.nl/document/?pdmfid=1516831&crid=a21dd056-e5e2-4235-a682-c41974bfe8a5&pddocfullpath=%2Fshared%2Fdocument%2Fnews%2Furn%3AcontentItem%3A64Y2-CGC1-JDK8-V54T-00000-00&pdcontentcomponentid=459394&pdteaserkey=sr0&pditab=allpods&ecomp=rz2yk&earg=sr0&prid=8f9b2cd7-b9de-49d4-8bfb-15f14acab902
6	Study finds Lyttleton sea levels rising faster than thought	https://www.stuff.co.nz/environment/climate-news/125584384/study-finds-lyttelton-sea-levels-rising-faster-than-thought

7	Sea level rise to put Timaru houses and infrastructure at risk	https://www.stuff.co.nz/timaru-herald/news/300275142/sea-level-rise-to-put-timaru-houses-and-infrastructure-at-risk
8	Thousands of properties at risk of flooding or erosion due to sea level rise	https://www.stuff.co.nz/environment/climate-news/126611933/thousands-of-properties-at-risk-of-flooding-or-erosion-due-to-sea-level-rise
9	Nine years ago, Kāpiti Coast residents drew a line in the sand. Now the council is trying again to draw hazard lines of its own	https://www.stuff.co.nz/environment/climate-news/126375538/nine-years-ago-kpiti-coast-residents-drew-a-line-in-the-sand-now-the-council-is-trying-again-to-draw-hazard-lines-of-its-own
10	Flood protection ramps up with sea-level rise of 1.35m predicted in next 100 years	https://www.stuff.co.nz/environment/climate-news/126721158/flood-protection-ramps-up-with-sealevel-rise-of-135m-predicted-in-next-100-years
11	Big changes on the way as Christchurch moves to adapt to sea level rise	https://www.stuff.co.nz/the-press/news/126544067/big-changes-on-the-way-as-christchurch-moves-to-adapt-to-sea-level-rise
12	Paris Agreement's failure could mean 20m of sea level rise	https://www.nzherald.co.nz/nz/paris-agreements-failure-could-mean-20m-of-sea-level-rise/43ITLZBHCXYWQWJSADARTQ3YVU/
13	A Shore Thing: NZ housing market unfazed by sea rise but Reserve Bank preps for change	https://www.stuff.co.nz/environment/climate-news/300471629/a-shore-thing-nz-housing-market-unfazed-by-sea-rise-but-reserve-bank-preps-for-change
14	$11m homes put at risk as cliff crumbles away	https://www.pressreader.com/new-zealand/the-northern-advocate/20220122
15	The West Coast town building a wall to defend from the sea	https://www.stuff.co.nz/environment/climate-news/126903078/the-west-coast-town-building-a-wall-to-defend-from-the-sea
16	Why baby steps won't be enough to defend our farms and cities	https://www.stuff.co.nz/environment/climate-news/127914284/why-baby-steps-wont-be-enough-to-defend-our-farms-and-cities

18	Greater disclosure of climate risks on way for home buyers	https://www.newsroom.co.nz/greater-disclosure-of-climate-risks-on-way-for-home-buyers
19	Cliff failure' on North Shore street sparks action: owners want to build seawall	https://www.nzherald.co.nz/business/cliff-failure-on-north-shore-street-sparks-action-owners-want-to-build-seawall/G6IBDPBVGEOWRHRM62P6A2XVCY/
20	The complex ways climate change is impacting our mental health	https://www.stuff.co.nz/environment/climate-news/128010007/the-complex-ways-climate-change-is-impacting-our-mental-health
21	A Shore Thing: Not enough money 'to hold back the sea', but defence is possible	https://www.stuff.co.nz/environment/climate-news/300471583/a-shore-thing-not-enough-money-to-hold-back-the-sea-but-defence-is-possible
22	A treaty to tame our 'Wild West' oceans	https://www.newsroom.co.nz/a-treaty-to-tame-our-wild-west-oceans
23	Our rapidly closing climate window	https://www.newsroom.co.nz/ideasroom/our-rapidly-closing-climate-window
25	West Coast councillor continues denying sea level rise	https://www.rnz.co.nz/news/national/465207/west-coast-councillor-continues-denying-sea-level-rise
26	Climate hazard property - from freehold to leasehold	https://www.rnz.co.nz/national/programmes/ninetonoon/audio/2018781916/climate-hazard-property-from-freehold-to-leasehold
28	Guidelines approved for Christchurch's move to adapt to sea level rise	https://www.stuff.co.nz/environment/128286471/guidelines-approved-for-christchurchs-move-to-adapt-to-sea-level-rise
30	Report details consequences of landfill of toxic waste at Tiwai Point	https://www.rnz.co.nz/news/national/438550/report-details-consequences-of-landfill-of-toxic-waste-at-tiwai-point
31	Westport house prices continue to rise despite flood damage	https://www.stuff.co.nz/national/128339226/westport-house-prices-continue-to-rise-despite-flood-damage
32	This landmark climate crisis report tells the story of our futures	https://thespinoff.co.nz/science/09-08-2021/this-landmark-global-climate-crisis-report-is-a-wake-up-call-for-every-one-of-us

