

The Framing of Science News



Scientists, communication officers and journalists
as intermediaries in newspaper coverage of ocean
research

AIKE VONK

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Intermediaries in Newspaper Coverage of Ocean Research

Aike Vonk

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The Framing of Science News

Scientists, Communication Officers and Journalists as
Intermediaries in Newspaper Coverage of Ocean Research

De Framing van Wetenschapsnieuws

Wetenschappers, Communicatiemedewerkers en Journalisten als
Tussenpersonen in de Berichtgeving over Oceaanonderzoek in
Kranten

Met een samenvatting in het Nederlands

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Summary

"The world is drowning in plastic. Will countries dare to say: enough is enough?" – NRC, Nov. 22, 2024. *"Large amounts of microplastics found in human brains: 'As much as a plastic spoon'"* – AD, Feb. 5, 2025. *"World in \$1.5 trillion 'plastic crisis' affecting the health of everyone from babies to the elderly, report warns"* – The Guardian, Aug. 4, 2025. *"Ocean chock-full of nanoplastics: 75 skyscrapers' worth of plastic in the top layer of the Atlantic Ocean alone"* – Volkskrant, July 9, 2025. *"Plastic, Plastic, Plastic Everywhere"* – The New York Times, February 24, 2026. *"Chronic ocean warming leads to 'alarming' loss of marine life, study finds"* – The Guardian, February 25, 2026.

The media regularly report on plastic pollution in the ocean and the risks it poses to ecosystems and human health. Because most people have little direct contact with science in their daily lives, they often rely on mediated sources such as newspapers for information. The topics that appear in the news and the way they are presented therefore influence which issues the public considers important and how scientific information is interpreted. For example, many people perceive plastic pollution as the greatest threat to the ocean, whereas scientists often identify climate change as the most significant risk. Such discrepancies between media coverage and scientific assessments can shape how ocean issues are understood and which solutions receive public support.

Because scientific research is often complex, it cannot be communicated directly to a general audience and therefore needs to be adapted before it appears in newspapers. Framing and narratives are commonly used to make science more understandable and relatable. Framing highlights specific aspects of research, such as problems, causes, solutions, or moral considerations, helping readers interpret the information more easily. Narratives place abstract knowledge in a human perspective, bridging the gap between complex subjects such as science and everyday experience, thereby increasing public interest and engagement.

Scientists, press officers, and journalists work together to translate scientific research into accessible newspaper articles. Research institutions often produce press releases that summarise

scientific studies in plain language. These are typically written by communication departments in close collaboration with researchers and distributed to journalists to spark interest and generate media attention. When journalists consider the research relevant, they write a newspaper article. In this process, they often consult the peer-reviewed publication and ask independent experts to interpret and verify research findings.

However, due to time pressure and budget cuts, specialist science journalists are becoming increasingly rare, meaning that general journalists report on science more frequently. These journalists may lack the expertise to fully verify or interpret scientific claims and often have limited time to conduct extensive background research or consult external experts. As a result, press releases are sometimes reproduced partly or even verbatim in news articles, a practice known as *churnalism*. Consequently, press releases play an increasingly important role in shaping how scientific research appears in newspapers and thereby how science reaches the public.

Against this backdrop, this thesis examines why certain studies appear in newspapers, how they are framed, and what role scientists, press officers and journalists play in this communication process. The research focuses specifically on ocean science, a subject that remains relatively obscure and abstract to many people, despite the vital role it plays in keeping our planet habitable. Understanding how ocean research reaches the public can help to make science communication more effective and relevant. This enables people to better assess the significance of research findings, and this knowledge can contribute to public awareness and policy-making.

In Chapter 2, I examine how research institutions communicate ocean science in press releases. The research focuses on two key environmental issues: plastic pollution and climate change. Both pose major threats to the ocean but differ in terms of public attention and understanding. In press releases, plastic pollution is primarily presented as a biological and health issue, with an emphasis on solutions and social responsibility. Climate change in the ocean is primarily framed as an environmental problem with socio-economic consequences, placing the responsibility for mitigation with politics. The narratives personalise scientific research by placing researchers at

the forefront but pay little attention to the social dimensions of ocean issues, which are deemed important to raise awareness and encourage pro-environmental behaviour.

In Chapter 3, I examine which factors determine whether scientific research becomes news. The study focuses on ocean plastic research, as this topic receives significant media attention and can thus provide insights into how research in other ocean-related fields can be presented in a more newsworthy manner. The analysis shows that the newsworthiness of press releases is enhanced when the research promises to have a major impact, is published in prestigious journals such as *Nature* or *Science*, and concerns negative or alarming news. Mentioning scientific details, such as methods and limitations, does not reduce the news value of press releases. Furthermore, churnalism appears to be common, as newspaper articles regularly reproduce passages from press releases verbatim, which highlights their strong influence on science news.

To investigate which elements of press releases are reproduced in newspaper articles, I analyse in Chapters 4 and 5 how the content of press releases shapes the framing and narratives in subsequent newspaper articles. Chapter 4 shows that press releases often explain scientific methods or uncertainties but rarely discuss research limitations. When press releases explicitly contain this scientific process information, journalists are more likely to include it in newspaper articles. Chapter 5 shows that journalists regularly adopt the framing and narratives from press releases and often present researchers as central actors. At the same time, the societal context and local relevance of ocean issues receive little attention. Furthermore, quotes from scientists directly influence how the story is communicated in newspaper articles, as these are often reproduced verbatim, whilst other actors play only a limited role. Moreover, scientific studies are almost never validated by an external researcher.

Although the findings in Chapters 3–5 demonstrate how press releases influence newspaper coverage of ocean science, it remains unclear exactly how press releases and newspaper articles are created and how scientists, press officers and journalists shape this communication. In Chapter 6, I investigate this through interviews with

all three groups. The process often begins with scientists drawing attention to new publications or research findings. Press officers and journalists then assess these signals for newsworthiness. In addition to traditional news values, such as impact, negative news and societal relevance, normative motives play a role, like the desire to raise public awareness of ocean issues. Besides normative motives, also people's professional role perceptions, communication objectives, the intended target audience, format constraints and organisational context influence how science is communicated. I summarise these factors and their interactions in a model showing that science communication is not a linear process but an interactive one in which scientists, press officers, and journalists jointly shape how ocean science is presented in newspapers.

The studies show that press releases play a central role in determining which research becomes news and how it is subsequently framed. Prestige strongly influences this selection, as journalists are more likely to pay attention to research from influential countries such as the United States or the United Kingdom, or to studies from well-known universities and renowned researchers (Chapter 6). Similarly, publications in leading journals such as *Nature* and *Science* increase the newsworthiness of research (Chapter 3). As a result, media coverage is shaped not only by the quality or societal relevance of research, but also by the status of the people and institutions involved. This can reinforce existing inequalities within science, as researchers from lesser-known universities or from countries with fewer resources receive less media attention. Consequently, the diversity of voices in both science and news coverage remains limited.

The strong influence of press releases on newspaper construction entails a responsibility for scientists, press officers, and journalists. Research institutions can, for example, develop internal guidelines for communicating research in press releases, such as highlighting study limitations, critically evaluating strong claims, and handling quotations with care. Journalists can contribute to a more diverse representation of science by being mindful of whom they quote and by reflecting on the influence press releases have on their news selection. At the same time, churnalism can lead to standardised communication in which local, cultural, and societal differences are

overlooked. This makes it even more important for scientists and research institutions to interpret research in press releases not only scientifically but also socially, placing findings within a broader context.

Framing does not begin solely with journalists but often starts with the scientists who first communicate research findings. All stakeholders can therefore consciously influence how ocean science is presented in the press. By presenting research findings not merely as scientific facts, but also by placing them within a broader societal context, ocean science can reach the public in a more relevant and understandable way. This can in turn influence how people interpret ocean-related issues, which risks they consider important, and to what extent they are prepared to support measures to protect ocean health.

The Framing of Science News

Samenvatting

"De wereld verzuipt in plastic. Durven landen te zeggen: genoeg is genoeg?" – NRC, 22 Nov 2024. *"Grote hoeveelheid microplastics gevonden in menselijke hersenen: 'Evenveel als plastic lepel'"* – AD, 5 Feb 2025. *"Wereld in 'plasticcrisis' van 1,5 biljoen dollar die de gezondheid van baby's tot ouderen aantast, waarschuwt rapport"* – The Guardian, 4 Aug 2025. *"Oceaan zit tjokvol nanoplastic: alleen al in top laag Atlantische Oceaan 75 wolvenkrabbers aan plastic"* – Volkskrant, 9 Juli 2025. *"Plastic, Plastic, overall Plastic"* – The New York Times, 24 Feb 2026. *"Chronische opwarming van de oceanen leidt tot 'ontstellend' verlies aan zeeleven, blijkt uit onderzoek"* – The Guardian, 25 Feb 2026.

In de media verschijnen regelmatig berichten over grote hoeveelheden plastic in de oceaan en de gevaren hiervan voor de natuur en onze gezondheid. Omdat mensen in hun dagelijks leven meestal weinig direct contact hebben met wetenschap, krijgen zij hun informatie vaak via de media, zoals kranten. Welke onderwerpen in de krant verschijnen en hoe ze worden gepresenteerd, beïnvloedt daarom welke onderwerpen wij belangrijk vinden en hoe we wetenschappelijke informatie interpreteren. Zo denken veel mensen dat plasticvervuiling de grootste bedreiging voor de oceaan vormt, terwijl wetenschappers klimaatverandering vaak als de belangrijkste bedreiging zien. Dit verschil tussen media-aandacht en publieke perceptie kan invloed hebben op hoe oceaanproblemen worden begrepen en welke strategieën worden gesteund om deze aan te pakken.

Omdat wetenschappelijk onderzoek vaak complex is, kan deze informatie niet rechtstreeks aan een breed publiek worden overgebracht, maar is er een vertaalslag nodig voordat onderzoek in de krant verschijnt. Hierbij worden framing en narratieven gebruikt om wetenschap begrijpelijker en herkenbaarder te maken. Framing legt de nadruk op specifieke aspecten van onderzoek, zoals problemen, oorzaken, oplossingen of morele overwegingen, zodat lezers de informatie gemakkelijker kunnen interpreteren. Narratieven plaatsen abstracte kennis in een menselijk perspectief, verkleint de afstand tot complexe onderwerpen zoals wetenschap en vergroot zo de interesse en betrokkenheid van het publiek.

Wetenschappers, persvoorlichters en journalisten zorgen samen voor de vertaalslag van wetenschappelijk onderzoek naar een begrijpelijk krantenartikel. Onderzoeksinstituten schrijven persberichten waarin wetenschappelijke artikelen in toegankelijke taal worden samengevat. Vaak stellen communicatieafdelingen deze persberichten op in nauwe samenwerking met de onderzoekers. Vervolgens verspreiden ze de persberichten naar journalisten om hun interesse te wekken en media-aandacht voor het onderzoek te genereren. Wanneer journalisten het onderzoek relevant vinden, schrijven zij een krantenartikel, waarbij ze het peer-reviewed artikel raadplegen en vaak ook onafhankelijke experts vragen om het onderzoek te duiden en te controleren.

Door tijdsdruk en bezuinigingen verdwijnen gespecialiseerde wetenschapsjournalisten steeds vaker, waardoor algemeen journalisten over wetenschap berichten. Deze journalisten hebben soms minder kennis om wetenschappelijke claims volledig te controleren of te duiden. Ook hebben zij niet altijd de tijd om gedegen onderzoek te doen en externe experts te raadplegen. Hierdoor nemen zij persberichten soms gedeeltelijk of zelfs volledig over in krantenartikelen, een praktijk die ook wel *churnalism* wordt genoemd. Als gevolg spelen persberichten een steeds grotere rol in hoe wetenschappelijk onderzoek in kranten verschijnt en hoe wetenschap het publieke domein bereikt.

Tegen deze achtergrond onderzoek ik in dit proefschrift waarom bepaalde studies in de krant verschijnen, hoe ze daarin worden geframed en welke rol wetenschappers, persvoorlichters en journalisten spelen in dit communicatieproces. Het onderzoek richt zich specifiek op oceaanwetenschap, een onderwerp dat voor veel mensen relatief onzichtbaar en abstract blijft, ondanks de belangrijke rol die het speelt in het leefbaar houden van onze planeet. Inzicht in hoe oceaanonderzoek het publiek bereikt, kan helpen om wetenschapscommunicatie effectiever en relevanter te maken. Zo kunnen mensen de betekenis van onderzoeksresultaten beter beoordelen en kan deze kennis bijdragen aan maatschappelijke bewustwording en beleidsvorming.

In hoofdstuk 2 laat ik zien hoe onderzoeksinstituten oceaanwetenschap communiceren in persberichten. Het onderzoek

richt zich op twee belangrijke milieuthema's: plasticvervuiling en klimaatverandering. Beide vormen grote bedreigingen voor de oceaan, maar verschillen in publieke aandacht en begrip. In persberichten wordt plasticvervuiling vooral gepresenteerd als een biologisch en gezondheidsprobleem, met nadruk op oplossingen en maatschappelijke verantwoordelijkheid. Klimaatverandering in de oceaan komt vooral naar voren als een milieuprobleem met sociaaleconomische gevolgen, waarbij politieke verantwoordelijkheid voor mitigatie centraal staat. De narratieven personaliseren wetenschappelijk onderzoek door onderzoekers centraal te stellen, maar besteden weinig aandacht aan de sociale dimensies van oceaanproblemen, die juist belangrijk zijn voor het vergroten van bewustwording.

In hoofdstuk 3 onderzoek ik welke factoren bepalen of wetenschappelijk onderzoek nieuws wordt. Het onderzoek richt zich op oceaanplasticonderzoek, omdat dit onderwerp veel media-aandacht krijgt en zo inzicht kan geven over hoe onderzoek in andere oceaandomeinen nieuwswaardiger kan worden gepresenteerd. De analyse laat zien dat de nieuwswaarde van persberichten wordt vergroot wanneer het onderzoek een grote impact belooft te hebben, gepubliceerd is in prestigieuze tijdschriften zoals *Nature* of *Science* en gaat over negatief of alarmerend nieuws. Het vermelden van wetenschappelijke details, zoals methoden en beperkingen, verlaagt de nieuwswaarde van persberichten niet. Bovendien blijkt churnalism vaak voor te komen, aangezien krantenartikelen met regelmaat passages uit persberichten letterlijk overnemen, wat de sterke invloed van persberichten op wetenschapsnieuws benadrukt.

Om te onderzoeken welke onderdelen van persberichten in krantenartikelen terugkomen, analyseer ik in hoofdstukken 4 en 5 hoe de inhoud van persberichten framing en narratieven stuurt. Hoofdstuk 4 laat zien dat persberichten vaak uitleg geven over wetenschappelijke methoden of onzekerheden, maar zelden beperkingen van het onderzoek bespreken. Wanneer persberichten expliciet procesinformatie bevatten, nemen journalisten deze wel vaker over. Hoofdstuk 5 toont dat journalisten framing en narratieven uit persberichten regelmatig overnemen en onderzoekers vaak als centrale actoren presenteren. Tegelijkertijd krijgen sociale context,

lokale relevantie en de maatschappelijke betekenis van oceaanproblemen weinig aandacht. Citaten van wetenschappers beïnvloeden bovendien direct hoe het verhaal in de krant wordt weergegeven, omdat deze vaak letterlijk worden overgenomen, terwijl andere actoren maar beperkt een rol spelen in krantenartikelen en studies bijna nooit worden gevalideerd door een externe onderzoeker.

Hoewel de resultaten in hoofdstukken 3-5 laten zien hoe persberichten krantenberichtgeving over oceaanwetenschap beïnvloeden, blijft onduidelijk hoe persberichten en krantenartikelen precies tot stand komen en hoe wetenschappers, persvoorlichters en journalisten deze communicatie vormgeven. In hoofdstuk 6 onderzoek ik dit via interviews met alle drie de groepen. Het proces begint vaak bij wetenschappers die nieuwe publicaties of onderzoeksresultaten onder de aandacht brengen. Persvoorlichters en journalisten beoordelen deze signalen vervolgens op nieuwswaarde. Naast klassieke nieuwswaarden, zoals impact, negatief nieuws en wetenschappelijke of maatschappelijke relevantie, spelen ook normatieve motieven een rol, bijvoorbeeld de wens om maatschappelijke aandacht te creëren voor oceaanproblematiek. Naast normatieve motieven beïnvloeden ook andere factoren de inhoud van communicatie, zoals professionele rolopvattingen, communicatiedoelen, de beoogde doelgroep, formatbeperkingen en organisatorische context. Ik vat deze factoren en hun onderlinge invloed samen in een model dat laat zien dat wetenschapscommunicatie geen lineair proces is, maar een interactief proces waarin wetenschappers, persvoorlichters en journalisten samen bepalen hoe oceaanwetenschap in de media verschijnt.

De studies laten zien dat persberichten een centrale rol spelen bij de selectie van welk onderzoek het nieuws haalt en hoe dit nieuws vervolgens wordt geframed. Prestige beïnvloedt deze selectie sterk: journalisten besteden vaker aandacht aan onderzoek uit invloedrijke landen, zoals de Verenigde Staten of het Verenigd Koninkrijk, aan studies van bekende universiteiten en gerenommeerde onderzoekers (hoofdstuk 6) en aan publicaties in toonaangevende tijdschriften zoals *Nature* en *Science* (hoofdstuk 3). Daardoor wordt mediaberichtgeving niet alleen bepaald door de kwaliteit of maatschappelijke relevantie van onderzoek, maar ook door de status van de betrokken instellingen. Dit kan bestaande ongelijkheden binnen de wetenschap versterken

omdat onderzoekers van minder bekende universiteiten of uit landen met minder middelen minder media-aandacht krijgen. Hierdoor blijft de diversiteit aan stemmen in zowel de wetenschap als het nieuws beperkt.

De grote invloed van persberichten brengt verantwoordelijkheid met zich mee voor wetenschappers, persvoorlichters en journalisten. Onderzoeksinstellingen kunnen bijvoorbeeld interne richtlijnen opstellen voor het rapporteren over onderzoek in persberichten, zoals het benoemen van beperkingen, het kritisch valideren van sterke beweringen en het zorgvuldig omgaan met citaten. Journalisten kunnen bijdragen aan een diverser beeld van wetenschap door bewust te zijn van wie zij citeren en van de invloed die persberichten hebben op hun selectie van nieuws. Tegelijkertijd kan churnalism leiden tot gestandaardiseerde communicatie, waarbij lokale, culturele en sociale verschillen vaak buiten beschouwing blijven. Dit maakt het des te belangrijker dat wetenschappers en onderzoeksinstellingen onderzoek in persberichten niet alleen wetenschappelijk, maar ook maatschappelijk duiden en in een bredere context plaatsen.

Framing begint niet alleen bij journalisten, maar vaak al bij wetenschappers die het eerste signaal van onderzoek geven. Alle betrokken actoren kunnen daarom bewust beïnvloeden hoe oceanwetenschap in de krant wordt gepresenteerd. Door onderzoeksresultaten niet alleen als wetenschappelijke feiten te presenteren, maar ook te plaatsen in een sociale en maatschappelijke context, kan oceanwetenschap het publiek relevanter en begrijpelijker bereiken. Dit kan vervolgens beïnvloeden hoe mensen oceanproblemen interpreteren, welke risico's zij als belangrijk zien en in hoeverre zij bereid zijn maatregelen ter bescherming van de ocean te steunen.

The Framing of Science News

Chapter 1 Introduction

1.1 Positionality

It is my personal belief that science helps our society progress and can improve all our lives, as it helps us understand and tackle major societal challenges and forms an important basis for evidence-based decision-making. However, the effective use of scientific knowledge depends on public trust in science, scientists, and scientific institutions. Research shows that when this trust is present, people are more inclined to follow scientific advice and support policies based on scientific evidence (Algan et al., 2021; Sturgis et al., 2021). This makes that trust in science plays an important role in addressing global challenges such as climate change, where people who have more trust in scientists are more inclined to take action (Cologna & Siegrist, 2020).

General trust in scientists and scientific methods is relatively high worldwide (Cologna et al., 2025). The same is true in the Netherlands, although the picture is more nuanced. While average levels of trust have increased since 2021, the proportion of people with low trust in science has also grown (Rathenau Instituut, 2025). This is important, because even a relatively small group of sceptics can influence how scientific evidence is weighed in policy and societal decision-making, particularly when these voices are strongly represented in the media or come from individuals in influential positions (Toff, 2018; Franta, 2022). Moreover, trust in science can be affected by misinformation and disinformation, which challenges the credibility and authority of scientific knowledge (Walchenbach & Van der Vlugt, 2024; West & Bergstrom, 2021; Roozenbeek *et al*, 2020).

The ways in which scientific knowledge reaches the public domain becomes increasingly important, as most people have little direct contact with science in their daily lives and therefore learn about it primarily through mediated sources, such as news media (Mede et al., 2025). Communication about science thus plays an important role in maintaining and strengthening public trust. My personal belief is not that this science communication should aim to convince everyone of the value of science or to provide everyone with a comprehensive understanding of how science works. That choice ultimately lies with each individual. However, I do believe that everyone has the right to

reliable information that helps them understand the world around them. In my view, science is one of the most reliable sources of knowledge we have.

Based on this conviction, my research focuses on how scientific knowledge reaches the public domain through mediated sources. I study how scientific findings are translated into newspaper articles, as these remain an important source of science news worldwide (Mede et al., 2025) and function both as a mirror of public debate and as actors that helps shape it (Pinto & Castro, 2021). With this thesis, I aim to provide insights into why certain scientific studies make the news, how these studies are translated in a journalistic context, and what role different actors play within this communication process.

1.2 Ocean science communication as case study

This thesis examines how science reaches the public domain through newspapers, using ocean science as a case study. Ocean science makes for a particularly relevant case because it is both of great societal importance and possesses multiple communication challenges. The ocean plays an important role in sustaining life on Earth, as it regulates global climate, supports biodiversity and provides millions of people worldwide with food, livelihoods and economic benefits. At the same time, ocean health is increasingly threatened by climate change, overexploitation and pollution, including from plastic (Abram et al., 2022; van Leeuwen et al., 2022). Raising public awareness of these issues is therefore considered important for building public support for ocean protection (Guan et al., 2023).

The way ocean issues are presented in newspapers influences how the public perceives and understands marine risks (Kramm et al., 2022). Plastic pollution, for example, receives considerably more attention in both news media and public debate than ocean climate change (Pinto et al., 2020; Thompson-Saud et al., 2018; Tiller et al., 2019). This imbalance in media attention is reflected in people's perceptions and knowledge of ocean issues, as the general public often regard ocean pollution, particularly plastic pollution, as the most pressing problem, even more pressing than climate change (Lotze et al., 2018). Scientists have therefore expressed concern that the strong

media focus on plastic pollution may distract attention from other urgent ocean challenges, such as climate change (Stafford & Jones, 2019). Media coverage not only influences public understanding but can also affect social engagement and people's willingness to take action to protect the ocean (Caruso et al., 2022; Kelly et al., 2022). Understanding how and why ocean science is presented in newspapers in particular ways can therefore provide valuable insights into the processes that shape public perception, concern, and responses to ocean issues (Keller & Wyles, 2021).

However, communicating ocean science effectively to the public presents several challenges. Ocean systems are complex and often difficult for non-specialists to understand. Much of the ocean, particularly the deep sea, is physically distant and largely invisible, which can create a sense of remoteness and make it harder for people to recognise its relevance to everyday life (Schuldt, 2016). Furthermore, ocean issues are often interconnected and driven by multiple environmental factors, making them difficult to explain in simple terms (Kelly et al., 2022). Oceanography also relies on technically complex methods that are challenging to translate for a non-specialist audience. Research into how such a complex and abstract scientific domain is represented in the news media can therefore provide broader insights into the communication of other technically complex or less visible areas of science.

1.3 Agenda setting, framing and media attention for scientific issues

Through repeated coverage, the media help shape the public agenda by influencing which topics are considered important or urgent (McCombs & Shaw, 1972). Scientists and research institutions actively try to influence this agenda, as media attention increases the visibility of their work, informs the public, and can ultimately influence policy decisions (Catalano et al., 2019; Stoll-Kleemann, 2019). An important tool for bringing research to the attention of the media is the press release. Press releases are concise summaries of scientific studies, often written in accessible language (Autzen, 2014). They not only communicate research to journalists and the public, but also serve

strategic goals, such as enhancing the reputation of the research institution (Carver, 2014).

Journalists play a central role in determining which research reaches the public. They assess press releases based on their newsworthiness, the criterion that determines whether a topic should receive media attention (Harcup & O'Neill, 2001, 2017). Scientific studies that meet these criteria are more likely to be selected for reporting (Badenschier & Wormer, 2012). This process is formalized in news factor theory (Galtung & Ruge, 1965), which explains news selection as the result of journalist assessments shaped by professional routines, organisational constraints, and broader cultural influences. Issues and actors possess certain characteristics, news factors, that increase the likelihood of coverage, such as societal impact, relevance to the public, or association with elite individuals or countries (Harcup & O'Neill, 2001, 2017). In addition, practical and editorial considerations play a role in news selection, as scientific stories may fail to reach the news agenda due to time constraints, competing events, or editorial priorities, such as clear narratives or strong visual material (Badenschier & Wormer, 2012). In this context, newsworthiness refers to the journalistic assessment of the relevance of news factors while taking practical constraints and organisational influences into account (Eilders, 2006).

Once a study is selected for communication in the media, it must be translated into forms that are understandable and engaging for non-specialist audiences. In this process, scientists, press officers, and journalists make choices about which details to emphasize or omit, thereby shaping how science is presented in the public domain (Nisbet & Mooney, 2007; Yang & Hobbs, 2020). Frames and narratives play an important role in making scientific information accessible. Frames shape which aspects of a text are emphasized, such as problems, causes, or possible solutions (Entman, 1993), thereby guiding how audiences interpret and understand complex information (Druckman & Lupia, 2017; Nisbet, 2009). Narratives, in contrast, structure information in the form of a story. They often include elements such as characters, emotions, personalisation, and stylistic devices, which help to present scientific information in a more engaging way (Glaser et al., 2009). By placing science within a human perspective, narratives create

a familiar point of reference for audiences (Dahlstrom, 2014), making information easier to understand and more relatable (Cherniak et al., 1983).

1.4 Pressure on science journalism

The quality and independence of science journalism are under pressure. Media companies are operating under difficult economic conditions (Bauer et al., 2013). Budget cuts and the increasing demand for fast online news have led to higher workloads and fewer resources for specialist reporting (Allan, 2011; Murcott & Williams, 2013; Van Leuven et al., 2015). As a result, science reporting is increasingly carried out by journalists without specific scientific expertise. However, such expertise is essential for assessing the value of scientific claims and correctly interpreting the relationships between researchers, institutions, and commercial actors (Korthagen, 2016). Journalists therefore report that, due to limited time, resources, and expertise, it is often not possible to conduct thorough research or produce high-quality articles on ocean science (Pinto & Matias, 2023).

The decline in available time, resources, and specialist expertise among journalists causes journalists to be more reliant on other sources of information besides the peer-reviewed scientific article (Van Leuven et al., 2015). As a result, newspaper articles on science are more frequently based on press releases from scientific organisations (Vögler & Schäfer, 2020). These press releases not only encourage journalists to write about certain topics (Bauer et al., 2013; Maiden et al., 2020), but are also used in the writing process of newspaper articles (Van Leuven et al., 2015). In some occasions, it's content is partially- or entirely copied verbatim, a practice known as "churnalism" (Boumans, 2018; Comfort et al., 2022; Vissers et al., 2026). Hence, due to churnalism, press releases play an increasingly important role in how science is presented in newspapers.

The growing reliance on press releases as a primary source for science news is concerning, as journalists traditionally play an important role as critical observers who help safeguard the accuracy of science communication (Göpfert, 2008; Korthagen, 2016). By critically assessing scientific claims and distinguishing between reliable and less reliable research, journalists can uncover issues such as unethical

funding, plagiarism, or flawed methodology (Fahy & Nisbet, 2011; Lexchin, 2003; Murcott & Williams, 2013). However, when journalists rely heavily on press releases, this critical function may be weakened. Science reporting has traditionally been based on peer-reviewed studies, whereas press releases do not undergo the same level of quality control and may therefore bypass important checks on the validity of scientific claims (Bauer & Gregory, 2008). Moreover, press releases from universities sometimes contain hype or exaggerations (Heyl et al., 2020; Bossema et al., 2019). When such press releases are used directly as news sources, inaccuracies or overstatements get reproduced in newspaper articles (Adams et al., 2019).

1.5 Knowledge gap and research questions

Press releases play an important role in bringing research to the attention of journalists and, through practices such as churnalism, can also influence how science is reported in newspapers. Newspaper coverage subsequently shapes how the public understands and evaluates ocean issues. Examining how ocean science reaches the public through newspapers can therefore provide insights into the communication process, potential bottlenecks, and ways to make science communication more relevant and effective. Against this background, I examine in this thesis how scientific research reaches the public domain through newspapers. Specifically, I aim to understand why certain scientific studies appear in the news, how they are framed, and what role scientists, press officers, and journalists play in this communication process. These questions are investigated on the basis of five studies.

1.5.1 Chapter 2: A comparative study of frames and narratives identified within scientific press releases on ocean climate change and ocean plastic

While public awareness of ocean plastic pollution is relatively high (Lotze et al., 2018), the seriousness of ocean climate change is not always equally recognised (Stafford & Jones, 2019). One possible explanation lies in how ocean issues are communicated. Communication research shows that the way environmental problems are presented can influence how people interpret their urgency and

relevance. For example, emphasizing the human and social dimensions of ocean issues can increase public engagement (Catalano, 2019; Stoll-Kleemann, 2019). At the same time, ocean problems are often communicated in predominantly negative ways, which may create the impression that it is too late to address environmental challenges (Duarte et al., 2015). In contrast, more constructive messages have been shown to encourage collective action (Kelly et al., 2022; McAfee et al., 2019).

Media coverage is shaped by frames and narratives, which structure how information is presented and thereby influence how audiences interpret environmental information (Nisbet & Mooney, 2007; Yang & Hobbs, 2020). Hence, considerable research has examined how issues like ocean plastic and climate change are communicated in the media. Most of this research has focused on climate change. Studies show that climate change is commonly framed through issue frames such as economic or environmental impacts, disasters, political conflict, national security, and public health, as well as through opportunity, morality, science, and efficacy frames (Bolsen & Shapiro, 2018; Nisbet, 2009; O'Neill et al., 2015). In contrast, the framing of ocean plastic has received considerably less scholarly attention. Existing studies suggest that media coverage of ocean plastic tends to emphasize risks and negative environmental impacts, particularly harm to marine life, while discussions of benefits or human health impacts receive less attention. Responsibility for addressing the problem is also often attributed to consumers and policymakers rather than industry (Henderson & Green, 2020; Schönbauer & Müller, 2021; Welzenbach-Vogel et al., 2022).

Most existing research focuses on media coverage itself, particularly newspaper articles. Because press releases from research institutions are often used in science reporting (Vissers et al., 2026; Comfort et al., 2022; Vögler & Schäfer, 2020), examining how ocean issues are framed earlier in the communication process may help explain how they are ultimately presented in the media. To date, little research has examined how ocean climate change and ocean plastic are communicated in scientific press releases. This chapter therefore investigates how research institutions use narratives and frames when communicating about ocean science, whether differences exist

between the communication of ocean plastic and ocean climate change, and how these communication patterns relate to media coverage. The following research questions guide this study:

- **RQ 1:** What narrative writing styles are used to communicate about ocean plastic and ocean climate change research, and do these differ between the two topics?
- **RQ 2:** Do press release authors use a dominant tone when writing ocean science press release?
- **RQ 3:** Do press releases emphasize the human and social dimensions of ocean issues by the use of personalization and actor roles?
- **RQ 4:** What frames are used by research organisations to communicate about ocean climate change and ocean plastic research and how do these frames relate to media frames?
- **RQ 5:** Do research organisations frame ocean climate change- and ocean plastic research differently?

Chapter 2 examines how scientific institutions communicate research on ocean climate change and ocean plastic through an analysis of 323 press releases published on EurekAlert between 2017 and 2022. Using a clustering analysis, four frames for ocean climate change and five frames for ocean plastic were identified, which were then analysed qualitatively. The results show that ocean plastic is mainly framed as a biological and health problem, with an emphasis on solutions and the societal responsibility to implement them. Ocean climate change is framed as an environmental and socio-economic issue, with responsibility for mitigation placed with politics. No dominant tone is used when writing about ocean science, positive, neutral and negative stories occur in relatively equal amount. Many press releases contained only 0-1 frame variable (35.2% press releases on Ocean Plastic research; 52.7% press releases on Ocean Climate Change research). This lack of framing might present ocean issues as abstract. Moreover, narratives mainly took the form of personalising science and depicting scientists. These findings suggest that future press releases could use more framing to explain ocean research and integrate more social dimensions to better engage the public with ocean issues.

By understanding how scientific organisations use frames and narratives to popularise their research, we can gain insights into how these frames might influence the representation of ocean science in the media.

1.5.2 Chapter 3: Journalism versus churnalism: how news factors in press releases affect journalistic processing of ocean plastic research in newspapers globally

Marine plastic litter is one of the most visible ocean-related problems in the public sphere (Seys et al., 2022). Research on newsworthiness can help explain why certain scientific topics are so successful in attracting media attention while others receive little coverage (Badenschier & Wormer, 2012). News factors are typically identified by analysing their presence in published newspaper articles (Bednarek & Caple, 2014; Harcup & O'Neill, 2001, 2017). However, this approach may overlook characteristics of scientific research that are rarely included in news coverage, such as explanations of research methods or limitations. The absence of these elements in science news may be related to their lower perceived newsworthiness, which could decrease the likelihood that studies are reported in the news (Mellor, 2015).

Examining press releases rather than newspaper articles provides an opportunity to identify which characteristics of scientific research may increase or decrease its chances of receiving media attention. Press releases from universities and research organisations often serve as an important intermediary between scientists and journalists and are widely used as sources for science news. Previous studies have examined the uptake of university press releases by newspapers (Kroon & Schafraad, 2013) and the extent to which content from these press releases is reproduced in newspaper articles (Vögler & Schäfer, 2020; Comfort et al., 2022). However, these studies do not specifically examine press releases about peer-reviewed research, leaving it unclear how successful they are in attracting international media coverage or how strongly they shape subsequent newspaper reporting.

This chapter therefore investigates the newsworthiness of ocean plastic research communicated through scientific press releases

and the extent to which journalists rely on these press releases when reporting on the topic. The following research questions guide this study:

- **RQ 1:** What fraction of press releases from scientific organisations about ocean plastic research published on EurekAlert! are covered by newspapers globally?
- **RQ 2:** Which factors are present in scientific press releases and how are they used to describe ocean plastic research as “(un)newsworthy”? caveat.
- **RQ 3:** How much of the content of scientific press releases is reproduced in subsequent newspaper articles?

In Chapter 3, it is examined why ocean plastic research received relatively high media attention, using newsworthiness theory. 81 press releases about peer-reviewed ocean plastic studies published between 2017 and 2021 on EurekAlert! were linked to 495 English-language newspaper articles. This allowed us to determine which press releases generated the most media attention. A textual comparison showed that newspaper articles often reproduced passages from press releases verbatim. Newsworthiness was primarily influenced by factors such as publication in high-impact journals, negative news and the scope of the research. Although important research details, such as methods and uncertainties, were usually mentioned, information about funding and limitations was often missing, without this affecting a press release’s newsworthiness.

By identifying which characteristics of press releases increase the likelihood of media uptake and how strongly journalists rely on these texts, this chapter provides insights into the mechanisms that shape the media visibility of ocean plastic research.

1.5.3 Chapter 4: Churnalism, a new opportunity in science news? The role of press releases in communicating the scientific process in newspaper articles

Communicating science involves more than presenting research findings, it also requires explaining the methods, objectives, and limitations of a study, as this transparency is essential for understanding how the research was conducted (Fahy & Nisbet, 2011). However, newspaper articles provide only limited information about the scientific process. They often omit details on research background and methodology (Hijmans et al., 2003), rarely contextualize findings within the broader field (Korthagen, 2016), and frequently leave out information on funding, limitations and uncertainties (Mellor, 2015).

It is unknown to what extent and in what way scientific press releases report on the scientific process, and how this influences the way newspapers present the same information. Previous research shows that press releases on ocean plastic often include details on methods and uncertainties without reducing news value, and that newspaper articles frequently rely on these press releases (Chapter 3). Studies also show that the media rarely include information that is in the original research paper but is missing in the press release (Sharp et al., 2021). Approximately one-third of scientific newspaper articles are largely or entirely based on the press release, while only 14% go beyond secondary sources (Taylor et al., 2015). What remains unknown is whether press releases that explicitly highlight the scientific process lead newspapers to include this information as well. To address this gap, we formulated the following research questions:

- **RQ 1:** How do university press releases and newspaper articles portray the scientific process behind peer-reviewed ocean plastic research?
- **RQ 2:** Does the presence of details about the scientific process in university press releases ensure that this information is also more prevalent in subsequent newspaper articles?

In Chapter 4, it is examined how press releases about ocean plastic research communicate the scientific process, and how this information

is subsequently reflected in newspaper articles. The analysis of ten scientific press releases from EurekAlert! and 130 English-language newspaper articles based on the same research as discussed in the press releases, shows that press releases about ocean research regularly discuss the methods used, the research area or sample that is analysed and, in half of the occasions, highlight research uncertainties. Research limitations, funding information and the need for further research are minimally discussed. Also references to other scientific studies are only occasionally made. A comparison between press releases and newspaper articles shows, that explicitly mentioning uncertainties, limitations, and methods in press releases, and linking these to the studies key findings or including them in quotes from researchers, increases the likelihood that such information also appears in newspaper coverage.

By showing that press releases can influence how science is explained in newspaper articles, this study demonstrates how communication professionals and scientists can shape the presentation of research in the media and contribute to a more realistic portrayal of science as a process of provisional knowledge rather than a source of absolute truths.

1.5.4 Chapter 5: How frames and narratives in press releases shape newspaper science articles: the case of ocean plastic pollution

The media plays an important role in shaping public perceptions of environmental issues such as ocean plastic pollution (Kramm et al., 2022; Pop et al., 2023). Previous research shows that ocean plastic is mainly framed negatively in newspapers, placing the emphasis on risks and damages, while opportunities or benefits related to the use of plastic are rarely discussed (Welzenbach-Vogel et al., 2022). Moreover, plastic pollution in the ocean is often presented as a threat to marine ecosystems, and not to human health, which makes it seem like a distant problem (Henderson & Green, 2020). In addition, reports on microplastics places responsibility for its cause and mitigation mainly on consumers and policymakers, with little mention of industry (Schönbauer & Müller, 2021).

What is less well understood is how these frames emerge in newspaper coverage. Previous research has shown that scientific press releases are fully or partially taken over in newspaper articles on ocean plastic research (Chapter 3) and that these press releases contain different narrative elements and clear frames (Chapter 2). However, it remains unclear which elements of press releases are adopted by journalists and to what extent the framing of press releases is reflected in newspaper articles. This fourth study therefore investigates the influence of press releases on the framing of newspaper articles about ocean plastic research by analysing shifts in framing and narrative strategies between press releases and newspaper articles. To examine this relationship, the following research questions are addressed:

- **RQ 1:** How do frames change during the transfer from press release to newspaper article?
- **RQ 2:** What are the differences in narrative elements such as: dramatization, personalization, emotion, and stylistic devices, between newspaper articles and the scientific press releases on which they are based?
- **RQ 3:** Do newspaper articles contain different actor roles and quotes compared to the press releases on which they are based?
- **RQ 4:** Does story tone differ between newspaper articles and the scientific press releases on which they are based?

In Chapter 5 is examined how peer-reviewed research on ocean plastic is framed in university press releases and newspaper articles by analysing 10 press releases and 130 related English-language articles. Using a combination of quantitative and qualitative analyses with an innovative visualisation technique, the study identifies what information journalists add, adapt, or omit. Results show that journalists frequently adopt both the framing and quotations from press releases, with little independent validation. Consequently, newspaper articles largely reproduce the perspectives presented in press releases. Scientists are depicted as central figures, either as heroes tackling the plastic crisis or as warnings about its risks, while non-scientific actors and affected communities are rarely included. Although some articles add context, most focus on key study results,

personalising science rather than highlighting broader societal implications.

By demonstrating that press releases strongly influence how ocean plastic research is framed in newspapers, this study highlights the opportunity for research institutions to promote more socially contextualised communication about ocean science.

1.5.5 Chapter 6: From research to newspaper: how scientists, press officers and journalists shape ocean science coverage in the Netherlands

Newspaper articles use specific frames that shape how ocean plastic is presented to the public (Henderson & Green, 2020; Schönbauer & Müller, 2021; Welzenbach-Vogel et al., 2022). At the same time, science news in newspapers is often based on press releases (Comfort et al., 2022; Vögler & Schäfer, 2020). Previous chapters of this thesis show that press releases about ocean plastic strongly influence how research on this topic appears in newspapers, as textual overlap indicates churnalism, with journalists frequently reproducing parts of press releases verbatim (Chapter 3). These press releases contain clear frames that place ocean plastic in a specific context (Chapter 2), and both this framing and information about how the research was conducted are often carried over into newspaper articles (Chapters 4 and 5). However, less attention has been paid to why ocean plastic is framed in particular ways in press releases and why journalists adopt these framings in their reporting.

Understanding how scientific research reaches the media and is ultimately framed requires insights into the roles of scientists, press officers, and journalists. Each group operates within its own professional routines, organisational structures, and communication objectives, which shape how scientific information is produced, translated, and reported (Weingart & Joubert, 2019). However, most existing research examines the perspectives of these actors separately (e.g., Van Leuven et al., 2021; Volk et al., 2023), leaving a limited understanding of how scientific research moves through the entire communication chain, from peer-reviewed publication to press release to newspaper article. This fifth study therefore investigates how ocean science enters the news and how its content is shaped through

interactions among scientists, press officers, and journalists. The study is guided by the following research questions:

- **RQ 1:** How do stakeholders determine which ocean science topics make the news, and what role do scientists, press officers and journalists play in this selection process?
- **RQ 2:** How do scientists, press officers, and journalists make framing choices in their communication and how does their interaction shape the representation of ocean science in newspaper articles?
- **RQ 3:** How do stakeholders determine which ocean science topics make the news, and what role do scientists, press officers and journalists play in this selection process?

Chapter 6 presents the results of 28 semi-structured interviews with ocean scientists, press officers working for Dutch organisations conducting ocean research, and journalists who regularly or occasionally report on ocean science in Dutch newspapers. The findings show that scientists often act as initial news triggers by signalling new publications or developments. These signals are subsequently evaluated for their news value, with decisions influenced not only by traditional news values but also by normative considerations, such as the perceived importance of protecting nature and encouraging environmental stewardship. Communication content is further shaped by professional roles, organisational context, target audiences, format constraints, and choices about whom to quote. Throughout this process, actors continuously balance scientific nuance with the need for simplification and newsworthiness. While all actors employ strategies to safeguard accuracy, the results suggest that press officers could improve practices by systematically verifying strong claims and methodological uncertainties.

By integrating the perspectives of scientists, press officers, and journalists, this study presents a model of the science communication chain, showing how news values and framing emerge through interaction between actors.

AI Declaration

In writing this dissertation, the author used artificial intelligence tools (including ChatGPT and DeepL) to assist with text and figure editing and the translation from Dutch to English texts.

Literature

- Abram, N., Gattuso, J.-P., Prakash, A., Cheng, L., Chidichimo, M.P., Crate, S., Enomoto, H., Garschagen, M., Gruber, N., Harper, S., Holland, E., Kudela, R.M., Rice, J., Steffen, K., von Schuckmann, K., Pörtner, H.-O., Roberts, D.C., Masson-Delmotte, V., Zhai, P., Mintenbeck, K. (n.d.). Framing and Context of the Report. In: IPCC Special Report on the Ocean and Cryosphere in a Changing Climate [H.-O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegría, M. Nicolai, A. Okem, J. Petzold, B. Rama, N.M. Weyer (Eds.)]. Cambridge University Press, pp. 73–129.
<https://doi.org/10.1017/9781009157964.003>.
- Algan, Y., Cohen, D., Davoine, E., Foucault, M. & Stantcheva, S. Trust in scientists in times of pandemic: panel evidence from 12 countries. *Proc. Natl Acad. Sci. USA* 118, e2108576118 (2021).
- Autzen, C. (2014). Press releases—The new trend in science communication. *Journal of Science Communication*, 13(03), C02.
<https://doi.org/10.22323/2.13030302>
- Badenschier, F., & Wormer, H. (2012). Issue selection in science journalism: Towards a special theory of news values for science news? In S. Rödder, M. Franzen, & P. Weingart (Eds.), *The Sciences' Media Connection – Public Communication and its Repercussions* (Vol. 28, pp. 59–85). Springer Netherlands. https://doi.org/10.1007/978-94-007-2085-5_4
- BAUER, B. M. W., & Gregory, J. (2008). From journalism to corporate communication in post-war Britain. In *Journalism, science and society* (pp. 45–64). Routledge.
- Bauer, M. W., Howard, S., Romo Ramos, Y. J., Massarani, L., & Amorim, L. (2013). *Global science journalism report: working conditions & practices, professional ethos and future expectations*. Science and Development Network.
- 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>

- Bolsen, T., & Shapiro, M. A. (2018). 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>
- Boumans, J. (2018). Subsidizing the news?: Organizational press releases' influence on news media's agenda and content. *Journalism Studies*, 19(15), 2264–2282. <https://doi.org/10.1080/1461670X.2017.1338154>
- Caruso, F., Tedesco, P., Della Sala, G., Palma Esposito, F., Signore, M., Canese, S., Romeo, T., Borra, M., Gili, C., & de Pascale, D. (2022). Science and dissemination for the UN Ocean Decade outcomes: Current trends and future perspectives. *Frontiers in Marine Science*, 9, 863647.
<https://doi.org/10.3389/fmars.2022.863647>
- Carver, R. B. (2014). Public communication from research institutes: Is it science communication or public relations? *Journal of Science Communication*, 13(03), C01. <https://doi.org/10.22323/2.13030301>
- Catalano, A. S., Lyons-White, J., Mills, M. M., & Knight, A. T. (2019). Learning from published project failures in conservation. *Biological Conservation*, 238, 108223. <https://doi.org/10.1016/j.biocon.2019.108223>
- Cherniak, C., Nisbett, R., & Ross, L. (1983). Human inference: Strategies and shortcomings of social judgment. *The Philosophical Review*, 92(3), 462.
<https://doi.org/10.2307/2184495>
- Cologna, V., & Siegrist, M. (2020). The role of trust for climate change mitigation and adaptation behaviour: A meta-analysis. *Journal of Environmental Psychology*, 69, 101428.
- Cologna, V., Mede, N. G., Berger, S., Besley, J., Brick, C., Joubert, M., ... & Metag, J. (2025). Trust in scientists and their role in society across 68 countries. *Nature Human Behaviour*, 9(4), 713–730.
- Comfort, S. E., Gruszczynski, M., & Browning, N. (2022). Building the science news agenda: The permeability of science journalism to public relations. *Journalism & Mass Communication Quarterly*, 107769902110479. <https://doi.org/10.1177/10776990211047949>
- Dahlstrom, M. F. (2014). Using narratives and storytelling to communicate science with nonexpert audiences. *Proceedings of the National Academy of Sciences*, 111(Supplement_4), 13614–13620.
<https://doi.org/10.1073/pnas.1320645111>
- Druckman, J. N., & Lupia, A. (2017). *Using frames to make scientific communication more effective* (K. H. Jamieson, D. M. Kahan, & D. A.

Scheufele, Eds.; Vol. 1). Oxford University Press.
<https://doi.org/10.1093/oxfordhb/9780190497620.013.38>

Duarte, C. M., Fulweiler, R. W., Lovelock, C. E., Martinetto, P., Saunders, M. I., Pandolfi, J. M., Gelcich, S., & Nixon, S. W. (2015). Reconsidering ocean calamities. *BioScience*, *65*(2), 130–139.
<https://doi.org/10.1093/biosci/biu198>

Entman, R. M. (1993). Framing: Toward clarification of a fractured paradigm. 10.

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

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>

Franta, B. (2022). Weaponizing economics: Big Oil, economic consultants, and climate policy delay. *Environmental Politics*, *31*(4), 555–575.

Galtung, J., & Ruge, M. H. (1965). The structure of foreign news: The presentation of the Congo, Cuba and Cyprus Crises in four Norwegian newspapers. *Journal of Peace Research*, *2*(1), 64–90.
<https://doi.org/10.1177/002234336500200104>

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

Göpfert, W. (2008). The strength of PR and the weakness of science journalism. In *Journalism, Science and Society* (pp. 227–238). Routledge.

Guan, S., Qu, F., & Qiao, F. (2023). United Nations decade of ocean science for sustainable development (2021–2030): From innovation of ocean science to science-based ocean governance. *Frontiers in Marine Science*, *9*, 1091598.

Harcup, T., & O'Neill, D. (2001). What is news? Galtung and Ruge revisited. *Journalism Studies*, *2*(2), 261–280.
<https://doi.org/10.1080/14616700118449>

Harcup, T., & O'Neill, D. (2017). What is news?: News values revisited (again). *Journalism Studies*, *18*(12), 1470–1488.
<https://doi.org/10.1080/1461670X.2016.1150193>

Henderson, L., & Green, C. (2020). Making sense of microplastics? Public understandings of plastic pollution. *Marine Pollution Bulletin*, *152*, 110908.
<https://doi.org/10.1016/j.marpolbul.2020.110908>

- Hijmans, E., Pleijter, A., & Wester, F. (2003). Covering scientific research in Dutch newspapers. *Science Communication*, 25(2), 153–176. <https://doi.org/10.1177/1075547003259559>
- Keller, E., & Wyles, K. J. (2021). Straws, seals, and supermarkets: Topics in the newspaper coverage of marine plastic pollution. *Marine Pollution Bulletin*, 166, 112211. <https://doi.org/10.1016/j.marpolbul.2021.112211>
- Kelly, R., Evans, K., Alexander, K., Bettioli, S., Corney, S., Cullen-Knox, C., Cvitanovic, C., de Salas, K., Emad, G. R., Fullbrook, L., Garcia, C., Ison, S., Ling, S., Macleod, C., Meyer, A., Murray, L., Murunga, M., Nash, K. L., Norris, K., ... Pecl, G. T. (2022). Connecting to the oceans: Supporting ocean literacy and public engagement. *Reviews in Fish Biology and Fisheries*, 32(1), 123–143. <https://doi.org/10.1007/s11160-020-09625-9>
- Korthagen, I. (2016). Wakers van de wetenschap: Over het belang en de functies van wetenschapsjournalistiek.
- Kramm, J., Steinhoff, S., Werschmöller, S., Völker, B., & Völker, C. (2022). Explaining risk perception of microplastics: Results from a representative survey in Germany. *Global Environmental Change*, 73, 102485. <https://doi.org/10.1016/j.gloenvcha.2022.102485>
- Kroon, A., & Schafraad, P. (2013). Copy-paste of journalistieke verdieping?: Een onderzoek naar de manier waarop nieuwsfactoren in universitaire persberichten nieuwssselectie en redactionele bewerkingsprocessen beïnvloeden. *Tijdschrift voor Communicatiewetenschap*, 41(3). <https://doi.org/10.5117/2013.041.003.283>
- Lexchin, J. (2003). Pharmaceutical industry sponsorship and research outcome and quality: Systematic review. *BMJ*, 326(7400), 1167–1170. <https://doi.org/10.1136/bmj.326.7400.1167>
- Lotze, H. K., Guest, H., O'Leary, J., Tuda, A., & Wallace, D. (2018). Public perceptions of marine threats and protection from around the world. *Ocean & Coastal Management*, 152, 14–22. <https://doi.org/10.1016/j.ocecoaman.2017.11.004>
- McAfee, D., Doubleday, Z. A., Geiger, N., & Connell, S. D. (2019). Everyone loves a success story: Optimism inspires conservation engagement. *BioScience*, 69(4), 274–281. <https://doi.org/10.1093/biosci/biz019>
- McCombs, M. E., & Shaw, D. L. (1972). The agenda-setting function of mass media. *Public opinion quarterly*, 36(2), 176–187.
- Mellor, F. (2015). Non-news values in science journalism. In B. Rappert & B. Balmer (Eds.), *Absence in Science, Security and Policy* (pp. 93–113). Palgrave Macmillan UK. https://doi.org/10.1057/9781137493736_5

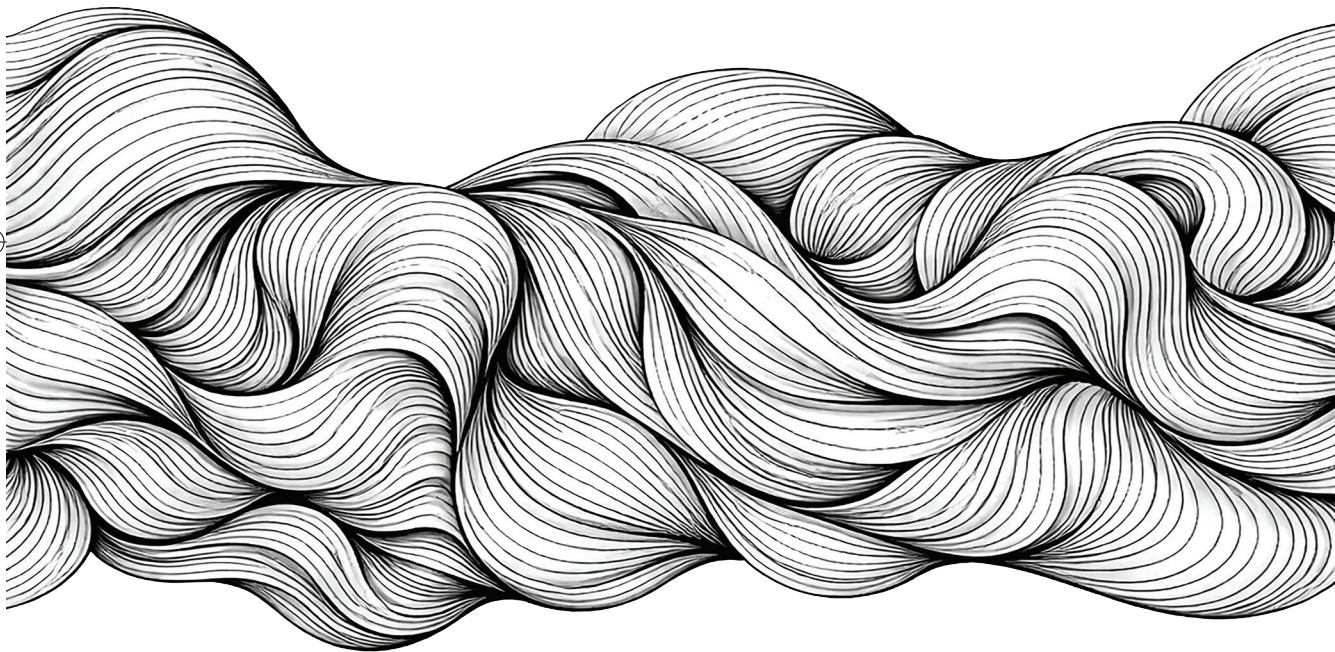
- Murcott, T. H. L., & Williams, A. (2013). The challenges for science journalism in the UK. *Progress in Physical Geography: Earth and Environment*, 37(2), 152–160. <https://doi.org/10.1177/0309133312471285>
- Nisbet, M. C. (2009). Communicating climate change: Why frames matter for public engagement. *Environment: Science and Policy for Sustainable Development*, 51(2), 12–23. <https://doi.org/10.3200/ENV.51.2.12-23>
- Nisbet, M. C., & Mooney, C. (2007). Framing science. *Science*, 316(5821), 56–56. <https://doi.org/10.1126/science.1142030>
- O'Neill, S., Williams, H. T. P., Kurz, T., Wiersma, B., & Boykoff, M. (2015). Dominant frames in legacy and social media coverage of the IPCC Fifth Assessment Report. *Nature Climate Change*, 5(4), 380–385. <https://doi.org/10.1038/nclimate2535>
- Pinto, B., Costa, J. L., & Cabral, H. (2020). What news from the sea? Assessing the presence of marine issues in the Portuguese quality press. *Ocean & Coastal Management*, 185, 105068. <https://doi.org/10.1016/j.ocecoaman.2019.105068>
- Pinto, B., & Matias, A. (2023). European journalists and the sea: Contexts, motivations, and difficulties. *Public Understanding of Science*, 32(4), 459–469. <https://doi.org/10.1177/09636625221137036>
- Pop, V., Ozunu, A., Petrescu, D. C., Stan, A.-D., & Petrescu-Mag, R. M. (2023). The influence of media narratives on microplastics risk perception. *PeerJ*, 11, e16338. <https://doi.org/10.7717/peerj.16338>
- Rathenau Instituut. (2025). *Vertrouwen in de wetenschap*. Den Haag. (Auteurs: J. Slief, B. Demirel, I. Huffnagel-Bastiaans, R. Van der Lee en A. Vennekens)
- Roozenbeek, J., Schneider, C. R., Dryhurst, S., Kerr, J., Freeman, A. L., Recchia, G., ... & Van Der Linden, S. (2020). Susceptibility to misinformation about COVID-19 around the world. *Royal Society open science*, 7(10).
- Schönbauer, S., & Müller, R. (2021). A risky object? How microplastics are represented in the German media. *Science Communication*, 43(5), Article 5. <https://doi.org/10.1177/10755470211030519>
- Schuldt, J. P., McComas, K. A., & Byrne, S. E. (2016). Communicating about ocean health: Theoretical and practical considerations. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 371(1689).
- Seys, J., Cox, L., Şahin Yücel, E., Ezgeta-Balić, D., Faimali, M., Garaventa, F., ... & Muñiz Piniella, A. (2022). Marine science communication in Europe—A way forward. In *Future Science Brief: Marine Science Communication in Europe—A way forward*.

- Sharp, M. K., Forde, Z., McGeown, C., O'Murchu, E., Smith, S. M., O'Neill, M., Ryanb, M., & Clyne, B. (2021). Irish media coverage of COVID-19 Evidence-based research reports from one national agency. *International Journal of Health Policy and Management*, 1. <https://doi.org/10.34172/ijhpm.2021.169>
- Stafford, R., & Jones, P. J. S. (2019). Viewpoint – Ocean plastic pollution: A convenient but distracting truth? *Marine Policy*, 103, 187–191. <https://doi.org/10.1016/j.marpol.2019.02.003>
- Stoll-Kleemann, S. (2019). Feasible options for behavior change toward more effective ocean literacy: A systematic review. *Frontiers in Marine Science*, 6, 273. <https://doi.org/10.3389/fmars.2019.00273>
- Sturgis, P., Brunton-Smith, I. & Jackson, J. Trust in science, social consensus and vaccine confidence. *Nat. Hum. Behav.* 5, 15281534 (2021).
- Taylor, J. W., Long, M., Ashley, E., Denning, A., Gout, B., Hansen, K., Huws, T., Jennings, L., Quinn, S., Sarkies, P., Wojtowicz, A., & Newton, P. M. (2015). When medical news comes from press releases—A case study of pancreatic cancer and processed meat. *PLOS ONE*, 10(6), e0127848. <https://doi.org/10.1371/journal.pone.0127848>
- Thompson-Saud, G., Gelcich, S., & Barraza, J. (2018). Marine environmental issues in the mass media: Insights from television, newspaper and internet searches in Chile. *Ocean & Coastal Management*, 165, 154–160. <https://doi.org/10.1016/j.ocecoaman.2018.08.015>
- Tiller, R., Arenas, F., Galdies, C., Leitão, F., Malej, A., Romera, B. M., Solidoro, C., Stojanov, R., Turk, V., & Guerra, R. (2019). Who cares about ocean acidification in the Plasticene? *Ocean & Coastal Management*, 174, 170–180. <https://doi.org/10.1016/j.ocecoaman.2019.03.020>
- Toff, B. (2018). Exploring the effects of polls on public opinion: How and when media reports of policy preferences can become self-fulfilling prophecies. *Research & Politics*, 5(4), 2053168018812215.
- van Leeuwen, J., Walker, T. R., & Vince, J. (2022). Plastic pollution. In P. G. Harris, *Routledge Handbook of Marine Governance and Global Environmental Change* (1st ed., pp. 253–262). Routledge. <https://doi.org/10.4324/9781315149745-27>
- Van Leuven, S., Deprez, A., & Raeymaeckers, K. (2015). Het journalistieke brongebruik in tijden van churnalism en Twitter: Een surveyonderzoek bij Vlaamse beroepsjournalisten (2008-2013). *Tijdschrift voor Communicatiewetenschap*, 43(1). <https://doi.org/10.5117/2015.043.001.064>

- Van Leuven, S., Vanhaelewyn, B., & Raeymaeckers, K. (2021). From one division of labor to the other: The relation between beat reporting, freelancing, and journalistic autonomy. *Journalism Practice*, 15(9), 1203–1221. <https://doi.org/10.1080/17512786.2021.1910982>
- Vissers, M., de Bruijn, G. J., & Paulussen, S. (2026). Selection and construction in the science news cycle: A Belgian case study of university press release newsworthiness during the COVID-19 pandemic. *Journalism Studies*, 1–20.
- Vögler, D., & Schäfer, M. S. (2020). Growing influence of university pr on science news coverage? A longitudinal automated content analysis of university media releases and newspaper coverage in Switzerland, 2003–2017. *International Journal of Communication*, 14, 3143–3164.
- Volk, S. C., Vogler, D., Fürst, S., Schäfer, M. S., & Sörensen, I. (2023). Role conceptions of university communicators: A segmentation analysis of communication practitioners in higher education institutions. *Public Relations Review*, 49(4), 102339. <https://doi.org/10.1016/j.pubrev.2023.102339>
- Walchenbach, L., & Van der Vlugt, I. (2024) *Informatie over anticonceptie op TikTok. Een gebrek aan nuance en expertise*. Rutgers. <https://rutgers.nl/wp-content/uploads/2024/01/samenvatting-onderzoeksrapport-AC-op-TikTok.pdf>. Visited: 8-03-2026.
- Weingart, P., & Joubert, M. (2019). The conflation of motives of science communication—Causes, consequences, remedies. *Journal of Science Communication*, 18(03), Y01. <https://doi.org/10.22323/2.18030401>
- Welzenbach-Vogel, I. C., Werling, K., Barkela, B., & Milde, J. (2022). Plastics in mass media. A content analysis of German media coverage of plastic-associated risks and sustainable alternatives to plastics. *Environmental Communication*, 16(2), 179–194. <https://doi.org/10.1080/17524032.2021.1979618>
- West, J. D., & Bergstrom, C. T. (2021). Misinformation in and about science. *Proceedings of the National Academy of Sciences*, 118(15), e1912444117.
- Yang, Y., & Hobbs, J. E. (2020). The power of stories: Narratives and information framing effects in science communication. *American Journal of Agricultural Economics*, 102(4), 1271–1296. <https://doi.org/10.1002/ajae.12078>



Chapter 2 A comparative study of frames and narratives identified within scientific press releases on ocean climate change and ocean plastic

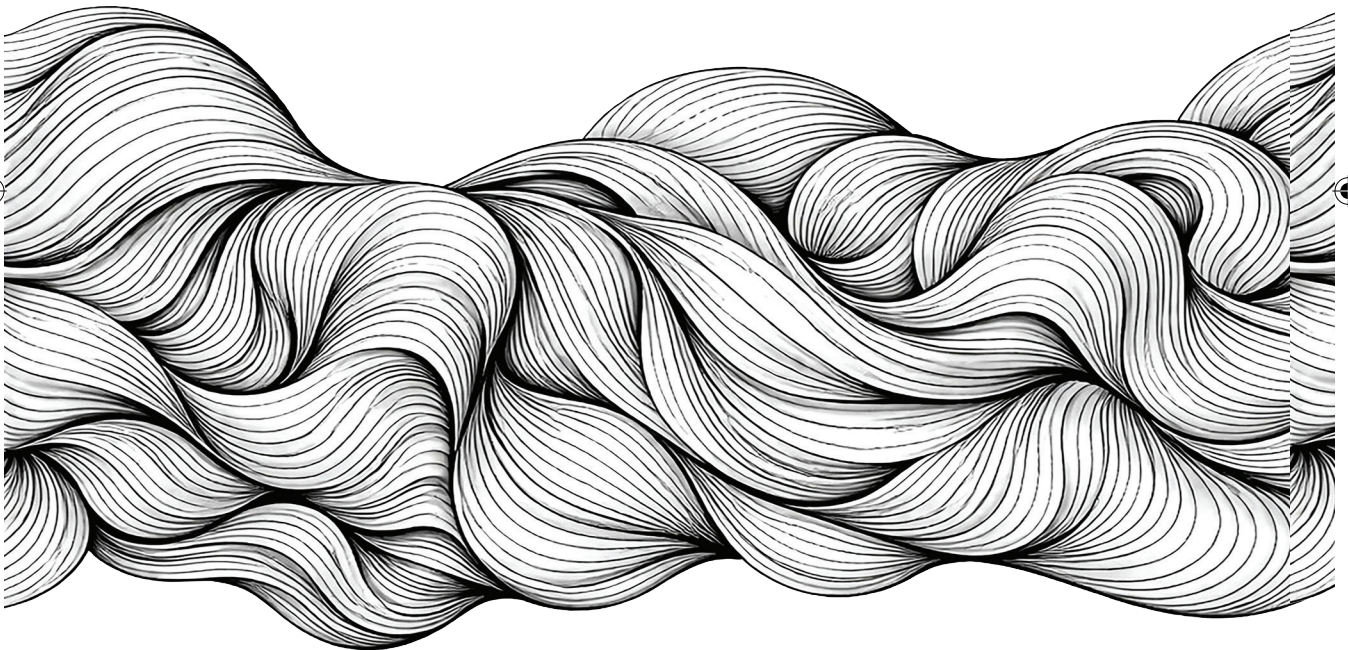




The Framing of Science News

This chapter is based on:

Vonk, A. N., Bos, M., Smeets, I., & van Sebille, E. (2024). 'A comparative study of frames and narratives identified within scientific press releases on ocean climate change and ocean plastic'. *JCOM*, 23(01), A01. <https://doi.org/10.22323/2.23010201>.