33	Accelerating to decelerate: Three New Zealand startups tackling climate change	https://thespinoff.co.nz/business/14-04-2022/accelerating-to-decelerate-three-new-zealand-startups-tackling-climate-change
34	Greater disclosure of climate risks on way for home buyers	https://www.newsroom.co.nz/greater-disclosure-of-climate-risks-on-way-for-home-buyers
35	Coastal areas scoped as potential new 'blue carbon' credit sites	https://www.stuff.co.nz/environment/climate-news/126525091/coastal-areas-scoped-as-potential-new-blue-carbon-credit-sites
36	Wellington project puts climate change into the video game world with $1m award	https://www.stuff.co.nz/environment/climate-news/127528198/wellington-project-puts-climate-change-into-the-video-game-world-with-1m-award#:~:text=The%20project%2C%20led%20by%20Wellington,like%20version%20of%20the%20capital.
37	NZ home-buyers' natural hazard blind spot	https://www.newsroom.co.nz/ideasroom/nz-home-buyers-natural-hazard-blind-spot
38	'Blue carbon' stores measured in groundbreaking Nelson inlet study	https://www.stuff.co.nz/environment/climate-news/127196555/blue-carbon-stores-measured-in-groundbreaking-nelson-inlet-study
39	Weather: What caused the Canterbury flood? Three questions answered	https://www.nzherald.co.nz/nz/weather-what-caused-the-canterbury-flood-three-questions-answered/BY2TK23FSO4LON5ZCMBJFSRKFQ/
40	'Don't run away like headless chickens': A view from the sharp end of NZ sea level rise	https://thespinoff.co.nz/politics/03-05-2022/dont-run-away-like-headless-chickens-a-view-from-the-sharp-end-of-nz-sea-level-rise
41	A terrifying glimpse of what is to come': La Niña raises sea levels in the western Pacific by 20cm	https://www.stuff.co.nz/environment/climate-news/300480030/a-terrifying-glimpse-of-what-is-to-come-la-nia-raises-sea-levels-in-the-western-pacific-by-20cm
42	How should Tasman District adapt to coastal hazards and sea level rise?	https://www.stuff.co.nz/environment/climate-news/126442237/how-should-tasman-district-adapt-to-coastal-hazards-and-sea-level-rise

43	New Zealand's glaciers melting faster, thinning by 1.5m a year	https://www.rnz.co.nz/news/national/441435/new-zealand-s-glaciers-melting-faster-thinning-by-1-point-5m-a-year#:~:text=New%20Zealand's%20glaciers%20are%20melting,ago%2C%20a%20study%20has%20found.&text=Nearly%20all%20of%20the%20world's,in%20the%20science%20journal%20Nature.
44	More than 300 old dumps at risk of coastal erosion and flooding	https://www.stuff.co.nz/environment/124123042/more-than-300-old-dumps-at-risk-of-coastal-erosion-and-flooding
45	Coromandel council accused of 'misrepresenting' future flooding risks	https://www.stuff.co.nz/waikato-times/news/128797351/coromandel-council-accused-of-misrepresenting-future-flooding-risks#:~:text=Coromandel%20council%20accused%20of%20'misrepresenting'%20future%20flooding%20risks,-Sharnae%20Hope14&text=Katina%20Conomos%20once%20worked%20for,of%20serious%20storms%20and%20floods.
46	Misplaced optimism: Why do we keep buying beach houses at risk of coastal erosion?	https://www.stuff.co.nz/environment/climate-news/300414725/misplaced-optimism-why-do-we-keep-buying-beach-houses-at-risk-of-coastal-erosion
47	The new housing crisis: Coastal inundation will impact home lending	https://www.newsroom.co.nz/new-housing-crisis-banks-wont-lend-against-coastal-properties
48	What the big climate report said about New Zealand	https://www.stuff.co.nz/environment/climate-news/126094665/what-the-big-climate-report-said-about-new-zealand
50	Climate change: Councils shouldn't wait to tackle coastal threats - report	https://www.nzherald.co.nz/nz/climate-change-councils-shouldnt-wait-to-tackle-coastal-threats-report/Q2B476AT5BT23PHUBPP7DVOR74/
51	New Nelson library's risk from faster sea level rise to be assessed	https://www.stuff.co.nz/nelson-mail/news/128691073/new-nelson-librarys-risk-from-faster-sea-level-rise-to-be-assessed#:~:text=The%20Nelson%20City%20Council%20chief,be%20affected%20from%20about%202130.
52	Major climate change report's stark outlook: Window to prevent worst impacts closing fast	https://www.nzherald.co.nz/nz/major-climate-change-reports-stark-outlook-window-to-prevent-worst-impacts-closing-fast/ITPHYUVIGBN5W6U6C6VCYX6JKI/
53	How to protect low-lying coastal Dunedin	https://www.stuff.co.nz/environment/127129224/how-to-protect-lowlying-coastal-dunedin#:~:text=Dunedin's%20coastline%20could%20be%20protected,the%20impact%20of%20climate%20change.
54	Climate change impact on Māori wellbeing and culture 'sobering' yet 'insightful'	https://www.stuff.co.nz/pou-tiaki/126750843/climate-change-impact-on-mori-wellbeing-and-culture-sobering-yet-insightful