Abstract: To understand how scientific institutions communicate about ocean climate change and ocean plastic research, 323 press releases published between 2017 and 2022 were analysed. A clustering method revealed 4 ocean climate change- and 5 ocean plastic frames that were analysed qualitatively. Ocean plastic was presented as a biological and health issue, placing an emphasis on solutions and society's obligation to implement them. Ocean climate change was framed as environmental and socio-economic problem, highlighting politics' responsibility for mitigation. Narratives were only used to personify science and represent scientists, indicating that future press releases could include more social dimensions to engage audiences in ocean issues.

2.1 Introduction

The ocean is important to life on Earth. It produces oxygen, regulates climate, and provides food and energy. Anthropogenic influences such as rising temperatures (Pörtner & Roberts, 2022) and increasing amounts of plastic (van Leeuwen et al., 2022) threaten ocean health. While the issues of plastic pollution and climate change are intrinsically connected, both through the ecosystems facing threats and the shared root cause of overconsumption of finite resources, they compete for public and policy attention (Ford et al., 2022).

Worldwide, differences exist in how people assess the seriousness of ocean problems such as climate change and ocean plastic. In many countries, ocean pollution is seen as the biggest threat to ocean health, while the severity of ocean climate change is not recognized as such (Lotze et al., 2018). In example, Tiller and colleagues (2019) found that there is more media representation on ocean plastic than on ocean climate-related issues such as ocean acidification, while more scientific studies are conducted on the latter. This raises concerns that the over-representation of ocean plastic in the media *“pushes the climate debate off the table”* (Stafford & Jones, 2019).

Science news in the media is often based on press releases from universities and publishing houses, which are themselves based on published or ongoing research (Autzen, 2014; Vogler, 2020). Science communicators who write press releases can therefore play an important role in helping the public understand current environmental issues, as they act as ‘interpreters’ of scientific studies. According to UNESCO (2021), good science communicators should not only explain the science behind issues but also relate scientific research to what is known to the public.

Making scientific research interesting and relatable to the public can be done by the use of frames and narratives. Frames create a context in which information can be interpreted (Entman, 1993), thereby making it easier to understand complicated data (Nisbet, 2009). Narratives can be used to create a familiar reference for audiences (Dahlstrom, 2014), and make information more interesting and relatable to the reader (Cherniak et al., 1983). Understanding how scientific organisations use frames and narratives to popularize their research enables us to gain insights into how these frames impact the

representation of ocean science in the media. This is a first step in understanding how possible differences in communication styles may affect people's perception of ocean climate change and ocean plastic.

There has been extensive research on how climate change (Bolsen & Shapiro, 2018), and to a lesser extent ocean plastic (Henderson & Green, 2020; Schönbauer & Müller, 2021; Welzenbach-Vogel et al., 2022), are framed in the media. One study analysed how large American companies frame climate change in press releases, finding the discourse to be largely expert-oriented and technocratic, with no attention to values and identification (Wetts, 2019). This study did not look at scientific organisations, and to date no study has analysed how ocean plastic and ocean climate change are framed by research institutions and how frames and narratives differ between these two topics.

In this paper, we present the results of our content analysis of press releases. The work described here involves an overview of often-used climate change and ocean plastic media frames, the development of a reliable coding scheme for the analysis of scientific press releases, and the application of a statistical clustering method to identify frames. Based on our results, we propose a set of frames used by scientific organisations to describe ocean plastic and ocean climate change research. In addition, we discuss how narratives are incorporated in press releases. In the final discussion and conclusion, we highlight the differences between ocean plastic and ocean climate change press releases, reflect on existing literature, and consider implications for future research.

2.2 Theoretical framework

2.2.1 Narratives in science coverage

Science journalists use narratives to make a topic appealing and recognizable for audiences (Dahlstrom, 2014). Narratives give insight in *how* a story is told by involving elements such as emotion, stylistic devices and personalization (Glaser et al., 2009). Scientists are also found to use narratives when writing about research and it is even suggested that using a more narrative writing style increases the uptake and influence of articles regarding climate change research

(Hillier et al., 2016). This leads to research question 1: What narrative writing styles are used to communicate about ocean plastic and ocean climate change research, and do these differ between the two topics?

It is expected that some press releases use a narrative writing style more heavily than others since some press releases will only state the results and conclusions of a scientific study whereas others pay attention to who conducted the research and describe the emotions of the scientists involved. We thus consider narration to be a gradual concept, in which press releases contain narrative elements in varying degrees that can be measured as “degree of narrativity” (Lück et al., 2018; Wozniak et al., 2015).

Studies measuring narrativity often base their work on Glaser et al. (2009) who deduced from narrative theory and psychological models of narrative impact four factors that measure the narrativity of a story:

- Dramatization is the process of organizing narrative content. In recognizing dramatization, we follow (Zerba, 2008) who distinguishes factual news from narratives by looking if a story is written in the typical inverted pyramid style known from classic news stories and scientific writing or, if the story highlights a sequence-of-events that lead to a clear plot, which indicates a more narrative story structure.
- Personalization creates a way of communicating abstract scientific concepts within a frame of reference, focusing on a particular individual or smaller group of people and exploring their actions and the consequences these uphold (Schiffer & Guerra, 2015).
- Emotionalization is used to present information in an emotional way.
- Stylistic devices are used to make a text more interesting and lively, for instance by including metaphors or analogies. Metaphors are often used in science- or climate communication to explain complicated information or communicate about matters ‘beyond human scale’ (Dahlstrom, 2021; Forgács & Pléh, 2022).

In narratives, story tone is important. Because tone adds to the way the author presents the story in a negative or positive manner, thereby

influencing the way people experience the story. This is not without risks, as past research showed that too many hopeful messages have the chance that they dilute the urgency and extent of environmental problems (Hornsey & Fielding, 2016). In contrast, negative stories can lead to pessimism in environmental behaviour, caused by the belief that the ocean is beyond restoration (Duarte et al., 2015). However, there are also positive examples, as shown by Kelly et al. (2021) and McAfee et al. (2019), who showed that positive stories can inspire people to work together to solve urgent marine environmental issues. Due to the influence story tone can have on people's perception of a story, we are interested to answer research question 2: Do press release authors use a dominant tone when writing ocean science press release?

The social dimensions of press releases are described in the narrative by personalization and actor roles. Personalization makes it possible for the audience to identify with a situation and to feel empathy for the characters involved (Dahlstrom, 2014). Schwarze (2006) created a way to characterize the characters in environmental communication, according to three classical narrative roles of "victim," "villain," and "hero". It is said that to increase public awareness and encourage pro-environmental attitudes and behaviours toward the ocean, ocean-related communications should place emphasis on the human and social dimensions of the ocean (Catalano et al., 2019; Stoll-Kleemann, 2019). This leads to research question 3: Do press releases emphasize the human and social dimensions of ocean issues by the use of personalization and actor roles?

2.2.2 Frames in science coverage

Framing means that certain features in a text are emphasized over others to promote a particular interpretation (Entman, 1993). Framing thus creates a context for the receiver to interpret a message, thereby not only shaping issues but also recommended behaviours (Pelletier & Sharp, 2008). The frames used in the media to communicate about ocean climate change and ocean plastic are found to shape public attitudes toward ocean health in general (Kelly et al., 2021) and ocean plastic (Bailey, 2022; Kelly et al., 2021) and climate change (Cooper, 2011; Schmidt et al., 2013) in particular. What we do not know,

however, is how research organisations frame ocean climate change and ocean plastic research in their press releases and if these frames differ from media frames. Hence, we want to answer research question 4: What frames are used by research organisations to communicate about ocean climate change and ocean plastic research and how do these frames relate to media frames?

Bolsen and Shapiro (2018) summarized five types of frames that are most commonly used in American media to describe climate change, which are: issue frames, opportunity frames, morality frames, science frames, and efficacy frames. Economic impact, environmental impact, disaster, political conflict, national security, and public health are the most prevalent issue frames (Nisbet, 2009; O'Neill et al., 2015). In comparison to studies defining climate change media frames, the framing of ocean plastic has received less attention in literature. Some studies do describe how ocean plastic is presented in the media, and state that a focus is placed on risks, damages and negative outcomes caused by ocean plastic, rather than on opportunities, benefits and positive outcomes of plastic use (Welzenbach-Vogel et al., 2022). Other research showed that ocean plastic is presented as a problem that affects marine life rather than as a threat to human health. The focus in newspaper articles is placed on wildlife entanglement, which may support the idea that macroplastics rather than microplastics are the main issue and that most people are not directly affected by ocean plastic in their daily lives (Henderson & Green, 2020). Microplastics are described as "*risky objects*" for both the environment and public health and are subject of discussion in the media. In newspaper articles, emphasis is placed on scientific knowledge, risk, and societies responsibility to address risks, which places the responsibility for mitigation on consumers and policy while the responsibility of industry seems almost absent (Schönbauer & Müller, 2021).

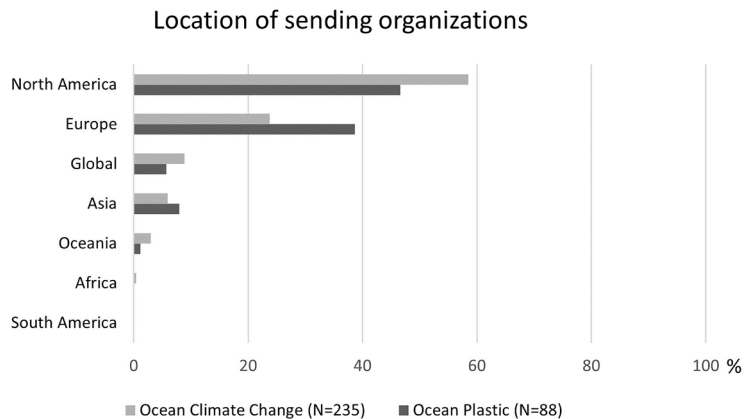
Although above-mentioned studies describe how ocean plastic is presented in the media, these studies rarely use the word 'framing', meaning that a general characterization of frames, like the one provided by Bolsen and Shapiro (2018), is lacking. This makes it difficult to compare how the topics of ocean climate change and ocean plastic are framed based on existing literature. Hence, we will compare the frames found in this study to answer research question 5: Do research

organisations frame ocean climate change- and ocean plastic research differently?

2.3 Methods

2.3.1 Sample

This study analysed a total of 323 press releases published on EurekAlert! between January 2017 and December 2021. EurekAlert! is a nonprofit news-release distribution platform run by the American Association for the Advancement of the Sciences (AAAS). EurekAlert! was picked as source, due to their policy that no press releases are changed, implying that framing in press releases is completely created by the sending institution. 2017 was chosen as start date, because this is the first year a substantial number (10 press releases) about ocean plastic were published. The sample is compiled using the search terms “ocean + plastic” and “ocean + climate”, which needed to be present in the article’s headline, sub-title or first paragraph. In total 235 press releases on ocean climate change and 88 on ocean plastic were retrieved. The press releases on ocean climate change were sent from 129 different organisations in 18 different countries. Ocean plastic press releases came from 65 organisations in 9 different countries (Figure 2.1).



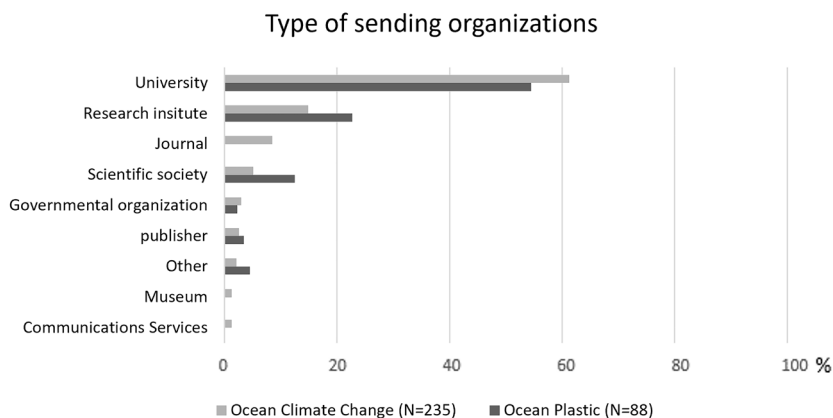


Figure 2.1: Organisations that published press releases on EurekAlert! and the continents in which they are located. Other organisations include: aquaria, environmental advocacy groups and foundations. Some press releases were sent from global organisations; therefore, no specific continent is listed.

2.3.2 Codebook development

Coding narratives

To determine narrative elements, we created a codebook¹ that describes how tone, actor roles and degree of narrativity can be recognized in press releases. In each press release, actors could fill a “victim,” “villain,” or “hero” role (Schwarze, 2006). In the coding scheme, a victim is defined as someone adversely impacted by characters or events, a villain negatively affects others or the world, and a hero is characterized by helping others or conquering challenges. It turned out that some actors did not fit into any of the three classic actor roles, but did fill a distinctive role in which they warned society about ocean plastic or ocean climate change. Consequently, we added the ‘warner’ role. We also coded which actors were quoted in the press release, and if these actors were scientists who were involved in the study or if they were independent actors. In addition, it was coded if the quote contained the actor’s opinion.

To code story tone, we did not only want to look at if a story was positive, negative or neutral, but also wanted to have an idea if ‘doom and gloom’ language was used in the communication of ocean

¹ The codebook is added to the additional online material.

science. Hence, we followed the approach of Lück et al. (2018) and Wozniak et al. (2015), and coded besides a positive, negative and neutral tone, also an alarmist/fatalistic or excited/ passionate tone when the text used superlatives or 'doom and gloom' language resembled by words like 'crisis' or 'disaster'.

The degree of narrativity was calculated for each press release based on the four factors indicating narratives as proposed by Glaser et al. (2009). In the texts, *Dramatization* was coded when the story was not written according to the traditional inverted pyramid style but was more compliant to a classical story structure with an introduction, middle and plot. When a person took a particular action or was affected by the action of others or natural phenomena, *personalization* was coded. *Emotion* was said to be present when an actor's feelings were explicitly mentioned and *stylistic* devices were coded when the text contained style devices like metaphors and/or analogies.

Coding frames

Because scientific press releases have not previously been analysed on the framing of ocean plastic and ocean climate change; and to make a comparison between the two topics possible, we used an inductive framing approach (Matthes & Kohring, 2008). In this technique, frames are not determined as a whole, but the elements that make up the frames are extracted individually from the text as independent variables. A cluster analysis subsequently groups the variables that occur systematically together throughout the various texts. These clusters of frame variables are called 'frames'.

We defined the textual elements that built the frames, i.e. the frame variables, by semi-open coding 20% of the data set. Coding was guided by the definition of framing provided by Entman (1993), whereby all variables in the text that defined a problem, cause, moral evaluation and/or solution were noted. This resulted in a list of 22 frame variables (Appendix 1) which we coded in the complete dataset.

To investigate if frame variables reflected underlying frames, a principal component analysis (PCA) was used (Semetko & Valkenburg, 2000) on both the ocean climate change and ocean plastic dataset. We used a threshold of 6% for the frame variables to be included in the PCA. The number of components was determined using Kaiser's

criterion (Kaiser, 1960). To subsequently determine the frames, only variables with critical loadings were considered (Stevens, 2002).

Intercoder reliability

All frame- and narrative variables were coded to be either present (1) or absent (0) in the press releases text. Krippendorff (2004) alpha was used to calculate the intercoder reliability, because it can be used for binary data and is particularly sensitive to coder disagreement in rare categories (Krippendorff, 2011). The validation of the codebook was done by four coders: two who validated narrative and two who validated framing. Initially, 8 randomly selected press releases for both ocean plastic and ocean climate change were coded. Based on verbal feedback and low Krippendorff's alpha scores, the codebook was altered (for the alterations that were made, see Appendix 2). Subsequently, 10% of the entire data set was coded by different coders, achieving intercoder reliability between 0.8-1.0 with Krippendorff's alpha. Values for intercoder reliability per frame- and narrative variable are shown in Appendix 2.

2.4 Results

2.4.1 Narratives

The degree of narrativity was 1.8 on a four-point scale for both ocean climate change (SD=0,87) and ocean plastic (SD=0,81) datasets. Figure 2.2 quantifies the frequency of occurrence of all separate narrative elements present in the texts. Almost all press releases contained personalization, because almost all texts referred to the scientists who conducted research and/or named people who were affected by their scientific findings. In addition, stylistic devices were often present in the form of metaphors. In almost one third of the press releases, the emotional expressions of scientists were stated. These expressions entailed excitement over scientific findings or sadness regarding the state of the ocean. Most press releases were written according to the classical inverted pyramid style, causing dramatization to be least present.

Press releases with a negative tone highlighted problems caused by ocean climate change or ocean plastic as well as challenges

encountered in mitigation. These press releases did not propose a treatment. Contrary, positive texts focused on how problems could be solved. The use of ‘doom and gloom’ language was indicated by a fatalistic or passionate tone. Fatalistic texts emphasized risk and danger and did not name any remedies to avert the risks discussed in the press release. Ocean plastic or ocean climate change was described as the ‘biggest threat of all time’ or a ‘climate crisis’. A passionate tone highlighted the ‘greatness’ of scientific findings, how important it is to conduct research, or how crucial it is to address ocean climate change or ocean plastic.

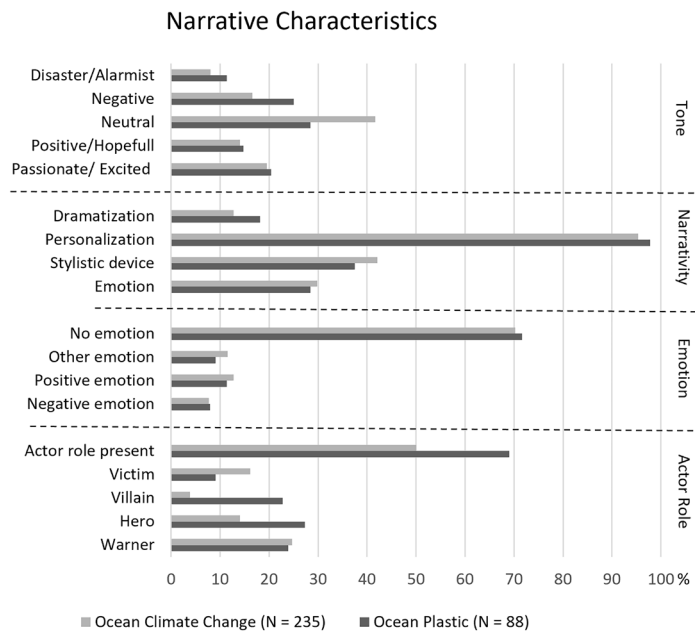
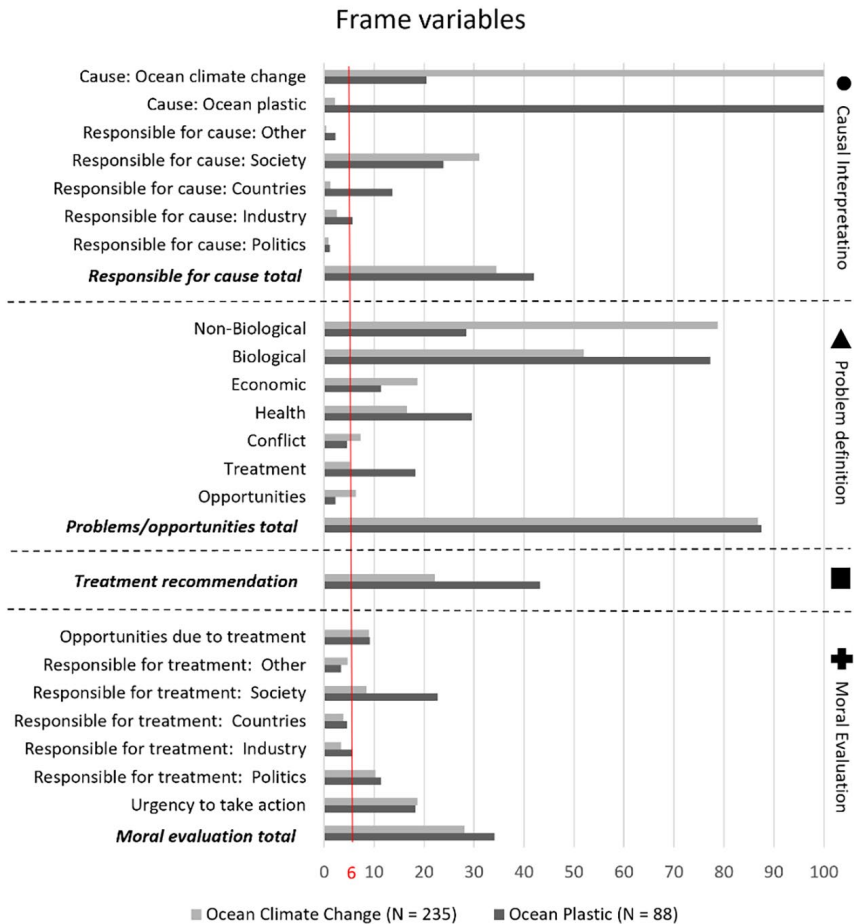


Figure 2.2: Percentages that narrative characteristics occurred in press releases. For the exact percentages, please see Appendix 3. Emotions coded among ‘other emotion’ were most often surprise, caused by unexpected scientific findings and unexpected or rare natural phenomena.

To further characterize the story, we looked at how many of the classical actor roles were present in the press releases’ text and if the actors were portrayed as victim, villain, hero or warner. Individual scientists or scientific organisations were always portrayed as heroes or warners. Villains were often not specified, and “our society” or “humanity” was held responsible for causing ocean climate change or

ocean plastic. Research on ocean plastic often focused on tracing the origin of plastic to a specific region or nation, causing almost a quarter of the ocean plastic press releases to hold regions/ countries specifically responsible for causing ocean plastic pollution. Industries such as fishing, tourism, agriculture or the packaging industry were almost never held responsible for ocean pollution or climate change. Victims were never individual actors, but always groups of people or organisations that were negatively affected by ocean plastic or ocean



climate change.

Figure 2.3: 22 frame variables defining the four frame elements as described by Entman (1993). Variables belonging to the Entman frame elements are separated by dashed lines. The total that an Entman frame element was present in the press

releases is indicated by the 'total' line in bold italics. The red line indicates the 6% threshold applied for inclusion in the PCA clustering analysis.

2.4.2 Frames

Frame variables

Frame variables were present in differing amounts in the ocean plastic and ocean climate change press releases, as can be seen in Figure 2.3. The main differences were that ocean plastic press releases referred to climate change but this happened almost never the other way around. Press releases on ocean climate change focused heavily on non-biological problems, whereas ocean plastic focused more on health- and biological problems. Lastly, press releases on ocean plastic paid twice as much attention to treatment and people's responsibility to solve issues than press releases on ocean climate change did.

Frame constructs

The way frame variables co-occur affects their meaning. Although the frame variables were similar between the ocean climate change and ocean plastic datasets, the cluster analysis (PCA) showed that they occurred in different combinations. This showed that different frames were used to communicate about ocean climate change and ocean plastic research. The PCA resulted in 4 clusters of frame variables for ocean climate change (Figure 2.4A) and 5 for ocean plastic (Figure 2.4B). The results of the PCA can be viewed in detail in Appendix 4.

In both the ocean plastic and ocean climate change dataset, the first cluster contained frame variables focusing on society's responsibility for causing and mitigating climate change, resulting in the **societal responsibility frame (1)**, the only frame that is present in both datasets. In the ocean climate change dataset, the second cluster contained frame variables that focused on political responsibility to mitigate climate change. Hence, this frame is called the **political action frame (2)**. Two clusters only contained frame variables related to the consequences of climate change, whereby one focused on opportunities due to climate change, the **climate change opportunity frame (3)**, and the other focused on humanitarian and economic problems, the **socio-economic problem frame (4)**.

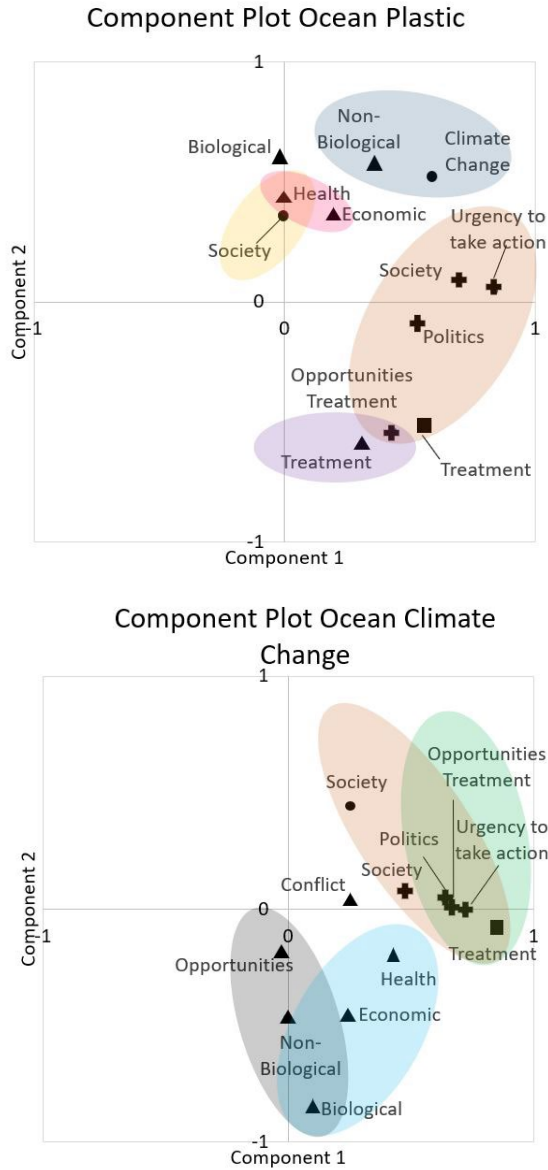


Figure 2.4: **A)** Component plot ocean climate change, showing four clusters. **B)** Component plot ocean plastic, showing 5 clusters. The symbols used for frame variables correspond to the Entman frame elements presented in Figure 2.3. **Legenda:** **Orange:** Societal responsibility frame; **Green:** Political action frame; **Grey:** Climate change opportunity frame; **Blue:** socio-economic problem frame; **Pink:** Health problem frame; **Yellow:** Societal blame frame; **Purple:** Scientific solution frame; **Blue Grey:** Dual problem frame.

In the ocean plastic dataset, the fifth cluster focused on health and economic problems. However, in the ocean plastic press releases the focus mainly lay on health problems, a more frequent frame variable. Hence, this cluster was called the **health problem frame (5)**. The sixth cluster focused on society's responsibility for causing ocean plastic and was named the **societal blame frame (6)**. The health problem and societal blame frame show overlap and often co-occur in press releases. The seventh cluster contained the frame variables: problems that occur with ocean plastic mitigation and opportunities that arise when treatment is carried out. Press releases containing these frame variables focused on scientists who solved mitigation problems and is therefore called the **scientific solution frame (7)**. The eighth cluster contained non-biological problems caused by climate change. Texts containing these variables focused on the relationship between climate change and ocean plastic, and the consequences they both have for the ocean. This cluster was called the **dual problem frame (8)**.

Frame distribution

A cross-table² was created showing the frame variables that appeared in each press release. When a press release not only stated the cause, either ocean plastic or climate change, but also identified associated problems, moral evaluations, and offered treatment recommendations, it encompassed all Entman frame elements and provided a comprehensive context for readers to interpret the scientific research in.

Using the cross-table, we calculated how many frame variables were present in each press release. On average, ocean climate change press releases contained fewer frame variables (4,0 SD=2,3) compared to ocean plastic press releases (4,6 SD=2,4). In both the ocean climate change-dataset and ocean plastic dataset, there was a large variation in the number of frame variables between press releases, as indicated by the high standard deviation. Since the frame variables define the meaning of the frame elements, we could quantify the number of Entman frame elements in each press release (Figure 2.5). In all press releases, climate change and ocean plastic were present as 'cause'.

² The cross-table with frame variables and press releases is added to the additional online material.

Hence, only the one responsible for causing these ocean issues was taken into account in the calculation. As a result, certain press releases did not incorporate any of the Entman frame elements. This absence led 52,7% of the ocean climate change press releases to have only one or fewer frame elements, in contrast to 35,2% of the ocean plastic press releases.

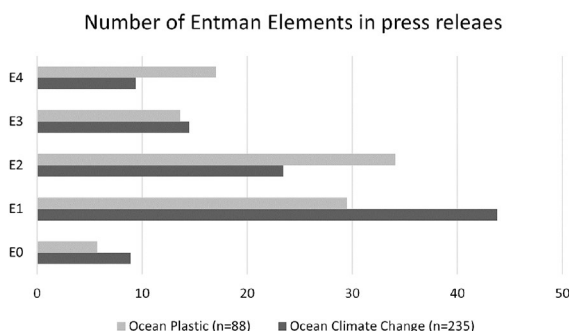


Figure 2.5: Bar chart showing the number of Entman frame elements present in ocean climate change and ocean plastic press releases. The figure shows that ocean plastic press releases contain on average more Entman frame elements than ocean climate change press releases do.

Because the PCA showed which clusters of frame variables make up a frame, we were able to use the crosstab to identify these frames in individual press releases. Linking the frames to individual press releases allowed us to calculate the distribution of frames within the dataset (Table 2.1 and 2.2). We only considered press releases for frame distribution calculation if the essential frame elements (either a problem, cause, treatment, and/or moral evaluation) were established by at least one frame variable. To better understand how press release authors formulated the frames, we qualitatively analysed all press releases that contained one of the 8 frames. The qualitative analysis provided a deeper understanding of the frames and how they were communicated using narrative characteristics.

Table 2.1: *Composition of frames and frame distribution in ocean climate change press releases*

Frame	No Frame	Societal responsibility	Political action	Climate change opportunity	Socio-economic problem
Solely present	62,1%	2,1%	4,7%	3,0%	19,6%
In combination		6,4%	10,2%	4,7%	26,8%

¹Please see appendix 1 for an explanation of the frame variables.

Table 2.2: *Composition of frames and frame distribution in ocean plastic press releases*

Frame	No Frame	Societal responsibility	Health problem	Societal blame	Scientific solution	Dual problem
Solely present	35,2%	5,7%	14,8%	8,0%	4,5%	5,7%
In combination		19,3%	29,5%	23,9%	5,7%	18,2%

¹Please see appendix 1 for an explanation of the frame variables.

Qualitative frame explication

In the following section, we showcase the eight frames by offering a quote that is illustrative for the frame, by providing a short description of the frame and by highlighting the narrative elements that are used in the communication of the frame. The frame descriptions stem from the qualitative analysis of press releases and offer insights into how frames and narrative elements are contextualized.

Frame 1 The societal responsibility frame

“The Antarctic has contributed very little to the production of greenhouse gases, and yet it’s one of the places on the planet receiving the most impact,” Todgham said. “I feel we have responsibility to care about the spaces that are so fragile. A1

The social responsibility frame is the only frame present in both datasets. Social responsibility explains how society has the power to mitigate ocean climate change and ocean plastic, a message accompanied by an urgent call to action. Emphasis is laid on the anthropogenic causes of ocean climate change and ocean plastic. There are no victims of ocean plastic, whereas victims of ocean climate

change are often mentioned. Scientists warn of the threat of ocean plastic or ocean climate change if “we” do not take immediate action. This emphasis is reinforced by the use of doom and gloom language, stressing the severity of problems and the urgency to address them. Scientists explain why it is important to carry out mitigation or how to solve the climate or plastic ‘crisis’. Scientists do not simply instruct readers to perform a treatment but call on them to help in the process.

Frame 2 The political action frame

“But these benefits require action and this study serves as a wakeup call to governments that they must change the way that fishing takes place or risk losing a crucial opportunity to secure our food supply for generations to come.”^{A2}

The political action frame focuses on the responsibility of politicians to solve climate change issues. The call for treatment is often accompanied by a request for immediate action. Mitigation is encouraged by emphasizing the opportunities that arise with treatment. References are made to systems threatened by climate change, for example, “our” economy. Scientists warn society of the losses that ‘we’ suffer if mitigation measures are not taken. Scientists give their opinion on the kind of measures that politicians should take. This is the only frame that portrays industries such as tourism, agriculture or fisheries as villains who contribute to climate change or overfishing. Coastal communities and countries threatened by rising sea levels, or groups of fishermen affected by shifting or declining fish populations, are portrayed as victims of climate change.

Frame 3 The climate change opportunity frame

Kaneohe Bay in Hawaii was hit hard; nearly half of its corals bleached. Hidden in the aftermath of this extreme event, however, were biochemical clues as to why some corals bleached while others were resistant, information that could help reefs better weather warming waters in the future.^{A3}

Opportunities that arise due to climate change are the central topic of these press releases, but besides opportunities, biological or nonbiological problems are always named. Texts state the positive effect climate change has on ocean life, for instance, fish species that respond favorably to warmer ocean water. Other press releases frame

problematic episodes happening due to climate change as learning opportunities for researchers. The story is told in a positive or enthusiastic tone, often expressing excitement about new scientific findings. Actors overall do not fulfil particular roles. In half of the ocean climate change press releases, scientists give their opinion, which is almost always about why the topic under study is worth studying: *“Learning about these forams is very intriguing and will shed light on how early eukaryotes evolved.”*

Frame 4 The socio-economic problem frame

“Global warming is already affecting and damaging our reefs and not only harms our biosphere, but also our economy; 25% of marine fish depend on them and the losses that are occurring may be irreparable,” warns Coronado Vila.^{A5}

The severity of climate change is put in a context related to society. The importance of mitigation is emphasized by describing that ‘we’ will suffer economic losses or that ‘our’ living surrounding or food supply is threatened. In some press releases, scientists and scientific organisations try to solve the socio-economic problems, placing them in a hero role. Often, scientists only warn society about the consequences of high CO₂ levels and the pace at which they are increasing. Inhabitants of coastal regions hit by sea level rise, changing weather patterns, or decreasing income caused by falling fish stock are victims of climate change. Overall, the texts are characterized by a negative or neutral tone. In some press releases, doom language emphasizes the severity of the socio-economic problems by using words such as ‘crisis’ or ‘catastrophe’.

Frame 5 The health problem frame

Analysis reveals that such minuscule fragments can stay airborne for hours or days, spreading the potential to harm the marine environment and, by climbing up the food chain, to affect human health.^{A6}

Ocean plastic is described as problem for ‘our’ health or ‘our’ ocean. The tone of the story is overall negative or neutral. A scientist is quoted in almost every press release, but they rarely provide an opinion. When they do, the opinion emphasizes the importance of research: *This study is important, said Brahney, but it is just the beginning. Much more work is*

needed on this pressing problem to understand how different environments might influence the process.^{A7} Scientists are portrayed in a hero or warner role. Industries or countries with bad waste management strategies are the villains of the story, whereas inhabitants of heavily polluted coastal areas are victims of ocean plastic.

Frame 6 The societal blame frame

“Consumer items found in everyday households are the plastics polluting our beaches and oceans. It is estimated that roughly 4.8–12.7 million tons of plastic enter the marine environment annually.”

^{A8}

The anthropogenic character of plastic is highlighted, emphasizing the fact that plastic used by society creates or enhances the problem of ocean pollution. The mention that ‘we’ created the ‘plastic crisis’ is enhanced through inclusive references, emphasizing how ‘we’ are polluting ‘our’ environment. Scientists describe ways to reduce ocean plastic, thereby fulfilling the hero role. Sometimes scientists warn society about the increasing amounts of ocean plastic.

Frame 7 The scientific solution frame

“Standard PET recycling today is essentially ‘downcycling,’” says senior author Gregg Beckham, a Senior Research Fellow at NREL. “The process we came up with is a way to ‘upcycle’ PET into long-lifetime, high value composite materials like those that would be used in car parts, wind turbine blades, surfboards, or snowboards.”

^{A9}

The scientific solution frame focuses on why it is difficult or challenging to reduce the amounts of ocean plastic. These problems are overcome by a ‘killer idea’^{A10} of a scientist that will solve the ‘plastic crisis’, placing scientists in the hero role. The texts are hopeful or passionately written, emphasizing the possibilities of treatment and opportunities that arise when treatment is carried out. The use of doom language to describe problems made solutions that were offered seem better or the value of science for society seem bigger.

Frame 8 The dual problem frame

At the root of global climate change and the worldwide plastics pollution problem are two related carbon-based fuels — oil and natural gas. Not only are the two among the key drivers of climate change, they are instrumental in the manufacturing of plastics.^{A11}

The dual problem frame highlights the relationship between climate change and ocean plastic. The focus is on problems caused by ocean plastic that are amplified by climate change. Some texts emphasize the similarities between climate change and ocean plastic, stating that both are driven by the same source, namely, oil. Other texts focus on how plastic contributes to climate warming. The tone is predominantly negative, with texts focusing on the combined negative impacts of plastic and climate change on ecosystems.

2.5 Discussion and conclusion

The frames and narratives identified in this study show that press releases focused on ocean climate change and ocean plastic not only consists of abstract facts but that they involve humans, with emotions and opinions. Although the human face of science is evident in press releases, the roles occupied by actors paint a one-sided picture of science as saviour of society. Victims of climate change or ocean plastic were mostly absent. When present, they were represented by specific groups or geographical regions, without a display of emotion.

2.5.1 Narrative elements used to communicate ocean science

We calculated a degree of narrativity to answer RQ1 and found that press releases on ocean climate change and ocean plastic both used the narrative elements personalization, emotion and stylistic devices, whereas dramatization was minimally employed. Moreover, both datasets showed a general degree of narrativity of 1.8 on a four-point scale, indicating that press officers use similar narrative writing styles for both topics. The degree of narrativity in press releases is relatively high compared to climate change news stories, which show a degree of narrativity ranging from 1.15 to 1.75, depending on the country (Lück et al., 2018). This high degree of narrativity in press releases might be explained since almost all press releases mentioned how scientists

conduct research, causing personalization to be almost always present. In addition, stylistic devices like metaphors were often used.

The results of our study are largely consistent with those of Wetts (2019), who found that the climate change discourse of organisations in press releases was largely expert-oriented and technocratic, with no attention to identification. The difference with Wetts (2019) is, however, that many scientific press releases did focus on societies' responsibility for contributing to mitigation and that scientists shared their feelings and opinions regarding ocean issues. But although the human face is evident in press releases, personalization was minimally used to highlight the social dimensions of ocean issues and was only used to personify science and represented scientists, whereby scientists were often portrayed as saviours of society. Thereby, in answer of RQ2, press releases did not emphasize the human and social dimensions of ocean issues, that are said to be needed to engage people with ocean issues and encourage pro-environmental attitudes toward the ocean (Catalano et al., 2019; Stoll-Kleemann, 2019). We did not find many negative nor alarmist press releases, rather the balance between positive, negative, excited and neutral proved quite even. Hence, the answer to RQ3 is that press release authors did not use a dominant tone when writing ocean science press release. It is known, however, that the media has a preference for the display of negative and alarming news stories (Harcup & O'Neill, 2017) so although the press releases do not paint a predominantly negative picture of ocean health, research in media representation is needed to evaluate whether or not press releases that focus on negative events are taken up more frequently in the news than press releases that convey a neutral or hopeful story.

2.5.2 Framing ocean science in press releases versus the media

In answer of RQ4 we found 8 different frames that were used to communicate about ocean climate change and ocean plastic in press releases. Not only ocean plastic press releases emphasize the dangers, damage and adverse effects of ocean plastic; media articles analysed in other studies (e.g., Welzenbach-Vogel et al., 2022) found the same emphasis. However, media articles focus heavily on negative

outcomes, whereas our results showed that the consequences of ocean plastic were often framed in relation to treatment in press releases. Similar to Schönbauer and Müller's (2021) findings, our study also found that ocean plastic was primarily framed as public responsibility, emphasizing society's role in causing problems or in addressing risks. Press releases made little attribution to the responsibility of corporations and industry. Although the research of Henderson and Green (2020) showed that media coverage of ocean plastic mainly focuses on wildlife entanglement, this was not seen in our dataset.

Bolsen and Shapiro (2018) summarized climate change frames used in US media, of which the environmental consequences, national security, (political) conflict, public health, economic problem, opportunity, efficacy and science frames, are all recognized in our dataset. In contrast to the frames described by Bolsen and Shapiro (2018), the frames we found are created by the use of a clustering method, because the combination in which frame variables occur influences their meaning. So although the frames described in Bolsen and Shapiro's (2018) study were also found in our study as frame variables, their meaning is found to differ when told in combination with other frame variables. For example, solely mentioning climate opportunities in the media might suggest that action is no longer necessary (O'Neill et al., 2015). This is an inference that does not occur in press releases because the climate opportunity is always told in combination with environmental problems. As a result, the need for mitigation is never ignored.

Many of the frame variables present in ocean plastic press releases, which are used to define the ocean plastic problem, correspond to above-mentioned climate change media frames that are used to contextualize climate change in newspaper articles. This implies that press officers use similar methods to create a context in which ocean plastic- and ocean climate change research can be interpreted. We suggest that the difference in framing between the issues of ocean plastic and ocean climate change is thus not caused by the conceptualization of frame variables, but by the frequency with which the variables occur in press releases and by the way they occur in combination with other variables.

2.5.3 Framing differences in relation to scientific understanding and efficacy

In our sample, press releases on ocean plastic paid twice as much attention to treatment and people's responsibility to solve issues than press releases on ocean climate change did. Climate change press releases did not often state solutions but did focus on society's responsibility for causing global warming. Climate change press releases did not often state solutions but did focus on society's responsibility for causing global warming. Focusing on the role of society in either ocean pollution or climate change draws attention to the human responsibility to combat ocean impacts and places human agency at the heart of the narrative. Earlier research showed that emphasizing society's responsibility to mitigate environmental problems, in combination with a proposed treatment, enhances people's self-efficacy (Hart & Feldman, 2014). Whereas not proposing solutions to environmental problems may lead people to feel guilty and pessimistic about their ecological future, which is a non-effective tool to motivate people to take action (O'Neill & Nicholson-Cole, 2009). The effect of how press releases formulate human agency should be further investigated.

In press releases on ocean climate change, climate change is portrayed as standalone problem, whereas press releases on ocean plastic highlight the connection between both topics in the dual problem frame. Ford et al., (2022), suggests that, rather than debating over the relative importance of climate change or marine plastic pollution, a more productive course would be to determine the linking factors between the two and identify solutions to combat both crises. Pointing out the relationship between ocean plastic and climate change more often in ocean climate change communications could, when we follow the notion of Ford et al., (2022), potentially have a positive effect on public appreciation of these two issues. If highlighting the connectedness of ocean plastic and ocean climate change in scientific press releases enhances people's appreciation of these ocean issues should be a topic for further analysis.

Ocean climate change press releases contained fewer frames than ocean plastic press releases. Although we found a total of 8 frames in our study, 62,1% of ocean climate change- and 35,2% of

ocean plastic press releases did not fall within one of the frames, because 52,7% of the ocean climate change press releases, and 35,2% of ocean plastic press releases contained only 0-1 frame element. Hence, it could be hypothesized that due to the lack of frame variables in the ocean climate change press releases, these press releases created less context in which the research could be interpreted, making them more abstract.

Moreover, press releases on ocean climate change often stated non-biological problems like changing ocean currents or changing ocean chemistry. In addition, ocean climate change was framed as a socioeconomic problem, involving problems from multiple (scientific) domains. The abstract origin and diverse character of the problems are known to hinder people's understanding of climate change (Skanavis et al., 2019). On the contrary, ocean plastic was mainly framed as a biological and health problem, using on average more frame variables to define the problems in press releases.

2.6 Limitations and future research

We are aware that the data set we analysed is US dominated and that the use of framing and narratives can differ per culture and country. In this study, we used both a quantitative and qualitative method to describe frames. The PCA cluster method used to define frames is limited as variables that occur infrequently but often in combination with others interfere with the analysis. Nevertheless, PCA yielded clear clusters with logical interpretations. Linking the quantitatively determined frames to individual press releases which were analysed again qualitatively, led to a better understanding of how the frames are communicated through frame variables and made it possible to analyse frame distribution. The calculation of frame distribution is, however, largely influenced by the inclusion criteria that are used for the analysis. Due to the strict inclusion criteria we applied, an underestimation of how often frames occur in press releases can be expected. Nevertheless, the strict inclusion criteria facilitated a clear qualitative interpretation of the frames.

We have demonstrated that ocean climate change and ocean plastic research is framed differently in press releases, whereby ocean climate change press releases name more abstract problems, use

fewer frames and give fewer treatment recommendations compared to ocean plastic press releases. Future research could analyse if press releases that contain more frame variables or fewer abstract problems create a context in which the scientific study can be more easily interpreted when compared with press releases that lack this context or that use more abstract problems.

Future research could focus on the rationale behind including narrative elements in scientific press releases to increase engagement and understanding. In literature it has been argued that concrete and imaginable information is easier to comprehend and more interesting to read (Cherniak et al., 1983; Sadoski, 1999), whereby concreteness and imaginability can be reached by the incorporation of narratives (Nisbett & Ross, 1980; Dahlstrom, 2014). We found that narratives differ in terms of their frequency of occurrence in scientific press releases. Experimental research could investigate the effect narrative elements in scientific press releases have on people's understanding of scientific topics, and if press releases that contain more narrative elements are easier to understand.

Lastly, it would be beneficial to also examine how frames and narratives in press releases are adopted or modified when the research is presented in the media. This will give us insights in the influence that scientific organisations have on the representation of scientists and scientific studies to wider audiences. To fully understand the process of framing happening from scientific publication to media representation, it is crucial to consider the perspectives of those who create these messages. This provides insights into best practices for science communication and sheds light on the role that science communication professionals believe press releases could and should play in making science meaningful.

This article has provided insights into the use and dissemination of frame and narrative elements in press releases and has taken an essential step to further explore the potential of frames and narratives in communicating ocean science in press releases. With the ultimate goal of creating well-designed texts that present scientific content in an understandable and engaging way.

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Literature

- Autzen, C. (2014). Press releases—The new trend in science communication. *Journal of Science Communication, 13*(03), C02.
<https://doi.org/10.22323/2.13030302>
- Bailey, I. (2022). Media coverage, attention cycles and the governance of plastics pollution. *Environmental Policy and Governance, 32*(5), 377–389.
<https://doi.org/10.1002/et.1977>
- Bolsen, T., & Shapiro, M. A. (2018). 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>
- Catalano, A. S., Lyons-White, J., Mills, M. M., & Knight, A. T. (2019). Learning from published project failures in conservation. *Biological Conservation, 238*, 108223. <https://doi.org/10.1016/j.biocon.2019.108223>
- Cherniak, C., Nisbett, R., & Ross, L. (1983). Human inference: Strategies and shortcomings of social judgment. *The Philosophical Review, 92*(3), 462.
<https://doi.org/10.2307/2184495>
- Cooper, C. B. (2011). Media literacy as a key strategy toward improving public acceptance of climate change science. *BioScience, 61*(3), 231–237.
<https://doi.org/10.1525/bio.2011.61.3.8>
- Dahlstrom, M. F. (2014). Using narratives and storytelling to communicate science with nonexpert audiences. *Proceedings of the National Academy of Sciences, 111*(Supplement_4), 13614–13620.
<https://doi.org/10.1073/pnas.1320645111>
- Dahlstrom, M. F. (2021). The narrative truth about scientific misinformation. *Proceedings of the National Academy of Sciences, 118*(15), e1914085117.
<https://doi.org/10.1073/pnas.1914085117>
- Duarte, C. M., Fulweiler, R. W., Lovelock, C. E., Martinetto, P., Saunders, M. I., Pandolfi, J. M., Gelcich, S., & Nixon, S. W. (2015). Reconsidering Ocean Calamities. *BioScience, 65*(2), 130–139.
<https://doi.org/10.1093/biosci/biu198>

The Framing of Science News

- Entman, R. M. (n.d.). Framing: Toward clarification of a fractured paradigm. 10.
- Ford, H. V., Jones, N. H., Davies, A. J., Godley, B. J., Jambeck, J. R., Napper, I. E., Suckling, C. C., Williams, G. J., Woodall, L. C., & Koldewey, H. J. (2022). The fundamental links between climate change and marine plastic pollution. *Science of The Total Environment*, 806, 150392. <https://doi.org/10.1016/j.scitotenv.2021.150392>
- Forgács, B., & Pléh, C. (2022). *The Fluffy Metaphors of Climate Science* (pp. 447–477). https://doi.org/10.1007/978-3-030-90688-7_22
- Glaser, M., Garsoffky, B., & Schwan, S. (2009). Narrative-based learning: Possible benefits and problems. *Communications*, 34(4). <https://doi.org/10.1515/COMM.2009.026>
- Harcup, T., & O'Neill, D. (2017). What is news?: News values revisited (again). *Journalism Studies*, 18(12), 1470–1488. <https://doi.org/10.1080/1461670X.2016.1150193>
- Hart, P. S., & Feldman, L. (2014). Threat without efficacy? Climate change on U.S. network news. *Science Communication*, 36(3), 325–351. <https://doi.org/10.1177/1075547013520239>
- Henderson, L., & Green, C. (2020). Making sense of microplastics? Public understandings of plastic pollution. *Marine Pollution Bulletin*, 152, 110908. <https://doi.org/10.1016/j.marpolbul.2020.110908>
- Hillier, A., Kelly, R. P., & Klinger, T. (2016). Narrative style influences citation frequency in climate change science. *PLOS ONE*, 11(12), e0167983. <https://doi.org/10.1371/journal.pone.0167983>
- Hornsey, M. J., & Fielding, K. S. (2016). A cautionary note about messages of hope: Focusing on progress in reducing carbon emissions weakens mitigation motivation. *Global Environmental Change*, 39, 26–34. <https://doi.org/10.1016/j.gloenvcha.2016.04.003>
- Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational and Psychological Measurement*, 20(1), 141–151. <https://doi.org/10.1177/001316446002000116>
- Kelly, R., Evans, K., Alexander, K., Bettiol, S., Corney, S., Cullen-Knox, C., Cvitanovic, C., de Salas, K., Emad, G. R., Fullbrook, L., Garcia, C., Ison, S., Ling, S., Macleod, C., Meyer, A., Murray, L., Murunga, M., Nash, K. L., Norris, K., ... Pecl, G. T. (2021). Connecting to the oceans: Supporting ocean literacy and public engagement. *Reviews in Fish Biology and Fisheries*. <https://doi.org/10.1007/s11160-020-09625-9>

- Krippendorff, K. (2004). Measuring the reliability of qualitative text analysis data. *Quality & Quantity*, 38(6), 787–800. <https://doi.org/10.1007/s11135-004-8107-7>
- Lotze, H. K., Guest, H., O'Leary, J., Tuda, A., & Wallace, D. (2018). Public perceptions of marine threats and protection from around the world. *Ocean & Coastal Management*, 152, 14–22. <https://doi.org/10.1016/j.ocecoaman.2017.11.004>
- Lück, J., Wessler, H., Wozniak, A., & Lycarião, D. (2018). Counterbalancing global media frames with nationally colored narratives: A comparative study of news narratives and news framing in the climate change coverage of five countries. *Journalism*, 19(12), 1635–1656. <https://doi.org/10.1177/1464884916680372>
- Matthes, J., & Kohring, M. (2008). The content analysis of media frames: Toward improving reliability and validity. *Journal of Communication*, 58(2), 258–279. <https://doi.org/10.1111/j.1460-2466.2008.00384.x>
- McAfee, D., Doubleday, Z. A., Geiger, N., & Connell, S. D. (2019). Everyone loves a success story: Optimism Inspires conservation engagement. *BioScience*, 69(4), 274–281. <https://doi.org/10.1093/biosci/biz019>
- Nisbet, M. C. (2009). Communicating climate change: Why frames matter for public engagement. *Environment: Science and Policy for Sustainable Development*, 51(2), 12–23. <https://doi.org/10.3200/ENVT.51.2.12-23>
- O'Neill, S., & Nicholson-Cole, S. (2009). "Fear won't do it": Promoting positive engagement with climate change through visual and iconic representations. *Science Communication*, 30(3), 355–379. <https://doi.org/10.1177/1075547008329201>
- O'Neill, S., Williams, H. T. P., Kurz, T., Wiersma, B., & Boykoff, M. (2015). Dominant frames in legacy and social media coverage of the IPCC Fifth Assessment Report. *Nature Climate Change*, 5(4), 380–385. <https://doi.org/10.1038/nclimate2535>
- Pelletier, L. G., & Sharp, E. (2008). Persuasive communication and proenvironmental behaviours: How message tailoring and message framing can improve the integration of behaviours through self-determined motivation. *Canadian Psychology / Psychologie Canadienne*, 49(3), 210–217. <https://doi.org/10.1037/a0012755>
- Pörtner, H.-O., & Roberts, D. C. (2022). Climate change 2022: Impacts, adaptation and vulnerability. 168.

- Sadoski, M. (1999). Theoretical, empirical, and practical considerations in designing informational text. *Document Design*, 1(1), 25–34. <https://doi.org/10.1075/dd.1.1.04sad>
- Schiffer, H., & Guerra, A. (2015). Electricity and vital force: Discussing the nature of science through a historical narrative. *Science & Education*, 24(4), 409–434. <https://doi.org/10.1007/s11191-014-9718-6>
- Schmidt, A., Ivanova, A., & Schäfer, M. S. (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>
- Schönbauer, S., & Müller, R. (2021). A risky object? How microplastics are represented in the German media. *Science Communication*, 43(5), 543–569. <https://doi.org/10.1177/10755470211030519>
- Schwarze, S. (2006). Environmental melodrama. *Quarterly Journal of Speech*, 92(3), 239–261. <https://doi.org/10.1080/00335630600938609>
- Semetko, H. A., & Valkenburg, P. M. V. (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.1460-2466.2000.tb02843.x>
- Skanavis, C., Antonopoulos, K., Plaka, V., Pollaki, S.-P., Tsagaki-Rekleitou, E., Koresi, G., & Oursouzidou, C. (2019). Linaria Port: An interactive tool for climate change awareness in Greece. In W. Leal Filho, B. Lackner, & H. McGhie (Eds.), *Addressing the Challenges in Communicating Climate Change Across Various Audiences* (pp. 281–295). Springer International Publishing. https://doi.org/10.1007/978-3-319-98294-6_18
- Stafford, R., & Jones, P. J. S. (2019). Viewpoint – Ocean plastic pollution: A convenient but distracting truth? *Marine Policy*, 103, 187–191. <https://doi.org/10.1016/j.marpol.2019.02.003>
- Stevens, J. P. (2002). *Applied multivariate statistics for the social sciences*. 2002. Hillsdale, NS: Erlbaum.
- Stoll-Kleemann, S. (2019). Feasible options for behavior change Toward more effective ocean literacy: A systematic review. *Frontiers in Marine Science*, 6, 273. <https://doi.org/10.3389/fmars.2019.00273>
- Tiller, R., Arenas, F., Galdies, C., Leitão, F., Malej, A., Romera, B. M., Solidoro, C., Stojanov, R., Turk, V., & Guerra, R. (2019). Who cares about ocean acidification in the Plasticene? *Ocean & Coastal Management*, 174, 170–180. <https://doi.org/10.1016/j.ocecoaman.2019.03.020>

- United Nations educational, scientific and cultural organization. (2021). *UNESCO Science Report 2021: The Race Against Time for Smarter Development*. United Nations. <https://doi.org/10.18356/9789210058575>
- van Leeuwen, J., Walker, T. R., & Vince, J. (2022). Plastic pollution. In P. G. Harris, *Routledge Handbook of Marine Governance and Global Environmental Change* (1st ed., pp. 253–262). Routledge. <https://doi.org/10.4324/9781315149745-27>
- Vogler, D. (2020). Growing influence of university pr on science news coverage? A longitudinal automated content analysis of university media releases and newspaper coverage in Switzerland, 2003–2017.
- Welzenbach-Vogel, I. C., Werling, K., Barkela, B., & Milde, J. (2022). Plastics in mass media. A content analysis of German media coverage of plastic-associated risks and sustainable alternatives to plastics. *Environmental Communication*, 16(2), 179–194. <https://doi.org/10.1080/17524032.2021.1979618>
- Wetts, R. (2019). Models and morals: Elite-oriented and value-neutral discourse dominates American organizations' framings of climate change. *Social Forces*. <https://doi.org/10.1093/sf/soz027>
- Wozniak, A., Lück, J., & Wessler, H. (2015). Frames, stories, and images: The advantages of a multimodal approach in comparative media content research on climate change. *Environmental Communication*, 9(4), 469–490. <https://doi.org/10.1080/17524032.2014.981559>
- Zerba, A. (2008). Narrative Storytelling: Putting the story back in hard news to engage young audiences. *Newspaper Research Journal*, 29(3), 94–102. <https://doi.org/10.1177/073953290802900308>

Appendix 1 - Explanation of frame variables

In all press releases, the causal interpretation is formed by either ocean plastic or climate change. In 29 press releases, only climate was named and not climate change. Therefore, these press releases were not included in the framing analysis. In all press releases it was coded if someone was held responsible for causing ocean climate change or ocean plastic.

The frame element problem definition describes the consequences that ocean climate change and ocean plastic have on our ocean and society, which are: Human environment (i.e., human health, living surroundings, food supply, etc.), economy (high costs, a decrease of valuable assets, economic sectors or jobs, etc.), biology (i.e., animal harm or death), conflict (i.e., conflicting ideas, politic conflicts, etc.), treatment (any form of treatment or recommendation of treatment was coded under treatment. Both mitigation as adaptation) and non-biological. Among non-biological consequences, are all consequences that ocean plastic or ocean climate change have on the ocean that do not involve animals. Examples are ocean acidification, changing ocean currents, ocean warming, and changing ocean chemistry. All issues that developed as a result of efforts to address climate change, ocean plastics, or related issues are considered treatment-related problems. For example: "Although the burning of plastic reduces the amount of waste being discarded onto land and into the seas, it generates potentially toxic fumes and contributes to greenhouse gas emissions."

A moral evaluation can be found in the press release by attributions of responsibility to solve problems named in the press releases, by an urgency to take action or when opportunities are named that occur when ocean plastic or ocean climate change is mitigated. Because opportunities due to treatment provide an evaluation of why it is important to carry out treatment and is therefore coded under moral evaluation.

During the first round of coding, it appeared that ocean climate change and ocean plastic, or issues related to these two topics, were not only causing difficulties but also opportunities. Hence, it was decided to also look at opportunities that arise due to ocean climate

change and ocean plastic or due to carrying out treatment of ocean climate change and ocean plastic. Finally, the treatment recommendation was coded, which describes a solution to reduce or remedy the problems or their cause.

Table 2A1: Description of frame variables

Frame element	Variables	Description
Problem definition	Consequence: Human environment	Consequences that threaten the direct livelihood of people. i.e., health-related problems, food shortages, migration crises, damaged houses due to sea level rise or heavy weather events.
	Consequence: Economic	Consequences that relate to the economy, to specific jobs or sectors. Press releases can also refer to possible costs arising due to mitigation of climate change or ocean plastics. Indications of economic impact are: affect marine resources, economic impact, economic consequence, fisheries are impacted, collapse in prizes, agriculture is negatively impacted, tourism is impacted, affect natural resources.
	Consequence: Biological	Consequences that relate to animal harm. For example: Affect marine life, impact organisms, impact food web, ingested of plastic by organisms, food chain is impacted, coral bleaching.
	Consequence: Non-Biological	Non-biological consequences comprise all effects that ocean climate change and ocean plastic have on the planet that do not directly involve living organisms. Examples are: extreme weather, melting ice caps, rising sea level, changing ocean circulation, ocean acidification, ocean stratification, changes in ocean chemistry, consequences for the ocean's carbon cycle, (Ocean warming or other temperature-related changes.
	Consequence: Treatment	Treatment related consequences are not directly caused by ocean plastic or ocean climate change, but comprise problems that have to do with treatment and/or mitigation efforts to prevent- or adjust to ocean climate change or ocean plastic.

	<p>Consequence: Conflict</p>	<p>A conflict could be a mention of a conflict in the science field, for instance that a topic is heavily debated. A conflict can also appear outside of the science field, as a political conflict or when different actors have conflicting or contrasting ideas.</p>
	<p>Opportunities due to ocean climate change or ocean plastic</p>	<p>Opportunities that (might) arise due to climate change, ocean plastics or to consequences related to the two topics. For example: better growth rates among certain species of fish due to ocean warming.</p>
<p>Causal interpretation</p>	<p>Cause: Ocean plastic</p>	<p>Problems or opportunities are direct- or indirectly caused by ocean plastics.</p>
	<p>Cause: Ocean climate change</p>	<p>Problems or opportunities are direct- or indirectly caused by ocean climate change.</p>
	<p>Actor responsible for cause</p>	<p>Someone is held responsible for causing ocean plastic, ocean climate change or related problems. The actor deemed responsible belongs to either: politics, industry, a specific region or country, or society.</p>
	<p>Opportunities due to treatment</p>	<p>Opportunities that (might) arise due to treatment of climate change, ocean plastics or to consequences related to the two topics. For example: enhancement of fishing stock, economic gain.</p>
	<p>Actor responsible for treatment</p>	<p>Someone is held responsible for mitigating ocean plastic, ocean climate change or related problems. The actor deemed responsible belongs to either: politics, industry, a specific region or country, or society.</p>
	<p>Urgency to take action</p>	<p>The urgency to take action states that it is important to diminish the problems named in the press release. The urgency to take action can be expressed by naming severe consequences if we do not take action or a direct call for action can be made.</p>

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Treatment recommendation	Treatment recommendation	The treatment recommendation refers to any recommendation done in the press release that provides a solution directly for ocean plastic, climate change, or for problems related to these two topics, i.e., decreasing atmospheric CO ₂ , using less energy from fossil fuels, creating MPAs, decreasing overall plastic use, change of lifestyle, change of economy.
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Appendix 2 - Validation of codebook using Krippendorff's alpha

The validation of the codebook was done by four coders: two who validated narrative and two who validated framing. Initially, 8 randomly selected press releases for both ocean plastic and ocean climate change were coded. Based on verbal feedback and low Krippendorff's alpha scores, the codebook was altered. The main feedback from the coders was that the codebook was too extensive and that it was hard to keep track of all the frame and narrative variables. Hence, the codebook was made more clear and comprised.

In the initial codebook, a frame or narrative variable with its explanation was listed and the second coder had to indicate if a variable was present in the text. This way of coding was altered into coding questions, on which the coder had to answer yes when the variable was present in the text or no when a frame variable was not present. In addition, a summary containing all the coding questions was added to the codebook. This way the coder had all the questions in one list, which helped them to not forget any of the variables. This was a very helpful step since the codebook is extensive. When the coder was in doubt about whether or not a variable in the summary was also present in the text, the coder could go to the right place in the codebook and see a more elaborated explanation about the variable including some examples.

Lastly, some frame variables were deleted from the codebook, making the codebook more concise. In the first codebook, the coder had to indicate if the story contained the method that was used during the research, if it talked about scientific uncertainty, if the need for future research was indicated and if scientific jargon was used. In addition, the coder had to say if a call to action was made in the press release. All these variables were deleted. And to clarify the other frame and narrative variables, extra examples were added to the codebook.

Table 2A2: Validation codebook using Krippendorff's alpha frame- and narrative variables.

Frame elements	Variables¹	Amount of press releases (N)	Occurrence of variable (N)	Krippendorff's alpha (α)
Problem definition	Humanitarian	36	9	0.92
	Economic	36	11	1.00
	Biological	36	20	1.00
	Non-Biological	36	29	0.84
	Treatment	36	2	1.00
	Conflict	36	2	1.00
Opportunities	Opportunities due to cause ⁴	36	2	1.00
	Opportunities due to treatment	36	2	1.00
Moral Evaluation	Actor: Responsible for treatment ^{1,2}	180	12	0.95
	Urgency to take action	36	7	0.91
	Ocean Plastic	36	9	0.93
	Ocean Climate Change	36	11	1.00
Causal attribution	Actor: Responsible for cause ^{1,2}	180	13	0.94
	Treatment recommendation	36	7	0.80

Narrative Characteristics				
Narrativity	Dramatization	36	34	0.78
	Personalization	36	36	1.00
	Emotionalization	36	4	0.84
	Stylistic device	36	17	0.89
Actor Roles	Victim	36	2	0.80
	Villain ³	36	1	1.00
	Hero	36	5	1.00
	Warner	36	13	0.83
	Internal Scientist	36	33	1.00
Actor Statements	Other Actor	36	1 ⁴	1.00
	Opinion Actor	36	15	0.89
	Fatalistic/ Alarmistic	36	2	1.00
	Negative	36	6	1.00
	Neutral	36	21	0.89
Story Tone	Positive/ Hopeful	36	6	0.89
	Passionate/ Excited	36	1	1.00

Krippendorff's alpha is calculated to indicate agreement between coders. N is the number of coding decisions on which the calculations are based, n is the amount a variable was coded by either one, or both coders.

¹ The following variables could be coded (0 = not present, 1 = present): Politics/governments, specific regions/ countries, society, companies/ industries and other.

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² For computing and reporting agreement coefficients for frame variables defining actor roles: who is responsible to carry out treatment and who is responsible for causing ocean plastic and ocean climate change, the variables were re-coded into their respective categorical variables. The number of coding decisions that is decisive in calculating Krippendorff's alpha for these variables increased accordingly (in this case 5 x 36 = 188 coding decisions)

³ This variable occurred in less than 5% of the entire data set.

⁴ The cause is either ocean plastic or ocean climate change.

Appendix 3 – Results narrative analysis

Table 2A2: Degree of narrativity, tone and actor roles. Percentages show the fraction of press releases where the device is present.

Narrativity	Degree of Narrativity	Dramatization	Personalization	Emotionalization	Stylistic devices
Ocean Climate Change	1.80 SD=0.85	13%	95%	30%	42%
Ocean Plastic	1.82 SD=0.81	18%	98%	28%	38%
Tone	Fatalistic	Negative	Neutral	Positive	Passionate
Ocean Climate Change	8%	17%	42%	14%	20%
Ocean Plastic	11%	25%	28%	15%	20%
Actor roles	Hero	Warner	Victim	Villain	Villain-Society
Ocean climate Change	14%	25%	16%	4%	31%
Ocean Plastic	27%	24%	4%	23%	24%

Appendix 4 – Results statistical analysis

Table 2A3: Factor loading scores ocean climate change press releases

Component	Initial Eigenvalues		Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	% of Variance	Cumulative %	Total	% of Variance	
1	2,824356	23,5363	23,5363	2,824356	23,5363	2,435862
2	1,54005	12,833746	36,370046	1,54005	12,833746	1,757901
3	1,272226	10,601884	46,97193	1,272226	10,601884	1,684791
4	1,134546	9,45455	56,42648	1,134546	9,45455	1,253488

Table 2A5: Pattern matrix ocean climate change press releases, PCA, Oblimin rotation with Kaiser Normalization

Frame elements	Frame Variables	Percentage %	Component 1	Component 2	Component 3	Component 4
Problem definition	Human Health	16.60	0,197	0,65	-0,06	-0,324
	Economic	18.72	0,034	0,76	-0,101	-0,048
	Non-Biological	78.72	-0,457	0,423	0,527	0,106
	Biological	51.91	-0,021	0,515	0,107	0,459
	Treatment	5.11 ¹	x	x	x	x
	Conflict	7.23	0,059	0,206	0,198	-0,486
	Opportunity	6.38	0,092	-0,007	0,096	0,759

Moral Evaluation	Opportunities due to treatment	8.93	0,826	0,014	-0,013	0,047
	Responsible for treatment					
	Actor: Politics	10.21	0,810	0,048	-0,003	-0,007
	Actor: Society	8.51	0,170	-0,082	0,720	0,087
	Actor: Countries	3.82 ¹	x	x	x	x
	Actor: Industry	3.40 ¹	x	x	x	x
	Actor: Other	4.68 ¹	x	x	x	x
Urgency to take action	18.72	0,401	0,071	0,537	-0,056	
Treatment recommendation		22.13		0,679	0,144	0,363
Causal Attribution	Ocean Climate Change	100.00 ²	x	x	x	x
	Plastic	2.13 ¹	x	x	x	x
	Responsible for cause:					
	Actor: Politics	0.85 ¹	-0,071	-0,337	0,492	-0,25
	Actor: Society	31.06	x	x	x	x
	Actor: Countries	1.28 ¹	x	x	x	x
	Actor: Industry	2.55 ¹	x	x	x	x
Actor: Other	0.43 ¹	x	x	x	x	

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Note: All critical factor loading scores that determine the frame variables that define the frames are bold. Typically, a loading of more than 0.3 is deemed important. However, the significance of a loading depends on the sample size. Hence, critical loadings of 0.298 for ocean climate change were used, as recommended by Stevens (2002).¹ All variables present in <6% of the ocean climate change data set are not used in the PCA. ² Because climate change is identified in all press releases as main cause, this variable is present in 100% of the press releases and could therefore not be used in the PCA.

Table 2A6: Structure Matrix ocean climate change press releases, PCA, Oblimin with Kaiser Normalization

Frame elements	Frame Variables	Percentage %	Component 1	Component 2	Component 3	Component 4	
Problem definition	Human Health	16.60	0,304	0,647	0,054	-0,296	
	Economic	18.72	0,122	0,750	-0,012	0,006	
	Non-Biological	78.72	-0,345	0,428	0,507	0,149	
	Biological	51.91	0,014	0,555	0,134	0,490	
	Treatment	5.11 ¹	x	x	x	x	
	Conflict	7.23	0,158	0,202	0,256	-0,489	
	Opportunity	6.38	0,029	0,066	0,063	0,744	
Moral Evaluation	Opportunities due to treatment	8.93	0,822	0,121	0,094	-0,033	
	Responsible for treatment:						
	Actor: Politics	10.21	0,817	0,150	0,108	-0,084	
	Actor: Society	8.51	0,244	0,023	0,728	0,023	
	Actor: Countries	3.82 ¹	x	x	x	x	
	Actor: Industry	3.40 ¹	x	x	x	x	
	Actor: Other	4.68 ¹	x	x	x	x	

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	Urgency to take action	18.72	0,486	0,177	0,600	-0,122
Treatment recommendation		22.13		0,738	0,274	0,463
Causal Attribution	Ocean Climate Change	100.00 ²	x	x	x	x
	Plastic	2.13 ¹	x	x	x	x
Responsible for cause:						
	Actor: Politics	0.85 ¹	x	x	x	x
	Actor: Society	31.06	-0,026	-0,310	0,461	-0,294
	Actor: Countries	1.28 ¹	x	x	x	x
	Actor: Industry	2.55 ¹	x	x	x	x
	Actor: Other	0.43 ¹	x	x	x	x

¹All variables present in <6% of the ocean climate change data set are not used in the PCA. ² Because ocean climate change is identified in all press releases as main cause, this variable is present in 100% of the press releases and could therefore not be used in the PCA.

Table 2A7: Factor loading scores ocean plastic press releases

Component	Initial Eigenvalues		Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	% of Variance	Total	% of Variance	Cumulative %	Squared Loadings
1	2,691294	20,702259	2,691294	20,702259	20,702259	2,36245
2	2,276339	17,510303	2,276339	17,510303	38,212562	1,920895
3	1,21059	9,312228	1,21059	9,312228	47,524789	1,400701
4	1,201859	9,245068	1,201859	9,245068	56,769857	2,037934
5	1,025831	7,891006	1,025831	7,891006	64,660863	1,247326

Table 2A8: Pattern matrix ocean plastic press releases, PCA, Oblimin rotation with Kaiser Normalization

Frame elements	Frame Variables	Percentage %	Component 1	Component 2	Component 3	Component 4	Component 5	
Problem definition	Human Health	29,55	-0,073	0,030	0,155	-0,083	0,837	
	Economic	11,36	0,171	-0,013	-0,395	-0,403	0,412	
	Non-Biological	77,27	-0,129	0,893	0,018	0,055	0,091	
	Biological	28,41	0,116	0,072	0,036	-0,597	0,184	
	Treatment	18,18	0,118	-0,120	-0,258	0,633	0,115	
	Conflict	4,55	x	x	x	x	x	
	Opportunity	2,27	x	x	x	x	x	
	Opportunities due to treatment	9,09	0,201	0,097	0,093	0,784	0,017	
Moral Evaluation	Responsible for treatment:							
	Actor: Politics	11,36	0,325	0,152	-0,241	0,264	0,262	
	Actor: Society	22,73	0,830	0,055	0,127	-0,112	-0,045	
	Actor: Countries	4,55	x	x	x	x	x	
	Actor: Industry	5,68	x	x	x	x	x	
	Actor: Other	3,41	x	x	x	x	x	
	Urgency to take action	18,18	0,777	0,235	0,000	0,087	0,010	

Treatment recommendation		43,18	0,679	-0,291	-0,040	0,345
Causal Attribution	Ocean Climate Change	20,45	0,862	-0,052	-0,050	-0,126
	Plastic	100	x	x	x	x
	Responsible for cause:					
	Actor: Politics	1,14	x	x	x	x
	Actor: Society	23,86	-0,021	0,773	-0,259	0,005
	Actor: Countries	13,64	0,235	-0,603	-0,225	-0,398
	Actor: Industry	5,68	x	x	x	x
	Actor: Other	2,27	x	x	x	x

Note: All critical factor loading scores that determine the frame variables that define the frames are bold. Typically, a loading of more than 0.3 is deemed important. However, the significance of a loading depends on the sample size. Hence, critical loadings of 0.512 for ocean plastic were used, as recommended by Stevens (2002). ¹ All variables present in <6% of the ocean plastic data set are not used in the PCA. ² Because ocean plastic is identified in all press releases as main cause, this variable is present in 100% of the press releases and could therefore not be used in the PCA.

Table 2A9: Structure matrix ocean plastic press releases, PCA, Oblimin rotation with Kaiser Normalization

Frame elements	Frame Variables	Percentage %	Component 1	Component 2	Component 3	Component 4	Component 5	
Problem definition	Human Health	29,55	-0,058	0,153	0,166	-0,170	0,842	
	Economic	11,36	0,219	0,131	-0,390	-0,378	0,453	
	Non-Biological	77,27	0,024	0,879	0,027	-0,077	0,214	
	Biological	28,41	0,076	0,193	0,071	-0,612	0,244	
	Treatment	18,18	0,206	-0,161	-0,337	0,674	0,060	
	Conflict	4,55	x	x	x	x	x	
	Opportunity	2,27	x	x	x	x	x	
Moral Evaluation	Opportunities due to treatment	9,09	0,276	0,033	-0,015	0,781	-0,016	
	Responsible for treatment:							
	Actor: Politics	11,36	0,429	0,213	-0,324	0,279	0,285	
	Actor: Society	22,73	0,805	0,197	-0,002	-0,050	0,014	
	Actor: Countries	4,55	x	x	x	x	x	
	Actor: Industry	5,68	x	x	x	x	x	
	Actor: Other	3,41	x	x	x	x	x	
	Urgency to take action	18,18	0,824	0,353	-0,140	0,130	0,080	
	Treatment recommendation			0,669	-0,228	-0,184	0,451	

Causal Attribution	Ocean Climate Change	20,45	0,338	0,883	-0,085	-0,126	0,018	
	Plastic	100	x	x	x	x	x	
	Responsible for cause:							
	Actor: Politics	1,14	x	x	x	x	x	
	Actor: Society	23,86	0,163	0,059	0,744	-0,299	0,031	
	Actor: Countries	13,64	0,297	0,027	-0,618	-0,119	-0,361	
	Actor: Industry	5,68	x	x	x	x	x	
	Actor: Other	2,27	x	x	x	x	x	

¹ All variables present in <6% of the ocean plastic data set are not used in the PCA. ² Because ocean plastic is identified in all press releases as main cause, this variable is present in 100% of the press releases and could therefore not be used in the PCA.

Appendix 5 – List with quote references

The list below shows all the quotes used in this publication. All press releases were published on EurekAlert!, the title of the press release, the organisation the press release was sent from and the date it was published on EurekAlert! Are listed below.

¹ “The Antarctic has contributed very little to the production of greenhouse gases, and yet it’s one of the places on the planet receiving the most impact,” Todgham said. “I feel we have responsibility to care about the spaces that are so fragile – Coping with climate stress in Antarctica, University of California – DAVIS, 17th of January 2018

² “But these benefits require action and this study serves as a wakeup call to governments that they must change the way that fishing takes place or risk losing a crucial opportunity to secure our food supply for generations to come.” – Study highlights urgent need to tackle fisheries management and climate change together, Environmental Defense Fund, 29th of August 2018

³ High temperatures were turning corals white around the globe. Kaneohe Bay in Hawaii was hit hard; nearly half of its corals bleached. Hidden in the aftermath of this extreme event, however, were biochemical clues as to why some corals bleached while others were resistant, information that could help reefs better weather warming waters in the future. – Uncovering how some corals resist bleaching, Michigan State University, 8th of February, 2021.

⁴ “Learning about these forams is very intriguing and will shed light on how early eukaryotes evolved.” – Some forams could thrive with climate change, metabolism study finds, Woods hole oceanographic institution, 27th May 2021

⁵ “Global warming is already affecting and damaging our reefs and not only harms our biosphere, but also our economy; 25% of marine fish depend on them and the losses that are occurring may be irreparable,” warns Coronado Vila. – Coral skeleton crystals record ocean acidification, Spanish Foundation for Science and Technology, 11th of July, 2019.

⁶ Analysis reveals that such minuscule fragments can stay airborne for hours or days, spreading the potential to harm the marine environment and, by climbing up the food chain, to affect human

health.- Plastic is blowing in the wind, Weizmann Institute of Science, 26th of December 2020.

⁷ This study is important, said Brahney, but it is just the beginning. Much more work is needed on this pressing problem to understand how different environments might influence the process. – Plastic planet: Tracking pervasive microplastics across the globe, S.J. Jessie E. Quinney College of Natural Resources, Utah State University, 12 of April 2021.

⁸ “Consumer items found in everyday households are the plastics polluting our beaches and oceans. It is estimated that roughly 4.8-12.7 million tons of plastic enter the marine environment annually.” – Microplastics are new homes for microbes in the Caribbean, Smithsonian Tropical Research Center, 7th of February, 2020.

⁹ “Standard PET recycling today is essentially ‘downcycling,’” says senior author Gregg Beckham, a Senior Research Fellow at NREL. “The process we came up with is a way to ‘upcycle’ PET into long-lifetime, highvalue composite materials like those that would be used in car parts, wind turbine blades, surfboards, or snowboards.” – ‘Upcycling’ plastic bottles could give them a more useful second life, Cell Press, 27th of February, 2019.

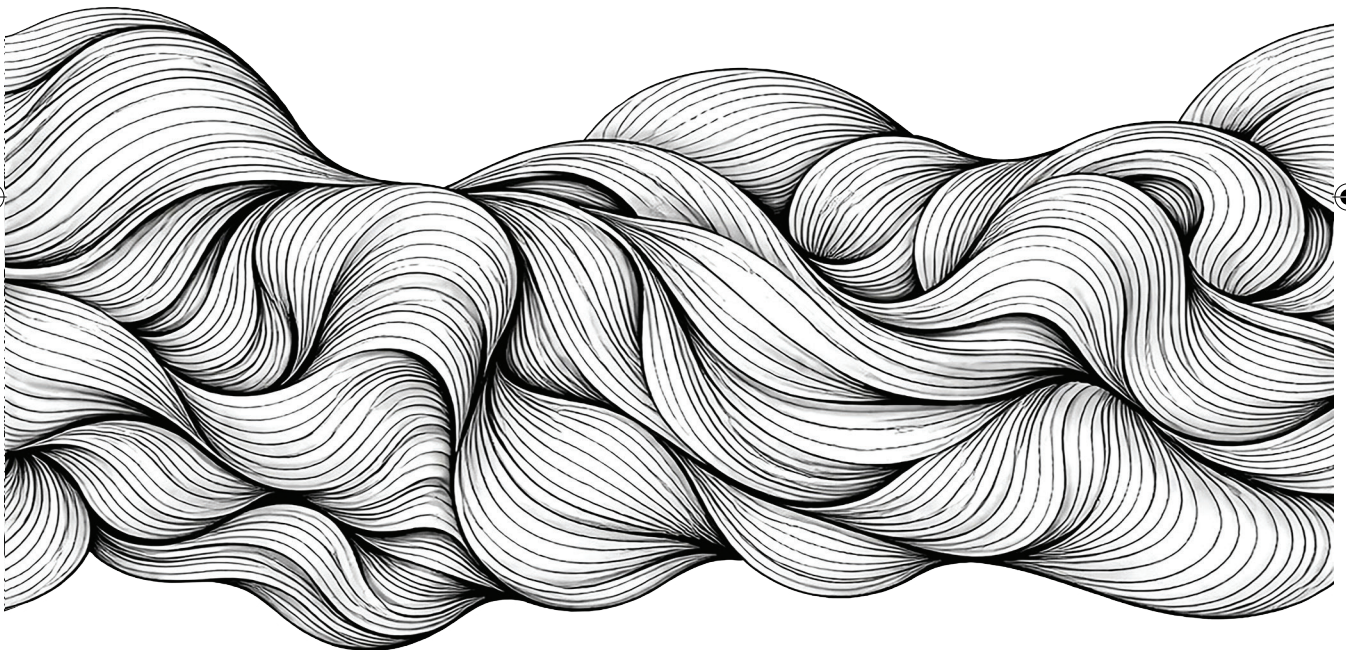
¹⁰ ‘killer idea’ – Ridding the oceans of plastics by turning the waste into valuable fuel, American Chemical Society, 3th of April 2017.

¹¹ At the root of global climate change and the worldwide plastics pollution problem are two related carbon-based fuels — oil and natural gas. Not only are the two among the key drivers of climate change, they are instrumental in the manufacturing of plastics. – URI scientists part of team that points to strong connection between climate change, plastics pollution, University of Rhode Island, 21st of October 2021.

The Framing of Science News



Chapter 3 Journalism versus churnalism: How news factors in press releases affect journalistic processing of ocean plastic research in newspapers globally

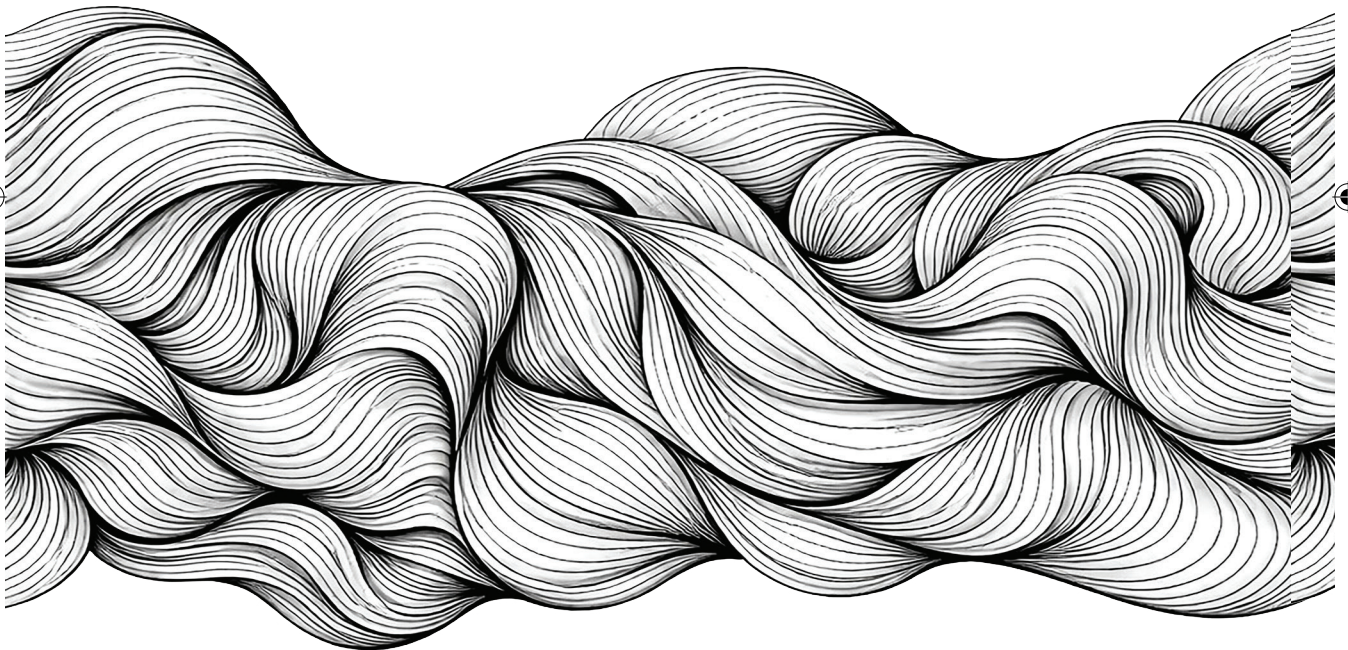




The Framing of Science News

This chapter is based on:

Vonk, A. N., Bos, M., & van Sebille, E. (2024). Journalism versus churnalism: How news factors in press releases affect journalistic processing of ocean plastic research in newspapers globally. *Journalism Studies*, 25(16), 2031–2050.



Abstract: This study evaluates the impact of news factors in press releases sent from scientific organisations on the representation of ocean plastic research in newspapers. We tracked 84 press releases discussing peer-reviewed ocean plastic studies, published between 2017 and 2021 on EurekAlert! And identified their presence in 495 English-language newspapers worldwide. Text comparison showed that press releases contribute highly to the construction of newspaper articles, with copied text segments in over half of the articles. News factors highlighting the prestige of the scientific study, like research published in high-impact journals or conducted by elite researchers were indicators of high newspaper coverage, as were the news factors bad news, magnitude, and social/economic relevance. Scientific press releases usually provide essential details about research, such as sample characteristics, research sites, and methods. However, funding information and research limitations were only marginally present. This study showed that providing research details does not reduce newsworthiness, instead sometimes even increasing it. Providing research details in press releases can influence journalists' understanding and evaluation of the scientific study and thereby their decision to report. Hence, to assess the newsworthiness of scientific research, we propose that news factor analysis should include research details.

Keywords: Science journalism, ocean plastic, news factors, frames, churnalism, press release

3.1 Introduction

Journalists play a crucial role in informing the public, especially regarding scientific topics, as citizens and decision-makers often rely on news media as their primary source of scientific information (Schäfer, 2017). However, journalism globally is facing challenges. Media houses are operating under difficult conditions (Bauer et al., 2013), and science journalism in particular, is at risk of being considered a luxury (Allan, 2011). Budget cuts have led to a situation where not only specialized science journalists but also general journalists, who may lack specialized training or expertise in science communication report on scientific issues.

Simultaneously, scientific organisations have professionalized their public relations efforts (Williams, 2015) and intensified their communications with the media (Autzen, 2014). With the decline of specialized science journalists and the increase in PR communications from scientific organisations, scientific organisations' communications have become increasingly important in the field of science journalism (Comfort, 2022; Vogler & Schäfer, 2020), whereby journalists increasingly rely on scientific press releases as a source of information about scientific developments (Schafraad & Zoonen, 2020). Previous research has shown that these press releases can both act as an incentive for journalists to cover specific scientific topics (Bauer et al., 2013; Maiden et al., 2020) and directly influence the actual content of newspaper articles (Autzen, 2014; Boumans, 2018a; Comfort et al., 2022; Schafraad & Zoonen, 2020). Whereby the content of press releases is frequently reproduced verbatim in news articles, a practice called churnalism (Boumans, 2018a; Comfort et al., 2022).

The reliance on press release content for science reporting is not without problems. Göpfert (2008) and Bauer & Gregory (2008) for example indicate that science journalists usually rely on peer-reviewed research for accurate reporting but that press releases are not subject to peer review. Using press releases as the sole news source can thereby bypass the critical review process that helps ensure the scientific validity of the research. This might allow scientific untruths that were present in the press release to enter the news (Bossema et al., 2019; Sumner et al., 2014). Hence, reliance on press release content for science journalism and the prevalence of churnalism not only

challenges how public relations professionals at scientific organisations craft press releases but also raises questions about the extent to which their content influences journalistic reporting practices concerning peer-reviewed publications.

Certain scientific topics remain under-reported in the media, despite their high scientific and societal relevance. A good example of this can be found in ocean science. Issues deemed important by scientists, such as ocean acidification and other climate change impacts like ocean warming, receive less media attention than ocean pollution (Tiller et al., 2019, Armoudian et al., 2023), with ocean plastic, in particular, dominating marine stories (Seys et al., 2022). Plastic pollution has become a prominent topic in public discourse, largely due to extensive media coverage. For example, the 2017 BBC documentary “Blue Planet II,” although not directly about plastic pollution, sparked a global conversation about plastic use, significantly increasing awareness (Males & Van Aelst, 2021).

Plastic marine litter is now one of the most visible marine issues in the public domain (Seys et al., 2022). However, this increased focus on plastic in the ocean has led to concerns within the marine research community about the potential misallocation of resources and funding, as other critical marine challenges risk being overshadowed in the public discourse (Stafford & Jones, 2019). By understanding why ocean plastic research has successfully garnered media and public attention, we can apply these insights to improve the communication of other (ocean) science topics that generally receive less attention.

Newsworthiness research can provide insights into why some types of research make it into the media (Badenschier & Wormer, 2012). The core of newsworthiness theory is that issues and topics have certain characteristics (news factors) that determine how likely they are to be picked up by news media (newsworthiness). These (scientific) news factors are often determined based on their presence and success in newspaper articles (Harcup & O’Neill, 2001, 2017; Bednarek & Caple, 2014). Because of this process, factors that are often absent from (scientific) news are not included in news factor analysis. By analysing press releases on peer-reviewed articles for news value, rather than newspaper articles, it becomes possible to identify factors

that not only increase the news value of peer-reviewed studies but potentially decrease it.

Our article examines the relationship between scientific press releases on peer-reviewed studies and subsequent newspaper articles, focusing on ocean plastic research as a case study. Because we analyse the content of press releases (rather than newspaper articles), we focus not only on factors that increase the news value of scientific research but also on factors that decrease that value. By analysing content similarities between press releases and newspaper articles, we can understand how scientific press releases affect how science is communicated in newspapers. This information is of value to public relations professionals and journalists alike, as it can contribute to more accurate, transparent, and impactful science journalism.

3.2 Theoretical framework

3.2.1 The success of scientific press releases in attracting newspaper attention

The rise of digital media, including social platforms and science communication channels, has revolutionized the dissemination of scientific information (Metag et al., 2023). This shift has led researchers and organisations to use multiple channels for sharing their findings, with social media, particularly Twitter/X, providing a direct way to connect with audiences and amplify scientific content through features such as 'retweeting' (Kopke et al., 2019). Nonetheless, press releases remain a crucial tool for communicating research findings to the media (Vogler & Schäfer, 2020), whereby journalists report using them as a source for writing scientific stories (Bauer et al., 2013; Maiden et al., 2020).

Boumans (2018a) found that 48.8% of the content in major Dutch newspapers was sourced from the Dutch news agency ANP, with online articles relying even more heavily on this source, at 75%. In a study focused specifically on scientific news, Vogler and Schäfer (2020) discovered that 42.7% of newspaper articles about science in Switzerland originated from university press releases. Although the importance of press releases as a source of science news is clear (Vogler & Schäfer, 2020), press releases seem inadequate in getting media attention since 90% of scientific press releases from universities

fail to make it into the media’s agenda (Kroon & Schafraad, 2013), highlighting a discrepancy between their potential impact and actual coverage.

University press releases cover a wide range of topics, from funding proposals and professor appointments to announcing new research and reporting on published peer-reviewed studies. Previous research has looked at newspaper uptake regarding all university press releases (Kroon & Schafraad, 2013) or how these press releases affect the content of academic newspaper articles (Vogler & Schäfer, 2020). However, neither study specifically looked at press releases about peer-reviewed studies, so it is unknown how successful they are in attracting (international) media attention or influencing newspaper content. Hence, to evaluate the effectiveness of obtaining global newspaper coverage of ocean plastic research through press releases published on EurekAlert!, we pose the following research question:

RQ 1: *What fraction of press releases from scientific organisations about ocean plastic research published on EurekAlert! Are covered by newspapers globally?*

3.2.2 The news value of ocean science research

Media representation of complex environmental risks often deviates from scientific consensus due to view standards and profit incentives, which may force journalists to ignore or misrepresent important environmental issues, or to focus more on event-based, personal, or sensational coverage (Boykoff & Boykoff, 2007; Hanson, 2010). The media tends to prioritise emotional stories, such as harmful impacts on charismatic marine animals like sea turtles (Keller & Wyles, 2021). In addition, marine narratives showcasing the beauty of ocean environments like coral reefs are more likely to be shared than stories about less charismatic ecosystems like seagrass (Duarte et al., 2008). When ocean science is covered in the media, the tone is predominantly sensational and negative (Eagle et al., 2018), whereby ‘bad news’ about the marine domain dominates newspaper headlines (Duarte, 2015).

As described above, clear patterns about what ocean topics are portrayed in the news and how they are written up seem to exist. Such patterns indicate a predictable decision-making process among

journalists (Harcup & O'Neill, 2001), aligning with news factor theory (Galtung & Ruge, 1965). News factor theory combines individual choices with professional and organisational routines and cultural influences (Harcup & O'Neil, 2001). At its core, the theory posits that issues possess certain characteristics (news factors) that determine their likelihood of being picked up by news media (newsworthiness). Newsworthiness, in turn, is a journalistic judgment of the relevance of each news factor (Eilders, 2006), where we define news factors as the newsworthy aspects of actors and issues (Galtung and Ruge, 1965; Harcup and O'Neill, 2001; 2017), whereby the overall newsworthiness increases with the number of news factors an issue gathers or the intensity with which these news factors are present. Based on these insights we hypothesize that: The presence of news factors positively influences newspaper coverage, whereby more news factors indicate higher coverage (H2.1).

Extensive research has been conducted on news factors that shape the visibility of topics in public media (Harcup & O'Neill, 2001, 2017; Bednarek & Caple, 2014). However, the news factors deemed important for coverage differ per news genre and even per news topic. Since the newsworthiness of ocean plastic research has not previously been investigated, we consider news factors identified for the communication of science news in general (Badenschier & Wormer, 2012; Kroon & Schafraad, 2013) and environmental science in particular (Molek-Kozakowska, 2017). These studies show that journalists, when covering scientific stories, tend to favour those linked to current issues, featuring controversies or surprising elements. Research that introduces something new or groundbreaking is deemed particularly newsworthy, a news factor known as novelty. Also 'relevance' is a crucial news factor, since it highlights the value of the research to society, economics, politics, or science itself (Badenschier & Wormer, 2012).

Moreover, the prestige of scientific research plays a pivotal role in science reporting. Journalists are more inclined to cover studies conducted by renowned scientists or institutes (Badenschier & Wormer, 2012). The prestige of research can be emphasized by institutional status markers, titles, or awards won by scientists or organisations (Molek-Kazakowska, 2017). Furthermore, newspapers

prioritise environmental issues that affect identifiable individuals or large groups (Kroon & Schaafraad, 2013; Molek-Kazakowska, 2017). Whereby stories with a strong emotional tone, especially those with implications for people or the environment, have more news value (Harcup and O’Neil; Badenschier & Wormer, 2012; Bednarek & Caple, 2014; Molek-Kozakowska, 2017).

News factor research does not typically focus on the content of press releases but primarily analyses stories in newspapers (e.g., Bednarek & Caple 2012; 2014; Molek-Kazakowska, 2017; Badenschier & Wormer, 2012). This approach is suitable for recognizing typical characteristics of newspaper articles, but it does not enable us to firmly state anything about factors that contribute to journalists not choosing the release, thereby decreasing the news value of the press release. Mellor (2015) highlighted several factors related to how scientific research is conducted, like limitations, uncertainties, and funding information, that are frequently omitted in science-related newspaper articles. Mellor questioned whether these factors, labelled as ‘non-news factors’ were often absent from newspaper stories due to their potential to ‘decrease’ the newsworthiness of scientific research and proposed to test this assumption in future research. Based on Mellor’s (2015) study we hypothesize that: The presence of non-news factors decreases the likeliness of press releases to be covered in the news media (H2.2).

Newspaper articles often focus on scientific results. However, information about the scientific process can help evaluate the quality of the scientific study and claims made about the results. Therefore, we agree with Mellor (2015) that providing information, such as funding details, limitations and uncertainties, can indeed affect how a journalist interprets and evaluates research, and influence a journalist’s decision to report on the study thereby affecting the study’s newsworthiness. Moreover, we hold the notion that research details that explain the scientific process, such as the methods used or the sample type/size analysed, may also affect a journalist’s interpretation and evaluation of the study, and therefore may also increase or decrease newsworthiness. Hence, to test H2.2, we look beyond the previously defined non-news factors as described by Mellor (2015) and also look at research details that describe the scientific process. We aim

to test H2.2 by examining the content of press releases rather than focusing solely on newspaper articles. By doing so, we can determine whether press releases contain factors commonly missing in newspaper coverage, like research details describing the scientific process rather than only the results, indeed diminish the newsworthiness of scientific research and can act as “non-news factors”.

3.2.3 Organisational news value criteria

Beyond news factors, journalists apply additional news value criteria in selecting issues or stories as news. These criteria are associated with organisational selection processes in newsrooms, focusing more on news gathering and processing, than on issues and actors featured in the news (Harcup & O’neil, 2001;2017). For example, content published in high-impact journals holds greater newsworthiness, as do stories featuring images (Badenschier & Wormer, 2012) or expert quotes (Brown Jarreau, 2014). Moreover, press releases written in language devoid of university-level complexity are easier to cover in newspaper articles, thereby increasing their newsworthiness (Comfort et al., 2022). Furthermore, national pride influences the publication of press releases, as countries often place local research in national newspapers (Badenschier & Wormer, 2012).

This study explores the concept of newsworthiness of issues in text. Like other scholars before us (Harcup & O’Neill, 2001; 2017), we hold the notion that some issues can intrinsically be newsworthy. But, like Bednarek & Caple (2014) and Molek-Kozakowska (2017) we also believe that authors can create or enhance newsworthiness by using language that emphasizes the newsworthy aspects of an issue. Hence, we view press releases from scientific organisations as mediated versions describing issues, where news value can be added to an issue by the language used in the press release, or where issues are viewed as intrinsically newsworthy. Moreover, we hold the notion that organisational factors surrounding news processing also influence the selection of news stories, and we argue that factors decreasing the time journalists need for writing newspaper stories might form an incentive for journalists to report about research.

Multiple studies looked at the news value of scientific research in newspaper articles (Badenschier & Wormer, 2012; Molek-Kazakowska 2017) or tested news factors deemed important in the communication of scientific press releases specifically (Kroon & Schafraad, 2013). However, these studies have primarily focused on university news in general rather than on peer-reviewed articles specifically. Consequently, there remains a research gap regarding how news factors impact the newsworthiness of peer-reviewed studies. This study seeks to address this gap by analysing the factors influencing the media uptake of scientific press releases on peer-reviewed articles about ocean plastic. Specifically, we aim to investigate whether the presence of (non-)news factors positively (or negatively) influences the newsworthiness of ocean plastic research, whereby we assess newsworthiness by the number of newspaper articles that are written following a particular press release. This inquiry leads to the following research question:

RQ 2: *Which factors are present in scientific press releases and how are they used to describe ocean plastic research as '(un)newsworthy'? caveat*

3.2.4 Churnalism: The copying of press release content

Churnalism has been detected in various degrees in news reporting. Boumans (2018b) calculated how much the content of press releases was comparable to newspaper articles, whereby online news sources scored higher on churnalism than printed newspapers. Most of the online sources copied press release content almost verbatim, the content was only shortened and a few words were rephrased. The printed newspaper articles had a lower Churnalism score, but still, more than half of these articles mainly consisted of press release content, although the content was edited more. Comfort et al. (2020) calculated the amount of textual overlap between university press releases and news mentions. They found the uptake of press release material to vary a lot between media outlets. In some cases up to 65% of sentences in science news articles reflected high similarity to press releases, however, the bulk of newspaper content showed less than 20% content similarity, causing the results to differ substantially from the amount of churnalism previously described by Boumans (2018b).

Due to the different ways in which churnalism was calculated in above mentioned studies, and the different outcomes of the studies, it is hard to quantify the amount of textual overlap we expect between press releases and newspaper articles. Based on these studies, we do hypothesize that: The majority of newspaper articles will be shorter than the press releases and will contain at least a few sentences that are copied verbatim or with minimal editing (H3). To understand the influence scientific organisations exert on the way their research is communicated in newspapers, we answer the third research question:

RQ 3: *How much of the content of scientific press releases is reproduced in subsequent newspaper articles?*

3.3 Methods

3.3.1 Dataset

The sample consisted of 84 press releases and 495 newspaper articles. Press releases were retrieved from EurekAlert! Using the search terms 'ocean' and 'plastic' and were published between January 2017 and December 2021. EurekAlert! Was chosen as a press release source, due to its policy of preserving the original content without alterations, ensuring that the press releases reflect the information provided by organisations. Furthermore, this research focuses on factors in press releases that increase the newsworthiness of peer-reviewed ocean plastic studies. However, such press releases form only a small part of the total PR materials from research organisations, making it challenging to create a feasible sample specifically about ocean plastic research solely from university websites. We chose 2017 as the starting year for the press release search since 2017 marked the first year that there were at least 10 press releases about ocean plastic research published on EurekAlert!.

Newspaper articles were retrieved using Altmetric and NexisUni. In Altmetric we searched using research DOI. In NexisUni we searched by 1) the names of scientists mentioned in the press release, 2) the organisation that published the press release, 3) the keywords 'ocean' and 'plastic', and 4) the title of the press release. We specifically selected English-language media reports that were published within the first month after publication of the scientific study. Hence, we

excluded later news reports, as these usually respond to incidents, linking the research to current issues that make it relevant again, thereby interfering with the news factor analysis. This search resulted in 495 English newspaper articles. Newspaper articles were published in 24 different countries, with the United Kingdom (N=204), the United States (N=89), Australia (N=65) and India (N=53) publishing most newspaper articles. See Appendix 1 for a visual representation of the Altmetric and NexisUni search and a more detailed description of the press release dataset and newspaper dissipation.

3.3.2 Coding news factors and organisational news value criteria in press releases

Based on the literature described in the theoretical framework, we compiled a list of 17 news factors deemed specifically important for environmental science coverage. To better understand how new factors were represented in the press releases, all press releases were loaded into NVIVO (R14.23.1). News factors were coded to be present (1) or absent (0) from the press release texts. Validation of the codebook³ was done by one second coder, who coded 40% of the entire data set, achieving a mean intercoder reliability score of 0.97 with Krippendorff's alpha (Krippendorff, 2004), whereby the intercoder reliability per variable ranged between 0.73 and 1.0. Values for intercoder reliability per news value criteria are shown in Appendix 2. For a detailed description of the news factors, examples, and coding rules, we refer to the codebook in the additional material.

We coded the news factors: 1) surprise; 2) novelty (newness of scientific findings or methods); 3) good news; 4) bad news; 5) consonance (conflict); 6) magnitude (the maximization or intensification of issues); 7) celebrities (famous people or companies); 8) range of impacts on people; 9) action perspective (whether the text mentions an action that can be performed by the reader); 10) societal-, 11) economic-, 12) political- and/or 13) scientific relevance. In addition, we coded instances where the text referred to societal impacts, making the research relevant to society, even though the actual impacts were still unknown. We referred to this news factor as 'caveat to societal

³ The codebook is provided in the supplementary materials.

framing' (14). Eliteness was coded by noting whether a scientist's title (15) and rewards (16) won by scientists/ research institutes were mentioned. Lastly, we coded actuality (17) when the research described in the press release was tied to ongoing issues. For the news factors elite title and impact, we coded not only its presence but also its scale of relevance. We coded impact to have: no magnitude (value=0), impacts on individuals (1), social groups (2), or entire populations (3). For scientists' titles, all titles present in the press release were coded, whereby we assigned students=1, PhD's=2, doctoral researchers=3, assistant professors=4, and professors=5. When a press release contained multiple titles, only the highest title was used in the calculation of the eliteness news value. Besides news factors, we also coded for 6 non-news factors, which are: 1) funding information; 2) limitations; and 3) dissonance (when the text was critical towards how well the research was conducted). The factors: 4) sample type; 5) range of the research area and; 6) methods used to analyse the data were also coded to analyse how much research context was created. To indicate if other factors might have influenced the coverage of press releases in newspaper articles, we coded whether press releases contained an image or quote, and we noted whether quotes were from people involved in the scientific research or from actors not involved in the study. Lastly, to assess the text complexity of the press releases, we used a Python script (TextDescriptives, v2.7.0) derived from Palma et al., (2020) that analysed all texts by language level.

To assess the newsworthiness of each news value criterion, the amount of newspaper articles was calculated per press release. As an additional exploratory analysis, we divided the amount of newspaper coverage into three groups: press releases with 0 newspaper articles, those with less than 5 articles, and those with more than 5 articles, to see whether some news factors were more often featured in press releases with high coverage (>5 newspaper articles). In addition, the Pearson correlation was calculated to find correlations between the amount of news factors in press releases and the subsequent newspaper coverage.

3.3.3 Calculating churnalism between press releases and newspaper articles

Not all newspaper articles from Altmetric were available on Nexis Uni, although the newspaper was listed as a Nexis Uni source. Consequently, we excluded untraceable articles, resulting in 345 articles for textual analysis. To assess the extent to which newspaper articles were shaped by press release content, we used automated one-by-one text comparisons using Python (`calculatechurnalism.py`), following methods previously used by Vogler & Schafer (2020) and Boumans (2018b). Before running the Python script⁴, we cleaned the press releases and newspaper articles texts by turning them into lowercase, and removing special characters and stop words.

To measure textual overlap, Vogler & Schäfer (2020) used the Jaccard Index, which measures similarity based on the presence or absence of words, providing a measure of the overlap between word groups in texts. It is useful for understanding the direct overlap of words regardless of their frequency (Lesekove et al., 2014). One limitation Vogler & Schäfer (2020) noted is that Jaccard similarities assess character-level similarity rather than similar meaning, potentially overlooking instances where the content appears similar but contains subtle differences. Hence, they stated that the method may fail to identify cases where an article is based on a press release when a journalist paraphrased the text.

We tried to solve this by combining the calculation with cosine similarity, a measure used by Boumans (2018b) to calculate whether an agency publication initiated an article. Cosine similarity captures similarity in terms of the frequency and distribution of words. Although cosine similarity can be used with embeddings to capture semantic similarities, our approach uses term frequency vectors to focus on the immediate contextual similarity without the additional layer of semantic embeddings.

The Jaccard Index and cosine similarity are both independent of text length. This means that when a press release contains 600

⁴ The Python script used to calculate text comparison:
<https://github.com/erikvanseville/CalculateChurnalism/blob/main/calculatechurnalism.py>

words, and a newspaper article contains only 100 words, but those words are the same as the press release, the similarity score will be 100%. However, we consider the deletion of material also as journalistic handling, since this can change the meaning of the story considerably. Hence, to comprehensively assess changes made when incorporating press release content into a newspaper article and accurately calculate textual similarity, we also need to account for variations in text length. Boumans (2018b) addressed this by calculating the Levenshtein distance to determine the extent to which a news article replicated agency content. The Levenshtein distance quantifies the edit distance between two strings of characters and represents the minimum operations required to change one string into another, taking into account deletion, insertion, or replacement of characters. This means that when a newspaper article is a shortened version of a press release, a lot of the text has been deleted, meaning a high score for textual change.

To comprehensively quantify textual similarity, we combined all three metrics: cosine similarity, Jaccard Index, and Levenshtein distance. To ensure equal consideration in defining churnalism, the sum of these metrics was divided by three. In line with Boumans (2018b), we want to calculate the relative effort a journalist has put into a media text, and as Boumans (2018b) explains “Twenty changes in a source text of only 30 words is not the same as 20 changes in a 500-word text”. Therefore, we normalized the Levenshtein distance by dividing it by the longest text length. To make interpretation easier, the inverse was taken from the normalized Levenshtein distance so all three metrics ranged from 0-1, whereby 1 indicated high textual similarity.

Churnalism =

$$\frac{\text{Cosine similarity} + \text{Jaccard Index} + \left(1 - \frac{\text{Levenshtein distance}}{\text{Text Length longest text}}\right)}{3}$$

To discern the degree of textual changes made by journalists when covering scientific press releases, we calculated the relative text difference between press releases and newspaper articles. We distinguished between added material (word-length press release < newspaper article) and deleted material (word-length press release >

newspaper article). This approach accounts for variations in length, providing insights into whether journalists added substantial content or removed information from the original press release. Note that when the word length did not considerably change, but the churnalism score was low, this indicates that the original text/words were removed and replaced by new content. The calculation of churnalism and the values of the three separate metrics can be viewed in the additional material.

3.4 Results

3.4.1 Influence of scientific press releases on newspaper coverage

Out of 84 press releases, 48 were covered by newspaper articles, yielding a total of 495 articles. This results in a mean of 10.3 articles per press release, with a range of 1 to 78 (RQ1). This indicates a relatively high uptake, with 57% of press releases being covered by newspaper articles.

3.4.2 News factors present in scientific press releases

The total number of news factors in press releases was found to be positively correlated with the number of newspaper articles based on these press releases ($R=0.28$, $p=0.04$), indicating that the presence of news factors indeed positively influences newspaper coverage (H2.1). In answer to RQ2, we found that press releases associated with higher newspaper coverage (>5 newspaper articles) often covered research published in high-impact journals or research conducted by elite researchers, i.e., professors; bad news (i.e., stories about the negative consequences of ocean plastic); press releases highlighting economic relevance (i.e., press releases mentioning the economic profits that can be gained due to mitigation strategies or that are lost due to the negative impacts of ocean plastic); and press releases emphasizing the magnitude of ocean plastic problems or the scientific study.

Surprisingly, highlighting the scientific relevance of a study appeared counterproductive in generating media uptake, as this news factor is most apparent in press releases that had no newspaper

coverage. The five news factors: novelty, political relevance, surprise, good news, and societal relevance are present in more than 10% of the press release dataset but do not clearly show a relation with higher newspaper coverage. The news factor caveat to societal framing occurred in 17.9% of the dataset, indicating that scientific studies sometimes claim societal relevance that they have not yet achieved. This news factor, however, did not seem to change newspaper coverage as it was equally present in press releases with zero newspaper coverage, <5 and >5 newspaper articles. While over half of the press releases included an image, this did not appear to influence media uptake, nor did the inclusion of actor quotes. The complexity of the press releases varied, ranging from challenging texts more suited for university graduates (Flesch Reading Ease 0-30) to texts easily comprehensible by 13-15-year-old students (Flesch Reading Ease 60-70). However, no discernible relationship between text complexity and newspaper coverage was identified.

Table 3.1 provides an overview of the 12 news factors prevalent in over 10% of the dataset, (so excluding consonance, actuality, rewards, action perspective, and celebrities because they were featured in less than 10% of all press releases, indicating that they were infrequently used to enhance newsworthiness). Consonance was only noted in the context of challenging current beliefs. Celebrities only occurred in the form of celebrity organisations, like 'The Ocean Cleanup'. Actuality was observed solely in press releases related to peer-reviewed studies on local disasters⁵ or crises occurring during the publication of the press release, like COVID19⁶.

⁵ Study outlines challenges to ongoing clean-up of burnt and unburnt nurdles along Sri Lanka's coastline, EurekaAlert!, 29-11-2021

⁶ New study pinpoints likely path of COVID-related plastic waste in the ocean, EurekaAlert!, 8-11-2021

Table 3.4: News factors in scientific press releases (present in >10% of the dataset*)

Newspaper articles	0	<5	>5	
<i>N</i> press releases	36	23	25	Occurance in press releases
<i>N</i> News factors ¹	3,92	4,13	6	
Title actor ²	2,42	3,13	3,16	85,7%
Magnitude	0,42	0,39	0,84	53,6%
Bad News	0,39	0,35	0,68	46,6%
Novelty	0,47	0,35	0,52	45,5%
Scientific relevance	0,56	0,26	0,32	40,0%
Societal relevance	0,36	0,35	0,44	38,1%
Political relevance	0,22	0,17	0,24	21,4%
Surprise	0,17	0,17	0,24	19,0%
Economic relevance	0,03	0,26	0,32	17,9%
Caveat to societal framing	0,19	0,17	0,16	17,9%
Range Impact	0,44	0,35	0,32	14,3%
Good news	0,11	0,13	0,16	13,1%

*The news factors: actuality, action perspective, celebrities, conflict, and reward were present in less than 10% of the dataset and are therefore not shown in this table. ¹ The number of news factors (*N* news factors) present in press releases is the count of all news factors including news factors that were present in less than 10% of the dataset. Title actor, range impact, and range research area are not taken into account in the calculation of the total number of news factors because these factors comprise a range and not a binary value. ² Title actor ranges from 0, no titles are used to describe researchers, up to 5 when the title of professor is used.

In considering non-news-related factors, press releases exhibited minimal emphasis on funding details (13%) and limitations (8.3%). In contrast, most press releases highlighted the methodology used to collect and analyse data (78.6%), discussed the region in which research was conducted (66.7%), and/or specified the analysed sample (57.1%). A broader research area appeared to positively impact newspaper coverage. Interestingly, the type of sample analysed in the scientific research did not influence newsworthiness: for instance, research on charismatic animals like turtles was not covered more often in newspapers than research on unicellular organisms. The other

non-news-related factors also had no adverse effect on newspaper coverage; mentioning funding information or research limitations was even found to marginally increase news value, leading us to reject H2.2.

3.4.3 Churnalism prevails in newspaper articles on ocean plastic research

278 newspaper articles were shorter than the press release, while only 63 were longer, and three had the same length. The resulting churnalism was plotted against the relative length difference (Figure 3.1). Through qualitative analysis of the dataset, a churnalism score above 0.7 was shown to indicate near-identical content between newspapers and press releases. With a score of around 0.3, most newspaper reports reproduced parts of the press release verbatim. Below 0.3, press release content was not copied verbatim, and new information was often added. However, a more qualitative analysis of the newspaper articles showed that the core content of the articles largely matched the press releases, but due to paraphrasing press release content, the churnalism score considerably dropped.

These findings answer RQ3 and support H3, that the majority of newspaper articles are shorter than the press release and contain at least a few sentences that are copied verbatim or with minimal editing, indicating the use of press releases as a source text for newspaper articles. Figure 3.1 shows, however, that the number of textual changes varies significantly between newspaper articles. To illustrate the textual changes occurring when press releases are covered in newspaper articles, we have added an example case study to Appendix 4.

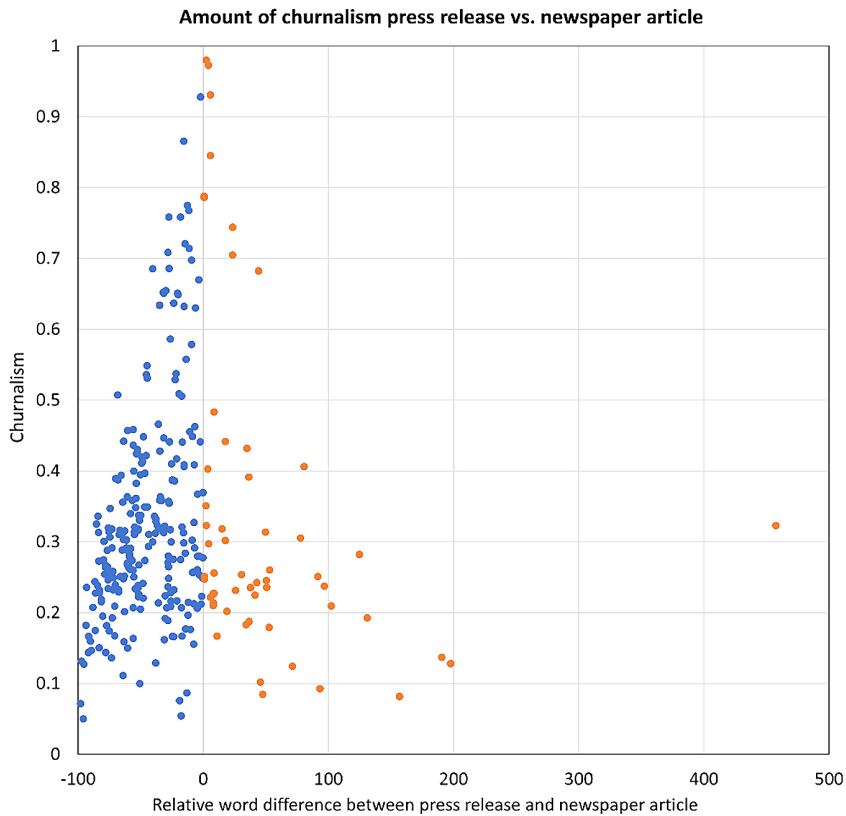


Figure 3.1: Churnalism in scientific press releases on ocean plastic plotted versus relative word difference. **Blue dots** = text press release > Newspaper article, **orange dots** = text press release < Newspaper article.

3.5 Discussion and conclusion

3.5.1 Scientific press releases are successful in getting newspaper attention for ocean plastic research

Our research shows that scientific press releases on peer-reviewed ocean plastic studies are still successful in garnering media attention and influencing subsequent media coverage. Over half (57%) of the press releases from EurekAlert! Were covered as newspaper articles, whereby a total of 495 newspaper articles were found. This coverage rate surpasses the ~10% previously described by Kroon & Schafraad (2013) and suggests that our narrower focus on peer-reviewed articles

did not result in lower coverage rates. This is a noteworthy finding, as peer-reviewed studies make up the minority of university PR materials, but do seem to be very successful in getting media attention. One possible explanation for this difference could be attributed to our global reach, as opposed to the national focus on Dutch university news in Kroon & Schafraad's study. National newspapers often prefer coverage of local research findings (Badenschier & Wormer, 2012), and with research collaborations in multiple countries, interest in these studies may cross geographic boundaries. Another reason can be the use of EurekAlert! As a distribution platform, as science journalists indicate that they often use alert services such as EurekAlert! As a starting point for the development of science-related stories (Maiden et al., 2020). Moreover, the distribution of press releases in English more easily facilitates their integration into the content of newspapers in English-speaking countries.

The influence of press releases on the dissemination of science news that we have demonstrated with this study is probably even greater than described. This is because we focused only on English-language newspaper articles and excluded other news sources. An extended search on Altmetric showed a broader uptake of press releases, including coverage by broadcasters (N=395), magazines (N=268), news websites (N=1006), and newspapers (N=705) (see Appendix 1). The finding that press releases occur on multiple websites is important because press releases published on EurekAlert! Are often copied directly to other science news websites, making them a direct source of news for science enthusiasts (Autzen, 2014). Most people today interact with science through mediated sources, such as websites found through the extended Altmetric search. This indicates that the communication strategies of research institutions can have a direct and crucial influence on the science news that people consume (Funk et al., 2017; Brossard & Scheufele, 2013).

3.5.2 News factors increase newspaper coverage of ocean plastic research

Consistent with previous research, our study found support for the hypothesis that a positive correlation between the presence of news factors and newspaper coverage exists (H2.1), aligning with findings

that a higher prevalence of news factors corresponds to increased newspaper attention (Galtung & Ruge, 1965; Eilders, 2006; Kroon & Schafraad, 2013). In agreement with news factors important for general news (Harcup & O'Neil, 2001; 2017), the factors magnitude, bad news, and economic relevance showed a positive relation with extensive coverage of ocean plastic press releases, emphasizing their significance in capturing media attention for ocean plastic science.

In contrast to the findings of other scholars (Keller & Wyles, 2021), we did not observe a bias toward charismatic animals in newspaper articles. This is a noteworthy finding, suggesting that factors beyond the charisma of the scientific sample play a more crucial role in determining the newsworthiness of ocean plastic research. We did find that studies conducted within a large research area, published in a high-impact journal, or conducted by well-established scientists, had a higher (>5 newspaper articles per press release) coverage. Indicating that the scope and prestige of the research is of greater importance than the charisma of the scientific sample.

Prior research (Vonk et al., 2024) revealed that the overall tone of scientific press releases was not predominantly negative nor sensationalized as indicated by other scholars (Scheufele & Tewksbury, 2007). However, when these press releases were picked up as newspaper articles, a more frequent portrayal of 'bad news' emerged, whereby stories conveying 'bad news' showed higher newspaper coverage. This indicates that news stories on ocean plastic, akin to findings in other marine topics (Eagle et al., 2018), tend to exhibit a bias towards more negative news.

Diverging from patterns observed in other studies (Badenschier & Wormer; 2012), our research indicates that the news factor 'scientific relevance' did not effectively attract media attention. This divergence may stem from press releases in our sample focusing heavily on methodological details and emphasizing the need for further research, targeting primarily a scientific audience. Consequently, these releases may have lacked appeal for journalists to cover in newspaper articles. Additionally, the news factor 'actuality' was minimally present in our dataset, differing from its importance in existing literature (Badenschier & Wormer, 2012). This deviation is

attributed to our dataset's nature, comprising press releases accompanying peer-reviewed studies. Since these releases are primarily intended to announce the publication of studies, they may not align with issues currently discussed in the news, causing actuality to be not emphasized in press releases.

The news factor conflict/consonance was only found in <10% of the press release dataset, although this factor is considered important in both general news (Harcup & O'Neil, 2001; 2017) and science news (Badenschier & Wormer, 2012). The reason for this discrepancy can be attributed to the fact that press releases are a form of PR material for research organisations. As a result, they only contain quotes from scientists from their ranks, who do not express dissent about the study being conducted. This result highlights the importance that journalists have in translating the research in press releases into newspaper articles, as they can provide a critical perspective on the scientific research that is lacking in press releases.

3.5.3 Research details do not decrease news value

Howell and Brossard (2021) suggest that enhancing transparency in scientific communication, particularly by providing detailed information on research methodologies, could improve comprehension of the scientific process and contribute to scientific literacy. Our analysis reveals that scientific press releases often include crucial details about research methodologies, such as sample characteristics, study locations, and analytical methods. This signifies a substantial effort by research institutes to provide context surrounding the research, offering valuable insights into the broader way science works.

Notably, including these non-news factors did not reduce the news value of scientific research, rejecting H2.2. Newspaper articles often lack funding information and research limitations (Mellor, 2015). These factors are also only marginally present in press releases. These omissions are of concern because they impede transparency, credibility, and accurate interpretation of research. Notably, EurekAlert! Consistently provides information about funding on its press release page, despite its absence in the text. It remains unclear whether journalists include this funding information and other non-

news factors in their coverage or only consider them when assessing scientific interest, which could explain their neutral impact on newsworthiness.

3.5.4 Churnalism and what is left out

The majority of newspaper articles either directly or indirectly incorporated content from scientific press releases, providing strong support for H3. This underscores the frequent use of press releases as news sources (Vogler & Schäfer, 2020). Nevertheless, many articles are significantly shorter than the original press releases, raising questions about omitted content. Despite most news articles focusing exclusively on press release content, churnalism scores indicate different levels of direct textual overlap. Over half of the news articles contained information that was copied verbatim, however, much of the content was also rewritten or omitted during the adaptation process for the newspaper article. This highlights the diversity of textual changes that can occur, making it challenging to fully understand the nature of textual changes based on churnalism scores alone. To deepen our understanding of the impact press releases have on news coverage and the extent to which churnalism occurs, future studies should employ qualitative text analysis to explore the extent to which articles are based on press release content and identify disparities between the two media. Especially, examining the omission of research details in newspaper articles, as often happens in news articles about science (Mello, 2015), should be compared to their presence in press releases, which could shed light on the adequacy of information for scientific literacy in media coverage of topics such as ocean plastic research.

Kroon & Schafraad (2013) hypothesized that press releases with a higher number of news factors would require less modification by journalists when transformed into newspaper articles. Contrary to their findings, our analysis did not reveal a positive relationship between churnalism and the presence of news factors (see Appendix 3 for the analysis). This discrepancy may arise from the different methods we used to calculate churnalism. While Kroon & Schafraad (2013) only considered differences in text length, we examined both text length and textual changes. We discovered that press releases and newspaper articles with similar lengths could still exhibit variations in

contextual or textual content, contributing to a lower degree of churnalism. Therefore, we emphasize that a comprehensive analysis of churnalism should consider not only textual length differences but also the broader spectrum of textual changes.

3.6 Limitations & Further Research

Due to the size of the dataset (84 press releases) and the number of factors we looked at (17 news factors and 6 non-news factors), we were unable to use statistical models to significantly validate the news value of each news factor and non-news factor. Further research could test the most important news values used to communicate ocean plastic research on a larger dataset to determine the predictive power of each news factor individually. It could be insightful to examine whether other less prominent scientific topics, such as ocean acidification (Tiller et al., 2019), exhibit similar news factors in press releases. Analysing whether these less covered topics have fewer news factors could then offer possible explanations for their limited media coverage.

We developed a measure of textual overlap between press releases and newspaper articles based on the Jaccard index, cosine similarity and Levenshtein distance. Although these traditional metrics provide a simple and interpretable measure of textual similarity, they have limitations. The Jaccard index and cosine similarity, as implemented in this study, focus on structural and contextual overlaps in text and therefore do not capture deeper semantic relationships between terms. Future research could investigate the use of word embeddings (e.g., Word2Vec, GloVe, FastText) and contextual embeddings (e.g., BERT, GPT) to explore deeper semantic similarities (Johnson et al., 2024) and analyse how the results for textual change would differ from using only traditional metrics for textual comparison, as used in this study.

Research details like methodology, sample type and size and research limitations can influence how a study is understood and valued by journalists and can therefore influence journalists' decisions to communicate about research. As shown in this study, journalists rely heavily on scientific press releases when communicating peer-reviewed articles on ocean plastic. Based on this, we suggest that, in addition to already known general news factors (e.g., Harcup & O'neil,

2001; 2017) and science news factors (Badenschier & Wormer, 2012), news factor analysis should also focus on what research details are given in press releases to understand the newsworthiness of scientific studies in general. We have described these research details as “non-news factors”.

Comprehending the entire process of news creation extends beyond analysing churnalism scores and news factors alone. To gain deeper insights into how ocean science news is generated in newsrooms, it is imperative to engage with individuals involved in various stages of the process. Not only can this shed light on why certain news factors or research details, like funding information and limitations, are often omitted in press releases and newspaper articles. It can also show how research details are used by journalists in their decisions about the newsworthiness of scientific research and how providing research details in press releases affects how extensively journalists report on the scientific process behind a study in newspaper articles.

This study highlights the continued importance of press releases as a vital source for journalists writing about ocean plastic research. Moreover, the content of press releases is found not only in newspaper articles but also on news websites, broadcasters’ websites, and magazines. In an era when press releases become instant news to science enthusiasts and many journalists use press release content, publication relations writers have the opportunity to make a difference in the quality of science news. Not only does churnalism prompt a reappraisal of press release writing practices within scientific organisations, it requires journalists to take a nuanced approach to process this information. In this context, science journalists have a significant impact on ensuring the integrity and accuracy of scientific reporting, by using not only press release content as a source for news articles, but also consulting outside experts and reviewing the original scientific study. This would, however, require time and resources, both of which are scarce and diminishing. The scarcity of these resources can lead to continued or even increased reliance on easily accessible information like press releases, compromising the quality of reporting. By not only focusing on scientific results but also the scientific process, journalists can uphold the standards of accuracy and integrity in

science journalism while contributing to a greater understanding of scientific methods among the public.