55	Havelock water systems vulnerable to sea level rise	https://www.stuff.co.nz/national/politics/local-democracy-reporting/127688294/erosion-control-needed-for-havelock-sewage-treatment-plant-following-floods
56	Moon's 'wobble' in the 2030s will cause 'decade of dramatic increases in flood numbers,' NASA says	https://www.nzherald.co.nz/world/moons-wobble-in-the-2030s-will-cause-decade-of-dramatic-increases-in-flood-numbers-nasa-says/DABCFGXEYWDARKA7HBIZN2MCTM/#:~:text=Photo%20%2F%20123RF-,Nasa%20has%20warned%20that%20a%20%22wobble%22%20in%20the%20moon's%20orbit,of%20problems%20for%20the%20globe.
57	NowNext: Buyers want climate-friendly, climate-change resilient homes	https://www.stuff.co.nz/business/126959496/nownext-buyers-want-climatefriendly-climatechange-resilient-homes
58	Climate change: A dozen Waikato schools to be hit by flooding, a 'scary reality' for coastal communities	https://www.stuff.co.nz/waikato-times/news/300243810/climate-change-a-dozen-waikato-schools-to-be-hit-by-flooding-a-scary-reality-for-coastal-communities
59	Wetlands to play important role in climate change, says new Forest & Bird Otago/Southland manager	https://www.stuff.co.nz/environment/124133620/wetlands-to-play-important-role-in-climate-change-says-new-forest--bird-otagosouthland-manager
60	Huge cost to protect Thames, Whitianga from projected sea level rise	https://www.nzherald.co.nz/bay-of-plenty-times/news/huge-cost-to-protect-thames-whitianga-from-projected-sea-level-rise/YUWD56I3EH3P2M566UW57JRJBE/#:~:text=Huge%207m%2Dhigh%20seawalls%20have,for%20part%20of%20the%20foreshore.
61	Sad final farewells for Matatā managed retreat fighters	https://www.stuff.co.nz/national/128203042/sad-final-farewells-for-matat-managed-retreat-fighters
62	Living with a changing climate	https://www.gisborneherald.co.nz/okategoriserade/20220402/living-with-a-changing-climate/
64	NZ's crumbling cliffs: It's not the biggest waves doing the most damage	https://www.nzherald.co.nz/nz/nzs-crumbling-cliffs-its-not-the-biggest-waves-doing-the-most-damage/EBVQ4TYB3IUZPOEPZMCIFJKD3A/
66	What is climate change adaptation and how do we do it?	https://www.stuff.co.nz/environment/climate-news/128459207/what-is-climate-change-adaptation-and-how-do-we-do-it

67	Familiar reforms part of new Government plan to adapt to a hotter world	https://www.stuff.co.nz/environment/climate-news/300573886/familiar-reforms-part-of-new-government-plan-to-adapt-to-a-hotter-world
68	New Zealand unveils plan to tackle climate crisis by adapting cities to survive rising seas	https://www.theguardian.com/world/2022/apr/27/new-zealand-unveils-plan-to-tackle-climate-crisis-by-adapting-cities-to-survive-rising-seas
70	Climate change: Proposed plan to adapt to 'unavoidable impacts'	https://www.1news.co.nz/2022/04/27/climate-change-proposed-plan-to-adapt-to-unavoidable-impacts/
71	NZ climate change adaptation plan to tackle costs and who pays as extreme weather events, managed retreat becomes reality	https://www.nzherald.co.nz/nz/nz-climate-change-adaptation-plan-to-tackle-costs-and-who-pays-as-extreme-weather-events-managed-retreat-becomes-reality/EKYJHURUOBUU73EQSZ63JJFUJQ/
72	Climate change adaptation plan out for consultation	https://www.rnz.co.nz/news/political/465963/climate-change-adaptation-plan-out-for-consultation
78	Dealing with climate change: Tough choices come next	https://www.rnz.co.nz/news/political/466103/dealing-with-climate-change-tough-choices-come-next
80	NZ sea level rising twice as fast	https://www.newsroom.co.nz/nz-sea-level-rising-twice-as-fast
81	Sea level rise: 'NZ cannot afford to protect everything we have built'	https://www.rnz.co.nz/news/national/466274/sea-level-rise-nz-cannot-afford-to-protect-everything-we-have-built
82	Rising risk: How our coast will be transformed	https://www.nzherald.co.nz/nz/rising-risk-how-our-coast-will-be-transformed/R24X3UURX7ESXCLKCGDSHFU2EU/
83	Rising sea levels - who wants to live in an octopus's garden?	https://www.nzherald.co.nz/nz/john-macdonald-rising-sea-levels-who-wants-to-live-in-an-octopuss-garden/RCR7ZYMI2N5KHVHKBIELPBIMEE/