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Literature

- Allan, S. (2011). Introduction: Science journalism in a digital age. *Journalism*, 12(7), 771–777.
- Armoudian, M., Stevens, G., Stephenson, F., & Ellis, J. (2023). New Zealand's media and the crisis in the ocean: News norms and scientific urgency. *Aquatic Conservation: Marine and Freshwater Ecosystems*.
- Autzen, C. (2014). Press releases—The new trend in science communication. *Journal of Science Communication*, 13(03), C02.
<https://doi.org/10.22323/2.13030302>
- Badenschier, F., & Wormer, H. (2012). Issue selection in science journalism: Towards a special theory of news values for science news? In S. Rödder, M. Franzen, & P. Weingart (Eds.), *The Sciences' Media Connection –Public Communication and its Repercussions* (Vol. 28, pp. 59–85). Springer Netherlands. https://doi.org/10.1007/978-94-007-2085-5_4
- Bauer, B. M. W., & Gregory, J. (2008). From journalism to corporate communication in post-war Britain. In *Journalism, science and society* (pp. 45–64). Routledge.
- Bauer, M. W., Howard, S., Romo Ramos, Y. J., Massarani, L., & Amorim, L. (2013). *Global science journalism report: working conditions & practices, professional ethos and future expectations*. Science and Development Network.
- 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>
- Bossema, F. G., Burger, P., Bratton, L., Challenger, A., Adams, R. C., Sumner, P., Schat, J., Numans, M. E., & Smeets, I. (2019). Expert quotes and exaggeration in health news: A retrospective quantitative content analysis. *Wellcome Open Research*, 4, 56.
<https://doi.org/10.12688/wellcomeopenres.15147.1>

- Boumans, J. (2018a). Subsidizing the news?: Organizational press releases' influence on news media's agenda and content. *Journalism Studies*, 19(15), 2264–2282. <https://doi.org/10.1080/1461670X.2017.1338154>
- Boumans, J. (2018b). The agency makes the (online) news world go round: The impact of news agency content on print and online news.
- Boykoff, M. T., & Boykoff, J. M. (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>
- Brown Jarreau, P. (2014). When quotes matter: Impact of outside quotes in a science press release on news judgment. *Journal of Science Communication*, 13(4), A02.
- Comfort, S. E., Gruszczynski, M., & Browning, N. (2022). Building the science news agenda: The permeability of science journalism to public relations. *Journalism & Mass Communication Quarterly*, 107769902110479. <https://doi.org/10.1177/10776990211047949>
- Duarte, C. M., Fulweiler, R. W., Lovelock, C. E., Martinetto, P., Saunders, M. I., Pandolfi, J. M., ... & Nixon, S. W. (2015). Reconsidering ocean calamities. *BioScience*, 65(2), 130–139.
- Duarte, C.M., Dennison, W.C., Orth, R.J.W. & Carruthers, T.J.B. (2008). The charisma of coastal ecosystems: Addressing the imbalance. *Estuaries and Coasts*, 31(2), 233–238. <https://doi.org/10.1007/s12237-008-9038-7>
- Eagle, L., Hay, R., & Low, D. R. (2018). Competing and conflicting messages via online news media: Potential impacts of claims that the Great Barrier Reef is dying. *Ocean & Coastal Management*, 158, 154–163. <https://doi.org/10.1016/j.ocecoaman.2018.03.037>
- Eilders, C. (2006). News factors and news decisions. Theoretical and methodological advances in Germany. *Comm*, 31(1), 5–24. <https://doi.org/10.1515/COMMUN.2006.002>
- Fleerackers, A., Nehring, L., Maggio, L. A., Enkhbayar, A., Moorhead, L., & Alperin, J. P. (2022). Identifying science in the news: An assessment of the precision and recall of Altmetric.com news mention data. *Scientometrics*, 127(11), 6109–6123. <https://doi.org/10.1007/s11192-022-04510-7>
- Funk, C., Gottfried, J., & Mitchell, A. (2017). Science news and information today. *Pew Research Center*, 20.
- Galtung, J., & Ruge, M. H. (1965). The structure of foreign news: The presentation of the Congo, Cuba and Cyprus Crises in four Norwegian

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newspapers. *Journal of Peace Research*, 2(1), 64–90.
<https://doi.org/10.1177/002234336500200104>

- Göpfert, W. (2008). The strength of PR and the weakness of science journalism. In *Journalism, science and society* (pp. 227–238). Routledge.
- Hanson, A. (2010). *Environment, media and communication*. (2nd ed.). Routledge.
- Harcup, T., & O'Neill, D. (2001). What is news? Galtung and Ruge revisited. *Journalism Studies*, 2(2), 261–280.
<https://doi.org/10.1080/14616700118449>
- Harcup, T., & O'Neill, D. (2017). What is news? News values revisited (again). *Journalism studies*, 18(12), 1470–1488.
- Harro-Loit, H., & Josephi, B. (2020). Journalists' perception of time pressure: A global perspective. *Journalism Practice*, 14(4), 395–411.
- Howell, E. L., & Brossard, D. (2021). (Mis) informed about what? What it means to be a science-literate citizen in a digital world. *Proceedings of the National Academy of Sciences*, 118(15), e1912436117.
- Johnson, S. J., Murty, M. R., & Navakanth, I. (2024). A detailed review on word embedding techniques with emphasis on word2vec. *Multimedia Tools and Applications*, 83(13), 37979–38007.
- Keller, E., & Wyles, K. J. (2021). Straws, seals, and supermarkets: Topics in the newspaper coverage of marine plastic pollution. *Marine Pollution Bulletin*, 166, 112211.
- Kopke, K., Black, J., & Dozier, A. (2019). Stepping out of the ivory tower for ocean literacy. *Frontiers in Marine Science*, 60.
- Krippendorff, K. (2004). Measuring the reliability of qualitative text analysis data. *Quality & Quantity* 38 (6), 787–800. doi:10.1007/s11135-004-8107-7
- Kroon, A., & Schafraad, P. (2013). Copy-paste of journalistieke verdieping?: Een onderzoek naar de manier waarop nieuwsfactoren in universitaire persberichten nieuwsselectie en redactionele bewerkingsprocessen beïnvloeden. *Tijdschrift voor Communicatiewetenschap*, 41(3).
<https://doi.org/10.5117/2013.041.003.283>
- Lehmkuhl, M., & Promies, N. (2020). Frequency distribution of journalistic attention for scientific studies and scientific sources: An input–output analysis. *PLOS ONE*, 15(11), e0241376.
<https://doi.org/10.1371/journal.pone.0241376>

- Lesekov, J., Rajaraman, A., & Ullman, J. D. (2014). *Mining of massive datasets*. Cambridge University Press.
- Maiden, N., Zachos, K., Franks, S., Wells, R., & Stallard, S. (2020, October). Designing digital content to support science journalism. In *Proceedings of the 11th Nordic Conference on Human-Computer Interaction: Shaping Experiences, Shaping Society* (pp. 1–13).
- Males, J., & Van Aelst, P. (2021). Did the Blue Planet set the agenda for plastic pollution? An explorative study on the influence of a documentary on the public, media and political agendas. *Environmental Communication*, 15(1), 40–54. <https://doi.org/10.1080/17524032.2020.1780458>
- Metag, J., Wintterlin, F., & Klinger, K. (2023). Science communication in the digital age—New actors, environments, and practices. *Media and Communication*, 11(1), 212–216.
- Mellor, F. (2015). Non-news values in science journalism. In B. Rappert & B. Balmer (Eds.), *Absence in science, security and policy: From research agendas to global strategy* (pp. 93–113). Palgrave Macmillan UK.
- Palma, D., Soto, C., Veliz, M., Riffo, B., & Gutiérrez, A. (2020). A data-driven methodology to assess text complexity based on syntactic and semantic measurements. In *Human Interaction and Emerging Technologies: Proceedings of the 1st International Conference on Human Interaction and Emerging Technologies (IHET 2019), August 22–24, 2019, Nice, France* (pp. 509–515). Springer International Publishing.
- Molek-Kozakowska, K. (2017). Communicating environmental science beyond academia: Stylistic patterns of newsworthiness in popular science journalism. *Discourse & Communication*, 11(1), 69–88.
- Schäfer, M. S. (2017). How changing media structures are affecting science news coverage. *The Oxford handbook of the science of science communication*, 51, 57.
- Schafraad, P., & Zoonen, W. V. (2020). Reconsidering churnalism: How news factors in corporate press releases influence how journalists treat these press releases after initial selection. *Communications*, 45(s1), 718–743. <https://doi.org/10.1515/commun-2019-2075>
- Scheufele, D.A. & Tewksbury, D. (2007). Framing, agenda setting, and priming: the evolution of three media effects models. *Journal of Communication*, 57(1), 9–20. <https://doi.org/10.1111/j.0021-9916.2007.00326.x>
- Seys, J., Cox, L., Şahin Yücel, E., Ezgeta-Balić, D., Faimali, M., Garaventa, F., García-Martínez, M-C., Gili, C., Kopke, K., Moreau, K., Petrera, F., Simon, D., Villwock, A., Zielinski, T., & Muñiz Piniella, A. (2022). Marine science

communication in Europe – A way forward. In A. Muñiz Piniella, P. Kellett, R. van den Brand, B. Alexander, A. Rodriguez Perez, J. Van Elslander, & J.J. Heymans (Eds.), *Future Science Brief 8 of the European Marine Board*, Ostend, Belgium. doi: 10.5281/zenodo.6444143

- Stafford, R., & Jones, P. J. (2019). Viewpoint–Ocean plastic pollution: A convenient but distracting truth? *Marine Policy*, *103*, 187–191.
- Sumner, P., Vivian-Griffiths, S., Boivin, J., Williams, A., Venetis, C. A., Davies, A., Ogden, J., Whelan, L., Hughes, B., Dalton, B., Boy, F., & Chambers, C. D. (2014). The association between exaggeration in health related science news and academic press releases: Retrospective observational study. *BMJ*, *349*(dec09 7), g7015–g7015. <https://doi.org/10.1136/bmj.g7015>
- Tan, P., Steinbach, M., & Kumar, V. (2006). *Introduction to data mining*. Pearson Education.
- Tiller, R., Arenas, F., Galdies, C., Leitão, F., Malej, A., Romera, B. M., Solidoro, C., Stojanov, R., Turk, V., & Guerra, R. (2019). Who cares about ocean acidification in the Plasticene? *Ocean & Coastal Management*, *174*, 170–180. <https://doi.org/10.1016/j.ocecoaman.2019.03.020>
- Vogler, D., & Schäfer, M. S. (2020). Growing influence of university PR on science news coverage? A longitudinal automated content analysis of university media releases and newspaper coverage in Switzerland, 2003–2017. *International Journal of Communication*, *14*, 22.
- Vonk, A. N., Bos, M., Smeets, I. and van Sebille, E. (2024). A comparative study of frames and narratives identified within scientific press releases on ocean climate change and ocean plastic *JCOM* *23*(01), A01. <https://doi.org/10.22323/2.23010201>
- Williams, A. (2015). Journalism, public relations and news sources. In A. Hansen & R. Cox (Eds.), *The Routledge handbook of environment and communication* (pp. 143–204). Routledge.
- Wooldridge, J., & King, M. B. (2019). Altmetric scores: An early indicator of research impact. *Journal of the Association for Information Science and Technology*, *70*(3), 271–282. <https://doi.org/10.1002/asi.24122>

Appendix 1 – Dataset Altmetric and Nexis Uni

Data collection

The amount of press coverage received by press releases was estimated using both Altmetric and NexisUni. For our first search, we used Altmetric, leveraging its ability to reflect the social impact of research (Wooldridge & King, 2019) and its relative reliability in identifying research citations (Fleerackers et al., 2022). Our search focused on research DOIs mentioned in press releases, capturing all Altmetric media mentions within one month of publication. This language-unrestricted approach provided a comprehensive view of the research's impact. We specifically analysed media mentions within the first month of the publication of the scientific study, to gauge the influence of press release news values on media mentions. Hence, we excluded later news items, since these typically respond to incidents, reconnecting the research to current events which make it relevant again.

Altmetric data includes diverse news sources, including content aggregators, such as *Foreign Affairs New Zealand*; press alert services, like EurekaAlert!; and websites such as Medium (Lehmkuhl & Promies, 2020). To categorize outlets, Google was used to identify if news mentions belonged to newspapers, magazines, press release agencies, news websites, broadcasting services or 'other'. Other categories were categories that did not occur often or that could not be defined using Google. Figure 3A1 shows a visual representation of the Altmetric search.

After we checked the media uptake of scientific research on Altmetric, we used Nexis Uni to verify if publications appeared in newspapers and extend the dataset. We searched for newspapers based on press releases on Nexis Uni by searching for the names of scientists mentioned in the press release, the title of the press release, and the name of the organisation sending the press release. Any non-English newspapers or duplicates were excluded from the diffusion analysis. A newspaper article was considered duplicate if it was published by the same news publisher at the same date and time and had the same headline, or if it was published by the same news publisher at a different time but with the same title and newspaper

content. This led to a database of 490 newspaper articles in total. For each article, the publication date, newspaper source, title, author's name, word count, and the newspaper articles' text were noted. The dataset consisting of all newspapers is added to the additional material of this paper.

Dataset

In Table 3A1 we show in which countries the 495 newspaper publications on ocean plastic research, which are part of our dataset, appeared. In addition, we added Table 3A2 showing all the countries from which press releases were sent.

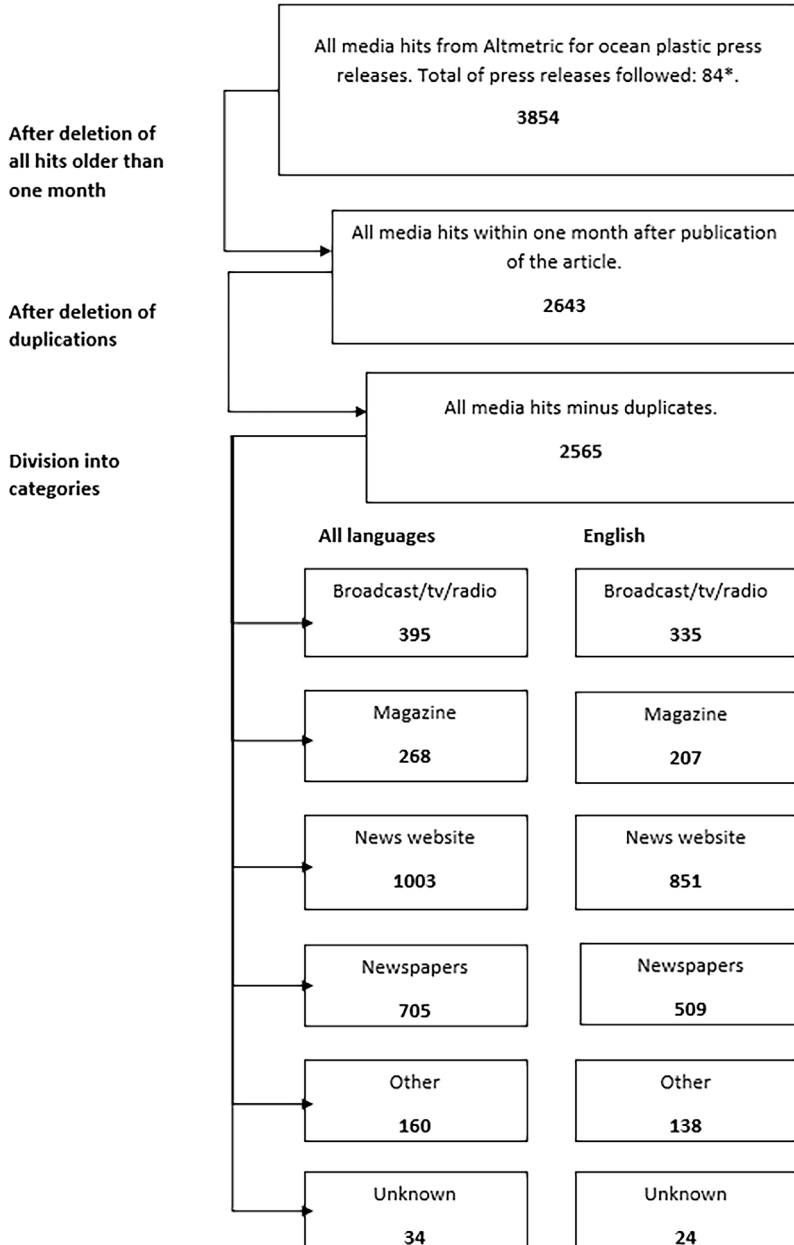


Figure 3A1: Visual representation of the Altmetric search.

Table 3A1: *Countries in which newspaper articles about the research described in the press releases were published.*

Countries in which ocean plastic news was published in newspapers on NexisUni	Newspaper articles
Australia	65
Bahrain	1
Bangladesh	2
Canada	13
China	2
Colombia	1
India	53
Iran	5
Ireland	18
Kenya	1
Malaysia	5
Namibia	1
New Zealand	12
Pakistan	2
Philippines	1
Qatar	1
Saudi Arabia	2
Singapore	9
South Africa	2
Sri Lanka	2
Tanzania	2
Thailand	2
United Kingdom	204
United States	89

* Some press releases were published by a global organisation, therefore no specific country could be listed.

Table 3A2: *Countries in which the research described in the press release was published.*

Countries in which the research was conducted	Number of press releases
Australia	1
Germany	9
Ireland	2
Japan	7
Spain	3
Sweden	1
Switzerland	2
United Kingdom	16
United States	36
N/A*	7

Appendix 2 – Intercoder reliability

From the 84 press releases, 36 were coded by a second coder. In the table below we have noted the amount frame variables appeared in the test dataset, the Krippendorff's alpha calculated per frame variable, and the percentage agreement between the coder and second coder.

For some news value criteria, the Krippendorff's alpha could not be calculated (indicated in Table 3A2.1 by 'n.a.') because the variable did not occur in the test dataset, or the variable occurred in every press release. Some variables occurred in less than 10% of the test dataset, this amount is too small to reliably test their Krippendorff's alpha. The variables that occurred infrequently in the test dataset, also occurred infrequently in the general press release dataset, and are due to their infrequency not shown in table 3A1 and 3A2.

Table A2: Intercoder reliability

News factors	N present in test dataset (N _{total} = 36)	Krippendorff's alpha	Percentage agreement
Eliteness title – Assistant professor	2	1	100%
Eliteness title – Associate professor	0	n.a.	100%
Eliteness title – Dr.	9	0.86	97%
Eliteness title – Other title	20	1	100%
Eliteness title – PhD	2	1	100%
Eliteness title – Professor	18	1	100%
Eliteness title – Student	2	1	100%
Research Institute	32	1	100%
Reward	0	n.a.	100%
Journal	34	1	100%
Surprise	8	1	100%
Novelty	20	1	100%

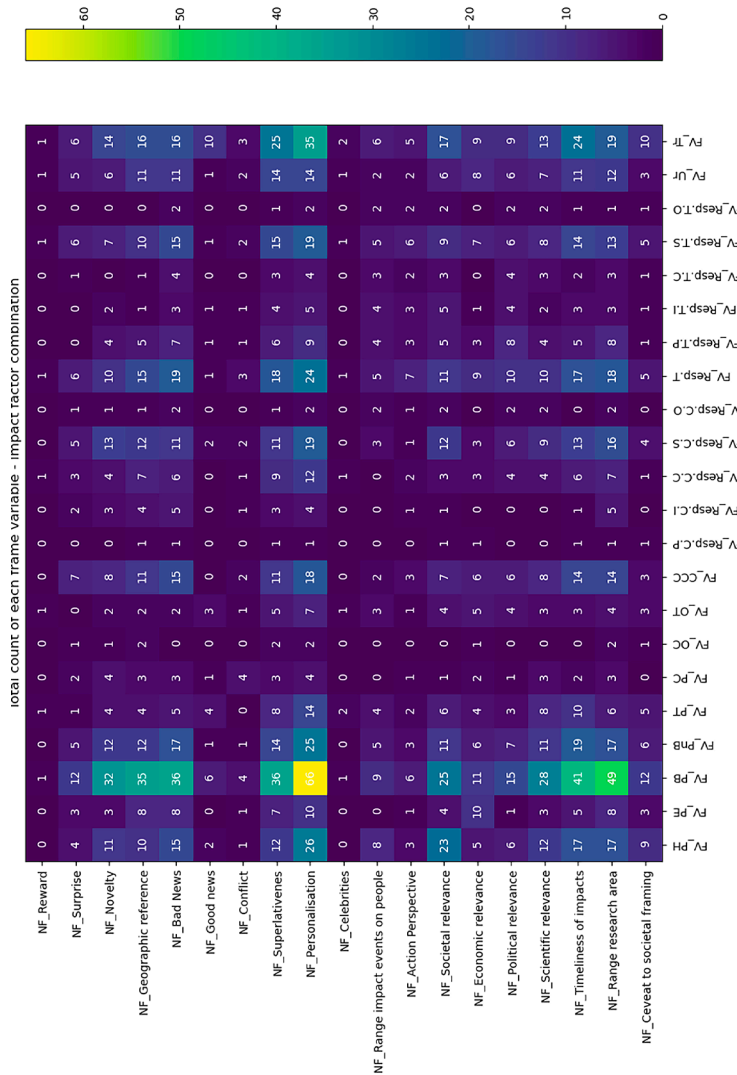
Geographic reference	26	1	100%
Good News	6	1	100%
Bad News	20	0.89	97%
Conflict	2	1	100%
Magnitude	17	0.89	97%
Celebrities	0	n.a.	100%
Range Impact events on entire populations	6	1	100%
Range impact events on groups of people	2	1	100%
Range impact events on some individuals	0	n.a.	100%
Action perspective	4	1	100%
Societal relevance	18	1	100%
Economic relevance	2	1	100%
Political relevance	12	1	100%
Scientific relevance	20	0.90	97%
Caveat to societal framing	6	1	100%
Actuality	4	1	100%
Non-News factors			
Limitations own study	12	0.88	97%
Dissonance	0	n.a.	100%
Funding information	4	1	100%
Range research area – Global	10	0.75	94%
Range research area – Lab-setting	2	1	100%
Range research area – Local	10	0.73	94%
Range research area – Regional	10	1	100%
Sample type – cold-blooded vertebrate	2	1	100%

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Sample type – Humans	2	1	100%
Sample type – Inorganic material	12	1	100%
Sample type – Invertebrate	10	1	100%
Sample type – Plants	0	n.a.	100%
Sample type – Unicellular	2	1	100%
Sample type – Warm-blooded vertebrates	2	1	100%
Method	30	1	100%
Incentives			
Quote internal actor	36	n.a.	100%
Quote external actor	2	1	100%

Appendix 4 – Pivot table of news factors and frame variables

To analyse if there was an overlap between frame variables and news factors, a pivot table was created plotting both news factors and frame variables (Figure 3A5.1). For an explanation of all frame variables, please see Vonk et al., 2024. The pivot table shows how often both variables occurred together in press releases.



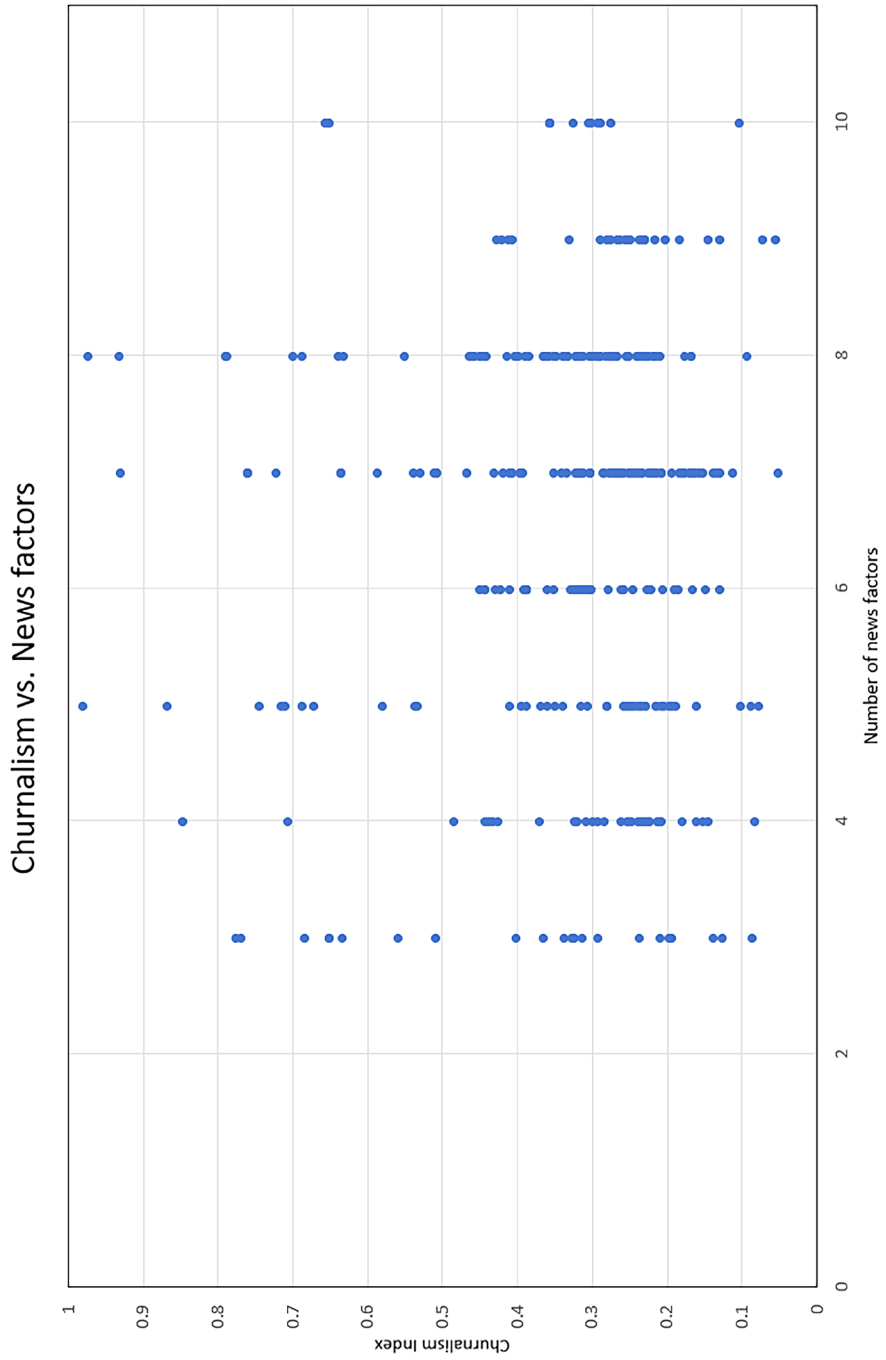
The Framing of Science News

Figure 3A5.1: *Pivot table showing how often frame variables and news factors cooccur in press releases.*

Appendix 5 – Relationship between churnalism and news factors

Kroon and Schaffraad (2013) identified a correlation between the prevalence of churnalism and the number of news factors within a press release. They hypothesized that a higher number of news factors in a press release would lead to fewer modifications required by journalists when transforming the press release into a newspaper article. To examine whether this hypothesis holds in our dataset, we plotted the total count of news factors in each press release against the calculated churnalism for each press release, as can be seen in the plot on the next page.

As highlighted in the discussion of this paper, we did not see a significant correlation between the quantity of news factors in press releases and churnalism. Several factors could explain this disparity. Our dataset is more diverse than the one analysed by Kroon & Schaffraad, which focused on Dutch universities and Dutch newspapers. Additionally, our calculation of churnalism differs: while Kroon & Schaffraad (2013) considered only differences in text length, we examined both text length and textual changes. We discovered that press releases and newspaper articles with similar lengths could still exhibit variations in contextual or textual content, contributing to a higher degree of churnalism. Therefore, we emphasize that a comprehensive analysis of churnalism should consider not only textual length differences but also the broader spectrum of textual changes.



Appendix 6 – Churnalism examples

To illustrate the variations in churnalism discussed in this paper, we compare two newspaper articles chosen based on their different churnalism scores but comparable word count. NA1 has a churnalism score of 0.25, and falls below the threshold of 0.3, indicating less direct textual overlap with the original press release. NA2 has a churnalism score of 0.47, exceeding the 0.3 threshold, indicating greater textual overlap between the press release and the newspaper article. NA1 consists of 352 words, while NA2 contains 388 words. NA1 and NA2 and the accompanied press release are added to this appendix.

NA1 contained a new quote from an expert who was not involved in the research together with new political information regarding measures to combat plastic pollution. Statements like: *"The report comes at the right time after Prime Minister Malcolm Turnbull announced a \$60 million plan to protect the Great Barrier Reef from coral-eating crown-of-thorns sea stars and runoff from farms"* and *"Separately, the Queensland government has allocated \$256 million over the next five years to improve the reef's water quality"* were added to the news article. Of the 388 words of the news article, 134 contained completely new content, while the rest presented similar information in a rewritten format, without verbatim copying. For example, the newspaper article stated: *"In the Asia-Pacific region a total of 11.1 billion plastic items – including shopping bags, fishing nets, even diapers and tea-bags – are ensnared on reefs, the scientists wrote in the journal Science this week. They projected the numbers would rise by 40 per cent by 2025 as marine pollution gets steadily worse."* Whereas the press release stated: *"The scientists estimate that about 11.1 billion plastic items are entangled on reefs across the Asia-Pacific region, and that this will likely increase 40 per cent over the next seven years"*.

On the contrary, NA2 copied some of the information from the press release verbatim. However, most of the content had been rewritten or omitted, since the press release was longer than the newspaper article (548 words). In this news article, the same content was present as in the press release, but the news article was written in interview style, for example: *"We estimate there are 11.1 billion plastic items on coral reefs across the Asia-Pacific and forecast this to increase by 40 per cent within seven years," she said.* The only new information in the

news article was quote from a scientist already quoted in the press release. The content of the quote was however new, suggesting some originality.

PR1: NEWS RELEASE 25-JAN-2018

A 'marine motorhome for microbes': Oceanic plastic trash conveys disease to coral reefs

Peer-Reviewed Publication CORNELL UNIVERSITY

ITHACA, N.Y. – For coral reefs, the threat of climate change and bleaching are bad enough. An international research group led by Cornell University has found that plastic trash – ubiquitous throughout the world’s oceans – intensifies disease for coral, adding to reef peril, according to a new study in the journal *Science*. “Plastic debris acts like a marine motorhome for microbes,” said the study’s lead author, Joleah Lamb, a postdoctoral research fellow at Cornell. She began collecting this data as a doctoral candidate at James Cook University in Australia. “Plastics make ideal vessels for colonizing microscopic organisms that could trigger disease if they come into contact with corals,” Lamb said. “Plastic items – commonly made of polypropylene, such as bottle caps and toothbrushes – have been shown to become heavily inhabited by bacteria. This is associated with the globally devastating group of coral diseases known as white syndromes.”

When plastic debris meets coral, the authors say, the likelihood of disease increases from 4 to 89 percent – a 20-fold change. The scientists estimate that about 11.1 billion plastic items are entangled on reefs across the Asia-Pacific region, and that this will likely increase 40 percent over the next seven years.

Coral are tiny animals with living tissue that cling to and build upon one another to form “apartments,” or reefs. Bacterial pathogens ride aboard the plastics, disturbing delicate coral tissues and their microbiome. “What’s troubling about coral disease is that once the coral tissue loss occurs, it’s not coming back,” said Lamb. “It’s like getting gangrene on your foot and there is nothing you can do to stop it from affecting your whole body.”

Lamb and colleagues surveyed 1 59 coral reefs from Indonesia, Australia, Myanmar and Thailand, visually examining nearly 1 25,000 reef-building corals for tissue loss and disease lesions. The number of plastic items varied widely, from 0.4 items per 1 00 square meters (about the size of a two-bedroom Manhattan flat), in Australia, to 25.6 items per 1 00 square meters in Indonesia. This is significant given that 4.8 to 1 2.7 million metric tons of plastic waste are estimated to enter the ocean in a single year, Lamb said.

The scientists forecast that by 2025, plastic going into the marine environment will increase to roughly 1 5.7 billion plastic items on coral reefs, which could lead to skeletal eroding band disease, white syndromes and black band disease.

“Our work shows that plastic pollution is killing corals. Our goal is to focus less on measuring things dying and more on finding solutions,” said senior author Drew Harvell, professor of ecology and evolutionary biology. “While we can’t stop the huge impact of global warming on coral health in the short term, this new work should drive policy toward reducing plastic pollution.”

Coral reefs are productive habitats in the middle of nutrient-poor waters, Harvell said. Thanks to the symbiotic relationship between corals and their solar-powered algae, “this miracle of construction creates the foundation for the greatest biodiversity in our oceans,” she said. “Corals are creating a habitat for other species, and reefs are critical to fisheries.”

Said Lamb: “This study demonstrates that reductions in the amount of plastic waste entering the ocean will have direct benefits to coral reefs by reducing disease-associated mortality.”

NA1: NA_1.12: Plastic waste not so fantastic for marine life

BILLION of bits of plastic waste are entangled in corals and sickening reefs from Thailand to Australia’s Great Barrier Reef, scientists say.

The trash is another pressure on corals, already suffering from over-fishing, rising temperatures caused by climate change and other

pollution. In the Asia-Pacific region a total of 11.1 billion plastic items – including shopping bags, fishing nets, even diapers and tea-bags – are ensnared on reefs, the scientists wrote in the journal *Science* this week.

They projected the numbers would rise by 40 per cent by 2025 as marine pollution gets steadily worse.

The plastic increases the likelihood of disease about 20 times, to 89 per cent for corals in contact with plastics from four per cent in comparable areas with none.

Trash may damage the tiny coral animals that build reefs, making them more vulnerable to illness. And bits of plastic may act as rafts for harmful microbes in the oceans.

Scientists were shocked to find plastic even in remote reefs. “You could be diving and you think someone’s tapping your shoulder but it’s just a bottle knocking against you, or a plastic trash bag stuck on your tank,” lead author Joleah Lamb of Cornell University said. “Corals are animals like us and have really thin tissues that can be cut and wounded, especially if they are cut by an item covered in all sorts of micro-organisms.” The scientists, from the United States, Australia, Thailand, Myanmar, Canada and Indonesia, surveyed 159 reefs from 2011-14 in the Asia-Pacific region. They found most plastic in Indonesia, with about 26 bits per 100 square metres of reef, and least off Australia, which has the strictest waste controls. The report is timely after Prime Minister Malcolm Turnbull announced a \$60 million plan to protect the Great Barrier Reef against coral-eating crown-of-thorns starfish and farm run-off.

Separately, the Queensland government has earmarked \$256 million over the next five years to improve reef water quality.

At least 275 million people worldwide live near reefs, which provide food, coastal protection and income from tourism. The presence of plastics seemed especially to aggravate some common coral afflictions, such as skeletal eroding band disease. The scientists urged tougher restrictions on plastic waste. In December, almost 200 nations agreed to limit plastic pollution of the oceans, warning that it could outweigh all fish by 2030.

NA2: NA_1.33: Plastic trash linked to disease in corals: study

Scientists have found that plastic trash ubiquitous throughout the world's oceans massively increases the chance of disease in corals.

"We examined more than 120,000 corals, both plastic-free and with plastic present, on 159 reefs from Indonesia, Australia, Myanmar and Thailand," said Joleah Lamb, from the Cornell University in the US.

"We found that the chance of disease increased from four per cent to 89 per cent when corals are in contact with plastic," said Lamb. Coral are tiny animals with living tissue that cling to and build upon one another to form "apartments," or reefs, according to a study published in the journal Science.

Bacterial pathogens ride aboard the plastics, disturbing delicate coral tissues and their microbiome.

"What's troubling about coral disease is that once the coral tissue loss occurs, it's not coming back," said Lamb.

"It's like getting gangrene on your foot and there is nothing you can do to stop it from affecting your whole body," the researcher said.

She said the problem of plastic waste looks to be getting worse.

"We estimate there are 11.1 billion plastic items on coral reefs across the Asia-Pacific and forecast this to increase by 40 per cent within seven years," she said.

The researchers said the finding adds to the burden of climate-related disease outbreaks that have already had an impact on coral reefs globally.

"Bleaching events are projected to increase in frequency and severity as ocean temperatures rise. There's more than 275 million people relying upon coral reefs for food, coastal protection, tourism income, and cultural significance," said Professor Bette Willis, from the James Cook University in Australia.

“So moderating disease outbreak risks in the ocean will be vital for improving both human and ecosystem health,” Willis said.

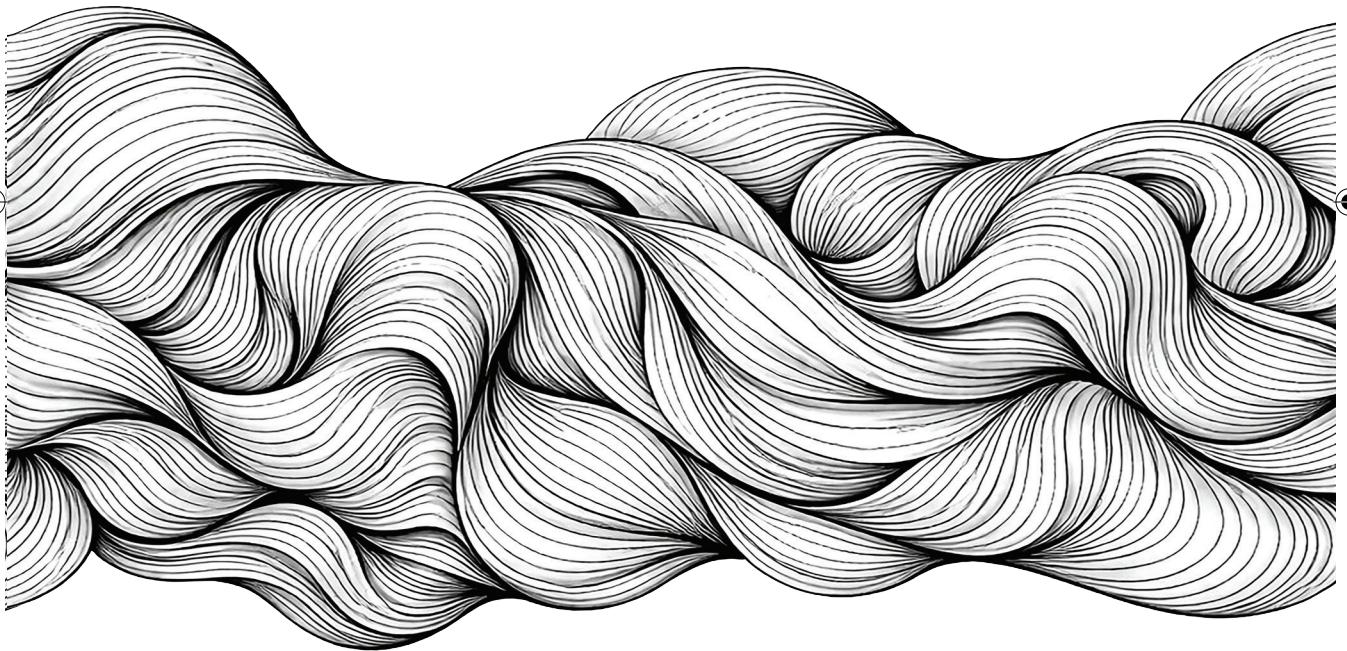
The scientists forecast that by 2025, plastic going into the marine environment will increase to roughly 15.7 billion plastic items on coral reefs, which could lead to skeletal eroding band disease, white syndromes and black band disease.

“This study demonstrates that reductions in the amount of plastic waste entering the ocean will have direct benefits to coral reefs by reducing disease-associated mortality,” Lamb said.



Chapter 4 Churnalism, a new opportunity in science news?

The role of press releases in communicating the scientific process in newspaper articles

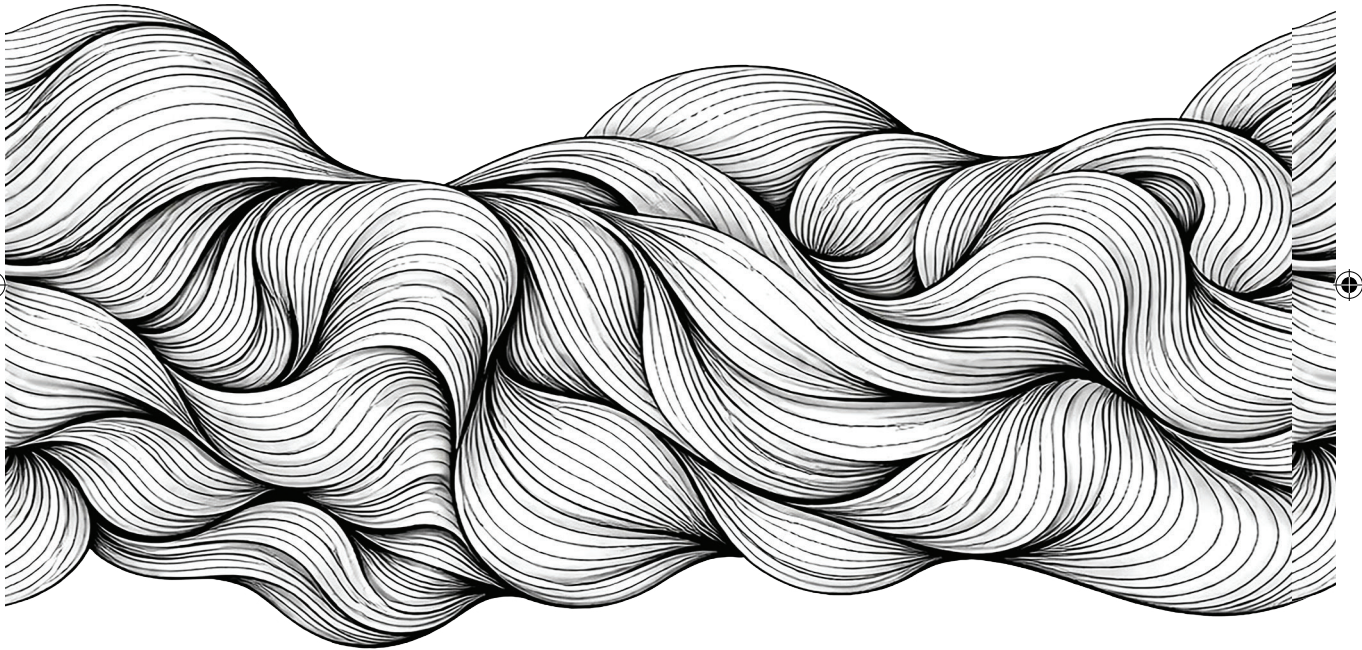




The Framing of Science News

This chapter is based on:

Vonk, A. N., Bos, M., & van Sebille, E. (2024). Journalism versus churnalism: How news factors in press releases affect journalistic processing of ocean plastic research in newspapers globally. *Journalism Studies*, 25(16), 2031–2050.



Abstract: Science news is often based on scientific press releases, with parts copied verbatim, a practice called churnalism. While this can lead to a loss of journalistic depth and the journalist's role as gatekeeper, this study explores a potential benefit. We conducted a qualitative and quantitative analysis of 10 scientific press releases and 130 English-language newspaper articles covering ocean plastic research to examine how they communicate details about the scientific process. Our findings indicate that explicitly mentioning the scientific process in press releases increases the likelihood that newspaper articles will cover not only the results, but broader research context like methods and uncertainties. Additionally, we offer examples of how churnalism occurs when communicating ocean plastic research and provide practical guidelines to clearly convey not only scientific findings but also the process behind research in scientific press releases.

Keywords: Science communication, Journalism, Press release, Churnalism, Science journalism

4.1 Introduction

Science journalism plays an important role in today's knowledge society as an informant and critical observer (Murcott & Williams, 2013; Wormer, 2008). As an informant, it makes scientific research accessible and understandable to wider audiences. This includes not only the results of research, but also information about methods, objectives, and limitations, as this information shows how scientific research is conducted (Fahy & Nisbet, 2011). Moreover, science journalism can expose abuses such as unethical funding, plagiarism, or methodological flaws by taking a critical stance toward scientific claims and distinguishing between reliable and less reliable research (Fahy & Nisbet, 2011; Lexchin et al., 2003; Murcott & Williams, 2013).

The quality and independence of science journalism is under pressure worldwide. Budget cuts and the increasing demand for online news are putting journalists under greater pressure and limiting the resources available for specialist reporting (Korthagen, 2016; Murcott & Williams, 2013; Van Leuven et al., 2015). As a result, science news is more often cut back (Allan, 2011), causing science reporting to increasingly shift from science journalists to journalists without specific scientific expertise. However, scientific expertise is important for assessing the value of scientific claims and understanding the relationships between researchers and companies in certain sectors (Korthagen, 2016). Without this knowledge, there is a risk that research findings will be interpreted and reported incompletely or inaccurately in the media (Murcott & Williams, 2013).

A carefully crafted press release can play an important role in preventing misleading science reporting in the media. Due to the decline in science journalists and the increase in science communication at universities, scientific organisations have gained increasing influence on journalism (Autzen, 2014; Comfort et al., 2022; Peters et al., 2008; Vögler & Schäfer, 2020). Science news is therefore increasingly based on press releases from universities (Vögler & Schäfer, 2020). These press releases are written by communication professionals and serve a dual purpose: on the one hand, they inform the general public about scientific research, and on the other hand, they serve as a strategic communication tool to enhance the visibility and reputation of the institution (Carver, 2014). For example, press

releases about research into plastic pollution in the ocean mainly highlight the positive voices of the researchers involved and use various forms of framing to position the research as relevant (Vonk, Bos, Smeets & Van Sebille, 2024).

Because press releases serve a dual purpose, it is important that (science) journalists approach them critically and situate the research within a broader context. This includes considering institutional motives, funding structures, and the role universities claim as knowledge producers (Autzen, 2014). In practice, press releases are an important source of information for journalists (Schafraad & Zoonen, 2020), who regularly use their content to write newspaper articles (Nelissen & Hendrickx, 2023; Van Leuven et al., 2015). Parts of press releases are sometimes copied verbatim (Comfort et al., 2022; Vonk, Bos & Sebille, 2024), a practice known as copy-paste journalism or churnalism (Kroon & Schafraad, 2013; Van Leuven et al., 2015).

Churnalism is concerning because journalists, as critical observers, play an important role in ensuring accurate science communication (Göpfert, 2008). University press releases, however, often contain exaggerations (Heyl et al., 2020; Schat et al., 2018; Sumner et al., 2014), which can lead to exaggerated news reports (Adams et al., 2019). In the Netherlands and Flanders, this means that universities themselves risk contributing to the spread of inaccurate science news (Smeets, 2021). As press releases increasingly form the basis of science reporting, universities carry a greater responsibility to communicate research carefully, providing transparency about methods, limitations, uncertainties, and funding so that scientific claims can be properly evaluated (Nisbet & Fahy, 2017). Yet, such contextual information is often missing in newspaper articles (Hijmans et al., 2003; Korthagen, 2016; Mellor, 2015).

This paper investigates whether including details about the scientific process in university press releases leads to greater coverage of these aspects in newspaper articles. It also provides practical recommendations for addressing churnalism in press releases, aiming to improve science communication by highlighting not only research results but also the process behind the science.

4.2 The ocean plastic case study

This study examines communication about ocean plastic research in English-language press releases and newspaper articles worldwide. Ocean plastic research provides a relevant case study because it combines complex biological, chemical and physical methods. Communication about complex scientific and technical fields can be challenging, as this research requires a relatively high level of prior knowledge to fully understand. At the same time, ocean plastic pollution is a concrete and visible problem, which means it also offers many opportunities for science communication about technical scientific fields.

The press releases in this study originate from EurekAlert!, an international platform where research institutions share their findings. According to the policy of EurekAlert!, the press releases they receive are not edited before publication. Because these releases appear unchanged, they provide a reliable starting point for analysing how research institutions present their research and how journalists subsequently adopt and edit this information in newspaper articles worldwide. Although the dataset is in English, the findings also offer insights for the Netherlands and Flanders, as universities frequently communicate their research internationally.

4.3 Theoretical framework

4.3.1 The scientific process highlighted

Various studies have investigated the extent to which details about the scientific process are reflected in press releases and newspaper articles. Newspaper articles contain little information about the background and methodology of research (Hijmans et al., 2003). In addition, research findings in the media are rarely contextualised by comparing them with other research in the same field (Korthagen, 2016), and funding details, limitations and uncertainties are often missing (Mellor, 2015). Brechman et al. (2009) found that press releases about cancer research often emphasise methodology and context, while newspaper articles provided less background information. In addition, uncertainty was often omitted in press releases but still included in some newspaper articles.

When journalists report scientific details that are not included in the press release, it means that they have consulted additional sources. To play an effective role as informants and critical observers, it is essential that they have access to information about the scientific process, such as research methods, limitations, uncertainties and funding. However, press releases on EurekAlert! Often lack important references, such as DOIs and titles of scientific publications (Orduña-Malea & Costas, 2023). This makes it more difficult for journalists to find the original study and verify information. In such cases, mentioning the scientific journal in press releases can help trace the original source.

Although the aforementioned studies have examined whether parts of the scientific process are discussed in press releases and newspaper articles, it remains unclear to what extent specific elements such as details about the research area or the analysed sample are communicated. In addition, little is known about how research methods, limitations and uncertainties are presented and whether journalists copy this information from press releases or supplement it with other sources. To our knowledge, this is the first study to examine how these components of peer-reviewed research are presented in press releases about ocean plastic and how they are subsequently reflected in the accompanying newspaper articles. To investigate this, we pose the following research question:

RQ 1: *How do university press releases and newspaper articles portray the scientific process behind peer-reviewed ocean plastic research??*

4.3.2 The influence of press releases on newspaper reporting

Previous research shows that the media rarely report information that is included in the original study but not in the press release (Sharp et al., 2021). Furthermore, approximately one-third of news reports are largely or entirely based on the press release, while only 14% go beyond a secondary source (Taylor et al., 2015). We therefore hypothesise that press releases that explicitly focus on the scientific process increase the likelihood that newspaper articles will do the

same. To investigate this, we formulate the following research question:

RQ 2: *Does the presence of details about the scientific process in university press releases ensure that this information is also more prevalent in the newspaper articles based on them?*

4.4 Methods

4.4.1 Dataset

Our dataset consists of 10 press releases about peer-reviewed research on ocean plastic, sourced from EurekAlert!, and 130 newspaper articles about the same peer-reviewed studies. The press releases were published by universities and research institutes in Canada, England and the United States. The newspaper articles were published in 75 newspapers from 13 countries⁷, ranging from internationally recognised quality newspapers such as The Times and The Guardian to local media. The newspaper articles were identified via NexisUni and Altmetric based on characteristics such as the names of researchers, titles of scientific articles and organisations involved. This dataset is a subset of the 84 press releases and 495 newspaper articles on ocean plastic research previously studied by Vonk et al (2024). For details about the data collection and the creation of this dataset, see Appendix 1.

4.4.2 Data analysis

Coding scheme and validation

To analyse how the scientific process is represented in the texts, we coded nine variables based on existing literature on science journalism and communication. First, we assessed whether the text included a reference to the *scientific journal* (1) in which the study was published, as this affects the findability of the original study for journalists. In addition, we coded whether various elements of the used methodology were highlighted, including: the scope of the *research area* (2), i.e.

⁷ Countries where the research has been published in newspaper articles: Australia, Canada, China, England, Ireland, India, Kenya, New Zealand, Pakistan, Singapore, Thailand and the United States.

whether the research took place at local, regional or global level; the *sample studied* (3), i.e. the group or material on which the research was based; and the *methods* used to analyse data (4), as these details are often missing in newspaper articles about science (Brechman et al., 2009; Hijmans et al., 2003). In order to investigate whether the research results were weighed by comparing them with other research (Korthagen, 2016), we coded whether references were made to *other research* (5). In addition, *uncertainty* (6), *funding information* (7) and research *limitations* (8) are regularly missing from newspaper articles about science (Mellor, 2015). To test whether these elements appear in scientific press releases and whether their presence increases the likelihood of being included in newspaper articles, we also coded for them. We coded for scientific uncertainty when the text indicated a lack of evidence, contradictory findings, or included hedging language ('hedgies' are words that suggest hesitation or doubt). In addition, we coded whether the text emphasized the need for *further research* (9), reflecting how peer-reviewed studies communicate that science is a system of knowledge production rather than absolute truth. We did not code research results separately, since all press releases in our dataset come from EurekAlert!, a platform that exclusively disseminates peer-reviewed research. We therefore assume that every press release, and its accompanying news article, includes scientific results.

The entire dataset was coded by a single coder in Nvivo (R14.23.1), with all paragraphs containing relevant variables marked. Only the main text of the articles was included in the analysis; titles and captions were excluded. In the press releases, only the text above the ###-symbol⁸ was coded. All results were exported to Excel and visualised in Figure 4.1 using Python⁹. The selected text in Excel was then qualitatively analysed to identify whether press releases and newspaper articles report on the scientific process in different ways⁴.

⁸ ### - is a symbol that appears in EurekAlert press releases. Because the information under this symbol is not always uniform across different press releases, it was decided to only code the information above it.

⁹ For the Python script, see: <https://github.com/erikvanseville/QualitativeDataVisualization/tree/main>.

The code book was developed iteratively and discussed with a second researcher. To check its applicability, a subset was independently coded by a second coder. Because some variables occurred less frequently, manual sampling was used to compile a subset so that each variable occurred in at least 20% of the texts. This resulted in a subset of 35 press releases and newspaper articles, representing 25% of the total dataset. Inter-coder reliability was calculated using a kappa score per variable, with an average score of 0.97 (ranging between 0.88 and 1). See Appendix 2 for a detailed reliability scores per variable.

Presence of scientific details

In order to analyse whether the presence of scientific details in university press releases leads to newspaper articles providing more information about the scientific process, we compared how often scientific variables occurred in press releases and the corresponding newspaper articles. For each variable, we counted how often it appeared in the press releases and in the newspaper articles, and then divided this into four categories: the number of times the variable was present in both the press release and the newspaper article; the number of times the variable was absent from the press release but present in the newspaper article; the number of times the variable was present in the press release but absent in the newspaper article; and the number of times the variable was absent in both the press release and the newspaper article. This approach allows us to determine whether a variable is more likely to appear in a newspaper article when it is included in the press release. All results are shown in Table 4.1.

4.5 Results

4.5.1 The scientific process described in press releases and newspaper articles

In order to determine the extent to which university press releases and newspaper articles pay attention to the scientific process (RQ1), and to compare these two media types, all variables for both text types have been visualised in Figure 4.1. To provide more context on how science is explained in press releases and newspaper articles and to investigate whether this is done in similar or different ways, we conducted a

qualitative analysis of the variables in Figure 4.1 and added quotations to the running text that illustrate the various ways in which the scientific process is communicated.

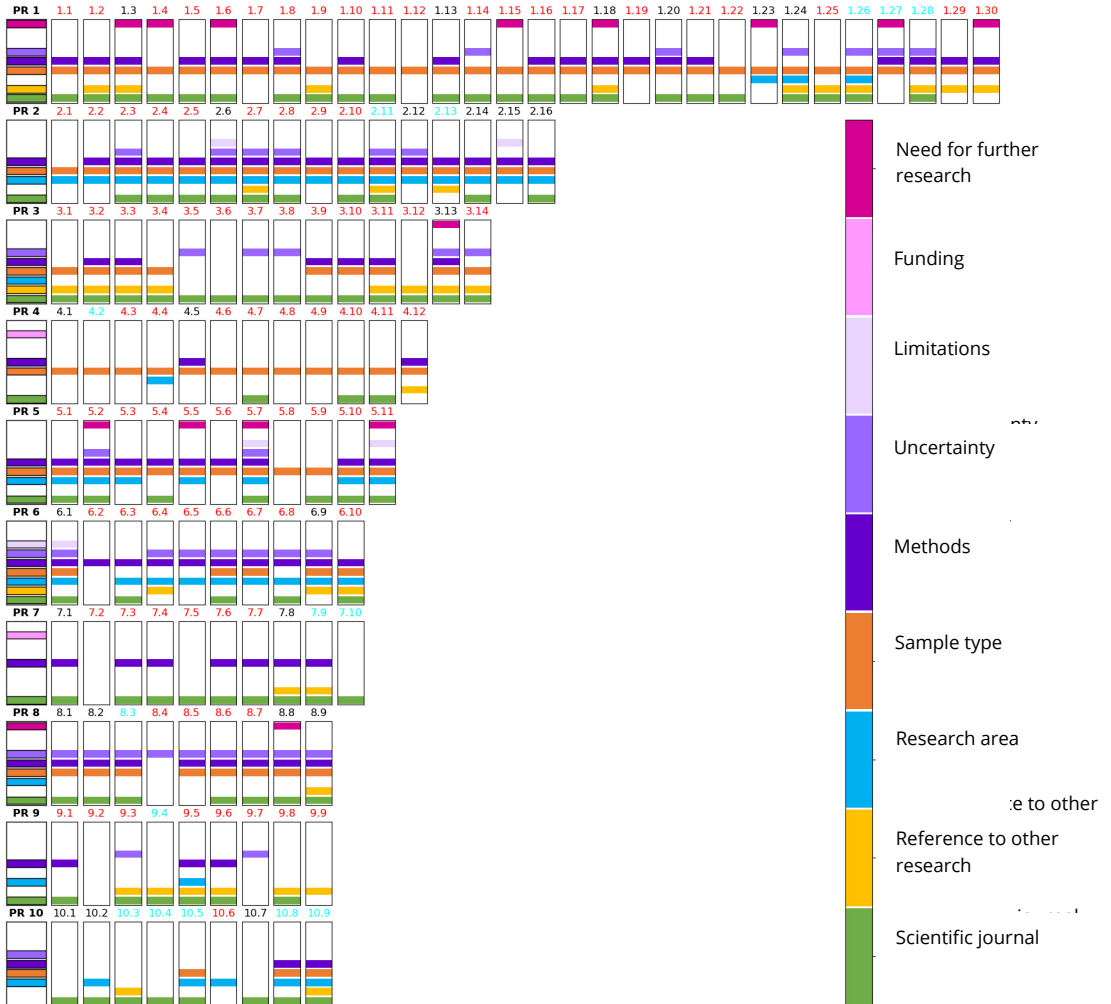


Figure 4.1: Visual representation of the variation in science variables in press releases (PR). Note: The IDs (1.1 and onwards) of the newspaper articles correspond to those in the dataset. Newspaper articles with cyan IDs have at least 20% fewer words than the press release, while newspaper articles with red IDs have at least 20% more words than the press release.

Scientific journal

Almost all press releases (N=9/10) and most newspaper articles (N=81/130) refer to the journal in which the research was published. These journals are: *Science, Endangered Species Research, Proceedings of the National Academy of Sciences, ACS Sustainable Chemistry and Engineering, Current Biology, and Nature Communications.*

Other research

Only a small number of press releases (N = 3/10) and newspaper articles (N = 33/130) include references to other research. In press releases, these references are primarily used to contextualize and interpret the authors' own findings:

Scientists say that the degradation rate is extremely fast compared to other recent discoveries, such as bacteria reported last year to biodegrade some plastics at a rate of just 0.1 3mg a day. – PB 1

In newspaper articles, references to other research are brief and mainly serve to contextualize the topic, for example by highlighting emerging problems from ocean plastic or illustrating the scale of plastic pollution:

The research sheds light on the true threat of plastic pollution to marine turtles, which other research has shown also eat plastic rubbish and marine creatures caught up in it – NA 6.4

In press releases, references to other research are also used to provide local context, occurring in 8 of the 33 cases where other studies are cited. These references typically highlight the amount of plastic produced or reduced in specific countries:

According to the Environmental Protection Agency (EPA) statistics from January 2017, Ireland is just under halfway to reaching its target for recycling plastic waste – NA 1.30

Scope of the research area and the sample studied

Most press releases (N=8/10) provide information about the study sample, while two (PR 7 and 9) describe computer models and contain no physical samples. Of the 111 newspaper articles reporting on studies with a sample, 95 explicitly mention it.

The scope of the research is specified in most press releases (N=7/10), indicating whether it was conducted in a laboratory (PR 1, 4, 5, 10), locally (PR 10), regionally (PR 2), or globally (PR 6, 9). In contrast, newspaper articles rarely mention the research area (N=42/130). Local studies take place within national borders, such as a bay or a section of the ocean floor, while regional studies cover multiple countries or extensive parts of the ocean:

The scientists analysed more than 120,000 corals from 159 reefs in Indonesia, Australia, Myanmar (Burma) and Thailand, some of which were affected by the presence of plastics and others free of this contamination. – NA 2.11

Research covering the entire ocean (global research) involves an interview study in which a survey was sent to experts worldwide (PR 6), or research in which the spread of plastic in the ocean is mapped using computer models (PR 9).

Research methods

All press releases (N=10) describe the research methods, compared with 81 of the 130 newspaper articles. Methods frequently mentioned in the articles include laboratory experiments on plastic degradation (PR 1), visual analyses of coral reefs (PR 2), computer model data (PR 7), and social media analysis (PR 8). Less frequently cited methods include lab experiments on plastic microbeads (PR 4), turtle feeding behaviour studies (PR 5), surveys (PR 6), and additional computer model data (PR 9).

Regarding the quality of method reporting, methods often drawn from press releases are summarised concisely in a single sentence, directly linked to the main findings. More detailed explanations typically appear later in the press release, for example:

University of Exeter scientists scoured existing published studies and Twitter for shark and ray entanglements, and found reports of more than 1,000 entangled individuals. – PR 8

Newspaper articles about this press release then use the short sentence, either copying it directly or paraphrasing it:

Scientists at the University of Exeter found reports of 1,116 of the creatures caught up in plastic in the world's oceans after scouring existing studies and social media. – NA 8.2

Methods that are less frequently included in newspaper articles are usually described in a full paragraph in the press release or mentioned throughout the text.

Uncertainty

Five out of ten press releases mention the uncertainty of the research, compared to 38 out of 130 newspaper articles. Press releases explicitly highlight this uncertainty, both in detailed descriptions and in direct or indirect quotes from scientists:

University of Exeter scientists scoured existing published studies and Twitter for shark and ray entanglements, and found reports of more than 1,000 entangled individuals. And they say the true number is likely to be far higher, as few studies have focused on plastic entanglement among shark and rays. – PR 8

Newspaper articles often reflect this uncertainty, expressing it as indirect or direct quotations from researchers. In some cases, journalists add references to uncertainty that were not included in the original press release, for example by referring to the peer-reviewed article or by new quotations:

However, researchers of the report concluded that, “despite the potential impacts, the total amount of pandemic-associated plastic waste and its environmental and health impacts are largely unknown.” – NA 9.7

Limitations

A small proportion of press releases (N=1/10) and newspaper articles (N=4/130) explicitly mention research limitations. In press releases, research limitations are presented as:

The report concluded that, based on the survey results, that more than 1 000 turtles are likely to die due to entanglement. But the figure is likely to be a ‘gross underestimation’ of the scale of the threat to turtles. Not all dead turtles strand on beaches, especially young animals, and some decay at sea. Some of the experts

surveyed said that not all stranded turtles are found and that some are removed by local people to eat. – PR6

The newspaper articles citing research limitations refer to the original peer-reviewed article:

That gave them the stunning figure of 11.1 billion pieces, which they project will increase to 15.7 billion in the next seven years, as worldwide plastics entering the ocean are projected to increase tenfold (the numbers do not include China and Singapore, for which they were not able to make estimates). – NA 2.15

Funding

Two out of ten press releases mention the funding of the research, while no newspaper articles include this information. In our dataset, funding details are available on EurekAlert! For five press releases. These studies are supported by national and international organisations, including scientific institutions, government agencies, and non-profit organisations. Press releases mention funding in two ways. One is a brief indication of the supporting body:

The research was supported by the National Science Foundation through the National SocioEnvironmental Synthesis Center (SESYNC). – PR 7

Alternatively, funding is presented as the result of an awarded grant, emphasizing the achievement of securing this support, as illustrated in press release 4. The term “awarded” highlights that receiving the grant is an important recognition for the research team:

A team, led by Dr Scott and including Professor Davide Mattia (Chemical Engineering) and Professor Karen Edler (Chemistry) has also just been awarded funding of just over £1 million by the Engineering & Physical Sciences Research Council to develop porous beads, capsules and microsponges. – PR 4

Need for further research

Both press releases (N=2/10) and newspaper articles (N=14/130) rarely emphasise the need for further research. Only two press releases (PR 1 and 8) explicitly mention that follow-up research is needed. In press release 1, this was expressed in a quote from a scientist:

“The caterpillar produces something that breaks the chemical bond, perhaps in its salivary glands or a symbiotic bacteria in its gut. The next steps for us will be to try and identify the molecular processes in this reaction and see if we can isolate the enzyme responsible.” – PR 1

Press release 8 refers to the peer-reviewed article to emphasise the need for further research:

The study says more research is needed, and the researchers have worked with the Shark Trust to create an online report form to gather data on entanglements. – PR 8

4.5.2 Scientific details in press releases and their uptake in newspaper articles

Table 4.1: *Scientific details as predictors for newspaper coverage*

Scientific variable	Present in			Absent in		
	Press release (PR)	Newspaper-article (NA)	PR and NA	PR, present in NA	in NA, present in PR	PR and NA
Reference to scientific journal	N=9	N=93	92/121	8/9	29/121	1/9
Reference to other research	N=3	N=36	21/54	15/76	33/54	61/76
Research area	N=7	N=42	38/78	4/52	40/78	48/52
Sample type	N=8	N=94	94/111	0/19	17/111	19/19
Research methods	N=10	N=85	85/130	0/0	45/130	0/0
Uncertainty	N=5	N=38	28/72	10/58	44/72	48/58
Limitations	N=1	N=5	1/10	4/120	9/10	116/120
Funding information	N=2	N=0	0/0	0/108	2/22	108/108
Need for further research	N=2	N=14	9/39	5/91	30/39	86/91

To investigate whether newspaper articles reported on the scientific process and how press releases influenced this reporting, we focused on two aspects in the results: (1) variables that appeared in both press releases and subsequent newspaper articles, and (2) variables that were absent from press releases but appeared in newspaper articles. Both are indicated with bold numbers in Table 4.1.

References to the scientific journal, the methods used, and the sample analysed almost always appear in press releases and are largely reproduced in newspaper articles. References to other research, the scope of the study, uncertainties, limitations, and the need for further research appear more frequently in newspaper articles when they are included in the press release. For example, the need for further research is mentioned in 9 of 39 newspaper articles when it is present in the press release, compared to 5 of 91 newspaper articles when it is absent. Overall, the inclusion of scientific details in newspaper articles is higher when those details are also present in the press release. These findings suggest that including scientific details in press releases increases the likelihood that the scientific process is reported in subsequent newspaper articles.

4.6 Discussion and conclusion

4.6.1 Churnalism, a new opportunity in science news?

The changing journalistic landscape, characterized by increasing time pressures and a decline in specialised science journalists, means that science news is increasingly covered in general news sections by non-specialised reporters. Press releases, originally intended for science journalists who can interpret uncertainties and scientific context, are now often used as direct sources of information for a broader audience due to copy-paste journalism (Kroon & Schafraad, 2013; Van Leuven et al., 2015). This trend can reduce journalistic depth and diminish the critical gatekeeping role of journalists (Göpfert, 2008; Korthagen, 2016). Churnalism thus increases the responsibility of scientific institutions in formulating their press releases, as they help determine how research appears in the newspaper.

This study shows that when press releases explicitly contain information about the scientific process, newspapers are more likely

to mention this. This suggests that communication professionals and scientists themselves have an influence on how their research is presented in the newspaper. By explicitly mentioning uncertainties, limitations and the need for follow-up research, concisely describing methods and linking them to the most important research results, and incorporating important information into quotations, there is a greater chance that this information will also be mentioned in the newspaper.

The implications of these findings are twofold. First, previous research shows that journalists often have limited time to consult additional sources, which means they mainly rely on press releases (Van Leuven et al., 2015). When these press releases contain clear and accessible information about the scientific process, this can potentially influence how journalists present the research and which conclusions they emphasise. As Korthagen (2016) also states: 'Good science communication leads to better science journalism.' We therefore argue that more complete reporting of the scientific process in press releases could contribute to less exaggerated and more nuanced reporting in newspaper articles. At the same time, the inclusion of details about the scientific process in journalistic reporting shows that universities' communications have a direct impact on what the public reads in the newspapers. When uncertainties, methodological choices and limitations are also communicated, this may contribute to a more realistic and honest picture of science as a process of provisional knowledge production, rather than as a source of absolute truths. However, there has not yet been sufficient empirical research into the extent to which this type of transparent communication actually leads to a more nuanced understanding or greater trust among the public.

In the following discussion, we will elaborate on our findings and provide practical tips that can be used to clearly communicate not only scientific results, but also the scientific process.

4.6.2 Little transparency about research funding and limitations

Press releases and newspaper articles often contain information about the scientific process, such as the methods and the analysed sample, but rarely communicate about research funding, a studies limitations, or the need for further research (RQ1). Funding information can be

found on EurekAlert! for half of the press releases, but is rarely included in the press release itself and never in the subsequent newspaper articles. This confirms Mellor's (2015) observation that funding details are frequently omitted from scientific reporting. In the case of ocean plastic research, which is often funded by government agencies, the likelihood of conflicts of interest is lower than in other fields, such as medical research, which frequently receives private funding (Lexchin et al., 2003). This may explain why funding information is often considered less relevant to communicate.

Brechman et al. (2009) found that research uncertainties were often absent from press releases but included in newspaper articles. In contrast, our analysis shows that half of the press releases on ocean plastic research mention uncertainty, which is then reproduced or cited to a lesser extent in newspaper articles. When uncertainty is not discussed in the press release, it almost never appears in the newspaper coverage. This suggests that journalists either do not consult the original peer-reviewed article for uncertainties or do not consider them newsworthy. We did not assess the extent to which uncertainties are reported, but differences may be due to the subject matter: Brechman et al. analysed cancer genetics, a controversial field where uncertainty and limitations can significantly affect public perception. Ocean plastic research, by contrast, focuses largely on the presence of plastic in the environment and its consequences, which may reduce journalists' motivation to investigate and report uncertainties and limitations.

4.6.3 Incorrect information often originates from press releases

Incomplete or incorrect information in newspaper articles often originates from scientific press releases (Schat et al., 2018; Smeets, 2021). This pattern is also evident in our dataset, for example in newspaper coverage of press release 1. This press release reports on a chance discovery made by a scientist while keeping bees: she placed wax moth larvae in a plastic bag, and the larvae ate their way out through the plastic. She subsequently investigated this degradation process further. In the press release, the scientist notes that the mechanism of degradation is not yet fully understood and that further

research is needed to clarify it. Later, she explains what she hopes to achieve with this research:

“We are planning to implement this finding into a viable way to get rid of plastic waste, working towards a solution to save our oceans, rivers, and all the environment from the unavoidable consequences of plastic accumulation.” - PR1

This framing can give the impression that the research offers an immediate solution to ocean plastic pollution. Newspaper articles about this study often omit the scientist's caveat that further research is needed, instead including statements that suggest a solution has already been found. It is well established that nuance, especially in headlines, can be lost as science news moves from press releases to newspapers and social media (Verstappen et al., 2022). Selective presentation of information can therefore create a misleading picture of the research.

An important consideration is the dual function of press releases about scientific research. In this study, we have primarily focused on their role in informing journalists and the public. At the same time, press releases also serve a strategic purpose: they increase the visibility of researchers and institutions and contribute to scientific profiling and branding (Carver, 2014). In a media landscape where the watchdog role of specialised science journalism is becoming less prominent, hype in press releases can lead to inaccuracies in reporting (Schat et al., 2018), as illustrated by the example above. This underscores the importance for scientists and press officers to carefully consider how they present their research and the expectations they create. Statements intended to increase news value may be exaggerated or taken out of context, and when key nuances are lost, it raises the question of whether the scientist can and will stand behind those statements.

4.6.4 Linking methods to results

The methods used in scientific studies are always discussed in press releases, but their presence in newspaper articles varies. Journalists sometimes include technically complex methods, but not consistently. Complexity itself does not appear to be a barrier; rather, the way

methods are described in the press release matters. Methods summarised in a single sentence and directly linked to the main findings are more likely to be reproduced than those explained in longer paragraphs. Given that journalists often face limited time and space (Nelissen & Hendrickx, 2023), it can be challenging to convey complex methods accurately in short articles. Scientists and communication professionals can therefore increase the likelihood that methods are included by providing concise summaries that clearly connect the method to the study's key results, alongside or instead of longer explanations.

4.6.5 The scientific process highlighted

Other studies have shown that it was extremely rare for media reports to contain information that was included in the research report but not in the scientific press release (Sharp et al., 2021), and that approximately one-third of the coverage was largely or entirely derived from the press release, while only 14% went beyond a secondary source (Taylor et al., 2015). Our results also show that when information about the scientific process is not included in the press release, this information is only described in 3%–20% of newspaper articles. When the information is included in the press release, this figure rises to 10%–85% (Table 4.1). This suggests that adding scientific details to press releases leads to more extensive reporting on the scientific process in newspaper articles (RQ2).

Our dataset shows that newspaper articles often convey aspects of the scientific process through direct or indirect quotes from researchers. The appearance of new quotes and references to the peer-reviewed article suggests that journalists sometimes consult additional sources. Quotes not included in the press release frequently appear across multiple newspapers. Since journalists often use social media for news gathering (Nelissen & Hendrickx, 2023; Van Leuven et al., 2015), these quotes may originate from platforms such as X, LinkedIn, or Bluesky. This provides scientists with an opportunity to add context to their research themselves: by posting a brief explanation on social media when their study is published, they might increase the likelihood that this information will be reflected in subsequent reporting.

4.7 Limitations and further research

Although our coding scheme is reliable, it only captures explicitly stated information, meaning that implicit information is not reflected in the results. For instance, three press releases did not explicitly specify the scope of the research area, even though it could be inferred from the methodology that the study was conducted in a laboratory. The same applies to identifying limitations: for example, the size of a dataset can implicitly indicate a study's limitations. It is also important to note that the dataset was coded entirely by a single researcher. While this ensured consistent application of the codebook, it is a limitation, and the results should therefore be interpreted as indicative, with the understanding that subjective interpretation may play a role. Another limitation concerns the composition of the dataset, which originates from various English-speaking countries with diverse cultural backgrounds. Science communication practices may differ, for example, between the United States and the United Kingdom. In this study, we focused on the content of press releases and newspaper articles, rather than linguistic style or cultural context. We acknowledge that regional and cultural differences may influence reporting practices, but this was beyond the scope of the current study and represents a promising direction for future research.

Implicit references to research limitations are logical in press releases, as these are aimed at science journalists who are able to make this translation. However, as the number of science journalists is declining (Allan, 2011), and science news is increasingly based on university press releases (Vögler & Schäfer, 2020) and press release content is directly reproduced in newspaper articles (Schafraad & Zoonen, 2020; Vonk, Bos, Smeets, & Van Sebille, 2024), there is a risk that these implicit references will not be recognised as limitations by readers with less knowledge of the scientific process, resulting in a loss of information about how to evaluate a study's conclusions. It is important that communication professionals at universities are aware of the shifting target audience of their press releases: from science journalists to general journalists and possibly even the general public, when press releases are copied. Addressing the scope and limitations of a study more explicitly in press releases might help general journalist and a general audience to better interpret research results.

The recommendations in this article are based on our research findings. A valuable follow-up study would be to discuss the implications of this study with scientists, press officers, science journalists and generalists. For example, we suggest that differences in the reporting of uncertainty between our study and that of Brechman et al. (2009) may be related to different fields of research, but we have not investigated this further. Interviews with journalists can provide insights into the considerations behind the inclusion or exclusion of scientific details in newspaper articles. In addition, our research shows that methods are mentioned more often in newspaper articles when they are presented briefly and in conjunction with the most important results. Interviews with scientists can reveal whether these concise formulations influence the accuracy of the reporting and whether simplification leads to a loss of methodological nuance which might create misinformation. Furthermore, we did not investigate where the information in newspaper articles that was not included in the press release came from. Hence, interviews might give insights in the sources used by journalists, and inform if they consult peer-reviewed articles and/or if social media. It is obvious that specialised science journalists generally have more time and expertise to report on science than generalist journalists. Copy-paste journalism probably plays a greater role among the latter group, as demonstrated in an earlier interview study with European journalists who report on ocean science (Pinto & Matias, 2023). Interviews with both groups can provide insights into the different sources they rely on when writing newspaper articles about science, and how they process information from press releases in their reporting. Finally, discussions with communication professionals, science journalists, and scientists can help identify strong examples of effective science communication that go beyond merely reporting scientific results.

Literature

- Adams, R. C., Challenger, A., Bratton, L., Boivin, J., Bott, L., Powell, G., Williams, A., Chambers, C. D., & Sumner, P. (2019). Claims of causality in health news: A randomised trial. *BMC Medicine*, 17(1), 91. <https://doi.org/10.1186/s12916-019-1324-7>
- Allan, S. (2011). Introduction: Science journalism in a digital age. *Journalism*, 12(7), 771-777. <https://doi.org/10.1177/1464884911412688>

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- Autzen, C. (2014). Press releases-the new trend in science communication. *Journal of Science Communication, 13*(03), C02.
- Brechman, J., Lee, C., & Cappella, J. N. (2009). Lost in translation?: A comparison of cancer-genetics reporting in the press release and its subsequent coverage in the press. *Science Communication, 30*(4), 453–474. <https://doi.org/10.1177/1075547009332649>
- Carver, R. B. (2014). Public communication from research institutes: Is it science communication or public relations? *JCOM, 13*(03), C01. doi:10.22323/2.13030301
- Comfort, S. E., Gruszczynski, M., & Browning, N. (2024). Building the science news agenda: The permeability of science journalism to public relations. *Journalism & Mass Communication Quarterly, 101*(3), 637–656.
- 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>
- Göpfert, W. 2008. "The strength of PR and the weakness of science journalism." In M. W. Bauwer, M. Bucchi (Eds.), *Journalism, Science and Society* (pp. 227–238). Routledge.
- Heyl, A., Joubert, M., & Guenther, L. (2020). Churnalism and hype in science communication: Comparing university press releases and journalistic articles in South Africa. *Communication, 46*(2), 126–145. <https://doi.org/10.1080/02500167.2020.1789184>
- Hijmans, E., Pleijter, A., & Wester, F. (2003). Covering scientific research in Dutch newspapers. *Science Communication, 25*(2), 153–176. <https://doi.org/10.1177/1075547003259559>
- Korthagen, I. (2016). Wakers van de wetenschap.: Over het belang en de functies van wetenschapsjournalistiek.
- Kroon, A., & Schafraad, P. (2013). Copy-paste of journalistieke verdieping?: Een onderzoek naar de manier waarop nieuwsfactoren in universitaire persberichten nieuwsselectie en redactionele bewerkingsprocessen beïnvloeden. *Tijdschrift voor Communicatiewetenschap, 41*(3). <https://doi.org/10.5117/2013.041.003.283>
- Lexchin, J., Bero, L. A., Djulbegovic, B., & Clark, O. (2003). Pharmaceutical industry sponsorship and research outcome and quality: systematic review. *BMJ, 326*(7400), 1167–1170.
- Murcott, T. H., & Williams, A. (2013). The challenges for science journalism in the UK. *Progress in Physical Geography, 37*(2), 152–160.

- Nelissen, E., & Hendrickx, J. (2023). How does a national, multilingual news agency contribute to news diversity? A mixed-methods case study. *Journalism*, 146488492311797. <https://doi.org/10.1177/14648849231179784>
- Nisbet, M. C., & Fahy, D. (2017). 29 New models of knowledge-based journalism. *The Oxford handbook of the science of science communication*, 273.
- Pinto, B., & Matias, A. (2023). European journalists and the sea: Contexts, motivations, and difficulties. *Public Understanding of Science*, 32(4), 459–469. <https://doi.org/10.1177/09636625221137036>
- Orduña-Malea, E., & Costas, R. (2023). 1. A scientometric-inspired framework to analyze EurekAlert! Press releases. In I. Broer, S. Lemke, A. Mazarakis, I. Peters, & C. Zinke-Wehlmann (Eds.), *The Science-Media Interface* (pp. 1–28). De Gruyter. <https://doi.org/10.1515/9783110776546-001>
- Peters, H. P., Brossard, D., de Cheveigné, S., Dunwoody, S., Kalfass, M., Miller, S., & Tsuchida, S. (2008). Science-media interface: It's time to reconsider. *Science Communication*, 30(2), 266–276. <https://doi.org/10.1177/1075547008324809> (Original work published 2008)
- Schafraad, P., & Zoonen, W. V. (2020). Reconsidering churnalism: How news factors in corporate press releases influence how journalists treat these press releases after initial selection. *Communications*, 45(s1), 718–743. <https://doi.org/10.1515/commun-2019-2075>
- Schat, J., Bossema, F. G., Numans, M. E., Smeets, I., & Burger, P. (2018). Overdreven gezondheidsnieuws. Relatie tussen overdrijving in academische persberichten en in nieuwsmedia. *Nederlands Tijdschrift voor Geneeskunde*, 162(1), D1936.
- Sharp, M. K., Forde, Z., McGeown, C., O'Murchu, E., Smith, S. M., O'Neill, M., Ryan, M., & Clyne, B. (2021). Irish media coverage of COVID-19 evidence-based research reports from one national agency. *International Journal of Health Policy and Management*, 1. <https://doi.org/10.34172/ijhpm.2021.169>
- Smeets, I. (2021). Vijf grote uitdagingen in de wetenschapscommunicatie. *Tijdschrift voor Communicatiewetenschap*, 49(2), 185–197. <https://doi.org/10.5117/TVC2021.2.005.SMEE>
- Sumner, P., Vivian-Griffiths, S., Boivin, J., Williams, A., Venetis, C. A., Davies, A., Ogden, J., Whelan, L., Hughes, B., Dalton, B., Boy, F., & Chambers, C. D. (2014). The association between exaggeration in health related science

The Framing of Science News

news and academic press releases: retrospective observational study. *BMJ*, 349.

- Taylor, J. W., Long, M., Ashley, E., Denning, A., Gout, B., Hansen, K., Huws, T., Jennings, L., Quinn, S., Sarkies, P., Wojtowicz, A., & Newton, P. M. (2015). When medical news comes from press releases—A case study of pancreatic cancer and processed meat. *PLOS ONE*, 10(6), e0127848. <https://doi.org/10.1371/journal.pone.0127848>
- Van Leuven, S., Deprez, A., & Raeymaeckers, K. (2015). Het journalistieke brongebruik in tijden van churnalism en Twitter: Een surveyonderzoek bij Vlaamse beroepsjournalisten (2008-2013). *Tijdschrift voor Communicatiewetenschap*, 43(1). <https://doi.org/10.5117/2015.043.001.064>
- Verstappen, M., Nelissen, E., Opgenhaffen, M., & McMartin, J. (2022). Van persbericht tot Facebookpost: Remediatie en vertaling in Vlaamse wetenschapsnieuws koppen. *Tijdschrift voor Communicatiewetenschap*, 50(3), 210–230. <https://doi.org/10.5117/TCW2022.3.005.VERS>
- Vissers, M., Paulussen, S., & de Bruijn, G. J. (2024). Surfing the COVID-19 news waves: A Belgian case study of science communication and public relations with university press releases. *JCOM: Journal of Science Communication*, 23(06), 1–17.
- Vögler, D., & Schäfer, M. S. (2020). Growing influence of university PR on science news coverage? A longitudinal automated content analysis of university media releases and newspaper coverage in Switzerland, 2003–2017. *International Journal of Communication*, 14, 3143–3164.
- Vonk, A. N., Bos, M., Smeets, I. and van Sebille, E. (2024). A comparative study of frames and narratives identified within scientific press releases on ocean climate change and ocean plastic. *JCOM*, 23(01), A01. <https://doi.org/10.22323/2.23010201>
- Vonk, A. N., Bos, M., & Van Sebille, E. (2024). Journalism versus churnalism: How news factors in press releases affect journalistic processing of ocean plastic research in newspapers globally. *Journalism Studies*, 25(16), 2031–2050. <https://doi.org/10.1080/1461670X.2024.2409836>
- Wormer, H. (2008). Science journalism. The international encyclopedia of communication.

Appendix 1 - Data collection

In this study, we investigate the influence of reporting on the scientific process in scientific press releases on how newspaper articles report on this subject. To this end, we compare the details mentioned about the scientific process between press releases and subsequent newspaper articles. To ensure that we obtain a good picture of this change, we want to have a reasonable number of newspaper articles per press release. For this reason, the dataset in this study is compiled from the dataset published by Vonk, Bos, Smeets and Van Sebille (2024), consisting of 84 press releases from EurekAlert! and 495 corresponding newspaper articles. Because the dataset already existed, we were able to select the press releases with the most newspaper articles and analyse them qualitatively.

The dataset was compiled as follows:

- 1) To avoid noise, we only selected articles that dealt with one specific study and excluded articles that discussed multiple studies. References to other studies were allowed in the text of the newspaper article, but if the study from the press release was not the main subject of the newspaper article, the newspaper article was excluded from analysis. Based on this criterion, 10 newspaper articles were excluded.
- 2) It is known that some press agencies copy content from other newspapers or that different newspapers belong to the same news organisation, resulting in the same article being published in different newspapers (Nelissen & Hendrickx, 2023). We identified these duplicates using the Jaccard index, whereby articles with a Jaccard score > 0.8 were excluded from the analysis, and only the first published article was analysed.
- 3) Two press releases reported on the same peer-reviewed study. We did not include these two press releases and accompanying newspaper articles in the analysis, as this would complicate the interpretation of the results because we cannot compare the newspaper article with one but with two press releases.
- 4) In order to gain a clear picture of the changes that occur when scientific studies are recontextualised in newspaper articles, we only analysed press releases with at least nine accompanying newspaper articles.

- 5) These steps resulted in a dataset of 10 press releases and 130 newspaper articles from universities and research institutes in Canada, England and the United States. The newspaper articles were published in 75 newspapers from 13 countries, ranging from quality newspapers such as The Times and The Guardian to local media. The dataset of press releases and newspaper articles, the complete code book and a visual summary of the data selection process can be requested from the first author.

Appendix 2 - Reliability scores for scientific variables

All variables are coded separately and discussed in detail in the code book (Appendix 3), which contains various examples. By coding individual variables, the inter-coder reliability score has proven to be highly reliable (> 0.8).

Variable	Kappa score	N present in 2 nd coder dataset
References to new research	0.88	15
Methods	1	25
Need for further research	1	4
Research Uncertainties	0.94	18
Research Limitations	0.90	6
Scientific journal	1	26
Funding details	1	4
Research area: - Global	0.91	7
- Laboratory	1	4
- Local	0.89	4
- Regional	1	7
Sample Type: - Cold-blooded	1	3
- Vertebrates		
- Humans	1	4
- In-organic material	1	4
- In-vertebrates	1	10
- Plastic	1	4

Appendix 3 - Codebook

Codebook: science variables

General information:

This study examines how much information on the scientific process regarding peer-reviewed ocean plastic studies is communicated in press releases and follow-up newspaper articles. This codebook is based on the codebook used for coding news factors and science variables in XXXX (2024). We want to emphasize that parts of this codebook is directly derived from this study, we added new examples, changed the order of the variables and in some cases added new variables. This codebook is intended to guide content analysis of press releases and newspaper articles written on peer-reviewed scientific articles on ocean plastic research.

This codebook contains instructions for **coding science variables** and describes which science variables are used in the content analysis, how these science variables were determined, and rules to apply to find the science variables in press releases.

Coding rules:

- Before you start coding, first read the entire text.
- Only code the text. Do not include titles, sub-titles, pictures, images or image captions into the coding.
- When coding, select the entire paragraph containing narrative-, frame or science variable (unless indicated otherwise) and code this paragraph in the designated location in NVivo.
- Please use the summaries provided at the end of each chapter when you are coding. You can use to summaries to make sure no variables were missed.

Coding scientific variables

The science variables provide extra information on the scientific research. On how it was conducted and on the preconditions making the research possible.

Methods

Does the story refer to ‘how’ the scientific results were obtained?

The methods describe how the scientific research was conducted and how the results were obtained. The methods can include a reference to certain gear that was used to conduct the study or a data set that was analysed in a specific way. Please code the entire paragraph describing the methods under “**11.1 Methods**”.

- **Example NA_1.6:** *As well as documenting the plastic waste they saw, the scientists visually examined nearly 125,000 corals, looking for evidence of disease.*
- **Example NA_11.2:** *According to the Canadian team, this prediction - based on models of different mitigation strategies - is seven times the amount deemed shocking in 2005.....In their study, the researchers examined the 24-34 million metric tonnes of plastic emissions that enter oceans, rivers and lakes annually - and modelled future scenarios based on current mitigation strategies.*

Urgency for further research

Does the story emphasize the importance of further research?

Further research focusses on the importance of more scientific research. Indications for further research can be made in press releases in the form of: more research is needed to determine, more research is needed to understand, etc. Please code the paragraph stating an urgency for further research under: “**11.2 Further research**”.

- **Example NA_17.5:** *The study says more research is needed and the researchers have worked with the Shark Trust to create an online report form to gather data on entanglements, which can be found at <https://recording.sharktrust.org/entanglement/record>*
- **Example NA_86.100:** *That said, further studies are needed to get a clearer view of exactly what chemicals in the plastics attract sea turtles and other marine creatures.*

Uncertainty

Does the story make any mention of uncertainty in the research field that might influence the way data can be interpreted?

Within press releases, scientific uncertainty might be stated by declaring that scientific evidence is missing or conflicting, or by hedging findings (hedgers are words that suggest hesitancy or doubt).

- **Example NA_1.15:** *It still remains unknown about how plastic can lead to disease in our Earth's waters. One theory is that plastic has the tendency to cut the corals, which leaves greater room for the protozoans to invade the corals.*
- **Example NA_25.8:** *"We found, based on beach strandings, that more than 1,000 turtles are dying a year after becoming tangled up, but this is almost certainly a gross underestimate."*

Limitations of own study

Does the story describe any limitations that the research has?

Scientific research limitations are constraints or limitations that affect the scope, validity or generalizability of research findings. These may include factors such as sample size, methodological limitations, measurement errors, biases and external influences that may affect the accuracy or applicability of the results.

- **Example NA_1.18:** That gave them the stunning figure of 11.1 billion pieces, which they project will increase to 15.7 billion in the next seven years, as worldwide plastics entering the ocean are projected to increase tenfold (the numbers do not include China and Singapore, for which they were not able to make estimates).
- **Example NA_86.27:** It did not determine the exact nature of the plastic-associated odours that attracted the turtles but the scientists believe dimethyl sulfide, a stinky chemical emitted by algae, could be the culprit. They add further studies are needed to understand more about the chemicals emitted through biofouling.

Journal

Does the text mention the journal in which the peer-reviewed article was published?

When the journal was named, please code the paragraph stating the name at “**11.5 Journal**”.

- **Example NA_67.13:** The scientists hope their findings, published in the journal Science, will help direct research into the impact of microplastics on marine life.

Funding information

Does the text state how the research was funded?

Please code the entire paragraph under: “**11.6 Funding**” when the text mentions with which resources the scientific study was funded.

- **Example NA_3.3:** *The analysis has been supported by US public policy non-profit The Pew Charitable Trusts and SYSTEMIQ, a company that partners with businesses and to make economic systems sustainable.*

Range research area

In scientific press releases, claims about the conducted study are often made. In these claims, the scientific study is placed in a larger context. The scope of the research is often different than the scope of the claims that are made. To make it possible for the reader to interpret the claims made in the text, it is important that the reader knows the scope of the research that was conducted and the method that was used to generate the results.

A text can for example state that mussels all over the world are severely affected by microplastic ingestion, because microplastic is present in all parts of the ocean, and the study found microplastic in mussels. This claim, however, is put in perspective when the study also states that they only looked at 1 species of mussel in 1 bay in this world.

In this research we do not look at exaggerations of scientific claims. But we do look if the text is transparent about the scope of the

research on which the claims they make in the text are based. Hence, we also code **how large the research area of the study is**.

Please code the paragraph stating the scope of the scientific study under: **"Range research area"** and indicate if the research was conducted:

1. **Locally:** one specific location, one bay, one country
2. **Regionally:** multiple countries, multiple ocean areas
3. **Globally:** World wide
4. **lab setting:** When the text clearly states that the study was conducted in a lab.

Sample type

Please code if the text mentions the type of sample that was analysed, and code the entire paragraph stating the sample type under: "8. Sample type". Indicate if the type of sample is:

1. **Inorganic material:** i.e., rocks, sand, water, etc.
2. **Plants:** seaweed
3. **Unicellular organisms:** plankton, diatoms, etc.
4. **Invertebrates:** coral, seasponge, worm, sea anemone, sea urchin, etc.
5. **Cold-Blooded Vertebrates:** Fish, Reptiles, Amphibians, etc.
6. **Warm-Blooded Vertebrates:** Birds, mammals, etc.
7. **Humans**
8. **Plastic:** microplastic, macro plastic or bio-plastic.

NOTE: Corals and sea sponges do not belong to plants, corals and sponges are invertebrates.

NOTE: Code all the types of organisms or non-lively materials that were analyzed during the research and that are stated in the text.

NOTE: When the study used a sample, you always need to state the type of sample. If the research did not use a sample, do not code this news factor.

Summary Science Variables:

Science variable Number	Science variable	Guiding question	Explanation of Science variable
11.1	Methods	Does the story refer to 'how' the scientific	The methods describe how the scientific

		results were obtained?	research was conducted and how the results were obtained. The methods can include a reference to certain gear that was used to conduct the study or a data set that was analyzed in a specific way.
11.2	Urgency for further research	<i>Does the story emphasize the importance of further research?</i>	Further research focusses on the importance of more scientific research. Indications for further research can be made in press releases in the form of: more research is needed to determine, more research is needed to understand, etc.
11.3	Uncertainty	<i>Does the story make any mention of uncertainty in the research field that might influence the way data can be interpreted?</i>	Within press releases, scientific uncertainty might be stated by declaring that scientific evidence is missing or conflicting, or by hedging findings (hedgies are words that suggest hesitancy or doubt).
11.4	Limitations own study	Does the story describe any limitations that the research has?	Scientific research limitations are constraints or limitations that affect the scope, validity or generalizability of research findings. These may include factors such as sample size, methodological limitations, measurement errors, biases and external influences that may affect the accuracy or applicability of the results.

The Framing of Science News

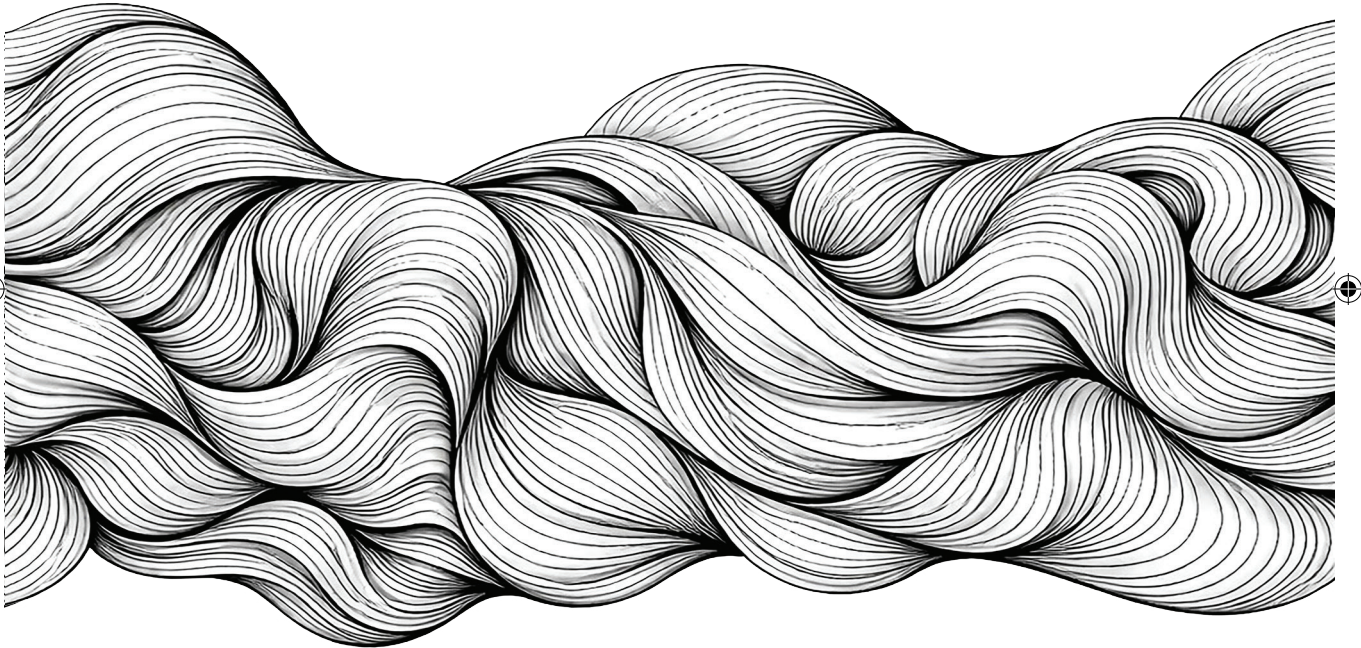
11.5	Journal	<p><i>Does the text mention the journal in which the peer-reviewed article was published?</i></p>	<p>Please code when the name of the scientific journal is stated in text, Example NA_67.13: The scientists hope their findings, <u>published in the journal Science</u>, will help direct research into the impact of microplastics on marine life.</p>
11.6	Funding	<p>Does the text state how the research was funded?</p>	<p>Please code when the text mentions with which resources the scientific study was funded, Example NA_3.3: The analysis has been supported by US public policy non-profit The Pew Charitable Trusts and SYSTEMIQ, a company that partners with businesses and to make economic systems sustainable.</p>
11.7	Research Area	<p><i>Does the text mention the scope of the scientific study in terms of research area?</i></p> <p>If yes, then also code what the research area was.</p>	<p>Locally: one specific location, one bay, one country Regionally: multiple countries, multiple ocean areas Globally: World wide lab setting: When the text clearly states that the study was conducted in a lab. Computer Model: When the research was done using a computer model, code computer model</p>

			and the scope of the research i.e., locally, regionally or globally.
11.8	Sample Type	<p><i>Does the text mention the type of sample that was analyzed in the scientific study?</i></p> <p>If yes, then also code what type of sample was analyzed.</p> <p>NOTE: if multiple sample types were analyzed, code them all.</p>	<p>Inorganic material: i.e., rocks, sand, water, etc.</p> <p>Plants: seaweed</p> <p>Unicellular organisms: plankton, diatoms, etc.</p> <p>Invertebrates: coral, seasponge, worm, sea anemone, sea urchin, etc.</p> <p>Cold-Blooded Vertebrates: Fish, Reptiles, Amphibians, etc.</p> <p>Warm-Blooded Vertebrates: Birds, mammals, etc.</p> <p>Humans</p> <p>Plastic: microplastic, macro plastic or bio-plastic.</p>

The Framing of Science News



Chapter 5 How frames and narratives in press releases shape newspaper science articles: the case of ocean plastic pollution

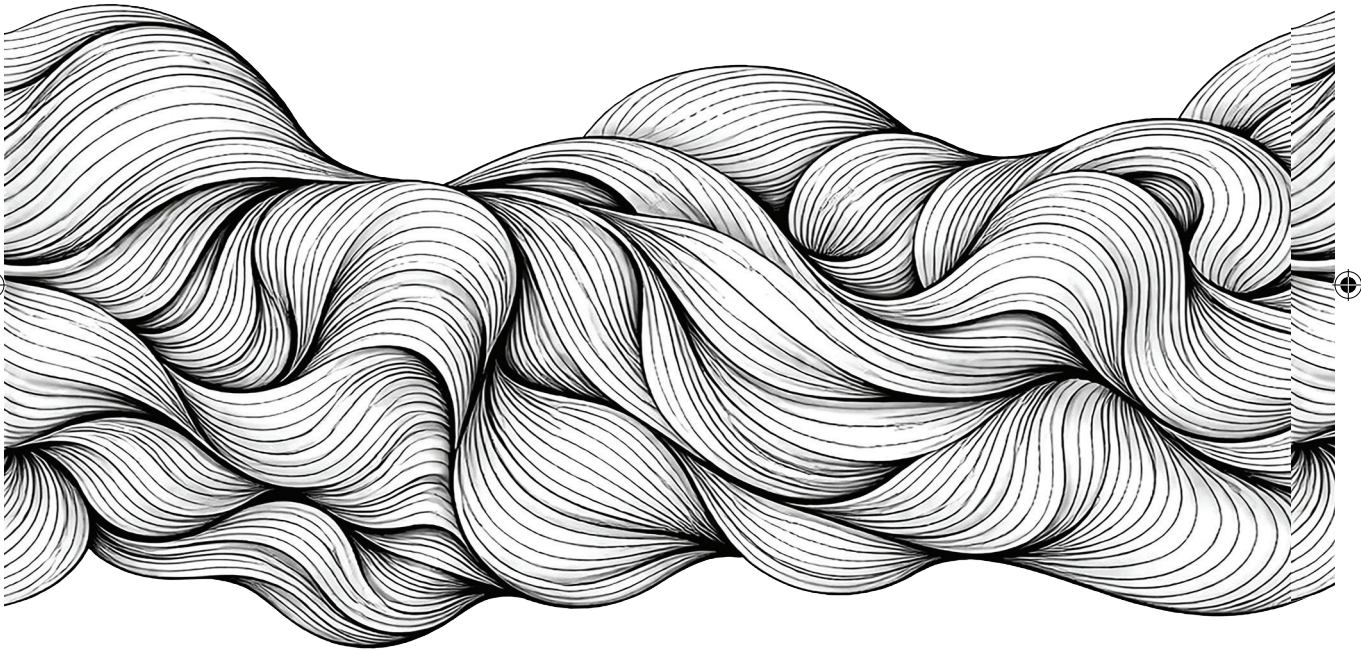




The Framing of Science News

This chapter is based on:

Vonk, A., Bos, M., & van Sebille, E. (2025). How frames and narratives in press releases shape newspaper science articles: the case of ocean plastic pollution. *Geoscience Communication*, 8(4), 297–317.



Abstract: Although framing of scientific topics in the media has been widely studied, relatively little is known about the origins of these frames. Since (geo)science journalism often relies on university press releases, this study investigates how peer-reviewed research on ocean plastic is framed in university press releases and newspaper articles. Using Entman’s framing theory, we examine how ocean plastic science is described through problem definitions, causes, moral judgments and solutions. Additionally, we studied narrative elements like personalization, dramatisation, and emotionalisation. Using a novel visualisation technique, we combine quantitative and qualitative analysis to reveal shifts in content and show which information is added, adapted or omitted by journalists when covering the research in the newspaper. Our results show that journalists often adopt framing and quotes directly from press releases, with scientists consistently portrayed as central figures, either as heroes addressing the plastic crisis or as warners highlighting its dangers. Although some articles add additional context, especially in assigning responsibility, the social embedding of the problem remains limited, resulting in personalization of the science instead of ocean plastic pollution. Information in the press release is almost never validated by a scientist not involved in the study. Moreover, non-scientific actors are rarely brought up and perspectives of victims or causers are often missing. These findings demonstrate that press releases strongly shape how ocean plastic research is framed in the media, offering research institutes an opportunity to promote more socially contextualised and relevant ocean science communication.

5.1 Introduction

The media play an important role in shaping public understanding on ocean issues. They are a major source of information about marine science and therefore influence how risks are perceived (Kramm et al., 2022). Although public awareness of ocean issues is increasing, perceptions of the most pressing problems often differ from those of scientists. For example, while the public often identify ocean pollution as their greatest concern, scientists are more likely to highlight climate change as the most urgent problem (Lotze et al., 2018). Scientists suggest that the disproportionate media coverage of ocean plastic, compared to other areas of ocean science (Pinto et al., 2020; Thompson-Saud et al., 2018), may have contributed to this gap in perception (Tiller et al., 2019).

How research gets in the news is increasingly determined by press releases from communication professionals, especially as the number of dedicated science journalists decreases and universities expand their media activities (Autzen, 2014; Peters et al., 2008; Comfort et al., 2022; Vögler & Schäfer, 2020). As a result, press releases have become an important source of information for journalists (Schafraad & Van Zoonen, 2020), who often draw directly from them when writing newspaper articles (Nelissen & Hendrickx, 2023; Van Leuven et al., 2015). These press releases do more than summarize research findings, they shape the tone and framing of problems like ocean plastic pollution (Vonk et al., 2024a). In some cases, parts of these press releases are copied verbatim (Comfort et al., 2022), a practice known as *"copy-paste journalism"* or *"churnalism"* (Autzen, 2014; Kroon & Schafraad, 2013; Van Leuven et al., 2015). As a result, the way research institutes frame science, plays an important role in how research is presented in newspaper articles.

In this study, we examine how scientific knowledge about ocean plastic spreads from research institutions to the public, focusing on the role of press releases in shaping media messages. Ocean plastic research forms a suitable case study because it is highly visible in both scientific communication and public discourse. While multiple studies show how ocean plastic is framed in public media, less attention has been given to the origins of these frames. Our study fills this gap, and explores contextual shifts among press releases and subsequent

newspaper articles, by examining changes in framing and narrative strategies. By comparing how framing is used in both press release and newspaper article, we can better understand the role of the press release in frame construction. Furthermore, analysis of narratives, actors and quotes provides information about the social context in which ocean plastic research is placed and the people deemed important in the conversation about ocean plastic pollution.

5.1.1 Communication challenges and the role of (science) journalism

Understanding the impacts of ocean problems, like ocean plastic, can be challenging for people, as ocean problems are deeply interconnected and influenced by multiple stressors, making it difficult to isolate and fully understand the impact of a single issue (Kelly et al., 2022). Moreover, ocean science often requires the use of complex biological, chemical and physical methods. Understanding these methods can be complicated as they require a relatively large amount of prior knowledge to comprehend it properly. Additionally, the ocean, and particularly the deep sea, is largely invisible and physically remote, contributing to a sense of detachment and making it harder for the public to perceive its relevance to society (Schuldt et al., 2016).

Effectively communicating ocean science to the general public therefore requires translating complex research into content that is accessible and meaningful for newspaper readers. In doing so, journalists encounter a number of challenges. In several European countries, journalists report that ocean science receives limited attention in newspapers, partly due to understaffed newsrooms and a shortage of specialized science reporters. Additionally, the complexity and technical nature of ocean science makes it difficult to accurately interpret research findings. Journalists often emphasize the need to consult directly with scientists to clarify and verify information, but such access is not always feasible. Time pressures further complicate their work, leaving journalists with little opportunity for in-depth investigation. As a result, they tend to rely more heavily on easily accessible international sources, often copying content related to ocean problems (Pinto & Matias, 2023).

One of the tasks of science journalists is to interpret the research findings from press releases and peer-reviewed articles, and present them in an accessible way to a wide audience (Autzen, 2014; Wormer, 2008; Korthagen, 2016). In line with this, it is said that to communicate ocean science effectively, communication must not only present scientific facts, but also contextualise them within broader social and cultural frameworks (United Nations Educational, Scientific and Cultural Organisation, 2021). Because by embedding ocean science in society, science journalists make complex issues more understandable and promote greater public engagement and pro-environmental behaviour towards the ocean (Catalano et al., 2019; Stoll-Kleemann, 2019).

To make research relevant and meaningful to their audiences, it is expected that journalists modify press release text, especially when embedding the research within local or cultural narratives. For example, press releases distributed via platforms like EurekAlert! are picked up by news outlets in multiple countries (Vonk et al., 2024b). When covering such international research, journalists often localise the content to enhance cultural resonance (Bassnett, 2005). In addition, journalists may choose to include voices from other sectors, such as government or public health officials, to broaden the perspective described in the press release and add societal relevance to the research (Sharp et al., 2021), as scientific press releases on ocean plastic typically only include quotes from the scientists involved in the study (Vonk et al., 2024a). A selective use of quotes results in a different contextualisation of the research in news articles compared to the original press release (Sharp et al., 2021).

5.1.2 Telling the story of ocean plastic pollution

In communicating research, journalists make choices about what information they highlight or omit, thereby determining how science is framed in the public arena (Nisbet & Mooney, 2007; Yang & Hobbs, 2020). These frames help structure complex information and make it meaningful (Nisbet, 2009), thereby guiding the interpretation of a story (Druckman & Lupia, 2017). Narratives can further support this process by placing scientific research within a human context and linking it to everyday life (Dahlstrom, 2014). They help make abstract

environmental problems, such as ocean plastic, more understandable and relevant to the public (Cooper & Nisbet, 2016). Given that frames and narratives strongly shape how audiences interpret scientific information, it is important to understand how they are used to communicate ocean plastic research.

Newspaper coverage about ocean plastic often emphasizes risks, damages, and the negative consequences of ocean plastic pollution, while opportunities or benefits related to plastic use are rarely addressed (Welzenbach-Vogel et al., 2022). In addition, ocean plastic pollution is typically portrayed as a threat to marine ecosystems rather than to human health, which may reinforce the perception that ocean plastic is a distant problem with little relevance to people's everyday lives (Henderson & Green, 2020). Moreover, news coverage of microplastics focuses on risks and scientific knowledge, placing responsibility for risk reduction mostly on consumers and policymakers, while the role of industry is hardly mentioned (Schönbauer & Müller, 2021).

5.2 Theoretical framework

5.2.1 The influence of scientific press releases in frame-building

Research on framing often identifies predetermined frames or looks at specific textual elements, for example positive or negative framings regarding plastic (Welzenbach-Vogel et al., 2022) or the actors deemed important in the story (Schönbauer & Müller, 2021). While these approaches provide valuable insights, they risk confirming expectations by narrowing the scope of analysis to what researchers already assume to be relevant. In this study, we take a more open approach. Rather than starting from fully formed, predetermined frames, we investigate how ocean plastic research is framed in general, how these frames are constructed, and what elements they consist of. To do so, we analyse individual frame components, known as frame elements, in line with Entman's (1993: 52) widely cited definition of framing:

“To frame is to select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to

promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described.”

Following Entman’s definition of framing, the context of texts regarding ocean plastic research is determined by frame variables highlighting problems caused by ocean plastic, causes of problems, moral evaluations (who is responsible for causing and mitigating ocean plastic), and treatment recommendations (Vonk et al., 2024a). By considering individual frame-building elements rather than at entire frames, it becomes possible to understand which parts of frames are often replicated in newspaper articles and which parts are added, changed or omitted by journalists. This approach allows us to better understand the role of press releases in frame construction in newspaper articles and shows what types of contextualization are preferred by journalists when communicating peer-reviewed ocean plastic research. In doing so, we hope to answer the following research question:

RQ 1: *How do frames change during the transfer from press release to newspaper article?*

Understanding how ocean plastic research is framed in newspaper articles, and the role press releases play in shaping this framing, is important, as media communication directly influences how the public perceives and understands marine risks (Kramm et al., 2022). Scientific press releases often address both the environmental and human health impacts of ocean plastic pollution, though they tend to emphasize environmental concerns (Vonk et al., 2024). Similarly, newspaper articles more frequently present ocean plastic as a threat to marine ecosystems rather than to human health (Henderson & Green, 2020). However, studies show that environmental problems are perceived as more urgent and personally relevant when linked to human health rather than to distant ecological effects (Nisbet, 2009). Consequently, this ecosystem-focused framing may reinforce the perception of ocean plastic as a remote issue with little relevance to people’s daily lives (Henderson & Green, 2020). How ocean science is framed in the media therefore shapes not only public understanding but also people’s motivation to engage with and act on marine environmental problems (Caruso et al., 2022; Kelly et al., 2021).

5.2.2 Narratives to communicate science

A narrative is a structured way of telling a story that connects events, characters, and emotions to convey meaning and shape how audiences understand a topic (Dahlstrom, 2014). In operationalizing narratives, we build on the approach of Vonk et al., (2024a), who adapted their narrative analysis from the four narrative dimensions identified by Glaser et al. (2009), including dramatization, emotionalisation, stylistic devices, and personalization. *Dramatization* concerns the structure of the story: whereas traditional factual reporting typically follows the inverted pyramid style, narratives often unfold with a clear beginning, middle, and end, creating tension and fostering engagement (Zebra, 2008). *Emotionalisation* refers to the expression of emotions, such as joy, anger, sadness, or surprise, by actors within a story, making their experiences and feelings more relatable to the audience (Glaser et al., 2009). *Stylistic devices*, including analogies and metaphors, are frequently used in science communication to make abstract or complex topics more accessible and to describe phenomena that extend beyond everyday human experience (Dahlstrom, 2021; Forgács & Pléh, 2022). Lastly, *Personalization* involves presenting abstract scientific issues in concrete human experiences by focusing on individuals or small groups and exploring their actions and the consequences thereof (Schiffer & Guerra, 2015).

Personalization helps bridge the gap between the reader and the subject matter, fostering emotional engagement and creating a sense of closeness with the material (Sangers et al., 2020). It allows audiences to identify with specific situations and feel empathy for the individuals involved (Dahlstrom, 2014). Characters within a narrative can be assigned distinct roles, such as victim, hero, or villain, which help the reader understand the type of characters that further shape the story context (Schwarze, 2006). Quotes subsequently serve as a means to convey the thoughts of key actors (Glaser et al., 2009). In science reporting, quotes increase the credibility and objectivity of an article and characterize the person quoted (Haapanen, 2017). As such, they help make scientific research more accessible to non-specialist audiences, allowing readers to hear the interpretive voice of the scientist directly (Hyland, 2010).

In scientific press releases on ocean plastic research, these narrative techniques primarily center on scientists, who explain important aspects of their research through quotes, positioning them as heroes or warners in the context of ocean plastic pollution (Vonk et al., 2024a). As a result, only the scientists' emotions are represented in the press releases, and the stories tend to personalize the scientific process itself, rather than the broader societal implications of ocean plastic pollution. Journalists commonly adopt quotes from press releases directly (Autzen, 2014; Sharp et al., 2021), which can reinforce the scientist-centred narrative in newspaper articles and may cause the social dimensions of ocean problems to be underreported.

To examine if newspaper articles employ narrative elements differently compared to press releases, and to find out if journalists go beyond personalizing science by including non-scientific actors and actor quotes compared to press releases, we pose the following questions:

RQ 2: *What are the differences in narrative elements - such as dramatization, personalization, emotion, and stylistic devices – between newspaper articles and the scientific press releases on which they are based?*

RQ 3: *Do newspaper articles contain different actor roles and quotes compared to the press releases on which they are based?*

Part of the narrative is Story tone. Story tone, along with frame- and other narrative elements, can influence how audiences perceive and respond to information about environmental problems. In the context of ocean health, positive messaging has been shown to promote public engagement and support for environmental action (Kelly et al., 2022), as optimistic stories can inspire hope and highlight opportunities for recovery (McAfee et al., 2019). While press releases on ocean plastic research show a range of tones, negative, neutral, positive or passionate (Vonk et al., 2024a), press releases highlighting more negative aspects of pollution are more often followed up by newspaper articles (Vonk et al., 2024b). It is important to understand how negative messages about the ocean come about in public discourse, as scientists have raised concerns that a consistently pessimistic portrayal

of ocean health in the media may discourage public engagement by reinforcing the perception that ocean degradation is irreversible (Duarte et al., 2015). It is well known that news selection criteria can create a bias towards negative news. Although science journalists report that tone is not a primary newsworthiness criterion in science news selection (Badenschier & Wormer, 2012), negativity remains a dominant news value in wider journalism (Bednarek & Caple, 2014). At the same time, positive news also plays a role in selection processes (Harcup & O'Neill, 2017), suggesting that both uplifting and alarming stories can attract media attention, depending on the context. While it is known that tone can affect what is selected as news, less is known about how the tone of press releases affects the tone of subsequent coverage in newspapers, a question we aim to answer in this study. This leads us to our fourth research question:

RQ 4: *Does story tone differ between newspaper articles and the scientific press releases on which they are based?*

This theoretical framework combines framing elements, narrative techniques, actor roles, and story tone to provide a multidimensional lens through which we analyse how communication on ocean plastic research is transformed as it moves from scientific institutions to the public through newspaper coverage.

5.3 Methods

5.3.1 Dataset

To analyse framing and narrative differences in ocean plastic science reporting, we compiled a dataset of 10 press releases and 130 subsequent newspaper articles about peer-reviewed ocean plastic research. All press releases were published on EurekAlert!, an international platform where research institutions share findings without editorial changes, making it possible to trace how the framing of research by research institutes translates into news articles worldwide. The press releases were published by research institutes in Canada, England and the United States. The 130 newspaper articles appeared in 75 newspapers across 13 countries, namely: Australia, Canada, China, India, Ireland, Kenya, New Zealand, Pakistan, Singapore, Thailand, England, and the United States. Newspapers

ranged from international quality newspapers such as The Times and The Guardian to local media. Newspaper articles were identified using NexisUni and Altmetric, based on author names, paper titles, and affiliated institutions.

This dataset is a subset of a larger collection compiled by Vonk et al., (2024b), which includes 84 EurekAlert! press releases published between January 2017 and December 2021, along with 495 related newspaper articles. These articles were published within one month of the corresponding press release, under the assumption that they were likely triggered by the publication of the peer-reviewed research, rather than by unrelated events that made the topic newsworthy. All newspaper articles were identified via NexisUni and Altmetric. By drawing from this pre-existing dataset, we focus on studies that received broad media coverage (i.e., at least nine newspaper articles based on a press release). To analyse how peer-reviewed studies are framed, only newspaper articles that discuss the research as their central topic are included; articles that cover multiple unrelated studies are excluded. The full selection criteria are provided in Appendix A, a visual overview of the selection process is added to the supplementary materials.

5.3.2 Coding

To analyse framing and narratives in ocean plastic reporting, we used the codebook developed by Vonk et al. (2024a), which is grounded in Entman's (1993) widely cited definition of framing. This approach breaks frames down into four core elements: problem definition, causal attribution, moral evaluation, and treatment recommendation. Given that all press releases focused on scientific studies about ocean plastic, causal attribution was consistently coded as "ocean plastic." Problem definitions were categorised by the types of consequences described, including biological, economic, and social impacts, as well as implementation challenges or conflicts. Positive impacts of ocean plastic, such as the creation of new habitats, or positive consequences due to the working of mitigation strategies were also coded. Moral evaluation captured who was portrayed as responsible for causing or resolving the problem and whether the press release expressed a sense of urgency. Finally, treatment recommendations were identified

when specific actions, solutions, or strategies were proposed to address ocean plastic pollution or its consequences.

In addition to Entman's four frame elements, we extended the original codebook to assess localisation by introducing the variable local-specific information, which captures instances where the text refers to culturally, nationally, or geographically relevant details.

Narrative elements were coded following Glaser et al., (2009), focusing on dramatization, stylistic devices, emotionalization, and personalization. Dramatization was identified using an inverted pyramid structure, common in journalistic writing. Stylistic devices were coded when analogies, figure of speech or metaphors were present in the text. Emotionalization was coded when the emotion of actors was expressed, for example fear, shock, surprise or hope. Personalization was analysed by coding if persons were present in a story, who caused events or were affected by events. In addition, we coded if these actors had specific roles such as victim, villain, hero, or warner. We also recorded whether these actors were quoted, and categorized quotes by source: the study's scientists, external experts, or non-scientific actors. Given that journalists often rely on press releases for quotes (Autzen, 2014; Sharp et al., 2021), we also noted if newspaper articles used quotes from the press release and we then coded whether these quotes were copied verbatim or if they were copied with minimal edits.

All texts were coded by a single coder using NVivo (version R14.23.1). Results were exported to Excel for further analysis and visualised using Python (see Figures 5.1–5.3)¹⁰. The selected text in the Excel was then qualitatively analysed to identify if the meaning of frame- and narrative variables was the same or differed between press release and newspaper article (see the supplementary materials for the codebook and Excel containing all results)¹¹.

¹⁰ For the Python script that created all images and the script that calculated the Jaccard Index, see: <https://github.com/erikvanseville/QualitativeDataVisualization/tree/main>.

¹¹ The codebook, dataset including all coded frame and narrative variables and the visual summary describing the dataset construction, as discussed in Appendix 1, are all available as additional materials to this paper. All additional materials can be downloaded in Zenodo, ID: 10.5281/zenodo.15389206

5.3.3 Coding rules and validation

Different coding rules were applied depending on the type of variable. For quotes, we coded each line that contained a quotation. For actor roles, framing variables, and narrative elements, we coded the entire paragraph in which the relevant content appeared. It did not matter which paragraph containing the variable was coded in the text, as long as the paragraph provided substantive information about it. For example, if a paragraph described a biological problem caused by ocean plastic, such as the degradation of coral reefs, that paragraph was coded for the “problem definition” variable. If the same frame element was repeated in multiple paragraphs within the same article or press release, it was only coded once. This approach was chosen due to the length and variation in the texts (some spanning up to two pages) and the large amount of different codes. Frequently recurring variables (like biological problems) appeared in nearly every paragraph, while others (like treatment recommendations) occurred only once. During codebook testing, coding every instance of frequent variables proved inefficient and reduced accuracy, as it shifted the focus from identifying unique elements to capturing repetition. This coding approach ensured consistency in identifying the meaning of frames and narratives. However, it did not account for differences in wording, as the same text fragments were not always selected.

Intercoder reliability was established. To ensure that even infrequent variables were included, a manual sampling strategy was applied. This produced a subset of 35 press releases and newspaper articles (25% of the full dataset), in which each variable appeared in at least 20% of the texts. The frame variables conflict and economic problems were largely absent in the dataset, and could therefore not be validated. Intercoder reliability was assessed using Krippendorff's alpha, which is particularly suitable for evaluating agreement for rare categories (Krippendorff, 2011; Krippendorff, 2004). Intercoder reliability was assessed differently for actor quotes compared to frame and narrative variables. For the latter, agreement was determined based on whether both coders identified the same meaning of a variable, regardless of the paragraph in which it appeared. In contrast, for actor quotes, intercoder agreement was calculated based on whether both coders selected the exact same wording from the text.

This more precise approach was necessary to evaluate whether quotes in newspaper articles were copied verbatim from press releases or with minimal edits.

After resolving discrepancies through discussion, high intercoder reliability was achieved for nearly all variables. The exception was stylistic elements, which had a low agreement on qualitative interpretation ($\kappa = 0.17$), though coders consistently identified their presence ($\kappa = 0.87$). As a result, we refrain from making interpretations regarding differences in specific stylistic elements used. Frame variables had an average kappa score of 0.92 (ranging from $\kappa = 0.84$ to $\kappa = 1.00$). Narrative variables – i.e., dramatization, emotion, and personalization, as well as actor roles - had an average kappa score of 0.91 (ranging from $\kappa = 0.76$ to $\kappa = 1.00$). Quotes had an average kappa score of 0.89 (ranging from $\kappa = 0.80$ to $\kappa = 0.94$). Story tone had an average kappa score of 0.84 (ranging from $\kappa = 0.76$ to $\kappa = 0.91$). For a full overview of inter-coder reliability scores per variable, see Table 5.1A, Appendix 2.

5.4. Results

5.4.1 Framing in press release vs. newspaper article

To answer RQ1 and assess whether newspaper articles use different frame-building elements than press releases, all frame variables were visualized (Figure 5.1). The results show considerable variation: 18 newspaper articles mirrored the press release in framing, these articles had a mean word count of 486. The majority of newspaper articles (N=70) were shorter (mean word count 328 vs. 689 in the press releases on which they were based) and contained fewer frame variables, often focusing solely on results. In contrast, 15 newspaper articles added frame elements (mean word count: 562), and 27 both added and omitted variables (mean word count: 615). These findings suggest that newspaper journalists typically reduce framing by shortening press releases, but sometimes reframe the content to provide additional context.

The Framing of Science News

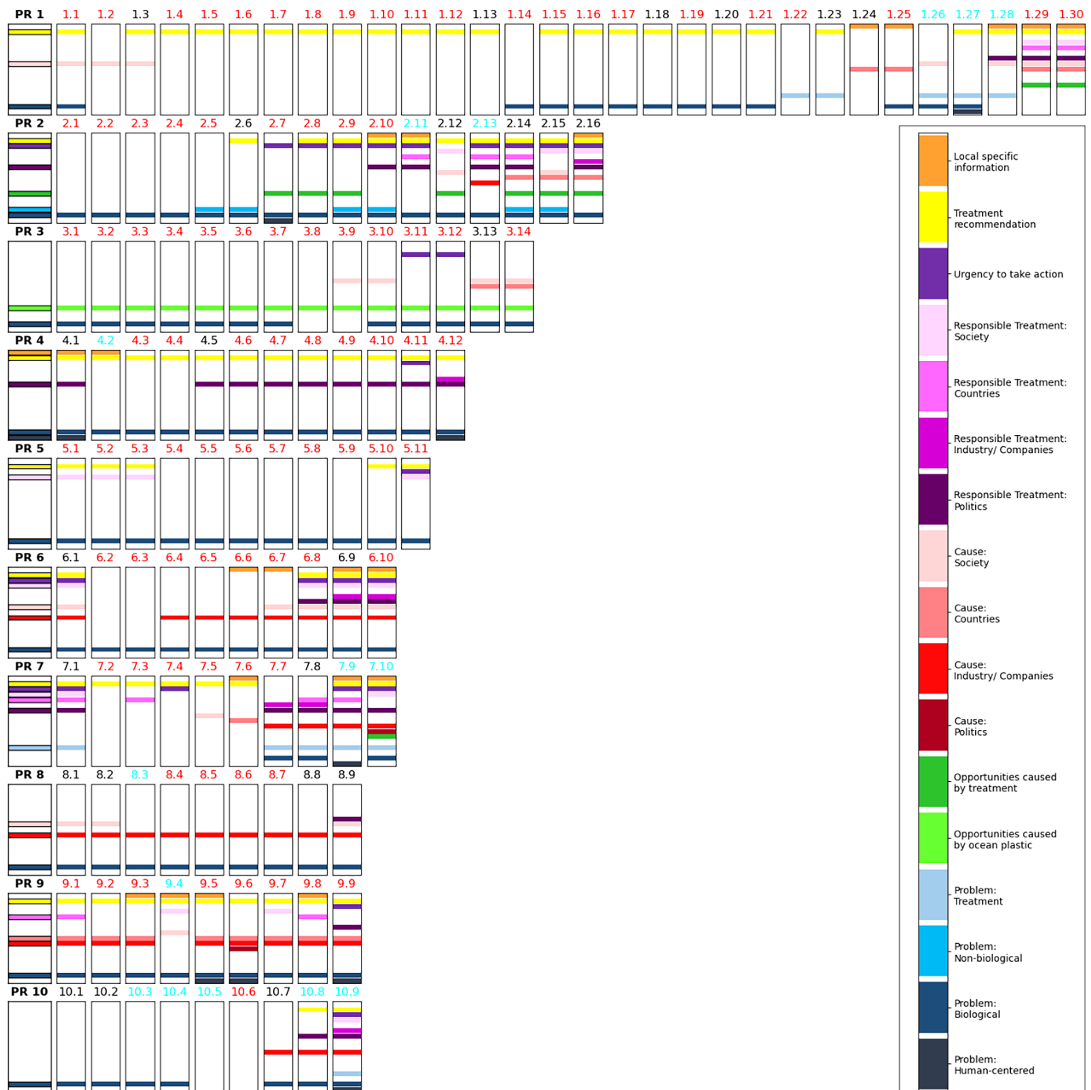


Figure 5.1: Visual representation of frame variable variation between press release (PR) and newspaper article (NA). The numbers of press releases and newspaper articles are provided at the top of the different cases. Newspaper IDs refer to entries in the dataset provided in the supplementary materials. Newspaper articles with red IDs have at least 20% less words than the PR, newspaper articles with cyan IDs have at least 20% more words than the PR. Each coloured line in the figure represents one frame variable, as explained in the legend to the right of the figure. The first block on the left shows the press release, with its internal framing indicated by the coloured lines. The blocks to the right represent the newspaper articles derived from that press release, whereby the

coloured lines indicate the same, or different framing compared to the press release. This allows us to see which elements of the original framing are preserved, which are frequently dropped, and which are added during the transfer from press release to news coverage.

Consequences of ocean plastic pollution

In both press releases and newspaper articles, ocean plastic was rarely framed as societal problem affecting daily life. Press releases mainly frame ocean plastic as biological problem, emphasizing problems to marine life, such as: animals ingesting plastic, getting entangled in plastic or coral reefs suffering from plastic-related diseases. These biological problems were repeated in newspaper articles when they matched research findings and were present in the press release, but were otherwise not emphasized. Press releases used precise scientific terminology, whereas newspapers simplified the language and presented the information more directly. For example:

PR2: The scientists forecast that by 2025, plastic going into the marine environment will increase to roughly 15.7 billion plastic items on coral reefs, which could lead to skeletal eroding band disease, white syndromes and black band disease.

NA 2.2: Plastic waste is destroying coral reefs by spreading diseases, a study has found.

Non-biological problems highlight the link between ocean plastic and broader environmental changes like climate change (e.g., changing weather patterns, warming ocean waters and ocean acidification). They were only discussed in press releases 2 and 3 and corresponding newspaper articles. Non-biological problems were never highlighted in newspaper articles when not present in the press release. Problems related to treatment appeared only in press release 7. Newspaper articles copied this framing when present in the press release, and otherwise almost never add it. Problems related to treatment differed between press release and newspaper article when newspaper articles quoted new societal actors that were not present in the press release, who provided additional criticism of ineffective solutions. For example:

PR 7: The researchers note, however, that even if the prescribed effort is realized, the world remains locked into an unacceptable plastic future.

NA 7.7: “The voluntary initiatives and commitments by the industry have failed,” said Nusa Urbancic, campaigns director at the Changing Markets Foundation. “Policymakers should look past the industry smokescreen.”

Opportunities related to ocean plastic were only mentioned in press release 3 and the corresponding newspaper articles. In this case, the study found that floating plastic debris created new habitats for coastal species that normally cannot survive in the open ocean. Newspaper articles replicated this positive framing by quoting the same researcher from the press release. Outside of this example, neither the press releases nor newspaper articles highlighted opportunities or positive aspects of plastic use. Opportunities resulting from mitigation mainly appeared in press release 1. Here, a researcher highlighted how reducing plastic waste could benefit coral reefs. Some newspaper articles copied this quote; others substituted a new quote from a different researcher involved in the study. Subsequently, this substitute quote was widely repeated across newspaper articles. For example:

PR 2: Said Lamb: “This study demonstrates that reductions in the amount of plastic waste entering the ocean will have direct benefits to coral reefs by reducing disease-associated mortality.”

NA 2.7: Prof Bette Willis said: “Bleaching events are projected to increase in frequency and severity as ocean temperatures rise. There’s more than 275 million people relying upon coral reefs for food, coastal protection, tourism income, and cultural significance. So moderating disease outbreak risks in the ocean will be vital for improving both human and ecosystem health.”

Treatment recommendation and urgency

Press releases typically include **treatment recommendations** in the form of direct quotes from the scientists involved, often suggesting ways to reduce plastic pollution. Newspaper articles generally replicate this framing, either by copying these quotes verbatim or paraphrasing them. Some newspaper articles extend the framing in the press releases, by including suggested solutions from new actors:

NA 10.9: “We can all make a difference by choosing not to buy fast fashion, which has a short shelf life in the shops and in our

wardrobes, or by choosing to avoid plastic packaging and so on,” he said.

Calls for **urgent action** to reduce the amounts of plastic or decrease our plastic use, are emphasized by scientists in press releases. Newspaper articles usually include such urgency only when it is present in the press release, but otherwise hardly add it. The call to action differs between newspaper articles and press releases when the newspaper article includes quotes from other (non-scientific) actors like environmental interest groups:

PR 6: “Experts we surveyed found that entanglement in plastic and other pollution could pose a long-term impact on the survival of some turtle populations and is a greater threat to them than oil spills. We need to cut the level of plastic waste and pursue biodegradable alternatives if we are to tackle this grave threat to turtles' welfare.”

NA 6.8: Paul de Zylva, senior nature campaigner at Friends of the Earth, added: “It's time to get drastic with plastic. We can all help by re-using bags, carrying a reusable water bottle and cutting down on plastic packaging.”

Responsibility for causing ocean plastic

Ocean plastic is rarely framed as problem **caused by individual plastic use** in either press releases or newspaper articles. Press releases never, and newspaper articles rarely, attribute responsibility for increasing amounts of plastic pollution to **political decision making**. In press releases, **countries** are held minimally responsible for plastic pollution, except in cases where the study explicitly focuses on this because the research tracks medical waste ending up in the ocean (PR 9). Newspaper articles more often highlight national responsibility, particularly when country-specific data is included, telling how much plastic a specific country used:

NA 1.25: A 2015 Central Pollution Control Board survey found that 60 of India's major cities generated 15,000 tonnes of plastic waste every day. Of the waste that is collected an overwhelming amount of waste is neither recycled nor treated, it lands up in landfills or is dumped in water bodies.

NA 2.15: Countries that take a great deal of care to keep plastic from entering the ocean -- like Australia -- see notably lower levels of it on reefs, and the problem was worst in those with poor infrastructure for managing waste, like Indonesia.

Both press releases and newspaper articles attribute responsibility to industry for causing ocean plastic pollution. In press releases, specific sectors are blamed, such as the fishing industry for discarding gear (e.g., PR 6 and PR 8), and hospitals for COVID-19-related plastic waste (PR 9). Newspaper articles often retain this framing. However, when journalists consult the original research article rather than relying solely on the press release, they may extend the framing of responsibility. For instance, PR 7 and PR 10 do not name specific industries, but the corresponding newspaper articles identify particular companies or sectors based on information from the original study that was not included in the press release.

NA 7.7: One case study involved Coca-Cola Co., which Break Free From Plastic has repeatedly named the world's biggest plastic polluter... The report also said that despite rhetoric to the contrary, beverage companies were actively undermining government efforts to curb plastic production by law.

Responsible for mitigating ocean plastic

In press releases, scientists emphasize **society's** shared responsibility to reduce plastic pollution. These quotes consistently use the inclusive "we" form, implying that scientists themselves are part of the collective effort to address the issue:

PR 6: "We need to cut the level of plastic waste and pursue biodegradable alternatives if we are to tackle this grave threat to turtles' welfare."