84	Sea levels rising twice as fast as thought in New Zealand	https://www.rnz.co.nz/news/national/466262/sea-levels-rising-twice-as-fast-as-thought-in-new-zealand
161	A novel approach to stopping floods	https://www.newsroom.co.nz/sustainable-future/a-novel-approach-to-stopping-floods
163	On the coast, climate change touches everything	https://thespinoff.co.nz/partner/20-05-2022/on-the-coast-climate-change-touches-everything
165	Forced retreat: one New Zealand town's fate highlights coming fight over climate adaptation	https://www.theguardian.com/world/2021/oct/30/forced-retreat-one-new-zealand-towns-fate-highlights-coming-fight-over-climate-adaptation
166	Rebuild or relocate? Climate crisis leaves New Zealand coastal communities facing tough choice	https://www.theguardian.com/world/2021/oct/29/rebuild-or-relocate-climate-crisis-leaves-new-zealand-coastal-communities-facing-tough-choice
168	Preparing Southland for climate change	https://www.stuff.co.nz/southland-times/southland-top-stories/128534298/preparing-southland-for-climate-change
169	More than 1200 Invercargill and Bluff homes at risk from sea level rise	https://www.stuff.co.nz/southland-times/southland-top-stories/113307717/more-than-1200-invercargill-and-bluff-homes-at-risk-from-sea-level-rise#:~:text=Invercargill%20appears%20to%20be%20in,seriously%20as%20they%20future%20proof.
170	New Zealand sea level rise: Councils' $8b climate change warning	https://www.stuff.co.nz/environment/climate-news/110114994/this-moment-will-not-come-again--councils-8bn-climate-change-warning
173	Geo-engineering could be the answer to rising sea levels	https://www.stuff.co.nz/environment/climate-news/300604937/geoengineering-could-be-the-answer-to-rising-sea-levels
172	Nelson Airport 'reassessing' future with new sea-level rise data	https://www.rnz.co.nz/news/national/467438/nelson-airport-reassessing-future-with-new-sea-level-rise-data
171	Are houses on 'stilts' a good solution to more frequent flooding?	https://www.stuff.co.nz/life-style/homed/sustainable-living/125808584/are-houses-on-stilts-a-good-solution-to-more-frequent-flooding

ARTICLES FROM THE NETHERLANDS		
73	In face of rising sea levels the Netherlands 'must consider controlled withdrawal	https://www.vn.nl/rising-sea-levels-netherlands/
76	KNMI adjusts expected sea level rise in the Netherlands upwards: to 1.2 meters in 2100"	https://www.volkskrant.nl/nieuws-achtergrond/knmi-stelt-verwachte-zeespiegelstijging-nederland-naar-boven-bij-tot-1-2-meter-in-2100~b3c65cea/#:~:text=Als%20de%20wereld%20voortgaat%20op,die%20beperkt%20tot%2030%20centimeter.
77	1,2 of zelfs 2 meter: KNMI stelt verwachte zeespiegelstijging naar boven bij	https://nos.nl/collectie/13871/artikel/2403074-1-2-of-zelfs-2-meter-knmi-stelt-verwachte-zeespiegelstijging-naar-boven-bij
79	Met dubbele dijken verleng je leven in Randstad misschien wel 300 jaar'	https://nos.nl/artikel/2403128-met-dubbele-dijken-kun-je-leven-in-randstad-misschien-300-jaar-rekken
85	De Waddenzee kan verdrinken', zegt hoogleraar na rapport zeespiegelstijging	https://www.volkskrant.nl/nieuws-achtergrond/de-waddenzee-kan-verdrinken-zegt-hoogleraar-na-rapport-over-zeespiegelstijging~b5b88ee4/#:~:text=Dat%20gebeurt%20nu%20al%2C%20maar,rusten%3A%20die%20lopen%20dan%20gevaar.
86	Klimaat moet topprioriteit zijn voor kabinet	https://advance-lexis-com.ezproxy2.utwente.nl/document/?pdmfid=1516831&crid=cfda6807-126d-472c-a72b-73058803622c&pddocfullpath=%2Fshared%2Fdocument%2Fnews%2Furn%3AcontentItem%3A63XV-1991-DY4D-Y4RS-00000-00&pdcontentcomponentid=311971&pdteaserkey=sr0&pditab=allpods&ecomp=rz2yk&earg=sr0&prid=ba7c3b08-6b8b-4d8a-a219-10fb52c30098
87	Landen bereiden zich voor op hoogwater; zeespiegelstijging Kustverdediging Europa is rommelig	https://advance-lexis-com.ezproxy2.utwente.nl/document/?pdmfid=1516831&crid=60457967-dd38-4099-972d-38542888255f&pddocfullpath=%2Fshared%2Fdocument%2Fnews%2Furn%3AcontentItem%3A6201-R131-DY4D-Y3RW-00000-00&pdcontentcomponentid=311974&pdteaserkey=sr0&pditab=allpods&ecomp=rz2yk&earg=sr0&prid=5f21d848-248a-4927-9d42-80e23bcd4972
88	UvW roept nieuw kabinet op om klimaatverandering weer topprioriteit te maken	https://www.agraaf.nl/artikel/427613-uvw-roept-nieuwe-kabinet-op-klimaartverandering-weer-topprioriteit-te-maken/
90	Denk aan een ring van eilanden in de Noordzee om kust te beschermen'	https://advance-lexis-com.ezproxy2.utwente.nl/document/?pdmfid=1516831&crid=1f5d5185-a632-4edf-9e6e-1d263a7e638e&pddocfullpath=%2Fshared%2Fdocument%2Fnews%2Furn%3AcontentItem%3A63XR-M9X1-DYRY-X48T-00000-00&pdcontentcomponentid=259070&pdteaserkey=sr0&pditab=allpods&ecomp=rz2yk&earg=sr0&prid=4236188a-3b9f-48ba-9fbc-15be5c3f95d8