Newspaper articles seldom introduce society's responsibility for addressing ocean plastic pollution when this is not already mentioned in the press release. However, they frequently copy or paraphrase press release quotes that assign such responsibility to society. In some cases, journalists expand on this framing by including additional voices, such as environmental advocates or policymakers, and by providing local context through examples of regional initiatives or policies:

NA 2.16: “Individuals need to look at their own use of plastic—bags, bottles, coffee cups,” Mr. Silverwood said. “They feel so insignificant sometimes ... but it's a declaration of intent that you don't want to be a contributor.”

NA 1.30: The 15-cent plastic bag levy was introduced back in 2002 to encourage Irish people to cut down on plastic waste.

Responsibility attributed to **countries** is limited in both press releases and newspaper articles. When present, responsibility is typically linked to political decision-making in specific countries or introduced through new quotes from scientists involved in the research, discussing possible treatments for ocean plastic:

NA 1.30: Ireland has signed up to aim to recycle 22 per cent of its plastic packaging waste back into other plastic products.

NA 9.1: To combat the influx of plastic waste into the oceans, the researchers urge for better management of medical waste in epicentres, especially in developing countries.

Several press releases (PR2, 7, and 4) stress the need for **policy** measures to mitigate plastic pollution. This framing is carried over to newspaper articles or expanded with additional quotes and references to national policies:

PR 2: “While we can't stop the huge impact of global warming on coral health in the short term, this new work should drive policy toward reducing plastic pollution.”

NA 2.16: “We also believe it's vital the NSW Government enacts a full ban to avoid facing an alarming future.” A spokesman for Woolworths said it was on track to phase out bags at the checkout by July 1, as it announced last year.

The responsibility of industry for carrying out a treatment for plastic pollution is reinforced in newspaper articles, as this was absent in press releases. This reinforcement takes the form of new actor quotes or as references to local policies or initiatives aimed at decreasing plastic use:

NA 6.10: "And if CEOs of major companies like Coca-Cola want to avoid being part of the problem then they need to start reducing their plastic footprint without delay."

5.4.2 Narratives to communicate peer-reviewed research

To investigate how narrative elements are used to communicate peer-reviewed research on ocean plastic (RQ2), we analysed story structure, personalization, stylistic elements, emotion, and story tone in both press releases and newspaper articles. All narrative elements are visualized in Figure 5.2, which illustrates the variation in narrative use between press releases and newspaper articles.

Overall, most newspaper articles (N=57) retained the same story tone as the corresponding press releases. Only one article shifted the tone to positive, 27 newspaper articles shifted to a negative tone, 13 articles shifted to a passionate or fatalistic tone and 19 articles changed the tone of the story to neutral. All press releases (N=10) and almost all newspaper articles (N=129) contain personalization. The inverted pyramid style is used in all press releases (N=10) and most newspaper articles (N=115). A few press releases (N=3) included emotional expressions from scientists. These emotions were reproduced in a limited number of newspaper articles (N=10). In a larger number of cases (N=39), newspaper articles introduced additional human emotion beyond what was present in the original press release.

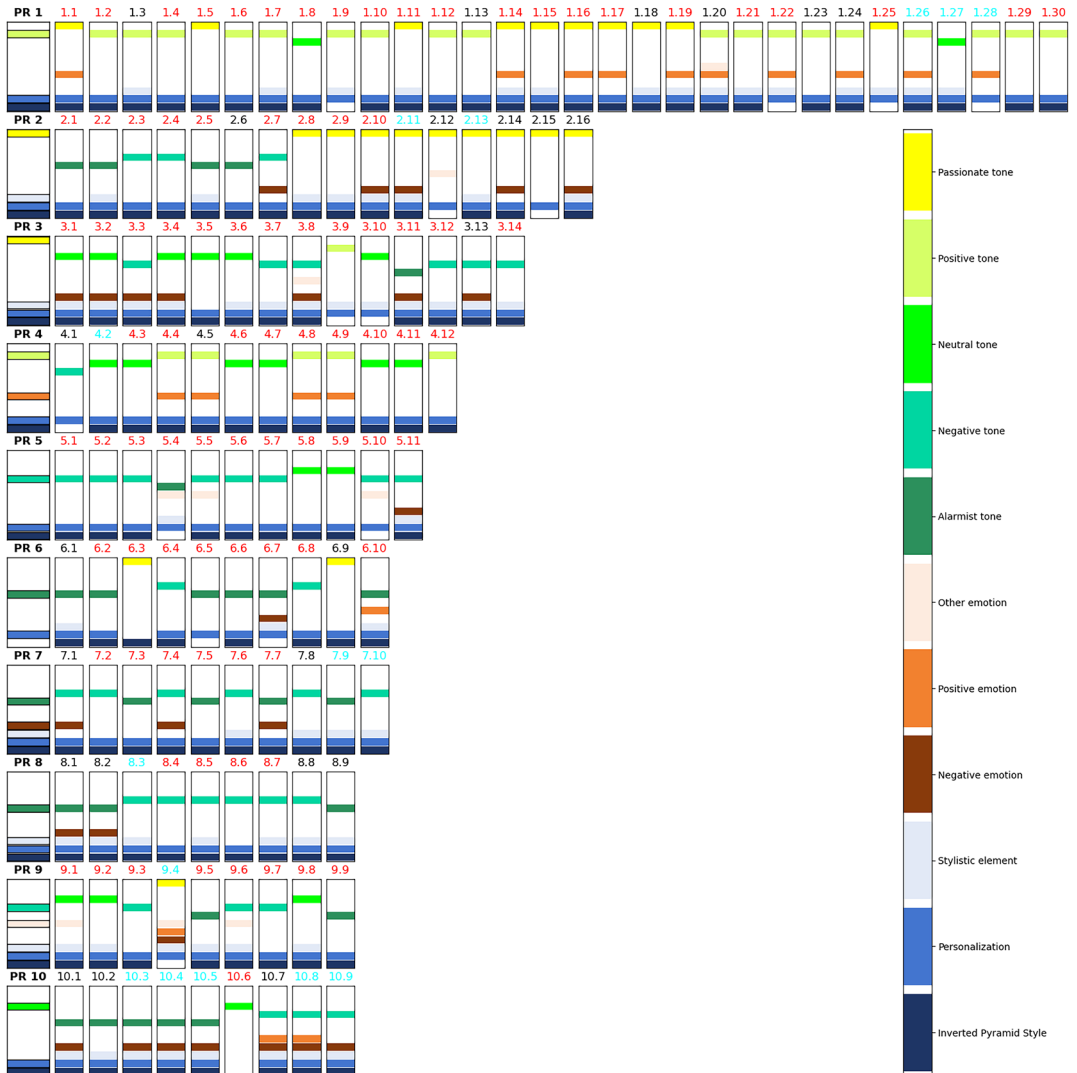


Figure 5.2: Visual representation of the variation in narrative elements between press release (PR) and newspaper article (NA). The numbers of press releases and newspaper articles are provided above of the different cases. For a detailed explanation of the figure, please see the subtext of Figure 5.1.

Dramatization, personalization, emotion and stylistic elements

Figure 5.2 shows that almost all press releases and newspaper articles have little dramatization, as they almost all use the inverted pyramid

style, highlighting key findings in advance. Personalization is also common in both media, whereby scientists who conducted the research are positioned as main characters. Both press releases and newspaper articles use stylistic elements, especially metaphors, to make abstract or complex scientific concepts more accessible. Metaphors in press releases are copied in newspaper articles, or new stylistic devices, such as figurative language, are added:

PR2: "What's troubling about coral disease is that once the coral tissue loss occurs, it's not coming back," said Lamb. "It's like getting gangrene on your foot and there is nothing you can do to stop it from affecting your whole body."

NA 2.5: When coral reefs come in contact with plastic trash in the ocean, their risk of becoming diseased skyrockets, said an international study out Thursday.

Press releases convey emotion primarily through scientists' reactions to their findings. These emotional cues tend to be either **positive**: expressing excitement about new discoveries, or **negative**: emphasizing concern over the implications of plastic pollution. Newspaper articles frequently retain or even amplify this emotional framing, typically attributing it to the same scientists, as these are the main actors:

NA 2.12: Lamb was surprised at how plastic is never mentioned as a threat to the aquatic ecosystem.

NA 10.1: Study leader Dr Ian Kane, from Manchester University, said: "Almost everybody has heard of the infamous ocean "garbage patches" of floating plastic, but we were shocked at the high concentrations of microplastics we found in the deep-sea floor."

Story tone

Newspaper articles are coded more negative than the press release on which they are based, as these often leave out contextual information and focus on the problems caused by ocean plastic (RQ3). When press releases and newspaper articles use a fatalistic tone, doom language emphasizes the negative aspects of ocean plastic pollution or the 'enormous' amounts of plastic:

NA 5.4: "Plastic is destroying life on the ground as well as underwater. We have stumbled upon many heart-wrenching videos

of turtles who've consumed plastic."

A passionate tone is present when scientists express enthusiasm about research findings; or when they tell that they believe they have found a treatment for problems related to ocean plastic:

NA 1.1: "It's extremely, extremely exciting because breaking down plastic has proved so challenging," said Paolo Bombelli from Cambridge University

However, when such quotes are omitted, newspaper articles shift to a more neutral or hopeful tone. In these cases, stories highlight viable solutions, scientific advances or policy measures, creating a positive narrative that suggests that plastic in the ocean is a solvable problem.

5.4.3 Different types of actors in press releases and newspaper articles

To determine whether newspaper articles and press releases contextualize research differently by featuring different actors in specific roles, and by using different actor quotes (RQ3), we analysed and plotted all actor roles and quotes in Figure 5.3.

Actor quotes

Nearly all press releases (N=9/10) include quotes from the scientists who conducted the study. Journalists copied these quotes either verbatim (N=44/121), or with minimal edits (N=16/121). Moreover, journalists added new quotes in newspaper articles from the scientists who conducted the study (N=50/121). Subsequently, these quotes were repeated across multiple newspaper articles. In contrast, few newspaper articles (N=14/130) featured quotes from non-scientists, such as politicians, corporate representatives, environmentalists, or citizens. An even smaller subset (N=9/130) featured quotes from scientists not involved in the study. When present, these quotes typically served to validate or contextualize the research rather than to introduce alternative perspectives:

NA 2.13: "I'd never thought of bits of plastic as a vector of disease spread from the slime that coats them, but the study shows convincingly that corals entangled in plastic are 20 times more likely to be infected."

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Figure 5.3: Visual representation of actor roles and quotes in press release (PR) and newspaper article (NA). The numbers of press releases and newspaper articles are provided above of the different cases. Please note that the variables “Quote studies scientist” and “Quote copied verbatim” share the same colour. “Quote studies scientist” refers to a press release that includes a quotation from a scientist who conducted the study. When this quotation is copied verbatim into the newspaper article, it is coded as “Quote copied verbatim,” hence the shared colour. If the quotation is rephrased or if a new quotation is added, these are shown in light blue and dark blue, respectively.

Actor roles

Press releases predominantly portray scientists in two roles: as heroes working to find solutions to plastic pollution, and as warners, warning society for the consequences of ocean plastic pollution. In contrast, newspaper articles depict a broader array of actor roles, depicting not only scientists but also but also communities, corporations, governments, and individuals as **victims, heroes, warners, or villains**. Victims in newspaper articles include individuals or communities disproportionately affected by plastic pollution:

NA 7.10: Across the globe, health problems associated with plastics production disproportionately affect lower-income Black, Indigenous, people of colour (BIPOC) communities

NA 1.26: “We're designing chemicals and we're designing products because of their stability. We're a victim of our own success,” says Dr. Reddy in a phone interview.

Villains include people littering, countries with poor waste management, high plastic discharge, or bad political decision-making; and corporate actors such as large companies producing plastic, like Coca-Cola and the petrochemical- and fishing industry:

NA 1.15: Yet, even though people are aware of this concept, many people are throwing waste in the Earth's waters. In turn, this damages the aquatic ecosystem, especially coral reefs.

NA 7.8: A case study involved Coca-Cola Co., which Break Free From Plastic has repeatedly named as the world's largest plastic polluter.

NA 2.12: Not much has changed in recent years. A 2015 Central Pollution Control Board survey found that 60 of India's major cities generated 15,000 tonnes of plastic waste every day.

Newspaper articles feature political actors or countries decreasing their plastic consumption as hero's. Also, companies trying to decrease their plastic use/production; international platforms or NGO's; newspapers and volunteers are featured in the hero role. However, in most cases, scientists finding or trying to find solutions to ocean plastic or related problems are the heroes of the story:

NA 8.6: The Daily Mail has campaigned against plastic waste for more than a decade

NA 2.10: Separately, the Queensland government has earmarked \$256 million over the next five years to improve reef water quality

NA 2.16: Harris Farm Markets has stopped offering single-use plastic bags at the checkouts, the first major retailer to do so, and is encouraging customers to bring their own bag or take a recycled box from the store

NA 1.17: "We are planning to implement this finding into a viable way to get rid of plastic waste, working towards a solution to save our oceans, rivers, and all the environment from the unavoidable consequences of plastic accumulation."

In newspaper articles, warnings about plastic and its consequences are often issued by the scientists quoted in the press release. The newspaper then relies on their words by copying their quote or they add extra context by quoting environmental- or government agencies:

NA 4.1: The growth of polluting microplastics in the Irish environment has been confirmed by the Environmental Protection Agency which has warned of the risk to public health.

NA 7.3: Ecologists from the University of Toronto are warning of the monumental scale of action needed to curb plastic waste entering the world's rivers, lakes and oceans

5.5. Discussion and conclusion

We demonstrated that both research institutes and individual scientists can benefit from adopting a more strategic approach to crafting press releases, as these shape how scientific findings are framed in newspaper articles. Our analysis of press coverage on ocean plastic reveals that journalists often use quotes directly from press releases, meaning that scientists can influence the tone and narrative direction of resulting news articles. Moreover, research institutes play a key role in conveying a sense of urgency about environmental action, as this urgency is often carried over from press releases into news articles, but is rarely introduced by journalists when it is absent in the original press release. Rather than portraying ocean plastic as an

isolated issue, press releases could strengthen ocean science communication by linking it to broader ocean challenges, emphasizing societal relevance, and clarifying responsibility. In this way, ocean science, often perceived as abstract or distant, can become more relevant to the public, and the need for action for a cleaner ocean is highlighted more clearly.

5.5.1 The societal blind spot in ocean science communication

We found that newspaper articles build on press releases by adding contextual elements such as quotes from additional actors or region-specific examples. Similar to Sharp et al., (2021) these additions shift the framing of research in newspaper articles compared to the original press releases. In our dataset, the most notable shift involves the attribution of responsibility: while press releases generally adopt a neutral or vague tone, newspaper articles more frequently refer to national policies or local governance, thereby placing the issue in a broader social context. However, these additions occur only to a limited extent. Most newspaper articles contain fewer framing elements than the original press releases and tend to focus primarily on the negative biological impacts of ocean plastic. This narrow framing may reinforce a sense of distance from the issue, as suggested by Henderson & Green (2020), who argue that portraying ocean plastic mainly as a biological problem can create the perception that it is not something people encounter in their everyday lives. As a result, ocean plastic remains an abstract concern for many, rather than a socially embedded issue requiring collective action.

As many people feel a distance from ocean science and plastic pollution (Schuldt et al., 2016), communication professionals, such as journalists and press officers, can help bridge this gap by using narrative storytelling and placing science in a relatable, human context (Dahlstrom, 2014). One key element of narrative construction is the use of direct quotes, which provide personal voices and emotional depth (Glaser et al., 2009). In some newspaper articles additional perspectives, such as those from policymakers, corporate actors, or NGOs, were included, thereby socially embedding the research. However, in most newspaper articles, the dominant narrative

remained anchored on the voices of the scientists. This focus on science is also evident in previous research, which showed that press releases on ocean plastic often adopt a science-centered narrative and personalise the scientists involved, rather than placing the research in a broader social context (Vonk et al., 2024a). We find that this narrative is then replicated in newspaper articles based on these press releases.

The influence press releases have in the portrayal of ocean plastic research in the newspaper, highlights an important opportunity for science communicators to improve ocean science communication to broad audiences. For example, our analysis shows that broader connections, such as linking plastic pollution to climate change, only appear in newspaper articles when they are introduced in the press release, highlighting the press release's role in guiding the larger ocean narrative. These connections are important to make, as they can increase the relevance of topics like climate change to society (Pinto & Matias, 2023) and enhance public awareness of how the ocean functions (Kelly et al., 2022). Moreover, our analysis suggests that when press releases place research in a societal context, for instance by highlighting impacts on communities or assigning responsibility to industry and policymakers, journalists are more likely to adopt this framing in their coverage. This indicates that communication professionals can exert influence to achieve more socially informed journalism. In addition, journalists could increase the social relevance of plastic ocean pollution by actively engaging a wider range of voices. Doing so might help to shift the focus away from scientists and the personalization of science and instead make ocean problems more relatable to the public.

5.5.2 Journalistic use of sources in ocean plastic coverage

The reliance of journalists on press release content is concerning, as journalists, in their role as critical observers, are expected to independently verify and contextualize scientific claims (Göpfert, 2008). However, this watchdog function appears to be under pressure. Although newspaper articles typically contain fewer frame elements than press releases, their strong overlap in content underscores the influence of the press release on how scientific research is portrayed

in the media (Vogler, 2020; Comfort et al., 2022). Moreover, journalists frequently reuse quotes from press releases, suggesting that these materials often serve as primary source material for newspaper articles (Nelissen & Hendrickx, 2023; Van Leuven et al., 2015). This pattern suggests a limited effort by journalists to seek external validation or include diverse perspectives, especially from scientists not directly involved in the research. One reason for this may be the difficulty journalists face in accessing relevant experts, an issue common in specialized fields like ocean science (Pinto & Matias, 2023). Additionally, when newspaper articles do include new quotes beyond those in the press release, these quotes often appear in multiple articles, indicating that they are likely sourced from wire services or international media rather than from original reporting (Nelissen & McMartin, 2022). This reliance on pre-packaged content reinforces the influence of research institutes, not only on what is reported, but also on whose voices are amplified in ocean plastic discourse.

5.5.3 Ethical messaging and the role of research institutes in public discourse

In recent years, the communication departments of research institutions, including universities, have intensified their engagement with the media (Autzen, 2014). This shift is not solely aimed at disseminating scientific knowledge; in many cases, it also serves institutional goals such as building public reputation and visibility (Fürst et al., 2022). Hence, press releases are not only meant to communicate science, but also have clear public relation goals (Carver, 2014). When public relations objectives take priority, there is a risk that scientific nuance and caution are lost in favour of more appealing or sensational narratives. This dynamic has been well documented in health communication, where exaggerations found in press releases often translate directly into similarly exaggerated media coverage (e.g., Sumner et al., 2014, Bossema et al., 2019). This underscores the ethical responsibility of research institutions to ensure that their press releases present accurate, balanced, and contextualized representations of scientific findings. Given the strong influence press releases have on media coverage, as also shown in our results, research institutions should be seen as active agents in shaping public understanding of science. Their role goes beyond facilitating media

uptake; it includes a responsibility to support truthful, nuanced, and socially responsible science communication.

The strong influence research institutes have on how science is portrayed in the media raises important ethical questions about responsible science communication, especially when findings call for urgent action or implicate societal actors, as in the case of plastic pollution. While some scientists warn that advocacy can compromise scientific neutrality (Büntgen, 2024), others argue that science is never neutral and that scientists have a moral duty to promote action on pressing issues (Van Eck et al., 2024). Research also shows that the public, particularly in the context of climate change, expects scientists to not only inform, but also take a stance on policy matters (Cologna et al., 2021; Ulug et al., 2025). However, our data suggests that journalists rarely take such stances independently. In our dataset, attribution of responsibility, and calls for urgent action are typically included in newspaper articles only when they are present in the press release. For instance, although general media coverage of plastic pollution often avoids blaming industry (Schönbauer & Müller, 2021), articles in our dataset only framed industry as a polluter when the press release did so. Similarly, calls for urgent action were only replicated in news coverage if prompted by the press release.

5.5.4 Negative ocean plastic news

Overall, most newspaper articles either retained the tone of the corresponding press releases or adopted a more negative one. Notably, around half of the press releases already conveyed a negative or alarmist tone, which contributed to newspaper coverage of ocean plastic often emphasizing the harmful and alarming aspects of pollution. The focus on negative aspects of ocean plastic is consistent with previous research showing that media coverage of plastic in the ocean often emphasises dangers and negative consequences (Schönbauer & Müller, 2021), while overlooking potential benefits or functional applications of plastic (Welzenbach-Vogel et al., 2022). The emphasis on ocean plastic problems in newspaper articles, reflects a broader media bias towards bad news (Harcup & O'Neil, 2017). However, this negativity bias was less pronounced in longer newspaper articles, which typically contained more framing elements and

contextual information, resulting in a more balanced presentation of the issue.

Importantly, we found that the tone of newspaper articles was strongly influenced by the tone set in the press releases, particularly through the reuse of emotional quotes. In many cases, quotes expressing concern, optimism, or passion were directly copied from press releases, thereby shaping the story tone of the final newspaper article. Although the concepts of emotional narrative elements and tone are closely related, they refer to distinct aspects of a text. Emotional (negative) narrative elements specifically refer to the emotions expressed by actors within the story, for example, a scientist expressing frustration or concern. In contrast, the tone of the story refers to the overall emotional impression it creates for the reader, which can arise not only from the emotions of characters but also from how the issue is framed. We found for example, that a text that emphasizes environmental decline without directly quoting emotional reactions can still convey a negative tone.

Given that optimistic messages and positive storytelling can encourage public engagement and support for addressing marine environmental challenges (Kelly et al., 2022), our research seems to indicate that press releases represent an opportunity for setting a constructive tone in media discourse. Including quotes that convey passion for science or optimism about environmental solutions might help to foster a more positive narrative, especially as such quotes are frequently reused by journalists (Autzen, 2014; Sharp et al., 2021). Such strategies could shift the dominant framing away from portraying the ocean as “beyond repair” (Duarte, 2015) and toward optimistic stories that inspire action and highlight the possibilities for restoration (McAfee et al., 2019). Nonetheless, it is important that this optimism remains grounded in realism (Cvitanovic & Hobday, 2018), as overly optimistic messages may undermine the perceived urgency and extent of environmental problems (Hornsey & Fielding, 2016).

5.6 Limitations and further research

While our coding scheme is reliable, it only captures explicitly stated information, potentially underrepresenting implicit framing. We for instance coded if texts made an explicit reference to the responsibility

of society for causing ocean plastic. Texts did refer to consumer goods contributing to ocean plastic. However, when these references were not explicitly linked to societal responsibility, this responsibility was not coded. We created our newspaper dataset by assessing which newspaper articles are based on the same research as discussed in press releases. As a result, we cannot be completely sure that the newspaper article is based on the press release or even that the journalist who wrote the newspaper article saw the press release. We recognize that other factors, such as prior knowledge or other press material, can also influence framing. The qualitative analysis of the type of framing and the large overlap in framing between press releases and newspaper articles and the copying of quotes from press releases, however, suggests that in most cases, the journalists did read the press release and used parts of it to write the newspaper article. Another limitation of our study concerns the composition of the dataset, which comes from different English-speaking countries with diverse cultural backgrounds. Practices in science communication may differ between the United States and the United Kingdom, for example. In our analysis, we focused on the content of the press releases and news articles, rather than linguistic style or cultural context. Although we did not observe remarkable cultural variation in the meaning of these elements, it is possible that differences exist at the linguistic level, such as tone, word choice or stylistic framing, we acknowledge that there may be variation based on regional or cultural norms. However, this variation was beyond the scope of this study. Future research could build on this work by focusing on differences in communication to better understand how ocean plastic research is communicated in different cultural contexts.

We examined how scientific press releases influence the framing of peer-reviewed research in newspaper articles using a combination of quantitative and qualitative text analysis. To support this, we developed a novel visualisation method that highlights differences in framing, narrative elements, actor roles, and citations. This approach enabled detailed case analysis, revealed broader trends, and improved transparency by linking findings directly to the data. By coding and visualising individual framing variables, we clearly identified shifts in framing between press releases and articles, and achieved high intercoder reliability even for complex elements like

story tone. This method offers potential for automation, as coded variables can train machine learning models. Future research could build on this foundation by training models on larger datasets to systematically compare framing shifts across scientific disciplines, countries, or types of institutions, shedding light on broader patterns in science communication and media translation.

Our results show that journalists primarily modify framing related to social frame variables, such as attributions of responsibility. However, the social framing of science often remains narrow in newspaper articles on ocean plastic due to the limited diversity of actors and the underrepresentation of societal opportunities and problems. To better understand these framing choices, future research could conduct interviews with journalists and press officers. Such interviews may shed light on the challenges they face when reporting on ocean plastic research, the factors that influence their selection of quotes, and their rationale for including or excluding specific social problems and perspectives. These insights can help distinguish best practices in ocean science communication that can be used to bridge the gap between ocean science and society, ensuring that communication around environmental problems reflects both ecological urgency and social relevance.

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Literature

Autzen, C.: Press releases—The new trend in science communication. *Journal of Science Communication*, 13(03), C02.

<https://doi.org/10.22323/2.13030302>, 2014.

Badenschier, F., & Wormer, H. (2012). Issue selection in science journalism: Towards a special theory of news values for science news?. In *The sciences' media connection—public communication and its repercussions*. Springer Netherlands, (pp. 59–85), <https://doi.org/10.1007/978-94-007-2085-5>.

- Bassnett, S. (2005). Bringing the news back home: Strategies of acculturation and foreignisation. *Language and Intercultural Communication*, 5(2), 120–130. <https://doi.org/10.1080/14708470508668888>.
- 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/10.1177/09579265135160>.
- Bossema, F. G., Burger, P., Bratton, L., Challenger, A., Adams, R. C., Sumner, P., & Smeets, I. (2019). Expert quotes and exaggeration in health news: A retrospective quantitative content analysis. *Wellcome Open Research*, 4, 56, <https://doi.org/10.12688/wellcomeopenres.15147.2>.
- Büntgen, U. (2024). The importance of distinguishing climate science from climate activism. *Npj Climate Action*, 3(1), 36. <https://doi.org/10.1038/s44168-024-00126-0>.
- Caruso, F., Tedesco, P., Della Sala, G., Palma Esposito, F., Signore, M., Canese, S., & de Pascale, D. (2022). Science and dissemination for the UN ocean decade outcomes: Current trends and future perspectives. *Frontiers in Marine Science*, 9, 863647, <https://doi.org/10.3389/fmars.2022.863647>.
- Carver, R. B. (2014). Public communication from research institutes: Is it science communication or public relations? *Journal of Science Communication*, 13(3), C01, <https://doi.org/10.22323/2.13030301>.
- Catalano, A. S., Lyons-White, J., Mills, M. M., & Knight, A. T. (2019). Learning from published project failures in conservation. *Biological Conservation*, 238, 108223. <https://doi.org/10.1016/j.biocon.2019.108223>.
- Cologna, V., Knutti, R., Oreskes, N., & Siegrist, M. (2021). Majority of German citizens, US citizens and climate scientists support policy advocacy by climate researchers and expect greater political engagement. *Environmental Research Letters*, 16(2), 024011. <https://doi.org/10.1088/1748-9326/abd4ac>.
- Comfort, S. E., Gruszczynski, M., & Browning, N. (2022). Building the science news agenda: The permeability of science journalism to public relations. *Journalism & Mass Communication Quarterly*, 107769902110479. <https://doi.org/10.1177/10776990211047949>.
- Cooper, K. E., & Nisbet, E. C. (2016). Green narratives: How affective responses to media messages influence risk perceptions and policy preferences about environmental hazards. *Science Communication*, 38(5), 626–654. <https://doi.org/10.1177/1075547016666843>.

- Cvitanovic, C., & Hobday, A. J. (2018). Building optimism at the environmental science-policy-practice interface through the study of bright spots. *Nature Communications*, 9(1), 3466. <https://doi.org/10.1038/s41467-018-05977-w>.
- Dahlstrom, M. F. (2014). Using narratives and storytelling to communicate science with nonexpert audiences. *Proceedings of the National Academy of Sciences*, 111(Supplement_4), 13614–13620. <https://doi.org/10.1073/pnas.1320645111>.
- Dahlstrom, M. F. (2021). The narrative truth about scientific misinformation. *Proceedings of the National Academy of Sciences*, 118(15), e1914085117. <https://doi.org/10.1073/pnas.1914085117>.
- Druckman, J. N., & Lupia, A. (2017). Using frames to make scientific communication more effective. In K. H. Jamieson, D. M. Kahan, & D. A. Scheufele (Eds.). *The Oxford Handbook of the Science of Science Communication*. Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780190497620.013.38>.
- Duarte, C. M., Fulweiler, R. W., Lovelock, C. E., Martinetto, P., Saunders, M. I., Pandolfi, J. M., Gelcich, S., & Nixon, S. W. (2015). Reconsidering Ocean Calamities. *BioScience*, 65(2), 130–139. <https://doi.org/10.1093/biosci/biu198>.
- Forgács, B., & Pléh, C. (2022). *The Fluffy Metaphors of Climate Science* (pp. 447–477). https://doi.org/10.1007/978-3-030-90688-7_22.
- Fürst, S., Volk, S. C., Schäfer, M. S., Vogler, D., & Sörensen, I. (2022). Assessing changes in the public communication of higher education institutions: A survey of leaders of Swiss universities and colleges. *Studies in Communication Sciences*, 22(3), 515–534, <https://doi.org/10.5167/uzh-223059>.
- Glaser, M., Garsoffky, B., & Schwan, S. (2009). Narrative-based learning: Possible benefits and problems. *Communications*, 34(4). <https://doi.org/10.1515/COMM.2009.026>.
- Göpfert, W. (2008). The Strength of PR and the Weakness of Science Journalism. In M. W. Bauwer & M. Bucchi (Eds.). *Journalism, Science and Society* (pp. 227–238), Routledge, ISBN: 9780203942314.
- Haapanen, L. (2017). *Quoting Practices in Written Journalism*, <http://urn.fi/URN:ISBN:ISBN 978-951-51-2952-9>.
- Harcup, T., & O'Neill, D. (2017). What is news?: News values revisited (again). *Journalism Studies*, 18(12), 1470–1488. <https://doi.org/10.1080/1461670X.2016.115019>.

- Henderson, L., & Green, C. (2020). Making sense of microplastics? Public understandings of plastic pollution. *Marine Pollution Bulletin*, 152, 110908. <https://doi.org/10.1016/j.marpolbul.2020.110908>.
- Hornsey, M. J., & Fielding, K. S. (2016). A cautionary note about messages of hope: Focusing on progress in reducing carbon emissions weakens mitigation motivation. *Global Environmental Change*, 39, 26–34. <https://doi.org/10.1016/j.gloenvcha.2016.04.003>.
- Hyland, K. (2010). Constructing proximity: Relating to readers in popular and professional science. *Journal of English for Academic Purposes*, 9(2), 116–127. <https://doi.org/10.1016/j.jeap.2010.02.003>.
- Kelly, R., Evans, K., Alexander, K., Bettioli, S., Corney, S., Cullen-Knox, C., Cvitanovic, C., de Salas, K., Emad, G. R., Fullbrook, L., Garcia, C., Ison, S., Ling, S., Macleod, C., Meyer, A., Murray, L., Murunga, M., Nash, K. L., Norris, K. & Pecl, G. T. (2022). Connecting to the oceans: Supporting ocean literacy and public engagement. *Reviews in Fish Biology and Fisheries*, 32(1), 123–143. <https://doi.org/10.1007/s11160-020-09625-9>.
- Korthagen, I. (2016). Wakers van de wetenschap.: Over het belang en de functies van wetenschapsjournalistiek.
- Kramm, J., Steinhoff, S., Werschmöller, S., Völker, B., & Völker, C. (2022). Explaining risk perception of microplastics: Results from a representative survey in Germany. *Global Environmental Change*, 73, 102485. <https://doi.org/10.1016/j.gloenvcha.2022.102485>.
- Krippendorff, K. (2011). Computing Krippendorff's Alpha-Reliability.
- Krippendorff, K. (2004). Measuring the reliability of qualitative text analysis data. *Quality & Quantity*, 38(6), 787–800. <https://doi.org/10.1007/s11135-004-8107-7>.
- Kroon, A., & Schafraad, P. (2013). Copy-paste of journalistieke verdieping?: Een onderzoek naar de manier waarop nieuwsfactoren in universitaire persberichten nieuwsselectie en redactionele bewerkingsprocessen beïnvloeden. *Tijdschrift voor Communicatiewetenschap*, 41(3). <https://doi.org/10.5117/2013.041.003.283>.
- Lotze, H. K., Guest, H., O'Leary, J., Tuda, A., & Wallace, D. (2018). Public perceptions of marine threats and protection from around the world. *Ocean & Coastal Management*, 152, 14–22. <https://doi.org/10.1016/j.ocecoaman.2017.11.004>.
- McAfee, D., Doubleday, Z. A., Geiger, N., & Connell, S. D. (2019). Everyone loves a success story: Optimism inspires conservation engagement. *BioScience*, 69(4), 274–281. <https://doi.org/10.1093/biosci/biz019>.

- Nisbet, M. C. (2009). Communicating climate change: Why frames matter for public engagement. *Environment: Science and Policy for Sustainable Development*, 51(2), 12–23. <https://doi.org/10.3200/ENVT.51.2.12-2>.
- Nisbet, M. C., & Mooney, C. (2007). Framing science. *Science*, 316(5821), 56. <https://doi.org/10.1126/science.1142030>.
- Peters, H. P., Brossard, D., De Cheveigné, S., Dunwoody, S., Kalfass, M., Miller, S., & Tsuchida, S. (2008). Science-media interface: It's time to reconsider. *Science Communication*, 30(2), 266–276. <https://doi.org/10.1177/1075547008324809>.
- Pinto, B., Costa, J. L., & Cabral, H. (2020). What news from the sea? Assessing the presence of marine issues in the Portuguese quality press. *Ocean & Coastal Management*, 185, 105068. <https://doi.org/10.1016/j.ocecoaman.2019.105068>.
- Pinto, B., & Matias, A. (2023). European journalists and the sea: Contexts, motivations, and difficulties. *Public Understanding of Science*, 32(4), 459–469. <https://doi.org/10.1177/09636625221137036>.
- Sangers, N. L., Evers-Vermeul, J., Sanders, T. J. M., & Hoeken, H. (2020). Vivid elements in Dutch educational texts. *Narrative Inquiry*, 30(1), 185–209. <https://doi.org/10.1075/ni.18090.san>.
- Schiffer, H., & Guerra, A. (2015). Electricity and vital force: Discussing the nature of science through a historical narrative. *Science & Education*, 24(4), 409–434. <https://doi.org/10.1007/s11191-014-9718-6>.
- Schönbauer, S., & Müller, R. (2021). A risky object? How microplastics are represented in the German media. *Science Communication*, 43(5), 543–569. <https://doi.org/10.1177/10755470211030519>.
- Schuldt, J. P., McComas, K. A., & Byrne, S. E. (2016). Communicating about ocean health: Theoretical and practical considerations. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 371(1689), 20150214. <https://doi.org/10.1098/rstb.2015.0214>.
- Schwarze, S. (2006). Environmental melodrama. *Quarterly Journal of Speech*, 92(3), 239–261. <https://doi.org/10.1080/00335630600938609>.
- Sharp, M. K., Forde, Z., McGeown, C., O'Murchu, E., Smith, S. M., O'Neill, M., Ryanb, M., & Clyne, B. (2021). Irish media coverage of COVID-19 evidence-based research reports from one national agency. *International Journal of Health Policy and Management*, 1. <https://doi.org/10.34172/ijhpm.2021.169>.

- Stoll-Kleemann, S. (2019). Feasible options for behavior change toward more effective ocean literacy: A systematic review. *Frontiers in Marine Science*, 6, 273. <https://doi.org/10.3389/fmars.2019.00273>.
- Thompson-Saud, G., Gelcich, S., & Barraza, J. (2018). Marine environmental issues in the mass media: Insights from television, newspaper and internet searches in Chile. *Ocean & Coastal Management*, 165, 154–160. <https://doi.org/10.1016/j.ocecoaman.2018.08.015>.
- Ulug, M., Islam, M. M., Cologna, V., Mede, N.G., Berger, S., Besley, J., & Shamsi, N.A. (2025). Trust in scientists and their role in society across 68 countries. *Nature Human Behaviour*, 9(713–730). <https://www.nature.com/articles/s41562-024-02090-5>.
- United Nations Educational, Scientific and Cultural Organization (2021). *UNESCO Science Report 2021: The Race against time for smarter development*. United Nations. <https://doi.org/10.18356/9789210058575>.
- Van Eck, C. W., Messling, L., & Hayhoe, K. (2024). Challenging the neutrality myth in climate science and activism. *Npj Climate Action*, 3(1), 81. <https://doi.org/10.1038/s44168-024-00171-9>.
- Van Leuven, S., Deprez, A., & Raeymaeckers, K. (2015). Het journalistieke brongebruik in tijden van churnalism en Twitter: Een surveyonderzoek bij Vlaamse beroepsjournalisten (2008-2013). *Tijdschrift voor Communicatiewetenschap*, 43(1). <https://doi.org/10.5117/2015.043.001.064>.
- Vögler, D., & Schäfer, M. S. (2020). Growing influence of university PR on science news coverage? A longitudinal automated content analysis of university media releases and newspaper coverage in Switzerland, 2003–2017. *International Journal of Communication*, 14, 3143–3164.
- Vonk, A. N., Bos, M., Smeets, I., & Van Sebille, E. (2024a). A comparative study of frames and narratives identified within scientific press releases on ocean climate change and ocean plastic. *Journal of Science Communication*, 23(01). <https://doi.org/10.22323/2.23010201>.
- Vonk, A. N., Bos, M., & Van Sebille, E. (2024b). Journalism versus churnalism: How news factors in press releases affect journalistic processing of ocean plastic research in newspapers globally. *Journalism Studies*, 25(16), 2031–2050. <https://doi.org/10.1080/1461670X.2024.2409836>.
- Welzenbach-Vogel, I. C., Werling, K., Barkela, B., & Milde, J. (2022). Plastics in mass media. A content analysis of german media coverage of plastic-associated risks and sustainable alternatives to plastics. *Environmental*

Communication, 16(2), 179–194.

<https://doi.org/10.1080/17524032.2021.1979618>.

Wormer, H. (2008). Science journalism. In W. Donsbach (Ed.), *The international encyclopaedia of communication, Vol. X* (pp. 4512–4514). Blackwell.

https://doi.org/10.1007/978-94-007-2085-5_4.

Yang, Y., & Hobbs, J. E. (2020). The power of stories: Narratives and information framing effects in science communication. *American Journal of Agricultural Economics*, 102(4), 1271–1296.

<https://doi.org/10.1002/ajae.12078>.

Zerba, A. (2008). Narrative storytelling: putting the story back in hard news to engage young audiences. *Newspaper Research Journal*, 29(3), 94–102.

doi:10.1177/073953290802900308.

Appendix 1 - Dataset construction

To obtain a comprehensive understanding of potential modifications, we restricted our database to press releases covered by a minimum of 9 different newspaper articles. It is known that some news agencies copy content from other newspapers or that different newspapers belong to one news organisation, causing the same article to be published multiple times in different newspapers. Hence, to avoid literal duplications in the dataset, we compared the content of all newspaper articles by calculating the Jaccard index in Python (See Appendix 3 for the Jaccard scores, the Python script is added to the online repository). All newspaper articles with a Jaccard index >0.8 were marked as duplicates, and only the first-published newspaper article was included in the analysis.

To analyse how a research institute frames research and to see if this framing differs from the framing in a newspaper article, we consider only newspaper articles that focus on the peer-reviewed research discussed in the press release, excluding newspaper articles that report on multiple studies (N=10). Moreover, press releases 3 and 45 and their newspaper coverage were excluded from the analysis since they covered the same scientific study, making data interpretation impossible as we would not be able to know with which press release we should compare the newspaper articles. To make it possible to evaluate trends in communication, we further excluded press releases with fewer than nine associated newspaper articles after all other exclusion criteria were applied. For a detailed explanation of the dataset construction and a visual representation, please refer to the flow chart in the supplementary materials.

Appendix 2 - Intercoder reliability

All variables are coded separately and discussed in detail in the codebook (added to the supplementary materials) which contains several examples.

Tabel A5: *Intercoder reliability results frames and narratives*

Variabele		Kappa score	Presence in 2 nd -coder dataset
Narratives			
Inverted pyramid style		0.77	27
Personalization		1	34
Stylistic element		0.17	61
Actor roles	Victim	1	3
	Villain	0.84	4
	Hero	0.90	18
	Warner	0.83	16
Quotes	Quote studies Scientist	0.92	15
	New Quote studies Scientist	0.80	72
	Quote copied verbatim from PR	0.94	20
	Quote copied minimal edits from PR	0.87	9
	Quote other actor	0.89	22
	Quote Scientist not involved in study	0.91	6
Emotion	Negative emotion	0.88	13
	Positive emotion	1	5
	Other emotion	1	3
Story Tone	Fatalistic	0.76	9
	Negative	0.88	17
	Neutral	0.82	3
	Positive	0.9	7

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	Passionate	0.84	4
Framing			
Problems	Human Centered	1	11
	Biological	0.86	27
	Non-Biological	0.93	10
	Treatment	0.73	14
Opportunities	Due to cause: i.e., ocean plastic	0.92	7
	Due to treatment of ocean plastic	0.91	7
Responsible for Cause	Politics or governments	1	4
	Companies or Industries	0.85	9
	Regions or Countries	0.84	4
	Human activity, society	0.88	16
Responsible for treatment	Politics or governments	0.94	12
	Companies or Industries	0.90	8
	Regions or Countries	1	4
	Society	0.92	8
Urgency to take action		1	14
Treatment recommendation		0.91	22
Local specific information		0.93	9

Appendix 3 - Duplicate newspaper articles

To avoid duplicate newspaper articles in the dataset, the content of all newspaper articles was compared by calculating the Jaccard index with Python. For the Python script that was used, please see the repository.

Tabel A2: Duplicate articles based on Jaccard Index

Article 1	Article 2	Article 1	Article 2	Article 1	Article 2
NA_1.38	NA_1.7	NA_3.29	NA_3.24	NA_38.10	NA_38.52
NA_1.27	NA_1.13	NA_3.29	NA_3.27	NA_38.36	NA_38.52
NA_1.27	NA_1.29	NA_3.29	NA_3.28	NA_38.54	NA_38.55
NA_1.29	NA_1.13	NA_3.29	NA_3.6	NA_38.7	NA_38.54
NA_1.30	NA_1.8	NA_3.29	NA_45.1	NA_38.7	NA_38.55
NA_1.37	NA_5.11	NA_3.29	NA_45.18	NA_42.10	NA_42.13
NA_1.38	NA_1.19	NA_3.29	NA_45.19	NA_42.10	NA_42.14
NA_1.47	NA_1.14	NA_3.29	NA_45.20	NA_42.10	NA_42.15
NA_1.7	NA_1.19	NA_3.3	NA_45.21	NA_42.10	NA_42.16
NA_17.1	NA_17.2	NA_3.6	NA_45.1	NA_42.10	NA_42.17
NA_17.1	NA_17.3	NA_3.6	NA_45.18	NA_42.10	NA_42.18
NA_17.2	NA_17.3	NA_3.6	NA_45.19	NA_42.10	NA_42.19
NA_25.11	NA_25.6	NA_3.6	NA_45.20	NA_42.13	NA_42.14
NA_25.12	NA_25.11	NA_3.7	NA_45.14	NA_42.13	NA_42.15
NA_25.12	NA_25.6	NA_3.8	NA_45.15	NA_42.13	NA_42.16
NA_3.10	NA_45.2	NA_35.15	NA_35.43	NA_42.13	NA_42.17
NA_3.11	NA_45.16	NA_35.15	NA_35.62	NA_42.13	NA_42.18
NA_3.12	NA_45.13	NA_35.20	NA_35.15	NA_42.14	NA_42.15
NA_3.14	NA_45.11	NA_35.20	NA_35.21	NA_42.14	NA_42.16
NA_3.15	NA_45.23	NA_35.20	NA_35.43	NA_42.14	NA_42.17
NA_3.16	NA_45.12	NA_35.20	NA_35.62	NA_42.15	NA_42.17
NA_3.17	NA_45.10	NA_35.21	NA_35.15	NA_42.16	NA_42.15
NA_3.17	NA_45.9	NA_35.21	NA_35.43	NA_42.16	NA_42.17
NA_3.2	NA_45.27	NA_35.21	NA_35.62	NA_42.18	NA_42.14
NA_3.24	NA_3.6	NA_35.43	NA_35.62	NA_42.18	NA_42.15
NA_3.24	NA_45.1	NA_35.47	NA_35.15	NA_42.18	NA_42.16

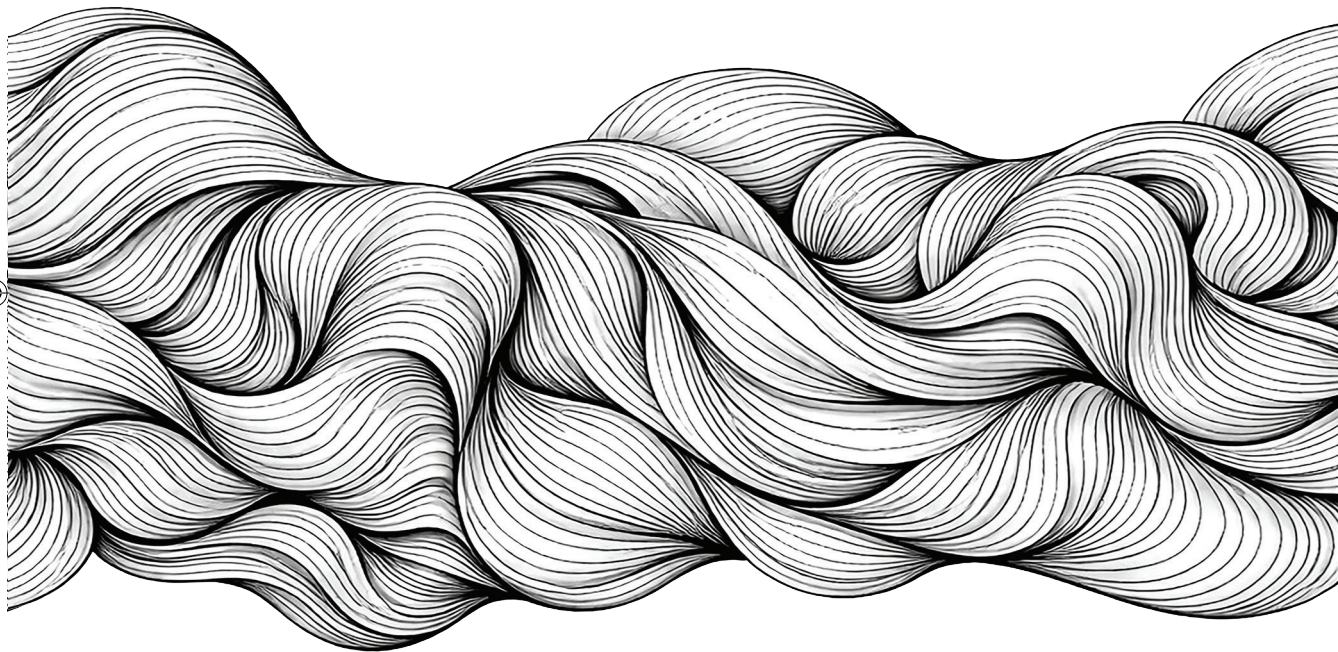
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NA_3.24	NA_45.18	NA_35.47	NA_35.20	NA_42.18	NA_42.17
NA_3.24	NA_45.19	NA_35.47	NA_35.21	NA_42.19	NA_42.13
NA_3.24	NA_45.20	NA_35.47	NA_35.43	NA_42.19	NA_42.14
NA_3.27	NA_3.24	NA_35.47	NA_35.57	NA_42.19	NA_42.15
NA_3.27	NA_3.28	NA_35.47	NA_35.62	NA_42.19	NA_42.16
NA_3.27	NA_3.6	NA_35.50	NA_35.46	NA_42.19	NA_42.17
NA_3.27	NA_45.1	NA_35.57	NA_35.15	NA_42.19	NA_42.18
NA_3.27	NA_45.18	NA_35.57	NA_35.20	NA_42.28	NA_42.11
NA_3.27	NA_45.19	NA_35.57	NA_35.21	NA_42.31	NA_42.29
NA_3.27	NA_45.20	NA_35.57	NA_35.43	NA_45.1	NA_45.18
NA_3.28	NA_3.24	NA_35.57	NA_35.62	NA_45.1	NA_45.19
NA_3.28	NA_45.20	NA_38.10	NA_38.36	NA_45.18	NA_45.19
NA_5.6	NA_5.8	NA_6.10	NA_6.16	NA_45.20	NA_45.1
NA_6.10	NA_6.11	NA_6.10	NA_6.9	NA_45.20	NA_45.18
NA_6.10	NA_6.12	NA_6.11	NA_6.12	NA_45.20	NA_45.19
NA_6.10	NA_6.15	NA_6.11	NA_6.15	NA_45.9	NA_45.10
NA_6.11	NA_6.16	NA_6.13	NA_6.12	NA_6.14	NA_6.11
NA_6.11	NA_6.9	NA_6.13	NA_6.15	NA_6.14	NA_6.12
NA_6.12	NA_6.15	NA_6.13	NA_6.16	NA_6.14	NA_6.13
NA_6.13	NA_6.10	NA_6.13	NA_6.9	NA_6.14	NA_6.15
NA_6.13	NA_6.11	NA_6.14	NA_6.10	NA_6.14	NA_6.16
NA_6.14	NA_6.9	NA_6.17	NA_6.15	NA_6.9	NA_6.15
NA_6.16	NA_6.12	NA_6.17	NA_6.16	NA_6.9	NA_6.16
NA_6.16	NA_6.15	NA_6.17	NA_6.9	NA_6.92	NA_6.26
NA_6.17	NA_6.10	NA_6.18	NA_6.19	NA_67.1	NA_67.2
NA_6.17	NA_6.11	NA_6.25	NA_6.95	NA_67.11	NA_67.17
NA_6.17	NA_6.12	NA_6.4	NA_6.8	NA_67.7	NA_67.6
NA_6.17	NA_6.13	NA_6.50	NA_6.117	NA_8.2	NA_8.1
NA_6.17	NA_6.14	NA_6.9	NA_6.12	NA_8.7	NA_8.8
NA_86.15	NA_86.17	NA_86.32	NA_86.35	NA_86.35	NA_86.63
NA_86.27	NA_86.32	NA_86.32	NA_86.48	NA_86.48	NA_86.50
NA_86.27	NA_86.35	NA_86.32	NA_86.50	NA_86.48	NA_86.63

NA_86.27	NA_86.48	NA_86.32	NA_86.63	NA_86.50	NA_86.63
NA_86.27	NA_86.50	NA_86.35	NA_86.48		
NA_86.27	NA_86.63	NA_86.35	NA_86.50		



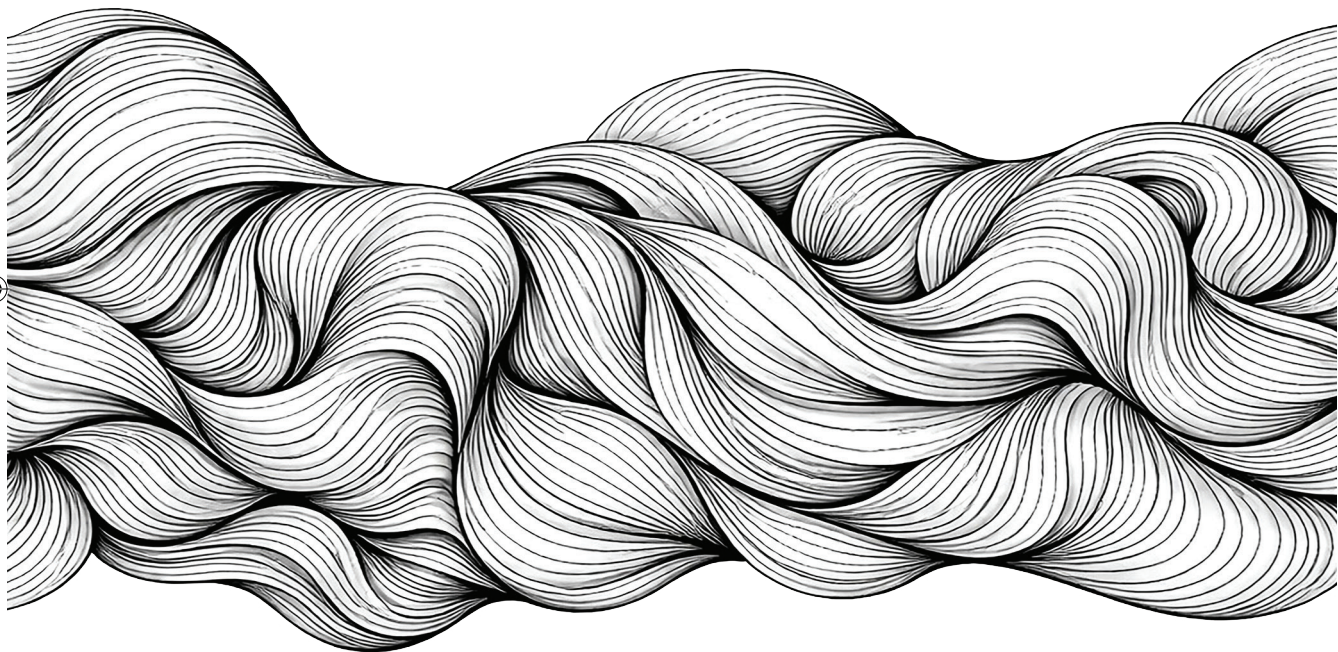
Chapter 6 From research to newspaper: how scientists, press officers and journalists shape ocean science coverage in the Netherlands





The Framing of Science News

This chapter is under review at Public Understanding of Science.



Abstract: Scientists, press officers, and journalists actively shape how scientific knowledge reaches the public through newspapers. To examine this communication chain, we conducted 28 semi-structured interviews across these three groups. Thematic analysis identified ten themes that explain how decisions are made about which research is communicated and how it is framed. Scientists often act as news triggers by signalling publications or research developments, which press officers and journalists then evaluate for newsworthiness. While traditional news values matter for news selection, decisions are also largely influenced by normative motives. Decisions about the content of communication are also influenced by professional role perceptions, communication goals, format limitations, the target audience, the choice of people to quote, and influence from within the organisation. Within this process, communicators negotiate tensions between maintaining scientific nuance, simplifying content, and maximizing news impact. By integrating perspectives from all three groups, this study presents an empirical model of science reporting as an interactive process, in which framing and newsworthiness emerge from collaboration and negotiation among scientists, press officers, and journalists.

Keywords: Medialization of science, science communication model, frame-building, newsworthiness, science journalism

6.1 Introduction

The news media and scientific institutions interact closely, as journalists seek to report on new scientific developments, while research institutions aim to increase the visibility of their work and inform the public. This ongoing exchange shapes how science is communicated in the media, a process often described as the *mediatization of science* (Rödder et al., 2012). Central to this process are *news values*, the criteria journalists use to assess whether a topic is considered newsworthy and therefore selected for media coverage (Harcup & O'Neill, 2001, 2017). Research that aligns with these news values is more likely to receive journalistic attention (Badenschier & Wormer, 2012). However, before scientific knowledge can be communicated through the media, it must be translated into forms that are understandable and relevant to non-specialist audiences. Framing plays an important role in this translation process by highlighting particular aspects of research (Entman, 1993) and situating complex findings within a broader societal context (Nisbet, 2009).

The influence of news media on science is not one-directional, as scientific institutions increasingly shape how scientific research is presented in the news. Due to the decline in specialized science journalists and the growth of communications departments within universities, research institutions have gained a stronger position in the production of science news (Autzen, 2014; Peters et al., 2008). Press releases no longer only serve as a signal that research has been completed, but also actively shape the content and angle of newspaper articles (Nelissen & Hendrickx, 2023; Van Leuven et al., 2015; Vonk et al., 2025b). In some cases, this leads to the almost literal copying of text fragments, a practice referred to as copy-paste journalism or “churnalism” (Vögler & Schäfer, 2020; Comfort et al., 2022; Kroon & Schafraad, 2013; Vonk et al., 2024).

To understand how scientific research reaches the media and is ultimately framed, it is necessary to examine how the key actors in this communication process, namely: scientists, press officers, and journalists, operate. Each group works within its own routines, professional norms, organisational contexts, and communication objectives (Weingart & Joubert, 2019). However, existing studies often focus on the perspectives of these actors separately (e.g., Van Leuven et al., 2021; Volk et al., 2023). As a result, there is limited integrated

understanding of how scientific research moves through the communication chain, from publication to press release and ultimately to newspaper coverage.

This study addresses that gap by systematically mapping the communication chain surrounding ocean research in the Netherlands. To this end, we conduct interviews with ocean scientists, press officers working for ocean research organisations, and journalists who report on ocean science in Dutch newspapers. By analysing the perspectives of these three groups, we gain insights into how communication choices are made and how these actors interact in bringing scientific research to the news. Based on these interviews, we develop a model that conceptualises the different phases of communication between researchers, press officers, and journalists, as well as the factors that influence the final content and framing of newspaper articles.

6.2 A case study of ocean science communication within the Dutch media and research landscape

The ocean is important for life on Earth, as it regulates the global climate, supports biodiversity, and provides the world with food, livelihoods, and economic benefits. However, ocean health is increasingly under pressure from climate change, pollution, and overexploitation (Abram et al., 2022). Raising awareness about the state of the ocean is therefore essential for building support for its protection (Guan et al., 2023). In this context, it is important for scientists and research organisations to communicate their findings to a wider audience, as media attention plays a key role in informing citizens about urgent developments and in placing ocean protection on the political agenda (Catalano et al., 2019; Stoll-Kleemann, 2019).

To understand how ocean science moves from research to news media, the Dutch context offers a particularly instructive example. The Netherlands has a strong science journalism tradition, with dedicated science journalists and specialised science sections in major newspapers, alongside general reporters who also cover scientific topics. In addition, the Netherlands hosts a robust research and knowledge infrastructure in ocean- and water sciences, including public research organisations, governmental agencies, and private

actors. This diverse institutional landscape offers a broad view of how scientists and press officers communicate ocean science, what they prioritise, and what motivates them to seek media attention. Furthermore, the Netherlands is strongly dependent on the ocean for its ecology, economy and safety. Because ocean science underpins key sectors such as coastal protection, shipping and climate adaptation, it is crucial to understand how this knowledge reaches the public through the media.

6.3 Theoretical framework

6.3.1 Newsworthiness of ocean science

Journalists follow relatively structured and predictable patterns when determining which topics are positioned as news. These patterns are conceptualised in the news factor theory (Galtung & Ruge, 1965), which explains news selection as the result of individual assessments by journalists, shaped by professional routines, organisational constraints and broader cultural influences. News factor theory states that issues and actors possess certain characteristics, known as news factors, that increase the likelihood of media attention (Harcup & O'Neill, 2001; 2017; Badenschier & Wormer, 2012). Newsworthiness, subsequently, refers to the journalistic assessment of the relevance of these characteristics (Eilders, 2006).

Research into newsworthiness often focuses on published newspaper articles, analysing which news factors are present in these texts (e.g., Bednarek & Caple, 2014; Harcup & O'Neill, 2001; 2017; Molek-Kozakowska, 2017). Based on such analyses, it appears that topics are considered more newsworthy when, for example, they have a major societal impact, are socially relevant, or relate to well-known individuals or elite countries, like the United Kingdom or the United States. Scientific topics are also measured against these factors of newsworthiness. Besides the classical news factors, interviews with journalists show that in the selection of scientific news, practical and editorial considerations play an important role (Badenschier & Wormer, 2012). For instance, scientific stories may fail to reach the news agenda due to time constraints or because other, more urgent events dominate media coverage. Conversely, scientific stories may be

prioritised when they fit editorial preferences, such as offering strong visual material, a clear narrative angle, or alignment with the thematic focus of a newspaper.

Scientific news coverage increasingly relies on press releases issued by research institutions (Vögler & Schäfer, 2020, Comfort et al., 2022). Hence, press releases function as an initial filter that largely determines which scientific studies become visible to journalists and, ultimately, the public. Despite this, research on newsworthiness has predominantly focused on journalistic gatekeeping (Harcup & O’Neill, 2011; 2017; Badenschier & Wormer, 2012), paying limited attention to earlier stages of institutional selection. As a result, little is known about which scientific topics fail to reach the news, and hence, which factors may decrease a study’s perceived newsworthiness. By concentrating primarily on journalists’ decision-making, previous research overlooks earlier stages in the communication chain, such as the selection of research by press officers or scientists’ own considerations in deciding whether and how to publicise their work. Consequently, the motivations and decision-making processes of the different actors involved remain insufficiently understood. To address this gap, the present study examines the full communication chain and asks:

RQ 1: *How do stakeholders determine which ocean science topics make the news, and what role do scientists, press officers and journalists play in this selection process?*

6.3.2 Framing ocean research: Content choices and the reasoning behind them

The ocean is an abstract and distant topic for many people (Schuldt et al., 2016). Hence, to make ocean research relevant, scientific knowledge must be embedded in recognisable social and cultural contexts (United Nations Educational, Scientific and Cultural Organisation, 2021). Framing plays an important role in this, as it determines which aspects of texts are emphasized (Entman, 1993) and thereby influences how complex findings are placed in a broader societal context (Nisbet, 2009). In the case of ocean science communication, however, press releases tend to focus primarily on biological problems and position scientists as the central voices (Vonk et al., 2024). This emphasis can lead to a personification of research,

while broader societal implications remain underrepresented. Such scientific framing is subsequently reproduced in newspaper articles (Vonk et al., 2025a).

Scientific knowledge from research papers cannot be conveyed fully in news coverage, it needs to be simplified, and choices must be made about which information to highlight or omit (Nisbet & Mooney, 2007). This simplification is reinforced by the episodic nature of science journalism, which focuses on specific events with immediate news value, often at the expense of broader context or methodological detail (Dunwoody, 2021). Dutch newspaper articles, for example, rarely describe research methods explicitly (Hijmans et al., 2003). In contrast, press releases, often do include methodological information, and when they do, it tends to appear in subsequent articles (Vonk et al., 2025b). Similarly, framing choices made in press releases, such as which aspects to emphasize or which scientist quotes to include, shapes how topics are presented in the newspaper (Vonk et al., 2025a). These findings suggest that decisions about how research is communicated are often made earlier in the communication chain, rather than solely during journalistic production.

An important dimension of science communication concerns the actors whose voices shape how research is presented. Press releases are typically written by communication professionals in collaboration with scientists (Autzen, 2014; Carver, 2014) and predominantly contain quotes from these researchers (Sharp et al., 2021; Vonk et al., 2024). These quotes are frequently reproduced verbatim in newspaper articles (Nelissen & Hendrickx, 2024), meaning that the way scientists articulate their findings and interpret their significance can directly influence how research is represented in the media (Vonk et al., 2025b). At the same time, journalists may introduce additional, non-scientific actors in newspaper articles, and the inclusion of such voices has been shown to alter the framing previously established in press releases (Sharp et al., 2021).

It is important to recognise that scientists, press officers, and journalists do not make decisions about communication in a neutral way. They hold normative views about science and about which aspects of research are most important (Elliott, 2022), meaning that science communication always involves interpretation (Van Eck et al.,

2024). Decisions about whom to quote, what to emphasise, and which aspects to omit determine which perspectives are amplified and which are marginalised in public discourse. Understanding how these actors make choices, what they prioritise in science communication, and how they negotiate content is therefore important for understanding how ocean research is represented in newspapers. Based on these considerations, we formulate the following research question:

RQ 2: *How do scientists, press officers, and journalists make framing choices in their communication and how does their interaction shape the representation of ocean science in newspaper articles?*

6.3.3 The accuracy of science news

Due to the mediatization of science, scientific findings are increasingly presented in formats that diverge from academic conventions, where simplification or strategic emphasis may create room for inaccuracies in reporting. Scientific press releases, for example, are designed not only to inform journalists about new research but also to enhance the visibility and reputation of the institutions behind that research (Carver, 2014). Science communication and public relations should therefore not be understood as strictly separate domains, but rather as two poles on a continuum (Vissers et al., 2024). When communication practices shift toward the public relations end of this continuum, where reputation management outweighs knowledge transfer, the integrity and nuance of scientific information may be at risk (Marcinkowski et al., 2014).

Within this landscape, journalists traditionally fulfil a watchdog role by critically assessing the quality and reliability of scientific claims (Korthagen, 2016). However, this role is increasingly challenged by rising workloads and the growing prevalence of churnalism. Because press releases do not undergo peer review, the uncritical reproduction of their content can facilitate the circulation of inaccuracies or exaggerations (Göpfert, 2008). Press releases frequently contain forms of exaggeration, such as presenting correlational findings as causal relationships, overstating the societal relevance of results (Heyl et al., 2020), or using exaggerated expert quotes (Bossema et al., 2019). Such

inaccuracies can subsequently be transferred to newspaper articles (Adams et al., 2019).

Against this background, scientists, press officers, and journalists each operate within institutional and professional constraints that require them to balance multiple objectives: attracting attention, maintaining newsworthiness, safeguarding scientific nuance, and navigating organisational reputational interests. Understanding how these actors perceive their responsibilities and negotiate tensions between accuracy and promotion can provide insights into how misinformation reaches the public domain through newspaper coverage. This leads to the following research question:

RQ 3: *How do scientists, press officers, and journalists perceive and guard the balance between objective knowledge transfer and institutional profiling in science reporting?*

6.4 Methods

A total of 28 semi-structured interviews were conducted with ocean scientists, press officers at ocean research institutes, and journalists who regularly or occasionally cover ocean science in Dutch newspapers. The interview guide (Appendix 1) was developed based on existing literature on the production of press releases and subsequent newspaper articles about ocean science, as discussed in the theoretical background.

The questions aligned with the study's research questions and are organized around the following thematic areas: (1) newsworthiness; (2) framing; (3) selection of citations; (4) accuracy of science news; and (5) perceived responsibilities of actors. Follow-up questions were used to further explore participants' values and criteria for what they consider to be 'good' science communication practice and their motivations to communicate. In the interviews, there was no direct mention of how actors frame, as all three groups might have different perceptions of what framing entails. Instead, it was asked how they determine the content of communication and which aspects they find most important to emphasise in communication and why.

The interviews were conducted between July and October 2025, with an average duration of 45 minutes. 4 interviews were held

through telephone, 16 by video call and 8 held face to face. Informed consent was obtained at the start of the interview. The study was approved by the Ethics Review Committee of the Faculty of Science at Utrecht University (ERB Review Science-25-0124).

6.4.1 Data collection

Participants were recruited using purposeful and snowball sampling. We held 9 interviews with ocean scientists employed in the Netherlands, 10 with press officers at Dutch ocean research institutes, and 9 with journalists covering ocean science in Dutch newspapers. All interviewed scientists held permanent academic positions (assistant, associate, or full professor) and led their own research projects, ensuring sufficient experience with research that could attract media attention. Some scientists had interacted frequently with journalists, while others had little or no media contact. Including both groups was important, as differences in media experience may influence how scientists perceive and engage with press officers and journalists. The sample represented several oceanography subfields (geology ecology, biology, physics, and law) and included researchers affiliated with universities, research institutes, governmental agencies and NGO's. Press officers responsible for communicating ocean science were recruited through the communication departments of these institutions. For the recruitment of journalists, an exploratory analysis was conducted using Nexis Uni. All Dutch newspaper articles related to ocean science published in June 2025 were extracted and reviewed to identify the journalists responsible for the coverage. Additionally, press officers were asked to indicate which journalists they had recently interacted with on ocean science topics. Based on this information, we selected journalists who work both on permanent and freelance employment contracts, and work across a variety of newspapers.

6.4.2 Data analysis

To analyse the interview data, Braun and Clarke's (2006) six phases of thematic analysis were followed. In the first phase, the audio recordings were transcribed verbatim, and all transcripts were read multiple times to allow for deep familiarisation with the data. This immersion was further strengthened by writing down initial analytic

thoughts directly after each interview and during transcription. In the second phase, the transcripts were coded in NVivo using a theory-driven (deductive) approach.

Only segments relevant to the science-communication process were coded; therefore, passages unrelated to this focus, such as personal background information, work history, or extended examples not applicable to science communication in newspapers, were excluded. Examples of omitted material include participants' experiences with television or detailed explanations of specific ocean phenomena. Relevant segments were coded according to the analytic components of the research questions: (1) newsworthiness of scientific research; (2) content of ocean research reporting; (3) selection of citations; (4) accuracy in science news; and (5) perceived responsibilities of actors in their job fulfilment. In the third phase, patterns across codes were examined, resulting in an initial set of 13 themes. Code groups were created for each theme (e.g., "how framing is determined").

During the fourth phase, these themes were refined resulting in a final set of 10 themes describing how the communication process unfolds. For instance, the initial theme "Determining Framing" was split into "Target Group", "Normative Motivations in communication", "Goal of Communication", "Influence of organisation" and "Format Restrictions". Similarly, the theme "Newsworthiness" was divided into "Signals for News," and "News Selection." Churnalism was removed as separate theme, as this theme overlapped almost entirely with Signals for News, as churnalism was always named in occurrence of press releases. Themes such as "Open Science," "Problems in Science Communication," and "Ocean Science Communication" were removed because the data did not sufficiently address the main research questions. The theme "Communication Priorities" was also removed because it did not provide insight into *why* certain framing choices were made and was therefore analytically peripheral. In phase five, the final theme names were developed and a detailed interpretative analysis was conducted for each theme. The themes identified at each stage of the analysis are presented in Table A1 in Appendix 2. Finally, in phase six, the findings were written up in the Results section, structured according to the final set of themes.

6.4.3 Intercoder reliability

A codebook was developed to define and operationalise the ten themes identified in the analysis (Appendix 3). In total, 1,331 text segments were coded in NVivo. To assess intercoder reliability, 10% of the dataset (N=134 text segments) was independently coded by a second researcher. The subsample was constructed to ensure representation of all ten themes, as well as contributions from scientists, press officers, and journalists. Intercoder reliability was calculated using Cohen's kappa, resulting in a coefficient of $\kappa = 0.90$, indicating a high level of agreement. The reliability dataset and the detailed calculation procedure are provided as supplementary material.

6.5 Results

The thematic analysis identified ten recurring communication themes that shape how ocean research is translated into media coverage. This section first presents these themes, derived from the interview analysis. Subsequently, the themes are integrated into a conceptual model that illustrates how scientific information moves from researchers to the public domain through interactions between press officers and journalists.

6.5.1 Thematic analysis

The ten themes capture both converging and diverging perspectives among scientists, press officers, and journalists regarding what should be highlighted, contextualised, or omitted in communication.

Theme 1 – Signal moment

Signal moments are triggers that prompt communication about research and can be either proactive, initiated by the actor based on new developments, or reactive, responding to ongoing public debates. While all three groups recognize both types, they differ in what they consider meaningful proactive triggers. For scientists, signal moments are often tied to scientific milestones and are directly linked to the research process, including new publications, monitoring programs, or research expeditions.

Scientist 5: "Usually, you look for a reason, such as a monitoring program starting or a report being delivered. Those are usually the moments when we release it."

Press officers also prioritise new publications as triggers, often learning of them through the scientist involved. They additionally highlight institutional milestones such as PhD defences, promotions or awarded grants. Journalists cover the broadest range of signal moments. In addition to monitoring institutional websites, press release distribution websites, or other (international) science news, they are constantly exposed to external information flows, including press releases from journals and universities and direct communication from researchers.

Journalist 4: "What I find very important is that scientists often act as tip-givers. There's a website called EurekaAlert!, which publishes scientific press releases, and many journals also provide embargoed access to articles.... And of course, universities send press releases as well, and we look at things like promotion calendars too."

Journalists all indicate that press releases are an abundant signal moment; however, they differ in how they respond to them. Some journalists base most of their research stories on press releases and use their content for quotes, while others try to limit their use and indicate the importance of seeking information independently.

Journalist 6: "I discard most press releases without reading them. I usually just skim the headline to see whether it might be important. I do read some, but mainly to check for useful quotes or details not in the paper itself."

Theme 2 – Newsworthiness

At multiple points in the communication process, scientists, press officers, and journalists assess whether research deserves public attention, drawing on similar classical news factors (Appendix 3). For all groups, the societal relevance of information is one of the most important newsworthiness criteria.

Journalist 7: "Yes, those may just be certain topics that are important to write about because they are ongoing developments or relate to major social issues."

Scientists rely on prior experience to judge a study's suitability for public communication, but their familiarity with media varies. Some defer entirely to the press office, uncertain what will attract attention, while others have a strong sense of newsworthiness, maintain direct journalist contacts, and may push a story even when the press office is sceptical.

Scientist 9: "As scientists, we often know quite well when something will catch on or not. Simply from experience. And I sometimes have discussions about this with our communications department... Sometimes I push ahead anyway, and then they come back to me later and say, yes, more than 2.5 million people have seen it."

Press officers prioritise research that strengthens the organisation's profile or highlights strategic research areas. Their personal interests and values also influence choices, as they are more likely to promote topics they consider socially important, such as climate change or biodiversity loss. Practical factors play a role as well, including a fair distribution among research groups, visual or narrative potential, and the clarity of the research, as overly complex press releases are less likely to be picked up by journalists. Decisions are further shaped by past experience with what attracts media attention and, at times, by pressure from scientists seeking coverage.

Press officer 4: "So it's an internal incentive... it motivates me when I have to make choices in my working week. When a researcher or scientist wants to do something with outreach, that also gives me energy, but then it also makes it easier."

For journalists, newsworthiness is strongly influenced by newsroom routines as editorial meetings shape themes and assign tasks. Practical constraints include expert availability, publication space and the availability of attractive visuals and accessible data. Lastly, personal curiosity and interest influences coverage decisions.

Journalist 1: "Every study I find interesting and could potentially write an article about. But sometimes it also depends on the readers, my own planning, and my personal curiosity. I always start from my own interest..."

All three groups identify reasons to avoid coverage, of which the most important factor is available time. Scientists rarely publicize research that is purely scientific or of limited social relevance, such as fundamental, niche, or incremental studies. Press officers tend to ignore studies with minor institutional contributions or overly technical content. In addition, late-stage awareness of a study can leave insufficient time to prepare a press release. Journalists avoid hyped studies, research with methodological weaknesses, highly specialized topics, or stories unlikely to engage a broader audience. Both press officers and journalists may refrain from covering studies when other news is abundant.

Theme 3 – Professional role perception

Across all three groups, professional role perception shapes how actors understand their responsibility in science communication, but they define this responsibility differently. Scientists see communication as a social duty, particularly when research is publicly funded or relevant to social debate. They view it as part of their task to raise awareness and translate complex findings for the public and policymakers. Others, however, argue that communication is not formally part of their role, pointing to competing academic responsibilities and limited training.

Scientist 6: “I don't think communication is our job at all... I think there's a kind of expectation that scientists should do this. And then I think, is that really the case? We weren't trained for that at all.”

Press officers define their main role as facilitating communication between science and media, thereby providing journalists with accurate and complete information and connect journalists and researchers. Moreover, their role is to enhance the organisation's visibility and support internal communication. They view themselves as first “filter” between science and the public, with some emphasizing their role in quality-control.

Press Officer 10: “But there are simply aspects (of research) that are not correct. And then I think that as a press officer, you also have a responsibility to point this out and that you are therefore the last link before something like this goes out into the world.”

Journalists emphasise their gatekeeping and watchdog roles toward government, industry, and science itself. They see informing the public, explaining research, and connecting science to societal issues as central tasks. They view communication as shared responsibility, encouraging scientists to actively share their findings and interpret their meaning.

Journalist 9: "Dare to share your findings... you are doing great work, but if you leave it for someone else to dig through, then it might not get dug through.... perhaps it is the job of journalists to ask someone: What would you say based on your expertise and the fact that this is a shared responsibility?"

Theme 4 – Normative motivation

Normative motivations reflect what actors consider important, both personally and in society. Across all three groups, reliability, relatability and objectivity are core values seen as essential to maintain trust in science. While prioritizing objective findings, scientists see value in expressing personal opinions to make research more tangible and relatable. They feel responsible for explaining their methods to justify research costs to society and stakeholders, to build support and to demonstrate science's value. They stress the intrinsic value of the ocean and nature, criticising the tendency to judge research only by direct human benefit.

Scientist 6: "If you cannot demonstrate the importance to people, many people are quick to dismiss it as irrelevant. And that is actually alarming. Even by colleagues."

Press officers similarly stress the importance of the ocean for human life and the need for action to maintain a habitable planet. They believe that researchers' work deserves recognition and that connecting science to society is essential for maintaining public trust. This requires clear, understandable communication and transparency about how research is conducted.

Press Officer 9: "...people need to be able to trust science, so you also need to be transparent, explain things. How did it come about? And people also need to understand that so many types of science contribute to the quality of your life."

Journalists strongly value critical verification of information and transparency regarding how research is conducted and funded. Like press officers, journalists aim to do justice to both the research and researcher, emphasizing the societal importance of science and recognizing the effort behind scientific work.

Journalist 5: "...it's a kind of tribute to the researcher when you say that someone has spent a year in a laboratory cataloguing all kinds of pieces of plastic they've fished out of the sea and putting them into a database... they deserve to have me mention it in that way."

Theme 5 – Communication goals

Across scientists, press officers, and journalists, a central goal of communication is to bridge the gap between science and society. All groups aim to raise awareness of the ocean's role in climate and human life, make complex knowledge accessible, and stimulate public engagement. Many hope that greater awareness will promote sustainable behaviour and, indirectly, influence political debate and policy. In addition, scientists aim to inspire young people to pursue science, demonstrate the societal value of research, and increase visibility of their organisation's work.

Scientist 4: "Well, the goal is, of course, to convey that message... But what I always try to convey as an underlying theme in my story is climate change, or convincing people of it, and that we need to do something about it and take action."

Press officers combine above mentioned goals with strategic objectives, as they seek to generate media visibility, profile their institution around key themes, strengthen its reputation as a knowledge institute, and attract funding. Communication is further used to explain research processes, justify the use of resources, and build or maintain public and stakeholder support.

Press Officer 10: "Yes, anything you do in a certain area that causes inconvenience to people... The first reaction you get is resistance... So the more transparent and consistent you are in your communication, the more support you will hopefully retain among your target group."

Journalists aim to increase public interest, understanding, and awareness of social-scientific issues. Some seek to promote social

change, hoping awareness will encourage sustainable behaviour and political action, while others explicitly reject this role, prioritizing objectivity over activism.

Journalist 4: "...some colleagues from other media outlets take a very activist stance. I don't think that's my role, so I always want to stay away from that. Even though I do have an opinion on the matter. But I don't think you should do that as a journalist."

Theme 6 – Form

Organisations, government agencies, and media channels establish various formal rules that shape communication. All actors in science communication operate within these formal and practical constraints that shape how research is presented. Across scientists, press officers, and journalists, clarity and accessibility are central, complex findings must be understandable, and the core message should remain accurate even when details are simplified. Differences emerge in the specific guidelines each group follows.

Scientists report relatively few formal rules, though government-funded research may require B1-level language or open data compliance. They emphasise that research needs to be understandable, but that simplification has its limits:

Scientist 9: "...many of our communications departments still think, oh, it has to be understandable. No, it doesn't all have to be understandable to people. It's fine if they understand 80% of it... They don't have to understand every letter, that triggers people to start thinking..."

Press officers work under more explicit constraints; besides B1-level writing, clarity is prioritised more broadly to ensure journalists read and use press releases. Strong visuals and a compelling headline are considered essential to increase news value. Press officers also work within strict length limits, usually allowing space for only one or two quotations, and requiring a single, clearly defined core message.

Press Officer 5: "You write one story, one angle, and I always tell those [scientists] that we can only develop one line of argument. Because when you read a newspaper article about a subject outside your field of expertise, one story is enough, because anything more than that won't stick."

Journalists navigate editorial constraints, including article length, genre (e.g., news versus background stories), and conventions like including both the main researcher and an independent expert to safeguard objectivity and assess research quality. They emphasise making science reporting concrete and vivid, using visualisations to make abstract concepts understandable, strengthen accuracy, and engage readers.

Theme 7 – Target group

The target audiences that actors aim to reach differ strongly across organisational contexts but also within professional groups (scientists, press officers, and journalists). Some scientists seek to address the general public and, through newspaper coverage, indirectly influence policymakers. Others argue that their research is too specialized for public debate and is primarily relevant to fellow scientists or policymakers.

Scientist 8: “The type of things we write is primarily important in terms of reaching policymakers and other scientists, rather than the general public.”

Several scientists deliberately move beyond classical journalism. They argue that if the goal is to create real impact, direct engagement with specific groups can be more effective than media visibility alone. As a result, some increasingly focus on engaging with children, elderly people or teachers.

Scientist 7: “...my communication is much less focused on journalism these days... journalism should be only a small part of your communication strategy. I focus much more on education, addressing teachers directly so they can introduce things in the right way...”

Press officers’ target audiences vary depending on the type of institution they represent. All press officers target specific media outlets, leading them to tailor press releases to the tone, interests, and working style of specific editorial teams and journalists. Universities primarily address policymakers and the general public, understood as people with limited prior knowledge of science, whereas governmental agencies focus more strongly on professional partners, and stakeholders within a business-to-business context.

Press Officer 8: "Yes, well, I hope our readers are: governments, policymakers, people from the field... We are more business-to-business, as we like to call it in communications. But still, I try to make it enjoyable for the public. But anyway, that's not our primary target group."

The primary target audience of journalists is the readership of the newspaper or media outlet, or, for freelancers, that of the newspaper in which they want to publish. Journalists write from the reader's perspective and anticipate their prior knowledge, interests, and potential questions.

Journalist 6: "... And with every step I take, I try to ask myself, okay, what? What does my reader want to know? What doesn't the reader understand? What question is my reader asking themselves right now?"

Theme 8 – Actor quotes

Across all three groups, the selection of sources is guided by a combination of expertise, relevance, and practical considerations. Scientists mainly respond to media requests when they have time and the topic falls within their expertise. Social relevance also motivates them to communicate; scientists respond when they find their insights important to public or political debates. When they find themselves not the appropriate spokesperson, they may refer journalists to colleagues, selecting replacements based on expertise as well as how good someone is in communicating their willingness to speak to the press. Scientists avoid commenting on topics where they feel insufficiently knowledgeable to prevent inaccuracies. Some do not actively pursue media attention and even avoid media performances in general, due to a lack in media training.

Scientist 2: "...what I also find very difficult is that I haven't had any media training. Oh yes, and I've already asked for it three times here, and every time the answer is, yes, there's no one who can do it. So yes, I do find that difficult."

Press officers primarily feature the main researchers, sometimes including other actors to highlight interdisciplinary scope or practical relevance. Well-known researchers or institutional "figureheads" may be included to strengthen news value or the organisation's reputation.

Practical considerations, such as willingness to appear, language skills, and storytelling ability, also influence selection, causing supervisors to speak instead of PhD candidates. Moral considerations also shape actor selection, as press officers find it inappropriate to exclude the scientist who conducted the research and emphasise the importance of featuring diverse voices to reflect the diversity of science.

Press Officer 6: "I want to show that science is human work. That it is done by young people, by old people, by people of color. And that science is not only done by white people with gray hair who are at least 1.85 meters tall... Science is a job for everyone..."

Journalists prioritise quoting the most relevant researcher in the field, only occasionally including support staff to illustrate research practices or social actors to increase reader recognition. Ethical considerations guide them to avoid repeatedly using the same expert to prevent a "hype" effect and to give young researchers and women a voice to reflect diversity in science. Practical factors, such as accessibility, language, time zones, and available contact information, strongly influence whom they approach, often favouring national over international researchers. Experts are typically identified via personal networks, previous newspaper articles, ANP press source database, using AI, or simple online searches featuring "professor".

Journalist 8: "Dutch researchers are slightly easier to access than international ones, so I take a different approach. I interview Dutch researchers, and I do the same internationally, but I also sometimes choose to quote other scientists from other journals and reliable sources. That way, you don't have to interview them yourself; you can just use one or two quotes from The Guardian, for example."

Theme 9 – Organisation

Across all three groups, communication is shaped by organisational strategies, routines, and formal rules. Institutions influence not only how communication is formulated, but also which topics, actors, and audiences are prioritised. Among scientists, experiences differ. Some adapt their communication to align with institutional profiling strategies, often in collaboration with press officers who help position the story. Others distance themselves from marketing goals and focus

on curiosity-driven science, perceiving the university's communication strategy as largely separate from their own choices.

Scientist 7: "The university simply has certain communication goals about how things are done, and that's just marketing, you know. And marketing is not compatible with science. At least not with science in the sense of curiosity-driven science. That's not what marketing is about..."

Press officers strongly differ in the extent to which organisational priorities shape their work. Some report that strategic goals influence which studies are highlighted and how they are presented, while others experience substantial autonomy.

Press Officer 2: "I always make sure that the university or faculty is mentioned prominently somewhere at the beginning of the article... But apart from that, I just focus on the research itself. It shouldn't be an advertising pitch for the university. You really have to focus on the researcher and the research."

Journalists experience organisational influence as articles are always reviewed by colleagues and editors-in-chief who may adjust headlines, nuance, or emphasis. In addition, they have specific form requirements and working protocols.

Journalist 9: "At [newspaper name] we have a protocol when reporting on scientific publications: you must interview the scientist involved, but also always someone who was not part of the study."

Theme 10 – Quality control

Scientists, press officers, and journalists all emphasize the importance of accurate science reporting and consider misinformation harmful to their professional reputations. At the same time, they recognize a tension between simplifying research for broader audiences and the risk of losing nuance or introducing inaccuracies. To address this, all three groups describe strategies for assessing the scientific quality of research and preventing misinformation in reporting, although the specific approaches they use differ. Scientists address quality control by reviewing drafts, monitoring press releases, and carefully crafting messages themselves.

Scientist 3: “Well, I think it's important that it's correct, so I always ask to be able to read it back. It's very easy for mistakes to creep in. Not because it's intentional, but because it's just such a complex subject...”

Press officers differ in how they perceive the tension between newsworthiness and scientific nuance. Some do not experience this tension in their work and do not see the pursuit of newsworthiness as a source of hype. Others acknowledge that researchers occasionally overstate findings, which can introduce inaccuracies. To support accurate reporting, press officers have press releases reviewed by scientists, provide journalists with full documentation and correct exaggerated claims. Some press officers state they only report on peer-reviewed research as quality control, as they indicate to lack expertise to independently assess study quality.

Press Officer 1: “Yes, it's definitely about thorough research, but I think we incorporate that by only doing something once the research has been peer-reviewed... Of course, there are many examples of peer-reviewed articles that are still problematic. Yes, but that's just not feasible. As a press officer, I can't do that... I think it's kind of built in.”

Journalists prioritise factual accuracy and nuance, but face tensions with clarity, space, and an appealing writing style. They safeguard quality by using their own expertise, consulting external experts, reviewing original papers, focusing on limitations and funding, and including diverse voices without creating false balance.

6.5.2 Science communication model

By linking the 10 themes, we present a model of how scientific information moves from researchers to the public via press officers and journalists (Figure 6.1). Communication unfolds in three phases: news selection, news construction, and news production. In the first phase, news selection, actors determine which research or topics are sufficiently newsworthy to communicate. In the second phase, news construction, internal and external drivers shape the content of the message. Finally, in the news production phase, content can still be adjusted through scientist feedback or editorial decisions, before it is published.

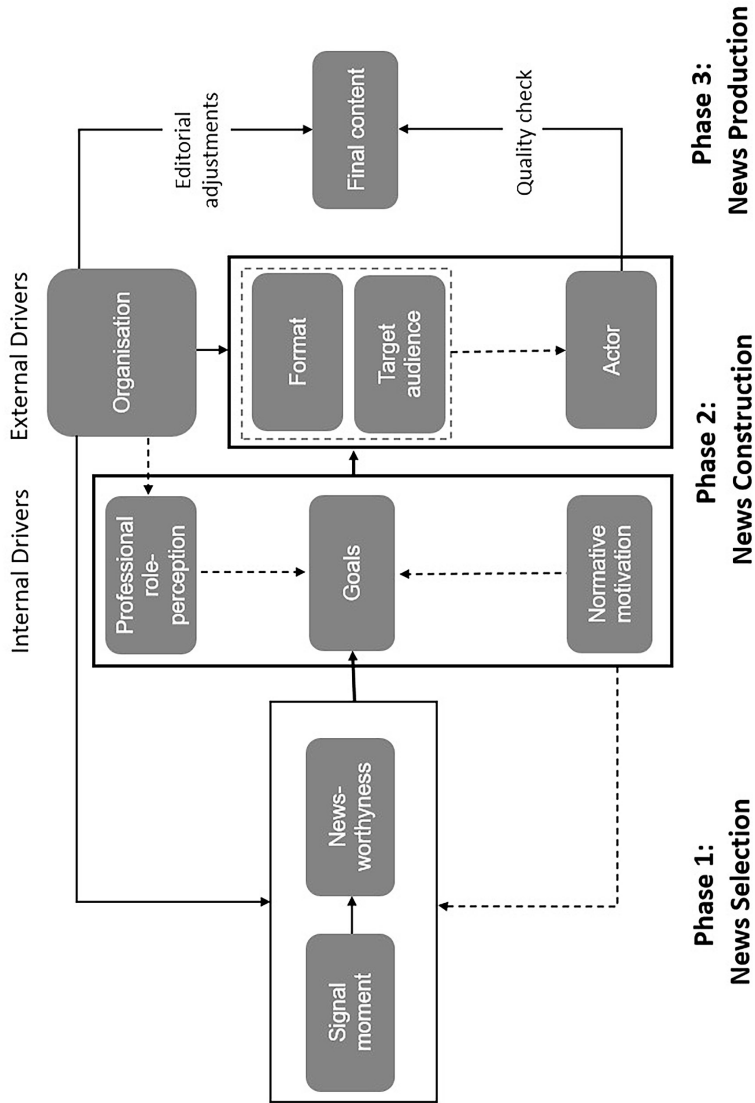


Figure 6.1: Hypothesized relationships between themes. Note: Solid lines indicate hypothesized direct effects and dotted lines indicate hypothesized indirect effects.

Phase 1: News selection

In the first phase, science communication is initiated by specific events that function as signal moments (Theme 1). These triggers can be proactive, such as the publication of new research, a scientific expedition, or a press release, or reactive, emerging from ongoing public debate. The nature of the trigger influences how the story is framed.

Press Officer 2: "... of course we don't just write because people publish, we also sometimes take a reactive approach... Well, that reactive approach is often more polemic in nature. It makes an appeal that resonates to something, that tries to influence the debate. And with regular [proactive] press releases, that's usually not the case."

When a signal moment occurs, scientists, press officers, and journalists assess whether it is sufficiently newsworthy to communicate (Theme 2). These evaluations are shaped by organisational contexts (Theme 9), which influence professional role perceptions (Theme 3) and thereby strategic communication goals (Theme 5). For journalists in particular, editorial routines and competition within newsrooms further shape selection decisions and can place topics on the agenda.

Journalist 4: "Sometimes we decide not to cover a topic, but then other newspapers cover it anyway. That makes it very difficult, because then there's a general editorial meeting and the editors-in-chief ask why we didn't cover it. And then what? You have to defend your decision, and sometimes you lose that battle. Then you have to write a story after all."

Normative motivations (Theme 4) shape what actors consider interesting or important to communicate. These personal values influence which topics journalists monitor, thereby affecting which events become signal moments (Theme 1), but also how all three groups assess a topic's newsworthiness (Theme 2).

Press Officer 4: "I am definitely more than averagely concerned about the state of the oceans. And when scientists convince me that climate change is progressing faster than we think and has serious consequences, I feel extra motivated to help them get that message across."

News selection determines not only whether a topic is covered, but also how it is framed, as press officers and journalists shape the angle of a story by keeping news values in mind, communicating in a way that highlights what is perceived as most relevant or interesting to their audience. Moreover, journalists frequently describe press releases as signal moments that draw attention to scientific developments. These press releases function primarily as background information that supports more independently produced journalism, but are sometimes reproduced more directly as news content.

Journalist 8: "But that probably already comes as a press release to ANP [General Dutch News Agency], and they turn it into a news article, which we then just post on the website or sometimes in the newspaper."

Phase 2: News construction

Once a study or topic is deemed newsworthy, the second phase begins: news construction. In this phase, both internal- and external drivers shape how ocean research is translated into press releases and newspaper articles. Internal drivers originate from within the communicator. They are shaped by professional role perceptions (Theme 3), how individuals understand their responsibilities, and by their normative motivations (Theme 4), which reflect personal values and beliefs about what is socially important. Together, these factors shape communication goals (Theme 5) and influence how research is framed. For example, communicators who strongly value climate action may use media attention to stimulate public debate or encourage behavioural change.

Scientist 1: "...bring the facts and also the beauty of the climate, the interest of the climate, to a broader audience and then have an influence on what people will talk...I wish people were talking about, what can we do about climate change?"

External drivers relate primarily to the organisational context in which communicators operate (Theme 9), as organisations shape both the intended audience (Theme 7) and the required form of communication (Theme 6). Different organisations address different audiences. Newspapers target a specific readership, while some research

institutes primarily communicate with policymakers or professional stakeholders.

Press Officer 8: "Our readers are governments, policymakers, people working in what we call the practical side. We're more business-to-business in our communication. I still try to make it enjoyable for the general public, but that isn't our primary audience."

Organisations also impose formal and practical constraints to communication, such as accessibility requirements, editorial protocols, and length limits. The format (Theme 6), together with the target audience (Theme 7) influences which actors are included in press releases or newspaper articles (Theme 8). As the format imposes practical limitations, for example when there is only space for one or two quotes, meaning that not everyone from a research team can be included. In addition, actors may be selected strategically because they resonate with the target audience or enhance the newsworthiness of the story. The influence of the organisation is visible here as well, as press officers may deliberately highlight certain researchers whose public profile benefits the institution, while journalists often draw on the newspaper's expert network and choose specific individuals when their involvement increases the relevance, accessibility, or perceived news value of the article.

Journalist 4: "He also has the advantage of being Dutch and already somewhat known. Readers can relate to that... That really matters because it makes people more inclined to read the piece."

While internal and external processes can be analytically distinguished, they are closely interconnected in practice. Internal drivers also shape how external processes unfold. For example, normative values influence decisions about actor selection (Theme 8). Both journalists and press officers emphasised the importance of demonstrating that science is accessible and not exclusively male-dominated. As a result, when multiple experts are available, gender considerations may guide who is given a voice in the story.

Journalist 2: "...If there is a man and a woman and they are both very well suited, I would now be more likely to choose the woman because, yes, I feel it is simply good to represent women in science."

At the same time, organisations influence internal drivers. They shape professional role perceptions by defining responsibilities, strategic priorities, and expectations. As a result, organisational goals can become embedded in communicators' understanding of their role, thereby influencing communication goals and framing, particularly in the case of institutional visibility and reputation.

Press Officer 6: "In our communication about the wind farm research, our main goal is to position [organisation] as the leading expert and show funders and partners that their investment is well spent."

Phase 3: News production

Once the content has been constructed, the final phase begins: news production. In this stage, the text is prepared for publication. Although the core message is largely fixed, adjustments can still be made.

A first layer of quality control often involves the featured researcher (Theme 10). Scientists typically review press releases or newspaper articles to check factual accuracy and ensure that key nuances are correctly represented. They generally do not interfere with journalistic framing or style, but they may request corrections if they identify inaccuracies. This feedback can lead to minor revisions before publication. In journalistic settings, an additional internal review process usually follows. Articles are commonly reviewed by fellow journalists or section editors before being sent to the final editor. The final editor has the authority to make last changes. These may include simplifying language, shortening the text, sharpening the narrative focus, or removing nuances to improve clarity and readability. Headlines are typically written or finalized at this stage, often by specialized headline editors.

Journalist 3: "Sometimes I make adjustments and add a bit more nuance...it has happened that a nuance I added was removed again by the final editor... And then the editor just says: 'Yes, I'm taking this out.' The final editor is the boss, they decide how it goes out."

6.6 Discussion and conclusion

In this study, we examined how ocean research moves from peer-reviewed publication to newspaper article, focusing on the roles of

scientists, press officers, and journalists within this communication process. The interviews reveal that science communication is shaped by a dynamic interplay of organisational- and practical factors, and people's normative values, which influence not only which research is communicated but also how it is framed and ultimately presented to the public. By integrating the perspectives of all three actor groups, this study provides a comprehensive model showing the communication chain and highlighting both the conscious and unconscious choices that shape the newsworthiness and framing of science reporting.

6.6.1 A multi-actor model for science communication

Previous research has often focused on isolated aspects of science communication, such as press releases' influence on media coverage (e.g., Comfort et al., 2022; Vögler & Schäfer, 2020), newsworthiness (Badenschier & Wormer, 2012; Vonk et al., 2024), or journalists' routines (e.g., Dijkstra et al., 2024; Pinto & Matias, 2023; Van Leuven et al., 2021). In contrast, our empirically based model maps the full communication chain from peer-reviewed article to newspaper, integrating the perspectives of scientists, press officers, and journalists. It conceptualizes science reporting as a multi-actor process, showing how decisions about what research is communicated, how it is presented, and which aspects are emphasized emerge from interactions between actors with differing professional norms, organisational constraints, and practical routines.

The model shows that the fundamental steps in communication, namely deciding what to convey and how, are the same for scientists, press officers and journalists, even if their emphasis or nuances differ. This is an important insight, because making these interactions explicit provides a tool for understanding both the conscious and unconscious choices that determine how science appears in the news. Practically, the model highlights where misalignments or bottlenecks can occur in the communication chain, offering a basis for improving coordination and transparency between scientists, press officers, and journalists. Theoretically, it contributes to science communication scholarship by conceptualizing reporting as a relational, multi-actor process rather than a linear transmission from research to news.

6.6.2 The influence of signal moments and normative values on newsworthiness

A key finding of this study is that scientists often initiate communication about new publications, ongoing research, or responses to public debates, triggering press officers to write releases or alert journalists. This upstream role demonstrates that scientists strongly influence which topics enter the media agenda, a perspective largely overlooked in newsworthiness research, which has focused on newspaper content (e.g., Bednarek & Caple, 2014; Harcup & O'Neill, 2001, 2017; Molek-Kozakowska, 2017) or journalists' perspectives (Badenschier & Wormer, 2012). Beyond classical news factors and editorial constraints, our findings show that normative motivations and individual values strongly influence how scientists, press officers, and journalists assess newsworthiness, guiding which topics are monitored, thereby influencing which events are interpreted as signal moments, and eventually which issues are communicated. In this way, personal values shape not only scientific practices (Elliott, 2022) but also how research is translated into media coverage.

In response to RQ1, our research shows that news emerges from interactions between scientists, press officers, and journalists, each guided by professional criteria, values, and strategic considerations, making media attention hard to predict from traditional news factors alone (Harcup & O'Neil, 2001, 2017). Both press officers and journalists highlighted the importance of a clear narrative hook, while journalists also stressed access to experts, visual material, and open data for verification and storytelling. For press officers and scientists, newsworthiness can thus be enhanced by framing research with a clear narrative angle, providing accessible visual material, and sharing open data so that journalists can validate studies and can generate images themselves. However, this all depends on the timeliness of communication, meaning that all relevant information is shared directly with journalists and the relevant researcher is available for communication.

6.6.3 Framing science news

Previous research shows that press releases, particularly in contexts of churnalism, strongly influence how science enters newspaper

coverage (e.g., Comfort et al., 2022; Vögler & Schäfer, 2020), and that framing in press releases is often transferred to newspaper articles (Vonk et al., 2025b). Our findings nuance this perspective by showing that the source of framing depends on how the story originates. When journalists report directly from a press release, scientists and press officers largely shape the framing through the information and quotes provided. In contrast, when journalists independently develop a story idea, the framing may be less influenced by the press release, though prior exposure to scientific communication can still play a role.

Scientists report that their normative values shape how they communicate, for example by emphasizing climate adaptation or the intrinsic value of the ocean. Press officers rely on these perspectives when producing press releases, while also ensuring a clear story that suits the intended audience. Journalists, in turn, vary in how much they draw on scientists' perspectives, as some already have a clear storyline in mind before speaking to a scientist, while others base the story mainly on the scientist's input. Consequently, the final framing of science in newspapers emerges from interactions among scientists, press officers, and journalists, with the relative influence of each actor shaped by the story type, the dynamics of their interactions, and the intended medium.

All actors stress that explaining how research is conducted can be important for making science accessible and potentially strengthening public trust. Yet the extent to which methodological details are included depends strongly on the type of media outlet. Only specialised media allow more room for contextualisation, whereas general news outlets prioritise brevity and narrative clarity. In line with previous studies, we found that in most cases, social contextualisation tends to outweigh broader methodological explanation (Dunwoody, 2021; Hijmans et al., 2003). This reveals a structural tension within news production, while transparency about the research process is normatively valued by all actors, it is frequently marginalised in practice due to media routines and format constraints.

In answer to RQ2, the framing of science news is largely shaped by the normative motivation of all actors, their strategic intentions, professional standards and the format constraints or their organisation. Hence, framing is not conveyed linearly from press

release to newspaper, but arises through interaction between scientists, press officers and journalists, and is simultaneously influenced by media formats, time pressure and the expectations of the audience for whom it is written. Thereby, our findings conceptualise the framing of science news as a dynamic process of co-construction within institutional media contexts.

6.6.4 Balancing scientific nuance with newsworthiness

For scientists and press officers, communicating research in the media serves a dual purpose, as it informs the public about recent developments and enhances the visibility and reputation of the researcher and institution (Carver, 2014). Previous studies suggest that this dual role can introduce inaccuracies when the pursuit of media attention outweighs scientific nuance, allowing exaggerations in press releases to reach newspaper articles (e.g., Heyl et al., 2020; Adams et al., 2019; Bossema et al., 2019). This dynamic is recognized by journalists, as they note that overstatement sometimes originates from scientists' own claims. All actors furthermore emphasise that inaccuracies often stem from the complexity of research and the need to simplify it for broader audiences. To mitigate risks of misinformation, actors adopt different strategies. Journalists use their own expertise, fact-checking, consult independent experts, and analyse research limitations. Some press officers indicate to have limited scientific expertise, and therefore always rely on the researcher as fact checker and only report on peer-reviewed studies as quality control measure. This reliance exposes a structural vulnerability in science communication, as scientists might overstate findings and press officers may overlook inaccuracies they are unable to independently evaluate.

In answer to RQ3, our research shows that scientists, press officers, and journalists seek a balance between objective knowledge transfer and institutional profiling through continuous interaction rather than through fixed rules. Each actor has their own priorities, as scientists emphasize the importance of accurately representing complex findings, press officers seek a balance between clarity and visibility for the organisation, and journalists weigh newsworthiness against factual accuracy. Miscommunication or exaggeration is rarely

intentional, but often stems from the challenge of simplifying complex research within the constraints of media formats. To limit potential misinformation, our findings suggest several practical strategies. Press officers could verify strong claims with other experts working within their own organisation, particularly when they themselves have little scientific expertise to evaluate research validity. In addition, making research data and data visualisations available to journalists can help communicate research more objectively and closer to the actual findings of the study in news articles.

6.7 Limitations and future research

Previous studies highlight the influence of press releases on science news, as they are often reproduced partially or verbatim in newspaper articles (e.g., Comfort et al., 2022; Vögler & Schäfer, 2020; Vonk et al., 2024), indicating widespread churnalism. Our findings nuance this for the Dutch context. Journalists describe press releases mainly as signals for potential stories rather than textual sources to copy. They emphasize the importance of independent reporting, consulting the original publication and interviewing researchers to verify research findings. This difference may reflect the Netherlands' strong tradition of specialised science journalism compared to other countries (Pinto & Matias, 2023), which provide journalists with the resources to critically assess research. However, this finding is based on journalists who regularly cover science, those in high-pressure news environments, who may rely more on press releases, were not included. Future research could examine whether similar patterns hold across other segments of the Dutch media landscape.

Although the use of artificial intelligence (AI) was not explicitly addressed in the interview protocol, several respondents mentioned using it in their work. Some use AI to draft press releases or identify experts within specific scientific domains. Scientists and press officers noted that one of the main reasons for not producing press releases is the time investment required. If AI tools reduce this time investment, they could lower the threshold for drafting press releases and potentially increase their frequency. At the same time, recent research shows that journalists are increasingly integrating AI in their work. A study in four European countries found that reporters use AI for

translating, transcribing, paraphrasing, and generating ideas (Dijkstra et al., 2024). All in all, these developments indicate that AI will increasingly determine how scientific information is processed and translated into news. Future research could therefore examine more systematically how AI is integrated into the communication chain between scientists, press officers, and journalists, and whether this influences the dynamics of science news production and the eventual content of science newspaper articles.

Finally, this study focused specifically on the communication of ocean science. Communication dynamics may differ across scientific fields, as disciplines vary in their societal relevance, institutional structures, and media visibility. At the same time, most journalists and press officers in this study did not work exclusively on ocean science. Instead, ocean-related research typically formed only a small part of the broader range of scientific topics they cover. This suggests that many of the practices and considerations identified in this study are likely transferable to other scientific domains. Nevertheless, future research could examine whether similar dynamics emerge in other scientific domains, in order to assess the extent to which the patterns identified here apply beyond the field of ocean science.

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Literature

Abram, N., Gattuso, J.-P., Prakash, A., Cheng, L., Chidichimo, M.P., Crate, S., Enomoto, H., Garschagen, M., Gruber, N., Harper, S., Holland, E., Kudela, R.M., Rice, J., Steffen, K., von Schuckmann, K., Pörtner, H.-O., Roberts, D.C., Masson-Delmotte, V., Zhai, P., Mintenbeck, K. (n.d.). Framing and context of the report. In H.-O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegría, M. Nicolai, A. Okem, J. Petzold, B. Rama, & N.M. Weyer (Eds.), *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate* (pp. 73–129). Cambridge University Press. <https://doi.org/10.1017/9781009157964.003>.

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- Adams, R. C., Challenger, A., Bratton, L., Boivin, J., Bott, L., Powell, G., Williams, A., Chambers, C. D., & Sumner, P. (2019). Claims of causality in health news: A randomised trial. *BMC Medicine*, *17*(1), 91. <https://doi.org/10.1186/s12916-019-1324-7>
- Autzen, C. (2014). Press releases—The new trend in science communication. *Journal of Science Communication*, *13*(03), C02. <https://doi.org/10.22323/2.13030302>
- Badenschier, F., & Wormer, H. (2012). Issue selection in science journalism: Towards a special theory of news values for science news? In S. Rödder, M. Franzen, & P. Weingart (Eds.), *The Sciences' Media Connection – Public Communication and its Repercussions* (Vol. 28, pp. 59–85). Springer Netherlands. https://doi.org/10.1007/978-94-007-2085-5_4
- 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>
- Bossema, F. G., Burger, P., Bratton, L., Challenger, A., Adams, R. C., Sumner, P., Schat, J., Numans, M. E., & Smeets, I. (2019). Expert quotes and exaggeration in health news: A retrospective quantitative content analysis. *Wellcome Open Research*, *4*, 56. <https://doi.org/10.12688/wellcomeopenres.15147.1>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Carver, R. B. (2014). Public communication from research institutes: Is it science communication or public relations? *Journal of Science Communication*, *13*(03), C01. <https://doi.org/10.22323/2.13030301>
- Catalano, A. S., Lyons-White, J., Mills, M. M., & Knight, A. T. (2019). Learning from published project failures in conservation. *Biological Conservation*, *238*, 108223. <https://doi.org/10.1016/j.biocon.2019.108223>
- Comfort, S. E., Gruszczynski, M., & Browning, N. (2022). Building the science news agenda: The permeability of science journalism to public relations. *Journalism & Mass Communication Quarterly*, 107769902110479. <https://doi.org/10.1177/10776990211047949>
- Dijkstra, A. M., De Jong, A., & Boscolo, M. (2024). Quality of science journalism in the age of Artificial Intelligence explored with a mixed methodology. *PLOS ONE*, *19*(6), e0303367. <https://doi.org/10.1371/journal.pone.0303367>

- Dunwoody, S. (2021). Science journalism: Prospects in the digital age. In *Routledge handbook of public communication of science and technology* (pp. 14–32). Routledge.
- Eilders, C. (2006). News factors and news decisions. Theoretical and methodological advances in Germany. *Comm*, 31(1), 5–24.
<https://doi.org/10.1515/COMMUN.2006.002>
- Elliott, K. C. (2022). *Values in Science* (1st ed.). Cambridge University Press.
<https://doi.org/10.1017/9781009052597>
- Entman, R. M. (1993). Framing: Toward clarification of a fractured paradigm. 10.
- Galtung, J., & Ruge, M. H. (1965). The structure of foreign news: The presentation of the Congo, Cuba and Cyprus Crises in four Norwegian newspapers. *Journal of Peace Research*, 2(1), 64–90.
<https://doi.org/10.1177/002234336500200104>
- Göpfert, W. (2008). The strength of PR and the weakness of science journalism. In *Journalism, science and society* (pp. 227–238). Routledge.
- Guan, S., Qu, F., & Qiao, F. (2023). United Nations decade of ocean science for sustainable development (2021-2030): From innovation of ocean science to science-based ocean governance. *Frontiers in Marine Science*, 9, 1091598.
- Harcup, T., & O'Neill, D. (2001). What is news? Galtung and Ruge revisited. *Journalism Studies*, 2(2), 261–280.
<https://doi.org/10.1080/14616700118449>
- Harcup, T., & O'Neill, D. (2017). What is News?: News values revisited (again). *Journalism Studies*, 18(12), 1470–1488.
<https://doi.org/10.1080/1461670X.2016.1150193>
- Heyl, A., Joubert, M., & Guenther, L. (2020). Churnalism and hype in science communication: Comparing university press releases and journalistic articles in South Africa. *Communication*, 46(2), 126–145.
<https://doi.org/10.1080/02500167.2020.1789184>
- Hijmans, E., Pleijter, A., & Wester, F. (2003). Covering scientific research in Dutch newspapers. *Science Communication*, 25(2), 153–176.
<https://doi.org/10.1177/1075547003259559>
- Korthagen, I. (2016). Wakers van de wetenschap: Over het belang en de functies van wetenschapsjournalistiek.
- Kroon, A., & Schafraad, P. (2013). Copy-paste of journalistieke verdieping?: Een onderzoek naar de manier waarop nieuwsfactoren in universitaire

persberichten nieuwsselectie en redactionele bewerkingsprocessen beïnvloeden. *Tijdschrift voor Communicatiewetenschap*, 41(3).
<https://doi.org/10.5117/2013.041.003.283>

Marcinkowski, F., Kohring, M., Fürst, S., & Friedrichsmeier, A. (2014). Organizational influence on scientists' efforts to go public: An empirical investigation. *Science Communication*, 36(1), 56–80.
<https://doi.org/10.1177/1075547013494022>

Molek-Kozakowska, K. (2017). Communicating environmental science beyond academia: Stylistic patterns of newsworthiness in popular science journalism. *Discourse & Communication*, 11(1), 69–88.
<https://doi.org/10.1177/1750481316683294>

Nelissen, E., & Hendrickx, J. (2023). How does a national, multilingual news agency contribute to news diversity? A mixed-methods case study. *Journalism*, 146488492311797.
<https://doi.org/10.1177/14648849231179784>

Nelissen, E., & Hendrickx, J. (2024). How does a national, multilingual news agency contribute to news diversity? A mixed-methods case study. *Journalism*, 25(8), 1754–1772.
<https://doi.org/10.1177/14648849231179784>

Nisbet, M. C. (2009). Communicating climate change: Why frames matter for public engagement. *Environment: Science and Policy for Sustainable Development*, 51(2), 12–23. <https://doi.org/10.3200/ENVT.51.2.12-23>

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

Peters, H. P., Brossard, D., De Cheveigné, S., Dunwoody, S., Kallfass, M., Miller, S., & Tsuchida, S. (2008). Science-media interface: It's time to reconsider. *Science Communication*, 30(2), 266–276.
<https://doi.org/10.1177/1075547008324809>

Pinto, B., & Matias, A. (2023). European journalists and the sea: Contexts, motivations, and difficulties. *Public Understanding of Science*, 32(4), 459–469. <https://doi.org/10.1177/09636625221137036>

Sharp, M. K., Forde, Z., McGeown, C., O'Murchu, E., Smith, S. M., O'Neill, M., Ryanb, M., & Clyne, B. (2021). Irish media coverage of COVID-19 evidence-based research reports from one national agency. *International Journal of Health Policy and Management*, 1.
<https://doi.org/10.34172/ijhpm.2021.169>

- Stoll-Kleemann, S. (2019). Feasible options for behavior change toward more effective ocean literacy: A systematic review. *Frontiers in Marine Science*, 6, 273. <https://doi.org/10.3389/fmars.2019.00273>
- United Nations Educational, Scientific and Cultural Organization. (2021). *UNESCO Science Report 2021: The race against time for smarter development*. United Nations. <https://doi.org/10.18356/9789210058575>
- Van Eck, C. W., Messling, L., & Hayhoe, K. (2024). Challenging the neutrality myth in climate science and activism. *Npj Climate Action*, 3(1), 81. <https://doi.org/10.1038/s44168-024-00171-9>
- Van Leuven, S., Deprez, A., & Raeymaeckers, K. (2015). Het journalistieke brongebruik in tijden van churnalism en Twitter: Een surveyonderzoek bij Vlaamse beroepsjournalisten (2008-2013). *Tijdschrift voor Communicatiewetenschap*, 43(1). <https://doi.org/10.5117/2015.043.001.064>
- Van Leuven, S., Vanhaelewyn, B., & Raeymaeckers, K. (2021). From one division of labor to the other: The relation between beat reporting, freelancing, and journalistic autonomy. *Journalism Practice*, 15(9), 1203–1221. <https://doi.org/10.1080/17512786.2021.1910982>
- Vissers, M., Paulussen, S., & De Bruijn, G.-J. (2024). Surfing the COVID-19 news waves: A Belgian case study of science communication and public relations with university press releases. *Journal of Science Communication*, 23(06). <https://doi.org/10.22323/2.23060206>
- Vögler, D., & Schäfer, M. S. (2020). Growing influence of university PR on science news coverage? A Longitudinal automated content analysis of university media releases and newspaper coverage in Switzerland, 2003–2017. *International Journal of Communication*, 14, 3143–3164.
- Volk, S. C., Vogler, D., Fürst, S., Schäfer, M. S., & Sörensen, I. (2023). Role conceptions of university communicators: A segmentation analysis of communication practitioners in higher education institutions. *Public Relations Review*, 49(4), 102339. <https://doi.org/10.1016/j.pubrev.2023.102339>
- Vonk, A. N., Bos, M., & Van Sebille, E. (2024). Journalism versus churnalism: How news factors in press releases affect journalistic processing of ocean plastic research in newspapers globally. *Journalism Studies*, 25(16), 2031–2050. <https://doi.org/10.1080/1461670X.2024.2409836>
- Vonk, A. N., Bos, M., Vergunst, N., & van Sebille, E. (2025a). Copy-paste-journalistiek, een nieuwe kans in wetenschapsnieuws? De rol van universitaire persberichten bij de communicatie over het

wetenschappelijk proces in krantenartikelen. *Tijdschrift voor Communicatiewetenschap*, 53(4), 366–391.

Vonk, A., Bos, M., & van Sebille, E. (2025b). How frames and narratives in press releases shape newspaper science articles: the case of ocean plastic pollution. *Geoscience Communication*, 8(4), 297–317.

Weingart, P., & Joubert, M. (2019). The conflation of motives of science communication—Causes, consequences, remedies. *Journal of Science Communication*, 18(03), Y01. <https://doi.org/10.22323/2.18030401>

Appendix 1 - Interview guide

The following text shows the interview questions asked per type of participant, i.e., scientist, press officer or journalist. The questions were asked in random order, depending on how the conversation was going. The interviews were held in Dutch; hence, the interview scheme is also in Dutch.

Interviewschema press officer:

Algemene vraag: Zou jij mij kort iets kunnen vertellen over je studie en werkachtergrond en hoeveel jaren je ervaring hebt als persvoorlichter?

I. Nieuwswaarde en nieuwsselectie

1a. Wat zijn redenen voor jou om te besluiten een persbericht over oceaanonderzoek te schrijven?

Wat maakte dat onderzoek voor jou nieuwswaardig? Hoe ging dit proces in gang? Kan je mij uitleggen waarom het belangrijk is dat juist dat onderzoek het nieuws haalde?

1b. Kan je ook een voorbeeld geven van een onderzoek waarover je juist geen persbericht hebt geschreven?

Wat ontbrak of werkte hier minder goed?

II. Proces

2. Kun je beschrijven hoe een persbericht over oceaanonderzoek doorgaans tot stand komt?

Wie bepaalt de inhoud, toon of invalshoek?

Hoe vindt de samenwerking met betrokken partijen plaats?

III. Framing – Wat, waarom en wie krijgt een podium?

3. Maak je bewuste keuzes over welke wetenschappers of onderzoeksgroepen je een podium geeft, en welke niet?

Waar baseer je die keuzes op? Wat vind je daar belangrijk in?

4. Hoe bepaal je de invalshoek van een persbericht over wetenschap? Maak je bewust keuzes in hoe je het onderwerp insteekt?

Welke dingen spelen een rol bij het bepalen van deze invalshoek?

5. Wanneer je oceaankwetenschap op een goede manier wilt communiceren in een persbericht, welke drie elementen vind jij dan het belangrijkste om te benadrukken?

Wat maakt deze elementen belangrijk?

Is er ook ruimte voor hoe het onderzoek is uitgevoerd? Bijvoorbeeld de methoden, beperkingen etc.? Waarom wel, waarom niet?

IV. Waarden, principes en verantwoordelijkheden

6. Wat vind jij jouw verantwoordelijkheid als persvoorlichter bij het vertalen van wetenschappelijke kennis naar nieuws?

V. Objectiviteit en nuance

7. Hoe ga je om met de balans tussen wervend schrijven en wetenschappelijke nuance?

Let je erop of onderzoek past binnen strategische thema's van de organisatie?

Heb je daar een aanpak of richtlijn voor?

Interviewschema journalist:

Algemene vraag: Zou jij mij kort iets kunnen vertellen over je studie en werkachtergrond en hoeveel jaren je ervaring hebt als journalist?

I. Nieuws waarde en nieuwsselectie

1a. Kan je een voorbeeld geven van een situatie waarin je hebt besloten een krantenartikel te schrijven over oceaankwetenschap?

Wat maakte dat onderzoek voor jou nieuwswaardig?

1b. En kan je ook een voorbeeld geven van een wetenschappelijke studie waarbij je hebt besloten er geen krantenartikel te schrijven?

Wat ontbrak of werkte hier minder goed?

II. Proces – gebruik persberichten

2. Hoe komt een artikel over oceaankwetenschap doorgaans tot stand?

Welke rol spelen persberichten, wetenschappers of redacties hierin?

Op welke manier gebruik je het persbericht?

3. Schrijf je anders over nationaal vs. internationaal onderzoek?

Kun je uitleggen waarom?

III. Framing – Wat, waarom en wie krijgt een podium?

4. Maak je bewuste keuzes over welke mensen/onderzoeksgroepen je een podium geeft in je artikelen?

Waar baseer je die keuzes op? Zijn het voornamelijk wetenschappers, niet-wetenschappers, onderzoeksgroepen? Wat vindt je belangrijk in deze keuze?

5. Hoe bepaal je de invalshoek van een artikel over wetenschap? Maak je bewust keuzes in hoe je het onderwerp insteekt?

Welke dingen spelen een rol bij het bepalen van deze invalshoek? o.i.d.: eigen interesse, persberichten, wetenschappers of redacties?

6. Wanneer je oceaankwetenschap op een goede manier wilt communiceren in een krantenartikel, welke drie elementen vind jij dan het belangrijkste om te benadrukken?

Wat maakt juist die drie elementen belangrijk voor jou?

IV. Waarden, principes en verantwoordelijkheden

7. Wat vind jij je verantwoordelijkheid als journalist bij het vertalen van wetenschappelijke kennis naar nieuws?

V. Objectiviteit en nuance

8. Hoe ga je om met de balans tussen de relevantie van je onderzoek benadrukken en 'nieuwswaardig' communiceren en wetenschappelijke nuance behouden?

Heb je daar een aanpak voor?

Interviewschema wetenschapper:

Algemene vraag: Zou jij mij kort iets kunnen vertellen over je studie en werkachtergrond en hoeveel jaren je ervaring hebt in een wetenschappelijke functie?

I. Nieuwswaarde en nieuwselectie

1a. Kun je een voorbeeld geven van een situatie waarin je hebt besloten *wel* over je onderzoek te communiceren via pers of persvoorlichters?

Wat speelde er mee in die keuze?

1b. En kun je ook een voorbeeld geven van een onderzoek waar je dit juist niet deed?

Waarom deed je het hier niet? Wat speelde er mee in die keuze?

II. Proces – gebruik persberichten

2. Kun je beschrijven hoe een persbericht of media-uiting over jouw onderzoek meestal tot stand komt?

Wie bepaalt wat er wel of niet in komt? In hoeverre zijn keuzes over de inhoud bewust versus gevoelsmatig?

III. Framing – Wat, waarom en wie krijgt een podium?

3. Wanneer je gecontacteerd wordt door de media om reactie te geven op onderzoek, wat zijn dan je overwegingen om dit wel of juist niet te doen?

Schuif je bijvoorbeeld ook andere meer junior onderzoekers naar voren?

4. Hoe bepaal je hoe je over je onderzoek communiceert? Maak je bewust keuzes in hoe je het onderwerp insteekt? Zo ja, wat vind je dan belangrijk om te benadrukken?

Welke rol dingen spelen een rol bij het bepalen van deze invalshoek?

5. Wanneer je wilt dat een krantenartikel op een goede manier over je onderzoek communiceert, welke drie elementen vind jij dan dat erin moeten zitten?

Waarom juist die drie elementen? Wat maakt die elementen belangrijk voor jou?

IV. Waarden, principes en verantwoordelijkheden

6. Wat vind jij je verantwoordelijkheid als wetenschapper bij het vertalen van wetenschappelijke kennis naar het publiek?

Waarom vind jij juist die dingen belangrijk?

V. Objectiviteit en nuance

7. Hoe ga je om met de balans tussen de relevantie van je onderzoek benadrukken en 'nieuwswaardig' communiceren en wetenschappelijke nuance behouden?

Heb je daar een aanpak voor?

Appendix 2 - Themes identified across the six phases of thematic analysis

The table below provides an overview of how themes developed throughout the six phases of the thematic analysis. It shows (1) the initial analytical categories derived from the research questions, (2) the preliminary themes identified during the third phase of analysis, (3) the refined themes that emerged after discussion with the co-authors in the fourth phase, and (4) the final set of themes established in the fifth phase.

Table A1: Themes across thematic analysis phase

Initial themes for coding based on research questions	Third phase of analysis	Fourth phase of analysis	Fifth phase of analysis	
N=5 initial codes	N=13 Themes	N=11 Themes	N=10 Themes	
Newsworthiness	Signals for news	Signals for news	Signal moment	
	News values	News values	Newsworthiness	
	Churnalism	removed	-	
Communication Content	Communication priorities	removed	-	
	Ocean science communication	removed	-	
	Open science	removed	-	
	Determining framing		Normative motivations in communication	Normative motivation
			Target group	Target group
			Goal of communication	Communication goals
			Influence of the organisation	Organisation
Format restrictions		Form		

The Framing of Science News

Selection of citations	Scientist motivation to communicate to press	Scientist motivation to communicate to press	Actor quotes
	Citations	Citations	
Accuracy in science news	Accuracy in science news	Accuracy in science news	Quality control
	Problems in science communication	removed	-
Responsibility	Professional role perceptions	Professional role perceptions	Professional role perception

Appendix 3 - Codebook

The codebook is used to validate the ten themes found with the thematic analysis. The calculation of the intercoder reliability and the dataset analysed by the second coder is added as additional material to this paper.

Thema	Betekenis	Voorbeeld
1. Signaalmoment	Een signaalmoment is een concrete gebeurtenis of ontwikkeling die aanleiding geeft om over onderzoek te communiceren binnen de communicatiestroom.	Een signaalmoment kan: <ul style="list-style-type: none"> • Proactief zijn: wanneer communicatie wordt geïnitieerd op basis van een nieuwe ontwikkeling, zoals een publicatie, veldwerk, rapport, subsidie of start van nieuw onderzoek. • Reactief zijn: wanneer communicatie een reactie vormt op een actuele maatschappelijke discussie, mediabericht of politieke gebeurtenis.
2. Nieuws waarde	Nieuws waarde is de inschatting dat een onderwerp de moeite waard is om te communiceren naar persvoorlichting, of vanuit persvoorlichting en wetenschappers richting journalisten. Journalisten	Voorbeelden van factoren die nieuws waarde vergroten: actualiteit, dat iets lokaal gebeurt, grote wetenschappelijke

	<p>maken op basis van nieuwswaarde vervolgens ook de inschatting of zij het onderzoek of onderwerp relevant genoeg achten om over te communiceren in de media.</p>	<p>ontwikkelingen, opvallend, verassend.</p> <p>Factoren die nieuwswaarde verkleinen: Te weinig tijd, onderzoek dat gehyped is, geen maatschappelijke relevantie etc.</p> <p>Praktische voorwaarden: Er zijn ook praktische voorwaarden die bepalen of iets nieuwswaarde heeft, zoals beschikbare tijd, of er tegelijkertijd veel ander nieuws is, of er goed beeldmateriaal beschikbaar is of het past binnen de expertise van de journalist, etc.</p>
<p>3. Verantwoordelijkheid</p>	<p>Verantwoordelijkheid gaat over de dingen die professionals zien als hun verantwoordelijkheid binnen hun professionele taken. Het gaat om hun ideeën over wat hun rol inhoudt.</p>	<p>Verantwoordelijkheid voor wetenschappers: Publiceren, onderzoek doen, communiceren naar het publiek.</p> <p>Journalisten: Publiek informeren, wetenschappelijke kwaliteit berichtgeving waarborgen, wetenschappers helpen in communicatie.</p> <p>Persvoorlichters: Onderzoek onder de aandacht brengen, marketing eigen</p>

		organisatie, interne communicatie.
4. Normatieve motivatie	Normatieve motivatie verwijst naar de waarden en overtuigingen die richting geven aan iemands handelen en communicatie. Het gaat om wat iemand belangrijk, wenselijk of juist problematisch vindt, zowel persoonlijk als maatschappelijk, en hoe die opvattingen keuzes beïnvloeden.	De natuur heeft intrinsieke waarde, wetenschap brengt ons als samenleving verder, iedereen heeft recht op begrijpbare informatie, klimaatverandering is een groot probleem waar wat aan gedaan moet worden.
5. Communicatiedoel	Communicatiedoel verwijst naar het concrete resultaat dat iemand met communicatie wil bereiken.	Vergroten van kennis over de oceaan bij het publiek, duurzaam gedrag stimuleren, bijdragen aan beleidsverandering, profileren van eigen organisatie, draagkracht creëren voor onderzoek, publiek informeren.
6. Format	Format verwijst naar de vormelijke en structurele kenmerken waarin communicatie wordt gegoten. Het gaat om de manier waarop een boodschap wordt gepresenteerd, inclusief lengte, opbouw, taalniveau, stijl, gebruik van beeldmateriaal en institutionele richtlijnen.	Tekstlengte, taalniveau, structuur, aantal citaten, gebruik van afbeeldingen, genre, open-data vereisten, heldere boodschap.
7. Doelgroep	Doelgroep verwijst naar de specifieke groep	Dit kunnen specifieke journalisten zijn, het

	mensen op wie communicatie is gericht.	algemeen publiek, beleidsmakers, de lezers van een specifieke krant, verschillende kranten etc.
8. Quotes	Quotes (citaten) zijn letterlijk overgenomen uitspraken van een bron, gebruikt om een boodschap te onderbouwen, te illustreren of te verlevendigen. In wetenschapscommunicatie en journalistiek geven quotes een stem aan betrokken actoren en vergroten ze de geloofwaardigheid en concreetheid van een verhaal.	Wij coderen de volgende vier dingen: <ul style="list-style-type: none"> - Wie en waarom worden er gevraagd voor quotes? - Hoe worden mensen gevonden voor quotes? - Waarom gaan wetenschappers wel of niet in op mediaverzoeken? - Naar wie verwijzen wetenschappers door wanneer ze zelf niet kunnen reageren op een mediaverzoek?
9. Organisatie	Organisatie verwijst naar de institutionele context waarbinnen communicatie plaatsvindt. Het gaat om de formele en informele structuren, strategieën, regels en routines van een instelling die invloed uitoefenen op wat, hoe en waarom er wordt gecommuniceerd.	<ul style="list-style-type: none"> - Communicatie afstemmen met universitaire profileringsthema's . - Strategische keuzes over welke onderzoeken worden uitgelicht, Redactionele vergaderingen die onderwerpen toewijzen.

		<ul style="list-style-type: none"> - Protocollen (bijv. verplicht een onafhankelijke expert citeren). Eindredactie die koppen, toon of nuance kan aanpassen.
<p>10. Kwaliteitscontrole</p>	<p>Kwaliteitscontrole is het geheel van activiteiten dat professionals inzetten om de betrouwbaarheid, objectiviteit en nauwkeurigheid van wetenschapscommunicatie te waarborgen en te garanderen dat de boodschap het onderzoek correct weergeeft.</p>	<ul style="list-style-type: none"> - Raadplegen van originele wetenschappelijke artikelen of aanvullende experts; - Vermijden van valse evenwichten en zorgen dat belangrijke context niet verloren gaat; - Controleren van journalistieke teksten op feitelijke juistheid; - Zorgen dat alleen peer-reviewed resultaten worden gepubliceerd; controleren van informatie bij meerdere bronnen of experts.

Chapter 7 Discussion

Salty Water

Eerie mountains

moving

Salty Water

Running across my cheeks

I taste

Salty Water

While the wind hisses,

I work, measure,

uncover

The Ocean

Ocean science is largely removed from everyday experience (Schuldt, 2016), causing people to mainly encounter it through mediated sources such as social platforms, newspapers and public broadcasters (Mede et al., 2025). In such contexts, framing and narration forms a central mechanism for creating meaning. Frames guide interpretation by emphasising certain aspects of reality and thereby define what is relevant (Entman, 1993), making complex information understandable (Nisbet, 2009). Narratives add a storytelling layer. Through personification, emotion, tone and plot, they build tension and place abstract knowledge in human context (Glaser et al., 2009), making science relatable and recognisable (Dahlstrom, 2014, 2021).