91	The Dijkzone housing plan takes into account a sea level rise of 3.5 metres. And if the water rises further than expected, measures can be taken against this, says Minister Hugo de Jonge	https://advance-lexis-com.ezproxy2.utwente.nl/document/?pdmfid=1516831&crid=4bb0d0ec-0364-4ccb-9ded-55ae61c08546&pddocfullpath=%2Fshared%2Fdocument%2Fnews%2Furn%3AcontentItem%3A64NS-B9M1-JBNJ-225N-00000-00&pdcontentcomponentid=471677&pdteaserkey=sr0&pditab=allpods&ecomp=rz2yk&earg=sr0&prid=6016d48b-ae50-4f73-a9b4-0fb0ca8036e6
92	Zuidwestelijke Delta in 2050 als eerste ter wereld klimaatbestendig: 'We weten wat de zee kan'	https://advance-lexis-com.ezproxy2.utwente.nl/document/?pdmfid=1516831&crid=acbd178c-b303-4a8b-9fc8-da88f4fe303e&pddocfullpath=%2Fshared%2Fdocument%2Fnews%2Furn%3AcontentItem%3A64C9-8B11-JBHV-K0YN-00000-00&pdcontentcomponentid=467106&pdteaserkey=sr0&pditab=allpods&ecomp=rz2yk&earg=sr0&prid=37637236-fab8-4a0f-baf5-e5ac9bac407e
94	Fijnmaziger computermodel voorspelt 25 procent minder zeespiegelstijging	https://www.volkskrant.nl/wetenschap/fijnmaziger-computermodel-voorspelt-25-procent-minder-zeespiegelstijging~b53d45a4/
95	De zee stijgt, dus het risico ook	https://www.nd.nl/nieuws/nederland/1065233/de-zee-stijgt-het-risico-ook-zolang-er-geen-overstromingen-zijn
96	Protection against sea level rise does not help against storm surges	https://advance-lexis-com.ezproxy2.utwente.nl/document/?pdmfid=1516831&crid=217318bf-efff-4ecc-89e9-c6aeb16c32ff&pddocfullpath=%2Fshared%2Fdocument%2Fnews%2Furn%3AcontentItem%3A6561-8V81-JBNC-73N9-00000-00&pdcontentcomponentid=311971&pdteaserkey=sr0&pditab=allpods&ecomp=rz2yk&earg=sr0&prid=a3ea9245-904b-49af-b80a-daba38f9bc8f
97	De stad mag niet verdrinken; klimaat Hoe voorkom je dat je hoofd wegzakt als de zeespiegel stijgt?	https://advance-lexis-com.ezproxy2.utwente.nl/document/?pdmfid=1516831&crid=d0c6479f-4bad-4fc7-94ef-ced93bee4196&pddocfullpath=%2Fshared%2Fdocument%2Fnews%2Furn%3AcontentItem%3A64RN-3D21-DY4D-Y2WG-00000-00&pdcontentcomponentid=311971&pdteaserkey=sr0&pditab=allpods&ecomp=rz2yk&earg=sr0&prid=a82aa3f2-2e06-44bb-8284-3959f6e2296d
98	Klimaatexperts: ‘Begin nú in Zeeland met het aanleggen van dubbele dijken’	https://www.bndestem.nl/zeeland/klimaatexperts-begin-nu-in-zeeland-met-het-aanleggen-van-dubbele-dijken~a34e6497/
99	Een huis onder water wonen	https://advance-lexis-com.ezproxy2.utwente.nl/document/?pdmfid=1516831&crid=0f9481dc-d4a5-49ed-82a3-6b4ee578ecb7&pddocfullpath=%2Fshared%2Fdocument%2Fnews%2Furn%3AcontentItem%3A652N-9C31-F108-D009-00000-00&pdcontentcomponentid=273960&pdteaserkey=sr0&pditab=allpods&ecomp=rz2yk&earg=sr0&prid=6d56abbc-3b0b-4351-9c49-cec2e39a6d05
101	Onderzoek klimaatverandering: geen enkel land doet	https://www.rtlnieuws.nl/nieuws/buitenland/artikel/5262945/klimaat-opwarming-aarde-glasgow-gambia

	genoeg, behalve Gambia	
102	Weer een klimaatrapport, wat staat erin?	https://advance-lexis-com.ezproxy2.utwente.nl/document/?pdmfid=1516831&crid=d4e53f48-152d-4930-b442-94d76164ad2b&pddocfullpath=%2Fshared%2Fdocument%2Fnews%2Furn%3AcontentItem%3A64WG-5S51-DYRY-X2KW-00000-00&pdcontentcomponentid=259070&pdteaserkey=sr0&pditab=allpods&ecomp=rz2yk&earg=sr0&prid=aa4a11c2-8fd8-4998-bb43-7139949096b7
103	Een slapende reus ontwaakt op Antarctica'; Glacioloog Stef Lhermitte vertelt over de smeltende 'doomsday'-gletsjer	https://www.topics.nl/-smelt-op-antarctica-is-een-slapende-reus-die-wakker-wordt-stef-lhermitte-over-de-doemdag-gletsjer-a16923705demorgen/9f4d6d643d3d6b43100109434508b0a4e65032d9e80f033cf812294b25fc5314/?referrerUserId=9b8b685f-5c16-4f76-abed-a74f6147c5ca
104	820.000 woningen gepland op plekken die gevaar lopen door klimaatverandering'r	https://advance-lexis-com.ezproxy2.utwente.nl/document/?pdmfid=1516831&crid=548c5c33-b92c-418f-8b94-07e8797af74a&pddocfullpath=%2Fshared%2Fdocument%2Fnews%2Furn%3AcontentItem%3A647N-YY61-DY0X-907J-00000-00&pdcontentcomponentid=467106&pdteaserkey=sr0&pditab=allpods&ecomp=rz2yk&earg=sr0&prid=d2599421-c050-4a11-bbdc-2e55a4ee4ce6
105	Delta Commissioner: 'New construction planned in risky places'	https://advance-lexis-com.ezproxy2.utwente.nl/document/?pdmfid=1516831&crid=2cc3efe4-abac-4279-b94a-32b8b3dba2c4&pddocfullpath=%2Fshared%2Fdocument%2Fnews%2Furn%3AcontentItem%3A647S-YKK1-JBNC-74RP-00000-00&pdcontentcomponentid=311974&pdteaserkey=sr0&pditab=allpods&ecomp=rz2yk&earg=sr0&prid=b98b2401-3173-4f16-8307-f04a2f616e73
106	Idee wisselpolders krijgt weinig bijval: 'Ontpolderen is niet dé oplossing'	https://advance-lexis-com.ezproxy2.utwente.nl/document/?pdmfid=1516831&crid=109fe84a-8993-45ef-899c-4b62892ff89b&pddocfullpath=%2Fshared%2Fdocument%2Fnews%2Furn%3AcontentItem%3A61VG-YFD1-JBHV-K2MP-00000-00&pdcontentcomponentid=467107&pdteaserkey=sr1&pditab=allpods&ecomp=rz2yk&earg=sr1&prid=c9b56ed8-1a57-4e7c-b168-2162166f58f6
107	Amersfoort aan Zee klinkt nog niet als een realistisch scenario	https://www.trouw.nl/opinie/amersfoort-aan-zee-klinkt-nog-niet-als-reeel-scenario~b64a21812/
108	KNMI: zeespiegel stijgt sneller dan verwacht	https://www.ad.nl/klimaat/knmi-in-rapport-zeespiegel-aan-nederlandse-kust-kan-sneller-stijgen-dan-eerder-werd-verwacht~ac180e69/
109	Hierdoor stijgt de zeespiegel aan de Nederlandse kust steeds sneller	https://www.rtlnieuws.nl/klimaat/artikel/5317858/zeespiegel-stijging-steeds-sneller-onderzoek-tu-delft-knmi-wind
110	De klimaatdreiging komt nu van alle kanten en dat vraagt om harde keuzes; Commentaar	https://www.nrc.nl/nieuws/2022/03/05/de-klimaatdreiging-komt-nu-van-alle-kanten-dat-vraagt-om-harde-keuzes-a4096844
111	Lijn door de pier voor de kust bij De Boekanier	https://advance-lexis-com.ezproxy2.utwente.nl/document/?pdmfid=1516831&crid=be735a07-69be-4ed2-9a55-0631bd3f99a9&pddocfullpath=%2Fshared%2Fdocument%2Fnews%2Furn%3AcontentItem%3A64T4-PGX1-JC8X-6550-00000-00&pdcontentcomponentid=256089&pdteaserkey=sr1&pditab=allpods&ecomp=rz2yk&earg=sr1&prid=84107b0a-77f1-4706-8d5b-f7ce70b10fa9

112	Stijging zeespiegel van 1.80 m deze eeuw niet uitgesloten	https://www.nporadio1.nl/nieuws/binnenland/189f41a4-d271-4411-9ef8-9b2211f911ce/stijging-zeespiegel-van-1-80-m-deze-eeuw-niet-uitgesloten
113	KNMI: de zeespiegel stijgt harder dan gedacht	https://www.parool.nl/amsterdam/knmi-de-zeespiegel-stijgt-harder-dan-gedacht~bdf857be5/#:~:text=In%20een%20veel%20optimistischer%20IPCC,39%20tot%2094%20centimeter%20geschat.
114	Grote ijsplaat op Antarctica dreigt binnen vijf jaar te versplinteren	https://www.rtlnieuws.nl/nieuws/buitenland/artikel/5274440/ijsplaat-antarctica-versplinteren-afbreken-zeespiegel-stijging
115	IPCC-rapport alarmerend voor Nederland	https://nos.nl/artikel/2393306-klimaatexperts-ipcc-rapport-alarmerend-voor-nederland
116	IPCC: ongeëvenaarde klimaatverandering leidt tot fors meer weersextremen	https://nos.nl/collectie/13871/artikel/2393226-ipcc-ongeevenaarde-klimaatverandering-leidt-tot-fors-meer-weersextremen
117	Current climate change is 'undeniably' caused by humans. But suppose there were no humans, how would the climate develop? --	https://www.volkskrant.nl/wetenschap/klimaatverandering-zonder-mensen-de-invloed-van-de-kosmos~b62f154c/
118	Is wonen op het water het antwoord op de stijgende zeespiegel? Nieuw groot onderzoek moet dat aantonen	https://eenvandaag.avrotros.nl/item/is-wonen-op-het-water-het-antwoord-op-stijgend-zeewater-nieuw-groot-onderzoek-moet-dat-aantonen/
119	More fine-grained computer model predicts 25 percent less sea level rise	https://www.volkskrant.nl/wetenschap/fijnmaziger-computermodel-voorspelt-25-procent-minder-zeespiegelstijging~b53d45a4/
120	Sea level rises, soil sinks; do we still have to build in the Green Heart?	https://www.nu.nl/klimaat/6150389/zeespiegel-stijgt-bodem-zakt-moeten-we-nog-wel-bouwen-in-het-groene-hart.html
121	Faster Antarctic melting poses a major	https://www.nu.nl/klimaat/6149888/snellere-afsmelting-antarctica-vormt-grote-bedreiging-voor-nederland.html