The poem *Salty Water* illustrates how meaning is constructed through frames and narratives. In its opening lines, the term “salty water” remains ambiguous, possibly referring to sweat or tears. Only in the final stanza: *work, measure, uncover, The Ocean*, does a clear interpretative frame emerge, anchoring it as ocean water, perhaps encountered by a field researcher. Simultaneously, an implicit narrative unfolds as the protagonist becomes visible through acts of feeling, working and measuring, placing scientific practice within an experiential storyline. The ocean is thus not only described, but experienced. Similarly, journalistic reporting relies on frames and narratives to communicate ocean science meaningful within the public sphere.

This thesis examined how frames and narratives are constructed as scientific knowledge travels from peer-reviewed publication to newspaper article, and how the communicative choices of different actors shape the fairness and accuracy of ocean science communication. In the first part of this discussion chapter, I provide an overview of the most important overarching findings, followed by a critical reflection on the methodological choices underlying this thesis and their implications for interpreting the results. Next, the main limitations are discussed and directions for future research are given. Finally, the broader theoretical significance of this work is outlined and consideration is given to the different forms that science communication could and should take within society, in order to give science meaning within the public arena.

7.1 Overall reflection on key findings

7.1.1 The newsworthiness of ocean research

The agenda setting power of ocean science press releases

Press releases are effective in generating media attention for peer-reviewed research, both nationally and internationally. In Belgium, for example, 80% of press releases about research are taken up by the media (Visser et al., 2026), while 57% are picked up by newspapers worldwide (Chapter 3). This contrasts with general university press releases, of which only about 10% receive media coverage (Kroon & Schafraad, 2013). The strong national uptake can partly be explained

by journalists' preference for covering research conducted within their own country, as these researchers are more readily available for comment, and the research is typically considered more relevant to domestic audiences (Chapter 6). One explanation for the international success of peer-reviewed press releases lies in the use of press release distribution platforms such as EurekAlert!, which journalists indicate to use as a starting point for stories (Maiden et al., 2020; Chapter 6). Moreover, journalists value press releases about peer-reviewed studies over promotional news items because they offer substantive scientific insights (Chapter 6). Despite this success, peer-reviewed studies account for only a small share of university communications (~10%; Vissers et al., 2024), as their technical complexity makes preparing press releases more time-consuming (Chapter 6). For scientists and press officers, this is a relevant finding, because a larger number of peer-reviewed press releases could potentially contribute to greater media attention and thus paint a more realistic picture of developments within the ocean research field.

Research limitations as news factor

The newsworthiness theory also applies to science news, as Chapter 3 shows that research with more news factors is more likely to receive media coverage. Among these factors, classical ones such as negativity, magnitude, and eliteness (Harcup & O'Neill, 2001, 2017) were particularly influential. In contrast, societal relevance played a limited role, suggesting that journalists do not rely solely on the inherent newsworthiness of the study itself when selecting stories. Instead, reporting on ocean science often depends on whether a study offers an interesting "hook" for storytelling (Badenschier & Wormer, 2012). This hook was emphasised in chapter 6 by journalist as being very important. Hence, research does not have to meet all traditional news values in order to attract attention. Its news value depends largely on the extent to which the findings can be framed and interpreted within a compelling journalistic narrative. For researchers and press officers, this means that presenting research results within a clear and engaging story can increase their newsworthiness. Even studies with limited inherent news value may attract media attention when they are embedded in a strong and accessible narrative.

In Chapter 3, we examined newsworthiness at the level of press releases rather than newspaper articles, which have traditionally been the focus of newsworthiness research (e.g. Bednarek & Caple, 2014; Harcup & O'Neill, 2001, 2017). To our knowledge, apart from the analysis presented in Chapter 3, only two studies have examined the newsworthiness of scientific press releases (Kroon & Schafraad, 2013; Vissers et al., 2026). These studies focused primarily on factors that may increase the likelihood that a press release is selected by journalists, but did not consider factors that might reduce the news value of research. By analysing press releases rather than newspaper articles, we were able to examine not only which characteristics make research more newsworthy, but also which factors may decrease its chances of receiving media attention. These potential barriers can be described as “non-news factors” (Mellor, 2015). Following Mellor (2015), we hypothesised that detailed descriptions of the scientific process, like methods, funding sources or research limitations, could act as non-news factors, as these are often absent from newspaper coverage. Contrary to this expectation, our findings showed that including such scientific details did not reduce media uptake, mentioning limitations even seemed to slightly increase it.

In addition to practical factors such as time constraints, more urgent news or low relevance of a study, the main reason why journalists do not report on research from a press release is that the research contains methodological shortcomings, exaggerations or hype. Journalists emphasised the need to quickly assess the quality of a study, including its methods and limitations (Chapter 6). We therefore theorise that transparent reporting on the research process in press releases can increase the likelihood of coverage, as it allows journalists to evaluate the quality of studies more efficiently. These findings suggest that scientists and press officers can improve the visibility and credibility of their work by communicating research methods and limitations clearly and accurately, rather than avoiding technical details.

7.1.2 Frames and narratives in ocean science reporting

The main finding from the framing and narrative analyses in Chapters 2 and 4 is not which frames dominate, but the strikingly low diversity

of frames and narratives. Chapter 2 shows that many press releases contain only 0–1 frame variable (35.2% press releases on Ocean Plastic research; 52.7% press releases on Ocean Climate Change research). This lack of framing might influence how ocean science is contextualised in newspaper articles, as science newspaper articles are often based on press releases (Nelissen & Hendrickx, 2023; Van Leuven et al., 2015), of which parts are sometimes directly reproduced in newspaper articles (Chapter 3; Comfort et al., 2022; Schafraad & Zoonen, 2020). Moreover, Chapter 5 shows that framing from press releases is frequently transferred to newspaper articles, although most newspaper articles contain fewer frame variables than the press releases themselves. As frames provide interpretative structures that help audiences understand complex issues (Nisbet, 2009), limited framing may restrict the ways in which ocean science is interpreted and understood within the public domain.

All analysed press releases were sourced from EurekAlert! and originated from different countries and scientific contexts, although they were predominantly produced by English-language institutions. The resulting newspaper articles were published across countries with diverse journalistic cultures, but the analysis focused exclusively on English-language news coverage. One might therefore expect at least some variation in how research is communicated across these contexts. However, newspaper coverage largely mirrored the press releases, with only minor changes, typically related to responsibility or local or national politics (Chapter 5).

Moreover, press officers emphasise that the primary purpose of press releases is to generate media attention (Chapter 6). This goal shapes their design, particularly for international distribution platforms such as EurekAlert!, where press releases often contain little local specific information (Chapter 2). This non-local character increases their “copyability,” making them easier and faster for journalists to process and reproduce, which may increase the likelihood of coverage across multiple outlets. Consequently, the use of press release distribution platforms in combination with journalistic copy-and-paste practices contributes to a standardised form of science communication in which local, cultural, and social differences are only minimally reflected.

However, contextual information is particularly important in ocean science communication. Geographical proximity to the coast, for example, influences how the public perceives and understands ocean issues (Lotze et al., 2018). Moreover, making ocean issues meaningful within society requires attention to their social dimensions (UNESCO, 2021), especially when communication aims to raise awareness or encourage pro-environmental behaviour (Catalano et al., 2019; Stoll-Kleemann, 2019), a communication goal frequently emphasised by scientists and press officers (Chapter 6).

To communicate ocean issues more meaningfully in press releases distributed across diverse countries, the interviews in Chapter 6 suggest that communication officers and scientists could complement research findings with contextual information that highlights the broader importance the ocean has for daily life. For example, the ocean produces more than 70% of the oxygen we breathe and contains over 90% of the Earth's living space for wildlife. The interviews further indicate that engagement does not necessarily depend on audiences fully understanding complex scientific details. Instead, effective communication can spark curiosity and wonder by highlighting unfamiliar aspects of the ocean, such as the fact that it covers more than 70% of the Earth's surface while less than 20% has been explored. Additionally, they emphasise that striking imagery, and storytelling about ocean environments can capture attention. In particular, the aesthetic and mysterious qualities of the ocean can transcend national boundaries and inspire interest in- and concern for marine environments. Emphasising these universal aspects of the ocean may therefore help communicate ocean science more meaningfully across different countries and cultural contexts.

7.1.3 Role and responsibilities within ocean science communication

The findings that press releases influence both which research appears in newspapers and how it is framed (Chapters 3–5) underscore the central role of institutional science communication in structuring research news (Autzen, 2014; Comfort et al., 2022; Vögler & Schäfer, 2020). As press releases increasingly circulate beyond journalistic mediation and reach the public directly, their function shifts from

supporting journalists to communicating science to wider audiences. This shift invites critical reflection on the responsibilities of scientific organisations, not only in setting the media agenda for research but also in shaping how science is framed, understood, and valued in society.

The responsibility of scientific institutions in accurate science communication

The increasing reliance on press releases in science news raises important questions about the independence and quality control of public science communication. Press releases are, first and foremost, instruments of institutional public relations (Carver, 2014), and press officers describe their primary tasks as promoting research, enhancing institutional visibility, and facilitating media uptake (Fürst et al., 2022; Chapter 6). Within this promotional logic, less emphasis is placed on critical contextualisation, the explicit communication of uncertainties, or the scrutiny of methodological robustness (Chapter 6). These functions are traditionally associated with the watchdog role of journalism (Korthagen, 2016) and, according to journalists, are particularly important in (ocean) science reporting, as they frequently encounter press releases or studies that overstate findings or contain methodological weaknesses (Chapter 6).

When PR-driven communication becomes a dominant source for news reporting, there is an increased risk of exaggerations or inaccuracies finding their way into media coverage. In Chapter 6, press officers indicate that they do not have the resources or expertise to assess the soundness of scientific studies and therefore only report on peer-reviewed research as a quality control measure. Furthermore, most press officers do not that recognize scientists use hype, or indicate that they would not recognize exaggerated claims because they mainly focus on scientists and their expertise as a quality control measure. However, research shows that scientists regularly overstate claims (Hyland & Jiang, 2021) and that press releases often contain exaggerated findings from researchers (Bossema et al., 2019; Chapter 6), and that these exaggerations and inaccuracies in press releases are then reproduced in news coverage (Adams et al., 2019).

Accuracy of press releases can be enhanced, by research organisations setting clearer internal guidelines, such as systematically

addressing study limitations, critically reviewing assertive claims with other experts, and ensuring that quotations do not contribute to misinformation when taken out of context. Institutional guidelines are important in this, given that communications departments are considered a support function within research organisations, like universities. Universities can have a hierarchical structure, which may cause researchers to resent having their expertise questioned by fact-checking. Including fact-checking as part of public relations work can thus contribute to greater awareness among communication staff about how misinformation can arise in communication, as well as offer them tools to deal with it.

News selection influence on scientific inequality

Press officers act as important gatekeepers, as they largely decide which studies receive media visibility (Chapters 3–6). In addition, scientific journals, particularly high-impact journals such as *Nature* and *Science*, also have an important agenda setting role, as publication in these journals increases the newsworthiness of scientific research (Chapter 3; Badenschier & Wormer, 2012). In addition, when research is published in high impact journals, press officers are more likely to produce press releases about them. Journalists, in turn, often keep track of new research developments through embargoed press releases distributed by these journals (Chapter 6). As a result, reporting is determined not only by scientific quality or societal relevance, but largely by institutional eliteness.

This eliteness-based logic reinforces existing inequalities within global science production. Publication in leading journals often requires considerable financial resources, which means that researchers from low-income countries, such as those in the Global South, have fewer opportunities to publish in influential media, limiting the visibility of their work (Turba et al., 2026). Moreover, editors at elite journals, are likely sensitive to institutional prestige themselves when selecting studies. Furthermore, the science news agenda is often influenced by front-page coverage in “elite” countries such as the United States and the United Kingdom, from which news is then replicated elsewhere (Chapters 2, 6; Nelissen & Hendrickx, 2023; Pinto & Matias, 2023; Harcup & O'Neil, 2001; 2017).

The fact that “eliteness” forms an important news factor within science communication, contributes to a geographically unequal representation of science in the news and reinforces existing inequalities between scientific institutions. Established institutions with greater resources receive more media attention, which further increases their visibility and reputation and, with it, their access to future funding and opportunities. This cumulative dynamic resembles the ‘Matthew effect’, whereby initial advantages generate further advantages. Hence, when scientific quality is implicitly assessed on the basis of institutional status, national reputation or journal impact factors, media coverage not only reflects the hierarchies within the global research system, but also reinforces them.

The legitimate voices of science

The image of who is seen as legitimate producers of knowledge extends beyond research institutions and also relates to who appears in the media as representatives of science, in other words, who the public recognises as the voice of scientific expertise. The importance of “eliteness” as news factor and the heavy reliance within science journalism on press releases from influential journals or elite institutions limits the range of voices represented in science news. Since the quality of research extends beyond the prestige of an institution or journal, prestige-based news selection risks marginalising valuable contributions and limiting diversity within public science communication.

There is a clear gender imbalance in media coverage, with male scientists being quoted more often than female scientists (Leidecker-Sandmann et al., 2026). In my opinion, the way in which experts are selected in the Netherlands further reinforces this imbalance. Both press officers and journalists usually allow the researcher who conducted the research to explain it themselves. In addition, journalists often ask for an external expert to validate research. This expert is usually found through existing editorial networks, previous news articles or simple internet searches using the title: “professor” (Chapter 6). In a scientific- and media environment in which men are already overrepresented, this search practice leads to a structural dominance of male scientists being put forward as experts.

Scientists, press officers and journalists can all contribute to a more balanced representation of scientific voices in the newspaper. Journalists can expand their search for experts from the newspaper network and job titles such as “professor” to include broader scientific positions like assistant professor or postdoctoral researcher. Moreover, professors can promote junior colleagues when they receive media requests. In addition, press officers at research institutes can facilitate media training early on in academia, as a lack of such training forms a reason why female researchers decline media requests (Chapter 6). In addition, support is needed in dealing with public reactions to media appearances, as these can be negative or hostile, especially for women (Chapter 6; Yelin & Clancy, 2020; Oksanen et al., 2022), which can lead to avoidance of media attention (Oksanen et al., 2022). Moreover, press officers can think about who they voice in press releases, as these researchers often appear subsequently in newspaper articles (Chapter 5; Nelissen and McMartin, 2022). These practices might enable a more inclusive picture of who is- and can be a scientist. Showing that scientific knowledge is not bound to gender, ethnicity, sexual orientation, or cultural background.

7.2 Theoretical advancement and methodological discussion

7.2.1 The use of clustering methods to define textual framing

In this dissertation, textual framing is operationalized using a clustering method, in which frame variables that frequently occurred together in texts are grouped (Chapter 2). Since the choice of clustering technique can influence the frames that are identified, we explain in this methodological discussion why Principal Component Analysis (PCA) was chosen. In addition, we compare this approach with an alternative method for identifying framing structures, namely Correspondence Analysis (CA). By comparing both methods, we reflect on the robustness of the frames found in Chapter 2 and on the broader methodological implications of frame clustering.

PCA versus CA

In Chapter 2, Principal Component Analysis (PCA) was applied to cluster frame variables that frequently occur together in press releases, in line with the approach of Semetko and Valkenburg (2000). The resulting clusters were then interpreted as frames, in accordance with the interpretative step described by Matthes & Kohring (2008). A methodological limitation of this approach is that variables that occur very frequently or very infrequently must be removed, as they can distort the analysis. In follow-up research, we analysed the same frame variables using Correspondence Analysis (CA) (Qianqian et al., 2025). This method makes it possible to correct individual outliers at the case level instead of excluding entire variables, thereby better preserving the structural similarity with the original dataset. CA is therefore suitable for revealing less dominant association patterns between frame variables that may remain underexposed within PCA.

Despite the methodological advantages of Correspondence Analysis (CA), we did not apply this method in Chapter 2. PCA emphasizes dominant covariation patterns in the data and is therefore in line with the primary research objective: identifying overarching frames that structure the discussion about ocean plastic in scientific press releases. In addition, PCA is a commonly used method in framing research, which increases comparability with existing studies (e.g., Semetko & Valkenburg, 2000). An additional, pragmatic consideration concerns the statistical complexity of CA. Being able to independently perform, interpret, and validate analyses was an important starting point within this thesis. Given the technical requirements of CA, its application was beyond the methodological expertise available within this project.

Similarities and differences across clustering methods

Figures 7.1a and b present the results of the Correspondence Analysis (CA) and Principal Component Analysis (PCA), respectively. While the overall frame structures identified through both clustering techniques are largely comparable, several differences led to minor variations in frame composition and variable loading. These similarities and divergences are discussed in detail below.

- Quadrant 1 (Q1) and the Scientific Solution frame:** Q1 largely corresponds with the Scientific Solution frame from PCA. The main difference is that the treatment variable had a cross-loading with Societal Responsibility in PCA, but is in CA fully allocated to Q1.

Quadrant 2 (Q2) and the Health Problem & Societal Blame frames: Variables from the Health Problem and Societal Blame frames co-occur in Q2. While PCA separated them analytically, CA confirms their frequent co-occurrence in press release discourse.

Quadrant 3 (Q3) and the Dual Problem frame: Within PCA, Resp.C.P and OC were excluded due to low frequency (<6%), there limited contribution was confirmed in the CA replication (Qianqian et al., 2025). CA shifts the composition of the Dual Problem frame by grouping economic problem (PE) with climate and non-biological issues, whereas PCA had included PE in the Health Problem frame. This shifts the composition of the Dual Problem frame to more explicitly incorporate economic dimensions.
- Quadrant 4 (Q4) and the Societal Responsibility frame:** Political and industrial responsibility variables (Resp.TC, Resp.TI, Resp.TO), excluded in PCA, cluster with societal responsibility in CA. This broader allocation suggests that responsibility framing extends beyond individual or societal actors to include institutional and governance dimensions.

Conclusion of cluster method comparison

The comparison between PCA and CA highlights their complementary strengths. CA captures subtle connections and outliers, providing greater analytical nuance, while PCA can identify overarching patterns and interpretable frame clusters. Minor differences between the results demonstrate the robustness of the identified frames in Chapter 2. CA's inclusion of all data points, including low-frequency variables, can slightly shift frame composition, emphasizing that frame analysis is shaped by methodological choices. Transparency in clustering decisions and variable selection is therefore essential. CA offers the most robust way to cluster data as it takes into the entire dataset and only excludes outliers. However, its methodological complexity may

not be feasible for every researcher. By contrasting PCA and CA, this discussion helps researchers weigh the trade-offs of each approach and choose the method best suited to their clustering goals.

7.2.2 Calculating Churnalism

In Chapter 3, churnalism was operationalised by means of an automated text comparison of 345 newspaper articles and the corresponding press releases. To quantify textual similarity, three complementary measurement methods were combined: cosine similarity, the Jaccard index and normalised Levenshtein distance, following earlier work by Bauwmans (2018b). Qualitative textual analysis showed that scores above 0.7 indicated widespread literal copying, scores between 0.3 and 0.7 indicated partial copying, and scores below 0.3 indicated substantial textual transformation.

A comparison with the study by Vissers et al. (2026), based on 763 news articles, puts these findings further into context. Their results also interpret scores above 0.7 as an almost literal reproduction and scores between 0.3 and 0.7 as a partial reproduction. The main difference concerns scores below 0.3. In our dataset, low scores mainly reflected paraphrasing combined with selective removal, whereas in the study by Vissers et al. (2026), low scores were more often the result of the removal of substantial text segments, while the retained content still closely matched the press releases.

To calculate churnalism in Chapter 3, the Levenshtein distance was normalised relative to the longest text, meaning similarity was assessed against the total amount of information in the press release. This approach was chosen, as we consider the removal of information to be a journalistic act, as it changes the meaning of the text and can alter textual framing. However, results reported by Vissers et al. (2026) place this assumption into perspective. Their analysis showed that articles with relatively low churnalism scores still closely resembled the press releases on which they were based, with the low scores largely explained by substantial textual deletions. Hence, they stated that in such cases, the formula underestimated the degree of copying.

By normalising the Levenshtein distance by the longest text the churnalism measure is sensitive to deletions, providing a more

accurate representation of overall textual overlap between press release and newspaper article. However, when instead the Levenshtein distance is normalized relative to the shortest text, the measure emphasizes containment, i.e., the extent to which the shorter text is fully derived from the longer one. This may better capture cases of substantial copying that are masked by deletions. To explore this further, we adjusted the formula from Chapter 3 by applying a normalized scaling to the Levenshtein distance using the following transformation:

$$\text{Normalized Levenshtein distance} = 1 - \left(\frac{\text{Levenshtein}}{\min(\text{LengthPR}, \text{LengthNA})} \right) / \left(1 + \frac{\text{Levenshtein}}{\min(\text{LengthPR}, \text{LengthNA})} \right)$$

Here, $\min(\text{LengthPR}, \text{LengthNA})$ selects the length of the shorter text, either the press release (PR) or the newspaper article (NA). By scaling the distance relative to the shorter text, the similarity score reflects how much of that shorter text can be found in the longer one. As a result, the measure becomes more sensitive to situations where a short newspaper article largely reproduces content from a longer press release. Applying this normalized measure to the dataset analysed in Chapter 3 shows that such short articles receive higher churnalism scores than under the original formula. As illustrated in Figures 7.2a and b, newspaper articles with already high churnalism scores (>0.7) remain largely unchanged, whereas shorter articles that previously scored below 0.3 now receive higher similarity scores when substantial portions of press release content are reproduced.

The comparison of our findings with those of Vissers et al. (2026) suggests that the original formula from Chapter 3 is robust for identifying near-verbatim reproductions and partial copies. However, when articles mainly reproduce selected passages and omit large parts of the source text, it may be analytically useful to adjust the Levenshtein normalisation. The revised scale tempers the influence of length differences and makes substantial copying in short articles more visible, while the original formula remains suitable for assessing the total textual overlap.

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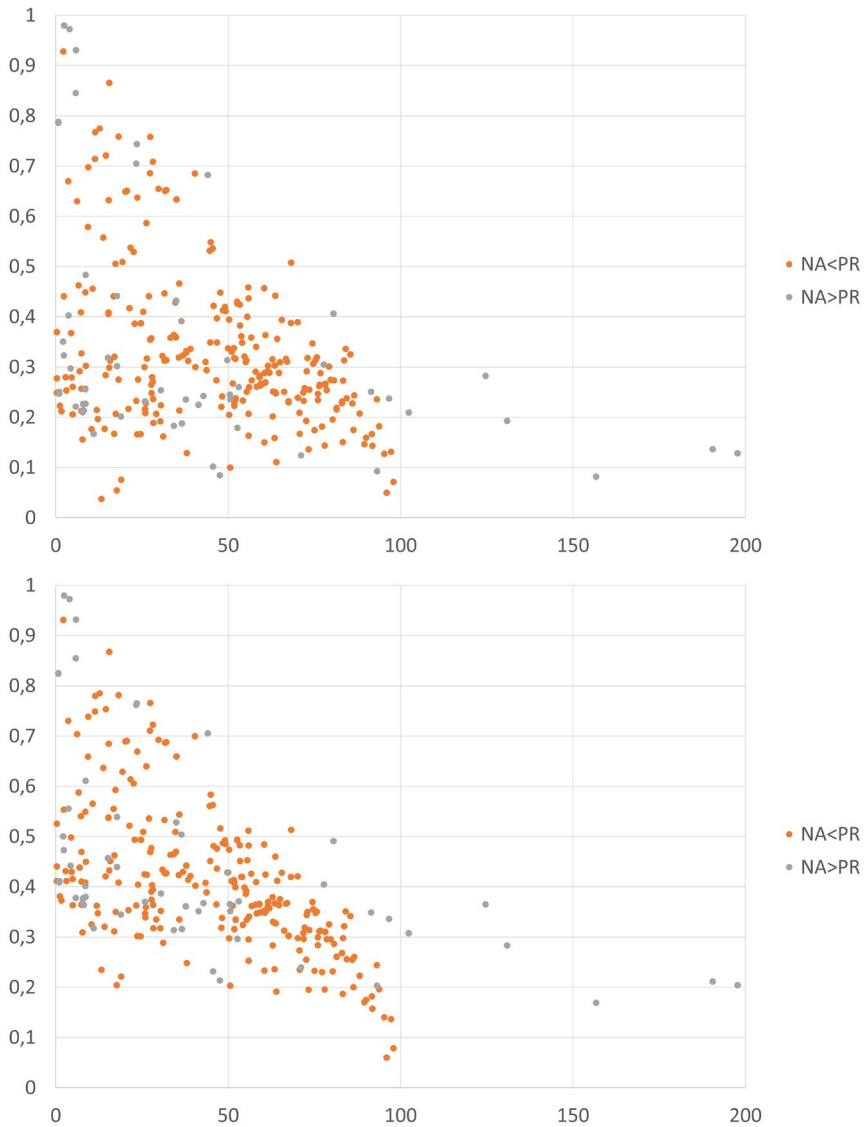


Figure 7.2A: Churnalism calculated according to the formula in Chapter 2; **B:** churnalism calculated with a new calculation for Levenshtein distance, taking into account larger textual differences. The orange colour refers to newspaper articles that are shorter than the press release, the grey colour refers to newspaper articles that are longer than the press release.

It is important to note that the churnalism score provides only an indication of textual similarity. In order to gain real insight into the nature of textual differences, for example where texts have been paraphrased but remain in meaning the same, a qualitative analysis is necessary, as we carried out in Chapter 4 and 5. By combining quantitative measures with qualitative textual analysis and visualising differences in framing, it becomes clear not only how much text corresponds, but also which specific passages have been copied. This combined approach offers a much more nuanced picture of the influence press releases have on the portrayal of science in newspapers.

7.3 Limitations and future research

An important limitation of this study is that it does not examine how framing influences the public's understanding and evaluation of ocean science. Framing theory suggests that the way information is presented, through emphasis, context, or omission, shapes how people interpret information (Entman, 1993) and can influence environmental decision-making (Homar & Cvelbar, 2021). The findings in this dissertation indicate that the public is often exposed to a relatively limited framing of ocean research (Chapter 2), which may provide few interpretative cues for understanding complex findings and make them appear abstract or distant from everyday life. In addition, science is frequently personified in press releases and newspaper articles, with individual researchers highlighted while broader societal dimensions of ocean issues receive less attention (Chapter 5). This framing might reinforce the perception that ocean problems are primarily scientific issues to be solved by researchers, rather than societal challenges requiring collective action.

At the same time, Chapter 4 shows that including scientific details in press releases, such as research methods and limitations, increases the likelihood that they will be reproduced in newspapers. However, it remains unclear whether such transparency also contributes to a better public understanding of how science works. Journalists interviewed in Chapter 6 also expressed concerns about how scientific uncertainty can be communicated in a way that remains both accurate and accessible. Future research could therefore

investigate how different framing strategies and levels of transparency about methods and limitations influence the public's understanding and evaluation of ocean science, thereby providing guidelines for more effective science communication.

Another limitation is that Chapters 2-5 identified frames, narratives, and levels of churnalism in press releases and newspaper articles, but did not analyse these findings in relation to the national media contexts in which they were produced. Consequently, the analyses cannot explain how country-specific factors may influence the selection, framing, and coverage of ocean science in the news. For example, one might expect higher levels of churnalism in countries without specialised science journalists compared to countries where such expertise is more established. In addition, press officers may produce multiple versions of press releases, one tailored to national audiences and another for international distribution. This could result in less locally contextualised texts on international press release platforms and may partly explain the limited amount of locally specific information found in the EurekaAlert! dataset analysed in this thesis.

To gain a deeper understanding of how national media contexts shape science communication practices, Chapter 6 zooms in on the Dutch context as a case study, enabling a more in-depth examination of how ocean science enters and is represented in national newspapers. This approach provides insights into the roles and interactions of scientists, press officers, and journalists within a specific media system. However, because the Dutch media system differs from those of other countries included in earlier chapters, these findings cannot be generalised cross-nationally. Instead, they highlight how organisational and cultural factors may shape science communication practices in different contexts. Future research should therefore examine ocean science communication across multiple national media systems to assess how such structural differences influence the uptake, framing, and interpretation of scientific research in newspapers.

A further limitation of this dissertation is that the framing analysis focused exclusively on textual framing within the main text of press releases and newspaper articles (Chapters 2-5). Headlines and accompanying images were not included. The study aimed to

understand how press officers and journalists explain and contextualise ocean science within the texts they produce, whereas headlines and visuals are often chosen later in the editorial process and are therefore not always under the direct control of these actors (Chapter 6). However, framing theory emphasises that headlines and visual elements also contribute to framing by highlighting specific actors, situations, or interpretations (Wozniak et al., 2015). The selection of specific images can even highly influence how people perceive information from newspapers and can strengthen or surpassing the efficacy of textual information (e.g., Anne Difrancesco & Young, 2011; Bolsen et al., 2019). Future research could therefore integrate headline and visual analysis to provide a more comprehensive understanding of how ocean science is framed in press releases and newspaper coverage.

Another limitation of this thesis is that the analysis focuses exclusively on traditional newspaper articles, while the contemporary media landscape is far more diverse. Younger audiences increasingly consume news via social media platforms (Mede et al., 2026), where the boundaries between journalism and other forms of public communication are often blurred. Research suggests that press releases also influence content on platforms such as Facebook and Instagram (Verstappen et al., 2022), where news is communicated in shorter, more visual formats (Verstappen & Opgenhaffen 2024a,b). By focusing on newspapers, this dissertation therefore overlooks alternative channels through which ocean science reaches the public and the framing dynamics that operate in social media environments. Future research could examine how ocean science is communicated on social media platforms, which sources underpin this content, and to what extent press releases influence its framing.

This thesis shows that decisions about newsworthiness often occur before research reaches journalists, as they are made by press officers or scientists. This highlights the importance of including multiple actors in newsworthiness research to better understand why certain studies gain media attention. Chapter 3 suggests that adding scientific details or mentioning limitations in press releases does not reduce newsworthiness. Based on the interviews in Chapter 6, I hypothesise that including such details may even increase

newsworthiness by helping journalists quickly assess a study's quality. Although the findings in Chapter 3 are based on a small exploratory dataset, they point to a promising direction for future research. Larger and more diverse datasets could test whether transparency about

7.4 Conclusion

The aim of this dissertation was to gain insights into how ocean science reaches the public domain through newspapers, how it is framed, and which actors shape this communication process. By combining quantitative and qualitative analyses of press releases and newspaper articles, this study demonstrates the central role of press releases in shaping science news. The findings show not only the extent to which newspaper articles resemble press releases, as measured through churnalism, but also highlight which framing elements are reproduced or modified when research moves from institutional communication to journalistic coverage.

Methodologically, this dissertation introduces a visual analytical technique to map changes in framing between press releases and newspaper articles. This approach increases the transparency of qualitative framing analyses and provides a more systematic way of identifying how frames evolve across different stages of science communication. In addition, this thesis extends research on newsworthiness by examining it at the level of press releases, thereby shifting attention to earlier stages of the news production process. By incorporating the perspectives of scientists and press officers, actors who act as primary gatekeepers in the communication of research, this dissertation offers new insights into how news selection processes shape the public visibility of ocean science.

Interviews with scientists, press officers, and journalists formed an important part of this research and show that science communication is not a linear process but the result of interactions and co-creation between different actors. By combining these perspectives with analyses of press releases and newspaper articles, this dissertation provides a comprehensive understanding of how ocean science is translated into the public domain. It demonstrates that media representations of science are not neutral reflections of

research, but are shaped by institutional priorities, journalistic practices, normative values, and the interactions between those involved in communicating science. Recognizing these dynamics is essential both for understanding how science communication works and for improving it by incorporating the practical insights of the actors involved.

Although my research focused on traditional science communication through newspapers, I fully acknowledge the importance of other communication channels. When discussing my work with scientists and press officers, they often ask: “How can I write a press release that gets picked up worldwide?” or “How do I ensure coverage in outlets like NRC, de Volkskrant, or The New York Times?” While such articles may reach wide audiences, the impact of science communication should not be measured by reach alone. A single newspaper article is rarely sufficient to tell a story that resonates or leaves a lasting impression. From my perspective, science can contribute to society by informing policies that take into account both scientific knowledge and societal values. For science informed policy to work, public trust in science is needed, as people need to trust science to act on its advice. Strengthening that trust, engaging people with science, and inspiring them requires more than traditional media alone. Effective science communication connects with the target audience, presenting research in ways that are clear, engaging, and accessible.

To give science meaning within society, we need newspapers, but also theatre, books, films, conversations in libraries, science festivals and sometimes just a nice poem about *Salty Water*.

Literature

- Adams, R. C., Challenger, A., Bratton, L., Boivin, J., Bott, L., Powell, G., Williams, A., Chambers, C. D., & Sumner, P. (2019). Claims of causality in health news: A randomised trial. *BMC Medicine*, *17*(1), 91. <https://doi.org/10.1186/s12916-019-1324-7>
- Anne DiFrancesco, D., & Young, N. (2011). Seeing climate change: The visual construction of global warming in Canadian national print media. *Cultural Geographies*, *18*(4), 517–536.

- Autzen, C. (2014). Press releases—The new trend in science communication. *Journal of Science Communication*, 13(03), C02. <https://doi.org/10.22323/2.13030302>
- Badenschier, F., & Wormer, H. (2012). Issue selection in science journalism: Towards a special theory of news values for science news? In S. Rödder, M. Franzen, & P. Weingart (Eds.), *The Sciences' Media Connection –Public Communication and its Repercussions* (Vol. 28, pp. 59–85). Springer Netherlands. https://doi.org/10.1007/978-94-007-2085-5_4
- 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>
- Bolsen, T., Palm, R., & Kingsland, J. T. (2019). Counteracting climate science politicization with effective frames and imagery. *Science Communication*, 41(2), 147–171.
- Bossema, F. G., Burger, P., Bratton, L., Challenger, A., Adams, R. C., Sumner, P., Schat, J., Numans, M. E., & Smeets, I. (2019). Expert quotes and exaggeration in health news: A retrospective quantitative content analysis. *Wellcome Open Research*, 4, 56. <https://doi.org/10.12688/wellcomeopenres.15147.1>
- Carver, R. B. (2014). Public communication from research institutes: Is it science communication or public relations? *Journal of Science Communication*, 13(03), C01. <https://doi.org/10.22323/2.13030301>
- Catalano, A. S., Lyons-White, J., Mills, M. M., & Knight, A. T. (2019). Learning from published project failures in conservation. *Biological Conservation*, 238, 108223. <https://doi.org/10.1016/j.biocon.2019.108223>
- Comfort, S. E., Gruszczynski, M., & Browning, N. (2022). Building the science news agenda: The permeability of science journalism to public relations. *Journalism & Mass Communication Quarterly*, 107769902110479. <https://doi.org/10.1177/10776990211047949>
- Dahlstrom, M. F. (2014). Using narratives and storytelling to communicate science with nonexpert audiences. *Proceedings of the National Academy of Sciences*, 111(Supplement_4), 13614–13620. <https://doi.org/10.1073/pnas.1320645111>
- Dahlstrom, M. F. (2021). The narrative truth about scientific misinformation. *Proceedings of the National Academy of Sciences*, 118(15), e1914085117. <https://doi.org/10.1073/pnas.1914085117>

- Entman, R. M. (1993). Framing: Toward clarification of a fractured paradigm. 10.
- Fürst, S., Volk, S. C., Schäfer, M. S., Vogler, D., & Sörensen, I. (2022). Organizational and societal goals in tension? A survey of communication practitioners at Swiss higher education institutions. *Journal of Science Communication, 21*(7), A06.
- Glaser, M., Garsoffky, B., & Schwan, S. (2009). Narrative-based learning: Possible benefits and problems. *Communications, 34*(4).
<https://doi.org/10.1515/COMM.2009.026>
- Harcup, T., & O'Neill, D. (2001). What Is news? Galtung and Ruge revisited. *Journalism Studies, 2*(2), 261–280.
<https://doi.org/10.1080/14616700118449>
- Harcup, T., & O'Neill, D. (2017). What is news?: News values revisited (again). *Journalism Studies, 18*(12), 1470–1488.
<https://doi.org/10.1080/1461670X.2016.1150193>
- Homar, A. R., & Cvelbar, L. K. (2021). The effects of framing on environmental decisions: A systematic literature review. *Ecological Economics, 183*, 106950.
- Hyland, K., & Jiang, F. K. (2021). 'Our striking results demonstrate...': Persuasion and the growth of academic hype. *Journal of Pragmatics, 182*, 189–202.
- Korthagen, I. (2016). *Wakers van de wetenschap: Over het belang en de functies van wetenschapsjournalistiek*.
- Kroon, A., & Schafraad, P. (2013). Copy-paste of journalistieke verdieping?: Een onderzoek naar de manier waarop nieuwsfactoren in universitaire persberichten nieuwselectie en redactionele bewerkingsprocessen beïnvloeden. *Tijdschrift voor Communicatiewetenschap, 41*(3).
<https://doi.org/10.5117/2013.041.003.283>
- Lotze, H. K., Guest, H., O'Leary, J., Tuda, A., & Wallace, D. (2018). Public perceptions of marine threats and protection from around the world. *Ocean & Coastal Management, 152*, 14–22.
<https://doi.org/10.1016/j.ocecoaman.2017.11.004>
- Maiden, N., Zachos, K., Franks, S., Wells, R., & Stallard, S. (2020). Designing digital content to support science journalism. *Proceedings of the 11th Nordic Conference on Human-Computer Interaction: Shaping Experiences, Shaping Society*, 1–13. <https://doi.org/10.1145/3419249.3420124>

- Matthes, J., & Kohring, M. (2008). The content analysis of media frames: Toward improving reliability and validity. *Journal of Communication*, 58(2), 258–279. <https://doi.org/10.1111/j.1460-2466.2008.00384.x>
- Mede, N. G., Cologna, V., Berger, S., C. Besley, J., Brick, C., Joubert, M., ... & R. Pearson, A. (2025). Public communication about science in 68 countries: Global evidence on how people encounter and engage with information about science. *Science Communication*, 10755470251376615.
- Mellor, F. (2015). Non-news values in science journalism. In B. Rappert & B. Balmer (Eds.), *Absence in science, security and policy* (pp. 93–113). Palgrave Macmillan UK. https://doi.org/10.1057/9781137493736_5
- Nelissen, E., & Hendrickx, J. (2023). How does a national, multilingual news agency contribute to news diversity? A mixed-methods case study. *Journalism*, 146488492311797. <https://doi.org/10.1177/14648849231179784>
- Nisbet, M. C. (2009). Communicating climate change: Why frames matter for public engagement. *Environment. Science and Policy for Sustainable Development*, 51(2), 12–23. <https://doi.org/10.3200/ENVT.51.2.12-23>
- Pinto, B., & Matias, A. (2023). European journalists and the sea: Contexts, motivations, and difficulties. *Public Understanding of Science*, 32(4), 459–469. <https://doi.org/10.1177/09636625221137036>
- Qi, Q., Hessen, D. J., Vonk, A. N., & van der Heijden, P. G. (2025). Correspondence analysis: Handling cell-wise outliers via the reconstitution algorithm. *Bulletin of Sociological Methodology/Bulletin de Méthodologie Sociologique*, 167(1), 96–122.
- Schafraad, P., & Zoonen, W. V. (2020). Reconsidering churnalism: How news factors in corporate press releases influence how journalists treat these press releases after initial selection. *Communications*, 45(s1), 718–743. <https://doi.org/10.1515/commun-2019-2075>
- Schuldt, J. P., McComas, K. A., & Byrne, S. E. (2016). Communicating about ocean health: Theoretical and practical considerations. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 371(1689).
- Stoll-Kleemann, S. (2019). Feasible options for behavior change toward more effective ocean literacy: A systematic review. *Frontiers in Marine Science*, 6, 273. <https://doi.org/10.3389/fmars.2019.00273>
- Semetko, H. A., & Valkenburg, P. M. V. (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.1460-2466.2000.tb02843.x>

- United Nations Educational, Scientific and Cultural Organization. (2021). UNESCO Science Report 2021: The race against time for smarter development. United Nations. <https://doi.org/10.18356/9789210058575>
- Van Leuven, S., Deprez, A., & Raeymaeckers, K. (2015). Het journalistieke brongebruik in tijden van churnalism en Twitter: Een surveyonderzoek bij Vlaamse beroepsjournalisten (2008-2013). *Tijdschrift voor Communicatiewetenschap*, 43(1). <https://doi.org/10.5117/2015.043.001.064>
- Verstappen, M., Nelissen, E., Opgenhaffen, M., & McMartin, J. (2022). Van persbericht tot Facebookpost: Remediatie en vertaling in Vlaamse wetenschapsnieuws koppen. *Tijdschrift voor Communicatiewetenschap*, 50(3), 210–230. <https://doi.org/10.5117/TCW2022.3.005.VERS>
- Verstappen, Marie, & Michaël Opgenhaffen. 2024a. "Creating the newsfeed: How social media editors remediate the news for Facebook and Instagram." *Journalism Practice*. doi.org/10.1080/17512786.2024.2407362
- Verstappen, Marie, & Michaël Opgenhaffen. 2024b. "Making it fit: How science news gets remediated for Facebook and Instagram." CONCLUSION 195 *Journalism Studies* 25 (9): 1010–28. doi.org/10.1080/1461670X.2023.2263799.
- Vissers, M., Paulussen, S., & De Bruijn, G.-J. (2024). Surfing the COVID-19 news waves: A Belgian case study of science communication and public relations with university press releases. *Journal of Science Communication*, 23(06). <https://doi.org/10.22323/2.23060206>
- Vissers, M., de Bruijn, G. J., & Paulussen, S. (2026). Selection and construction in the science news cycle: A Belgian case study of university press release newsworthiness during the COVID-19 pandemic. *Journalism Studies*, 1–20.
- Vögler, D., & Schäfer, M. S. (2020). Growing influence of university pr on science news coverage? A longitudinal automated content analysis of university media releases and newspaper coverage in Switzerland, 2003–2017. *International Journal of Communication*, 14, 3143–3164.
- Wozniak, A., Lück, J., & Wessler, H. (2015). Frames, stories, and images: The advantages of a multimodal approach in comparative media content research on climate change. *Environmental Communication*, 9(4), 469–490. <https://doi.org/10.1080/17524032.2014.981559>
- Yang, Y., & Hobbs, J. E. (2020). The power of stories: Narratives and information framing effects in science communication. *American Journal of Agricultural Economics*, 102(4), 1271–1296.

The Framing of Science News

Yelin, H., & Clancy, L. (2021). Doing impact work while female: Hate tweets, 'hot potatoes' and having 'enough of experts'. *European Journal of Women's Studies*, 28(2), 175-193.

Curriculum Vitae

Aike Vonk was born on 22 May 1994 in Rotterdam, the Netherlands. She completed her secondary education at the Daltonlyceum Barendrecht, followed by a Bachelor's degree in Earth Sciences at Utrecht University. After her undergraduate studies, she spent a year traveling and working as a volunteer diver in the Philippines, assisting with biological research to monitor the health of coral reefs in marine protected areas. This experience exposed her to the challenges of conservation, particularly the tensions between ecological protection and local livelihoods, and sparked her interest in science communication.

She subsequently obtained a Master's degree in Earth, Life and Climate at Utrecht University, with a focus on sedimentary systems and marine research. For her master's thesis, she conducted a research project at the Royal Netherlands Institute for Sea Research (NIOZ) on Texel, using stable isotopes to construct a food web of the Saba Bank. She also completed a minor in Science Education and Communication and developed an educational website on ocean plastic pollution, aimed at informing high school students about scientific research. Prior to starting her PhD, Aike worked for three years as a geotechnical engineer and soil advisor.

In 2021, she began her PhD at the Freudenthal Institute, Utrecht University, marking a transition from earth sciences to science communication. Her research focused on the role of scientists and organizations in communicating research to the media. She conducted both qualitative and quantitative textual analyses of press releases and newspaper articles, examining framing, narratives, and newsworthiness. She developed a churnalism formula to identify textual overlaps between press releases and newspaper articles and designed a novel visualisation method to track changes in framing between these texts. Additionally, she conducted interviews with scientists, press officers, and journalists, and based on these insights, developed a model explaining how and why ocean research is represented in newspapers.

Throughout her PhD, Aike has actively engaged in outreach and public engagement activities, communicating her research both within and beyond the academic community.

Public engagement and outreach

05-01-2026/06-02-2026 Scientist in Residence

Invited as Scientist in Residence at Teylers Museum (Haarlem) to live and work at the museum for one month while developing a public engagement activity on science communication for a new exhibition.

26-05-2024 Kennis Knetters

Participated as a scientist in the 'Feit of Fabel' show at the Kennis Knetters Science Festival, engaging children with interactive statements and explanations about misconceptions and facts related to plastic pollution.

25-1-2024 Wetenschapscommunicatie onder de loep

Organised and led the 'Wetenschapscommunicatie onder de loep' workshop and networking event (funded by The Young Academy, €4,500), bringing together scientists, press officers, and journalists to discuss how scientific research becomes news.

14-11-2023 Slimme Gasten

Science outreach volunteer in the 'Slimme Gasten' programme, developing and delivering a one-hour lecture for primary school students.

01-11-2023-22-04-2024 Hoe?Zo! Show

Participant in the 'Hoe?Zo! Show', an interactive science theatre performance for primary school students (grade 6) focused on asking questions, investigating phenomena, and explaining scientific answers.

21-11-2022 Even over morgen

Participant in the 'Even over morgen' public dialogue programme, discussing societal topics such as sustainability with library visitors.

Presentations

10-02-2026 Science for Sustainability café

Invited speaker at the Science for Sustainability Café (Utrecht University), presenting research on how ocean science moves from researchers through press offices to journalists and becomes framed as news in the media.

- 05-02-2026** **Etmaal van de Communicatie Wetenschap**
Verbal presentation titled: From publication to publicity, the role of scientists, press officers and journalists in the communication of ocean science in (Dutch) Newspapers.
- 10-11-2025** **Guest Lecturer Leiden University**
Invited guest lecturer at Leiden University's Science Communication and Society group, presenting methods for analysing framing in science communication.
- 19-06-2025** **Meet the Expert Nationaal Expertisecentrum Weetenschap & Samenleving (NEWS)**
Invited panellist in the 'Meet the Expert' science communication session on the role of press releases in connecting researchers, press officers, and journalists.
- 27-05-2025** **Public Communication of Science and Technology (PCST) Aberdeen**
Poster presentation titled: Who frames science?
- 21-01-2025** **Wetenschnapps XXL**
Speaker at Wetenschnapps XXL 2025 (Utrecht University), contributing to discussions on the pathway from press releases to (social) media and the balance between accuracy and impact in science communication.
- 08-02-2024** **Etmaal van de Communicatie Wetenschap**
Verbal presentation titled: A new visualization method for qualitative text analysis: a case study on institutional communication about ocean plastic research and its representation in the media.
- 11-04-2023** **Public Communication of Science and Technology (PCST) Rotterdam**
Poster presentation titled: The difference in framing between ocean climate change and ocean plastic, a content analysis of press releases.
- 02-02-2023** **Etmaal van de Communicatie Wetenschap**
Verbal presentation titled: Framing ocean climate change and ocean plastic in scientific press releases.

Honors and awards

- 2023** Awarded Best Poster Prize at PCST 2023 (Public Communication of Science & Technology conference, Rotterdam)

Academic service

2023/2024

Departements Advies commissie (DAC)

PhD representative on the Freudenthal Institute DAC, advising on departmental matters and representing PhD student perspectives.

2023

Organise PhD weekend Freudenthal Institute

Organised the PhD Weekend at the Freudenthal Institute, coordinating events and networking opportunities for doctoral researchers.

2022

Westerdijk committee

PhD representative on the Westerdijk Selection Committee at the Freudenthal Institute for a full professor appointment.

Scientific publications

Vonk, A. N., Bos, M., Smeets, I. and van Sebille, E. (2024). 'A comparative study of frames and narratives identified within scientific press releases on ocean climate change and ocean plastic'. *JCOM* 23(01), A01.

Vonk, A. N., Bos, M., & van Sebille, E. (2024). Journalism versus churnalism: How news factors in press releases affect journalistic processing of ocean plastic research in newspapers globally. *Journalism Studies*, 25(16), 2031–2050.

Qi, Q., Hessen, D. J., Vonk, A. N., & van der Heijden, P. G. (2025). Correspondence analysis: handling cell-wise outliers via the reconstitution algorithm. *Bulletin of Sociological Methodology/Bulletin de Méthodologie Sociologique*, 167(1), 96–122.

Vonk, A. N., Bos, M., Vergunst, N., & van Sebille, E. (2025). Copy-paste-journalistiek, een nieuwe kans in wetenschapsnieuws? De rol van universitaire persberichten bij de communicatie over het wetenschappelijk proces in krantenartikelen. *Tijdschrift voor Communicatiewetenschap*, 53(4), 366–391.

Vonk, A., Bos, M., & van Sebille, E. (2025). How frames and narratives in press releases shape newspaper science articles: the case of ocean plastic pollution. *Geoscience Communication*, 8(4), 297–317.

FI Scientific Library

- 126 Ottenheim, V. (2026). *One class, two worlds – Understanding transactional distance in hybrid learning.*
- 125 Alstein, P. (2025). *Exploring special relativity through simulation-based inquiry learning.*
- 124 Wei, H. (2025). *Hands-on: A digital-embodied path to functional thinking.*
123. Schoegje, T. (2024). *Task-based search for municipal knowledge workers –Designing and implementing specialized search functionality.*
122. Waard, E. de (2024). *Into the cycle of sustainability – Fostering students' life cycle reasoning in secondary chemistry education.*
121. Linden, A. van der (2024). *Chasing Newton – Designing and implementing an intrinsically integrated game on Newtonian mechanics.*
120. Hattinga van 't Sant, E.A. (2023). *De mythe van de alfaman - De dominantie van dominantie in de behavioural sciences, 1920-2020. Een historische reconstructie.*
119. Bachtiar, R. W. (2023). *Animated reasoning - Supporting students' mechanistic reasoning in physics by constructing stop-motion animations*
118. Harskamp, M. van (2023). *Ask, find out, and act: Fostering environmental citizenship through science education.*
117. Boels, L. (2023). *Histograms - An educational eye.*
116. Huang, L. (2022). *Inquiry-based learning in lower-secondary mathematics education in China (Beijing) and the Netherlands.*
115. Jansen, S. (2022). *Fostering students' meta-modelling knowledge regarding biological concept-process models.*
114. Pieters, M.L.M. (2022). *Between written and enacted: Curriculum development as propagation of memes. An ecological-evolutionary*

perspective on fifty years of curriculum development for upper secondary physics education in the Netherlands.

113. Veldkamp, A. (2022). *No Escape! The rise of escape rooms in secondary science education.*
112. Kamphorst, F. (2021). *Introducing special relativity in secondary education.*
111. Leendert, A.-M. J. M. van (2021). *Improving reading and comprehending mathematical expressions in Braille.*
110. Gilissen, M. G. R. (2021). *Fostering students' system thinking in secondary biology education.*
109. Dijke-Droogers, M.J.S. van (2021). *Introducing statistical inference: Design and evaluation of a learning trajectory.*
108. Wijnker, W. (2021). *The unseen potential of film for learning. Film's interest raising mechanisms explained in secondary science and mathematics education.*
107. Groothuijsen, S. (2021). *Quality and impact of practice-oriented educational research.*
106. Wal, N.J. van der (2020). *Developing techno-mathematical literacies in higher technical professional education.*
105. Tacoma, S. (2020). *Automated intelligent feedback in university statistics education.*
104. Zanten, M. van (2020). *Opportunities to learn offered by primary school mathematics textbooks in the Netherlands*
103. Walma, L. (2020). *Between Morpheus and Mary: The public debate on morphine in Dutch newspapers, 1880-1939*
102. Van der Gronde, A.G.M.P. (2019). *Systematic review methodology in biomedical evidence generation.*
101. Klein, W. (2018). *New drugs for the Dutch republic. The commodification of fever remedies in the Netherlands (c. 1650-1800).*

100. Flis, I. (2018). *Discipline through method - Recent history and philosophy of scientific psychology (1950-2018)*.
99. Hoeneveld, F. (2018). *Een vinger in de Amerikaanse pap. Fundamenteel fysisch en defensie onderzoek in Nederland tijdens de vroege Koude Oorlog*.
98. Stubbé-Albers, H. (2018). *Designing learning opportunities for the hardest to reach: Game-based mathematics learning for out-of-school children in Sudan*.
97. Dijk, G. van (2018). *Het opleiden van taalbewuste docenten natuurkunde, scheikunde en techniek: Een ontwerpgericht onderzoek*.
96. Zhao, Xiaoyan (2018). *Classroom assessment in Chinese primary school mathematics education*.
95. Laan, S. van der (2017). *Een varken voor iedereen. De modernisering van de Nederlandse varkensfokkerij in de twintigste eeuw*.
94. Vis, C. (2017). *Strengthening local curricular capacity in international development cooperation*.
93. Benedictus, F. (2017). *Reichenbach: Probability & the a priori. Has the baby been thrown out with the bathwater?*
92. Ruiten, Peter de (2016). *Het mijnwezen in Nederlands-Oost-Indië 1850- 1950*.
91. Roersch van der Hoogte, Arjo (2015). *Colonial agro-industrialism. Science, industry and the state in the Dutch Golden Alkaloid Age, 1850- 1950*.
90. Veldhuis, M. (2015). *Improving classroom assessment in primary mathematics education*.
89. Jupri, Al (2015). *The use of applets to improve Indonesian student performance in algebra*.
88. Wijaya, A. (2015). *Context-based mathematics tasks in Indonesia: Toward better practice and achievement*.
87. Klerk, S. (2015). *Galen reconsidered. Studying drug properties and the foundations of medicine in the Dutch Republic ca. 1550-1700*.

86. Krüger, J. (2014). *Actoren en factoren achter het wiskundecurriculum sinds 1600.*
85. Lijnse, P.L. (2014). *Omzien in verwondering. Een persoonlijke terugblik op 40 jaar werken in de natuurkundendidactiek.*
84. Weelie, D. van (2014). *Recontextualiseren van het concept biodiversiteit.*
83. Bakker, M. (2014). *Using mini-games for learning multiplication and division: a longitudinal effect study.*
82. Ngô Vũ Thu Hằng (2014). *Design of a social constructivism-based curriculum for primary science education in Confucian heritage culture.*
81. Sun, L. (2014). *From rhetoric to practice: enhancing environmental literacy of pupils in China.*
80. Mazereeuw, M. (2013). *The functionality of biological knowledge in the workplace. Integrating school and workplace learning about reproduction.*
79. Dierdorp, A. (2013). *Learning correlation and regression within authentic contexts.*
78. Dolging, R. (2013). *Teachers' professional development in context-based chemistry education. Strategies to support teachers in developing domain-specific expertise.*
77. Mil, M.H.W. van (2013). *Learning and teaching the molecular basis of life.*
76. Antwi, V. (2013). *Interactive teaching of mechanics in a Ghanaian university context.*
75. Smit, J. (2013). *Scaffolding language in multilingual mathematics classrooms.*
74. Stolk, M. J. (2013). *Empowering chemistry teachers for context-based education. Towards a framework for design and evaluation of a teacher professional development programme in curriculum innovations.*

73. Agung, S. (2013). *Facilitating professional development of Madrasah chemistry teachers. Analysis of its establishment in the decentralized educational system of Indonesia.*
72. Wierdsma, M. (2012). *Recontextualising cellular respiration.*
71. Peltenburg, M. (2012). *Mathematical potential of special education students.*
70. Moolenbroek, A. van (2012). *Be aware of behaviour. Learning and teaching behavioural biology in secondary education.*
69. Prins, G. T., Vos, M. A. J., & Pilot, A. (2011). *Leerlingpercepties van onderzoek & ontwerpen in het technasium.*
68. Bokhove, Chr. (2011). *Use of ICT for acquiring, practicing and assessing algebraic expertise.*
67. Boerwinkel, D. J., & Waarlo, A. J. (2011). *Genomics education for decision-making. Proceedings of the second invitational workshop on genomics education, 2-3 December 2010.*
66. Kolovou, A. (2011). *Mathematical problem solving in primary school.*
65. Meijer, M. R. (2011). *Macro-meso-micro thinking with structure-property relations for chemistry. An explorative design-based study.*
64. Kortland, J., & Klaassen, C. J. W. M. (2010). *Designing theory-based teaching-learning sequences for science. Proceedings of the symposium in honour of Piet Lijnse at the time of his retirement as professor of Physics Didactics at Utrecht University.*
63. Prins, G. T. (2010). *Teaching and learning of modelling in chemistry education. Authentic practices as contexts for learning.*
62. Boerwinkel, D. J., & Waarlo, A. J. (2010). *Rethinking science curricula in the genomics era. Proceedings of an invitational workshop.*
61. Ormel, B. J. B. (2010). *Het natuurwetenschappelijk modelleren van dynamische systemen. Naar een didactiek voor het voortgezet onderwijs.*
60. Hammann, M., Waarlo, A. J., & Boersma, K. Th. (Eds.) (2010). *The nature of research in biological education: Old and new perspectives*

on theoretical and methodological issues – A selection of papers presented at the VIIIth Conference of European Researchers in Didactics of Biology.

59. Van Nes, F. (2009). *Young children's spatial structuring ability and emerging number sense.*
58. Engelbarts, M. (2009). *Op weg naar een didactiek voor natuurkunde-experimenten op afstand. Ontwerp en evaluatie van een via internet uitvoerbaar experiment voor leerlingen uit het voortgezet onderwijs.*
57. Buijs, K. (2008). *Leren vermenigvuldigen met meercijferige getallen.*
56. Westra, R. H. V. (2008). *Learning and teaching ecosystem behaviour in secondary education: Systems thinking and modelling in authentic practices.*
55. Hovinga, D. (2007). *Ont-dekken en toe-dekken: Leren over de veelvormige relatie van mensen met natuur in NME-leertrajecten duurzame ontwikkeling.*
54. Westra, A. S. (2006). *A new approach to teaching and learning mechanics.*
53. Van Berkel, B. (2005). *The structure of school chemistry: A quest for conditions for escape.*
52. Westbroek, H. B. (2005). *Characteristics of meaningful chemistry education: The case of water quality.*
51. Doorman, L. M. (2005). *Modelling motion: from trace graphs to instantaneous change.*
50. Bakker, A. (2004). *Design research in statistics education: on symbolizing and computer tools.*
49. Verhoeff, R. P. (2003). *Towards systems thinking in cell biology education.*
48. Drijvers, P. (2003). *Learning algebra in a computer algebra environment. Design research on the understanding of the concept of parameter.*

47. Van den Boer, C. (2003). *Een zoektocht naar verklaringen voor achterblijvende prestaties van allochtone leerlingen in het wiskundeonderwijs.*
46. Boerwinkel, D. J. (2003). *Het vormfunctieperspectief als leerdoel van natuuronderwijs. Leren kijken door de ontwerpersbril.*
45. Keijzer, R. (2003). *Teaching formal mathematics in primary education. Fraction learning as mathematising process.*
44. Smits, Th. J. M. (2003). *Werken aan kwaliteitsverbetering van leerlingonderzoek: Een studie naar de ontwikkeling en het resultaat van een scholing voor docenten.*
43. Knippels, M. C. P. J. (2002). *Coping with the abstract and complex nature of genetics in biology education – The yo-yo learning and teaching strategy.*
42. Dressler, M. (2002). *Education in Israel on collaborative management of shared water resources.*
41. Van Amerom, B.A. (2002). *Reinvention of early algebra: Developmental research on the transition from arithmetic to algebra.*
40. Van Groenestijn, M. (2002). *A gateway to numeracy. A study of numeracy in adult basic education.*
39. Menne, J. J. M. (2001). *Met sprongen vooruit: een productief oefenprogramma voor zwakke rekenaars in het getalengebied tot 100 – een onderwijsexperiment.*
38. De Jong, O., Savelsbergh, E.R., & Alblas, A. (2001). *Teaching for scientific literacy: context, competency, and curriculum.*
37. Kortland, J. (2001). *A problem-posing approach to teaching decision making about the waste issue.*
36. Lijmbach, S., Broens, M., & Hovinga, D. (2000). *Duurzaamheid als leergebied; conceptuele analyse en educatieve uitwerking.*
35. Margadant-van Arcken, M., & Van den Berg, C. (2000). *Natuur in pluralistisch perspectief – Theoretisch kader en voorbeeldlesmateriaal voor het omgaan met een veelheid aan natuurbeelden.*

34. Janssen, F. J. J. M. (1999). *Ontwerpend leren in het biologieonderwijs. Uitgewerkt en beproefd voor immunologie in het voortgezet onderwijs.*
33. De Moor, E. W. A. (1999). *Van vormleer naar realistische meetkunde Een historisch-didactisch onderzoek van het meetkundeonderwijs aan kinderen van vier tot veertien jaar in Nederland gedurende de negentiende en twintigste eeuw.*
32. Van den Heuvel-Panhuizen, M., & Vermeer, H. J. (1999). *Verschillen tussen meisjes en jongens bij het vak rekenen-wiskunde op de basisschool – Eindrapport MOOJ-onderzoek.*
31. Beeftink, C. (2000). *Met het oog op integratie – Een studie over integratie van leerstof uit de natuurwetenschappelijke vakken in de tweede fase van het voortgezet onderwijs.*
30. Vollebregt, M. J. (1998). *A problem posing approach to teaching an initial particle model.*
29. Klein, A. S. (1998). *Flexibilization of mental arithmetics strategies on a different knowledge base – The empty number line in a realistic versus gradual program design.*
28. Genseberger, R. (1997). *Interessegeoriënteerd natuur- en scheikundeonderwijs – Een studie naar onderwijsontwikkeling op de Open Schoolgemeenschap Bijlmer.*
27. Kaper, W. H. (1997). *Thermodynamica leren onderwijzen.*
26. Gravemeijer, K. (1997). *The role of context and models in the development of mathematical strategies and procedures.*
25. Acampo, J. J. C. (1997). *Teaching electrochemical cells – A study on teachers' conceptions and teaching problems in secondary education.*
24. Reygel, P. C. F. (1997). *Het thema 'reproductie' in het schoolvak biologie.*
23. Roebertsen, H. (1996). *Integratie en toepassing van biologische kennis– Ontwikkeling en onderzoek van een curriculum rond het thema 'Lichaamsprocessen en Vergift'.*

22. Lijnse, P. L., & Wubbels, T. (1996). *Over natuurkundedidactiek, curriculumontwikkeling en lerarenopleiding.*
21. Buddingh', J. (1997). *Regulatie en homeostase als onderwijsthema: een biologie-didactisch onderzoek.*
20. Van Hoeve-Brouwer G. M. (1996). *Teaching structures in chemistry – An educational structure for chemical bonding.*
19. Van den Heuvel-Panhuizen, M. (1996). *Assessment and realistic mathematics education.*
18. Klaassen, C. W. J. M. (1995). *A problem-posing approach to teaching the topic of radioactivity.*
17. De Jong, O., Van Roon, P. H., & De Vos, W. (1995). *Perspectives on research in chemical education.*
16. Van Keulen, H. (1995). *Making sense – Simulation-of-research in organic chemistry education.*
15. Doorman, L. M., Drijvers, P. & Kindt, M. (1994). *De grafische rekenmachine in het wiskundeonderwijs.*
14. Gravemeijer, K. (1994). *Realistic mathematics education.*
13. Lijnse, P. L. (Ed.) (1993). *European research in science education.*
12. Zuidema, J., & Van der Gaag, L. (1993). *De volgende opgave van de computer.*
11. Gravemeijer, K., Van den Heuvel-Panhuizen, M., Van Donselaar, G., Ruesink, N., Streefland, L., Vermeulen, W., Te Woerd, E., & Van der Ploeg, D. (1993). *Methoden in het reken-wiskundeonderwijs, een rijke context voor vergelijkend onderzoek.*
10. Van der Valk, A. E. (1992). *Ontwikkeling in energieonderwijs.*
9. Streefland, L. (Ed.) (1991). *Realistic mathematics education in primary schools.*
8. Van Galen, F., Dolk, M., Feijs, E., & Jonker, V. (1991). *Interactieve video in de nascholing reken-wiskunde.*
7. Elzenga, H. E. (1991). *Kwaliteit van kwantiteit.*

6. Lijnse, P. L., Licht, P., De Vos, W., & Waarlo, A. J. (Eds.) (1990). *Relating macroscopic phenomena to microscopic particles: a central problem in secondary science education.*
5. Van Driel, J. H. (1990). *Betrokken bij evenwicht.*
4. Voegelezing, M. J. (1990). *Een onverdeelbare eenheid.*
3. Wierstra, R. F. A. (1990). *Natuurkunde-onderwijs tussen leefwereld en vakstructuur.*
2. Eijkelhof, H. M. C. (1990). *Radiation and risk in physics education.*
1. Lijnse, P. L., & De Vos, W. (Eds.) (1990). *Didactiek in perspectief.*



For many people, the media are the primary source of information about (ocean)science. What appears in the news, and how it is presented, thereby shapes which topics gain public attention and how scientific knowledge is understood and valued. This dissertation examines why peer-reviewed research appears in newspapers, how it is presented, and the roles scientists, press officers, and journalists play in this process.

Press releases play a central role in determining which studies reach the news and how they are framed. They often place scientists at the centre of the story, while the broader societal context, important for raising awareness of ocean issues, is frequently absent (Chapter 2). These press releases are effective in generating media attention, particularly when they highlight negative findings or are based on publications in prestigious journals. Including information about the scientific process, such as methods and limitations, does not reduce news value (Chapter 3).

Press releases strongly shape newspaper content. Articles often reproduce parts of press releases verbatim (Chapter 3), and include scientific details more frequently when these are present in the press release (Chapter 4). Additionally, press release framing is often copied while additional context is rarely added, and findings are seldom validated by external experts (Chapter 5). Interviews show that framing is created by the interaction between scientists, press officers and journalists, in which news values, normative motivations and institutional context all shape how science eventually reaches the public (Chapter 6).



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