	threat to the Netherlands	
122	New dike in the sea must protect the Netherlands against rising sea levels	https://www.omroepzeeland.nl/nieuws/13897124/nieuwe-dijk-in-zee-moet-nederland-beschermen-tegen-stijgende-zeespiegel
123	What to do with houses that will soon be far below sea level?	https://www.nu.nl/wonen/6167444/wat-te-doen-met-woningen-die-straks-ver-onder-zeeniveau-liggen.html
124	Rutte: climate report is very worrying	https://www.ad.nl/politiek/rutte-klimaatrapport-is-zeer-zorgelijk~a78b2e22/
125	Jakarta is niet de enige stad die in zee zinkt: 'We zijn onszelf omlaag aan het pompen, op mondiale schaal'	https://www.volkskrant.nl/nieuws-achtergrond/jakarta-is-niet-de-enige-stad-die-in-zee-zinkt-we-zijn-onszelf-omlaag-aan-het-pompen-op-mondiale-schaal~b9d7be55/
126	Higher dikes are not a solution for the Netherlands in the event of stronger warming	https://www.nu.nl/klimaat/6120669/hogere-dijken-voor-nederland-geen-oplossing-bij-sterkere-opwarming.html
128	Solution to housing shortage and rising sea level: build a floating city . And that turns out to be relatively easy	https://www.volkskrant.nl/wetenschap/oplossing-woningnood-en-stijgende-zeespiegel-bouw-een-drijvende-stad-en-dat-blijkt-relatief-een-makkie~bda95c44/
129	Dutch dikes will soon be able to handle higher sea levels too	https://nos.nl/artikel/2206084-nederlandse-dijken-kunnen-hogere-zeespiegel-straks-ook-aan
130	Most Dutch people not prepared for flooding	https://nos.nl/artikel/2080183-meeste-nederlanders-niet-voorbereid-op-overstroming
131	'Don't wait for the next flood, but look higher'	https://www.trouw.nl/duurzaamheid-economie/wacht-niet-op-een-volgende-watersnood-maar-zoek-het-hogerop~b5646bea9/
132	Delta Commissioner hopes that 'Limburg' has opened its eyes. 'Climate change requires more money	https://www.trouw.nl/duurzaamheid-economie/deltacommissaris-hoopt-dat-limburg-de-ogen-heeft-geopend-door-klimaatverandering-is-meer-geld-nodig-voor-waterbeheer~bfe6fdc5/

	for water management'	
133	Moving with the water that rises or suddenly falls	https://www.trouw.nl/duurzaamheid-economie/meebewegen-met-het-water-dat-stijgt-of-opeens-valt~bbb2eb5b/
134	Bouwen in groene-hart onverstandig toch komt er een complete nieuw dorp	https://www.nu.nl/klimaat/6150662/bouwen-in-groene-hart-onverstandig-toch-komt-er-een-compleet-nieuw-dorp.html#:~:text=Nog%20meer%20bouwen%20in%20het,Dorp'%20een%20heel%20nieuwe%20plaats.
135	Klimaatexpert Van-den-Hurk Nederland moet zich weerbaarder maken	https://frieschdagblad.nl/samenleving/Klimaatexpert-Van-den-Hurk-Nederland-moet-zich-weerbaarder-maken-26981056.html
136	Deskundigen: 'Grevelingenmeer moet zoet worden, we mogen niet langer een andere kant uit kijken'	https://www.omroepzeeland.nl/nieuws/14438387/deskundigen-grevelingenmeer-moet-zoet-worden-we-mogen-niet-langer-een-andere-kant-uit-kijken
137	After us the deluge	https://revu.nl/artikel/449998/na-ons-de-zondvloed
138	Rapport: Europese kustplaatsen krijgen de volle laag door stijgende zeespiegel	https://www.rtlnieuws.nl/nieuws/nederland/artikel/5291413/ipcc-klimaat-opwarming-aarde-milieu
139	I said goodbye to the Wadden Sea with wadloper Wim	https://www.vice.com/nl/article/akvze5/ik-nam-afscheid-van-de-waddenzee-met-wadloper-wim
140	New climate report: 'Major polluters set fire to our only house'	https://nos.nl/collectie/13871/artikel/2419267-nieuw-klimaatrapport-grote-vervuilers-stichten-brand-in-ons-enige-huis
141	Summit on adaptations to a new climate; what should the Netherlands prepare for?	https://nos.nl/artikel/2365844-top-over-aanpassingen-aan-nieuw-klimaat-waar-moet-nederland-zich-op-voorbereiden
142	KNMI: sea level off the Dutch coast is rising 1.5 times faster due to climate change	https://www.limburger.nl/cnt/dmf20220120_94475571
143	KNMI: Sea level rise off the Dutch coast	https://www.nu.nl/klimaat/6163142/knmi-zeespiegelstijging-voor-nederlandse-kust-dreigt-fors-te-versnellen.html

	threatens to accelerate sharply	
144	Researchers: Limit housing development in coastal areas due to sea level rise	https://www.nu.nl/klimaat/6158201/onderzoekers-beperk-woningbouw-kustgebieden-vanwege-zeespiegelstijging.html#:~:text=Onderzoekers%3A%20Beperk%20woningbouw%20kustgebieden%20vanwege%20zeespiegelstijging,-21%20september%202021&text=Het%20aantal%20mensen%20dat%20risico,door%20bevolkingsgroei%20in%20kwetsbare%20kustgebieden.
145	Researcher sea level rise: The Netherlands is like a bathtub	https://advance-lexis-com.ezproxy2.utwente.nl/document/?pdmfid=1516831&crid=fce6f8bf-7211-4339-941a-dd2d2d57ba6c&pddocfullpath=%2Fshared%2Fdocument%2Fnews%2Furn%3AcontentItem%3A63B7-H3N1-JBNJ-23K3-00000-00&pdcontentcomponentid=471677&pdteaserkey=sr2&pditab=allpods&ecomp=rz2yk&earg=sr2&prid=aa7c4f57-d161-41e5-8195-f0e221af4852
146	Alarmistic KNMI report on sea level in the North Sea, but there is also criticism: 'Extremely remarkable'	https://www.telegraaf.nl/nieuws/1082763524/alarmistisch-knmi-rapport-zeespiegel-noordzee-maar-kritiek-is-er-ook-uiterst-merkwaardig#:~:text=Als%20de%20wereldwijde%20uitstoot%20van,maandag%20gepubliceerde%20rapport%20Klimaatsignaal'21.
147	Oceanographer's 'delusion' about damming the North Sea is getting serious	https://www.limburger.nl/cnt/dmf20210816_92622619
148	Slangen: The Netherlands is like a bathtub	https://dvhn.nl/extra/Onderzoeker-Aim%C3%A9e-Slangen-over-zeespiegelstijging-Nederland-is-als-een-badkuip-26981164.html
149	Finger on the pulse of the Wadden area	https://frieschdagblad.nl/opinie/Vinger-aan-de-pols-van-het-Waddengebied-27127057.html
150	According to experts, the municipality must stop construction in low-lying river areas	https://www.nu.nl/klimaat/6161626/gemeente-moet-volgens-experts-stoppen-met-bouw-in-laaggelegen-riviergebied.html
151	The power of salt marsh - Towards a climate-proof coast in the Ems-Dollard	https://www.groene.nl/artikel/de-kracht-van-de-kwelder
152	Delta knowledge is Dutch export success	https://www.volkskrant.nl/nieuws-achtergrond/deltakennis-is-nederlands-exportsucces~b923037f/
153	Nieuwe satelliet gaat zeespiegelstijging beter monitoren	https://nos.nl/artikel/2357431-nieuwe-satelliet-gaat-zeespiegelstijging-beter-monitoren
155	Proef met zeegras in de Waddenzee verloopt onverwacht succesvol	https://nos.nl/artikel/2345872-proef-met-zeegras-in-de-waddenzee-verloopt-onverwacht-succesvol

157	Wadden area threatened by sea level rise	https://nos.nl/artikel/2403424-waddengebied-bedreigd-door-zeespiegelstijging
158	'Letter to all Dutch people' draws attention to sea level rise	https://nos.nl/artikel/2320790-brief-aan-alle-nederlanders-vraagt-aandacht-voor-zeespiegelstijging
159	Does the Netherlands face up to its own vulnerability to climate change?	https://www.nu.nl/nu-klimaat/6160712/ziet-nederland-de-eigen-kwetsbaarheid-voor-klimaatverandering-wel-onder-ogen.html
160	The Netherlands should be a frontrunner in reducing CO2 emissions	https://www.volkskrant.nl/columns-opinie/nederland-zou-juist-een-voorloper-moeten-zijn-bij-het-terugdringen-van-de-co2-uitstoot~be0f6537/
174	Will the Netherlands still be habitable in the future if the sea level continues to rise so rapidly?	https://www.parool.nl/nederland/is-nederland-in-de-toekomst-nog-wel-bewoonbaar-als-de-zeespiegel-zo-snel-blijft-stijgen~b7b0a1c0/
176	Het toekomstige Amsterdam ligt in zee, en dat hoeft geen ramp te zijn	https://www.parool.nl/amsterdam/het-toekomstige-amsterdam-ligt-in-zee-en-dat-hoeft-geen-ramp-te-zijn~b5fac17a/
177	Melting of Greenland ice sheet makes sea rise 27.5 cm anyway	https://www.nrc.nl/nieuws/2022/08/30/smelten-van-groenlandse-ijskap-laat-zee-hoe-dan-ook-275-cm-stijgen-a4140261
178	Onderzoeker zeespiegelstijging: Nederland is als een badkuip	https://www.ad.nl/binnenland/onderzoeker-zeespiegelstijging-nederland-is-als-een-badkuip~aa7af0a90/
179	Het Waddengebied krijgt het zwaar, we moeten de menselijke druk tot een minimum beperken | Opinie	https://frieschdagblad.nl/opinie/Het-Waddengebied-krijgt-het-zwaar-we-moeten-de-menselijke-druk-tot-een-minimum-beperken-27078938.html
180	Ook aan de Nederlandse kust stijgt	https://www.ad.nl/binnenland/ook-aan-nederlandse-kust-stijgt-zeespiegel-sneller-volgens-studie-tu-delft~a7159719/

	de zeespiegel sneller, blijkt uit onderzoek van de TU Delft	
181	Don't panic, sea level rise of 8 meters is very unlikely'	https://www.ad.nl/politiek/geen-paniek-zeespiegelstijging-van-8-meter-is-zeer-onwaarschijnlijk~ac4c3f77/