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 (i.e. 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-biologic 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 1: 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.
	Consequence: Conflict	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.
	Opportunities due to ocean climate change or ocean plastic	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.
Causal interpretation	Cause: Ocean plastic	Problems or opportunities are direct- or indirectly caused by ocean plastics.
	Cause: Ocean climate change	Problems or opportunities are direct- or indirectly caused by ocean climate change.
	Actor responsible for cause	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.
Moral evaluation	Opportunities due to treatment	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.
	Actor responsible for treatment	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.
	Urgency to take action	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.
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 MPA's, decreasing overall plastic use, change of lifestyle, change of economy.

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

Frame elements	Variables[1]	Amount of press releases (N)	Occurrence of variable (n)	Krippendorphs 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
Moral Evaluation	Opportunities due to treatment	36	2	1.00
	Actor: Responsible for treatment[1,2]	180	12	0.95
	Urgency to take action	36	7	0.91
	Urgency to take action	36	7	0.91
Causal attribution	Ocean Plastic	36	9	0.93
	Ocean Climate Change	36	11	1.00
	Actor: Responsible for cause[1,2]	180	13	0.94
Treatment recommendation	Treatment	36	7	0.80
Narrative Characteristics				
Narrativity	Dramatization	36	34	0.78
	Personzalization	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
Actor Statements	Internal Scientist	36	33	1.00
	Other actor	36	1[4]	1.00
	Opinion of actor	36	15	0.89
Story Tone	Fatalistic/ Alarmist	36	2	1.00
	Negative	36	6	1.00
	Neutral	36	21	0.89
	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.

[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 3: 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	12.77%	95.32%	29.79%	42.13%
Ocean Plastic	1.82 SD= 0.81	18.18%	97.73%	28.41%	37.50%
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 4: Factor loading scores ocean climate change press releases

Component	Total	Initial Eigenvalues *% of Varience*	*Cumulative %*	Extraction Sums of Squared Loadings *Total*	*% of Varience*	*Cumulative %*	Rotation Sums of Squared loadings
1	2,824356	23,536300	23,536300	2,824356	23,536300	23,536300	2,435862
2	1,540050	12,833746	36,370046	1,540050	12,833746	36,370046	1,757901
3	1,272226	10,601884	46,971930	1,272226	10,601884	46,971930	1,684791
4	1,134546	9,454550	56,426480	1,134546	9,454550	56,426480	1,253488

Table 5: Pattern matrix ocean climate change press releases, PCA, Oblimin rotation with Kaiser Normalization

Frame Elements	*Frame Variables*	**Ocean Climate Change** Percentage %	Component 1	2	3	4
Problem definition	*Human Health*	16,60	0,197	**0,650**	-0,060	-0,324
	Economic	18,72	0,034	**0,760**	-0,101	-0,048
	Non-Biological	78,72	-0,457	**0,423**	**0,527**	0,106
	Biological	51,91	-,021	**,515**	,107	**,459**
	Treatment	5,11[1]	x	x	x	x
	Conflict	7,23	0,059	0,206	0,198	-0,486
	Opporutnity	6,38	0,092	-0,007	0,096	**0,759**
Moral evaluation	*Opporutnity 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**	0,065
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	-0,071	-0,337	**0,492**	-0,250
	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

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]. [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.

[1] Stevens, J. P. (2002). Applied multivariate statistics for the social sciences. 2002. *Hillsdale, NS: Erlbaum*.

Table 6: Structure Matrix ocean climate change press releases, PCA, Oblimin with Kaiser Normalization

Frame Elements	*Frame Variables*	**Ocean Climate Change** Percentage	Component			
Problem definition	*Human Health*	16,60	0,304	0,647	0,54	-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
	Non-Biological	51,91	,014	,555	,134	,490
	Treatment	5,11[1]	x	x	x	x
	Conflict	7,23	0,158	0,202	0,256	-0,489
	Opporutnity	6,38	0,029	0,66	0,63	0,744
Moral evaluation	*Opporutnity 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	0,23	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
	Urgency to take action	18,72	0,486	0,177	0,600	-0,122
Treatment recommendation		22,13	0,738	0,274	0,463	-0,013
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

[1] All 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 7: Factor loading scores ocean plastic press releases

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared loadings
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	
1	2,691294	20,702259	20,702259	2,691294	20,702259	20,702259	2,362450
2	2,276339	17,510303	38,212562	2,276339	17,510303	38,212562	1,920895
3	1,210590	9,312228	47,524789	1,210590	9,312228	47,524789	1,400701
4	1,201859	9,245068	56,769857	1,201859	9,245068	56,769857	2,037934
5	1,025831	7,891006	64,660863	1,025831	7,891006	64,660863	1,247326

Table 8: Pattern matrix ocean plastic press releases, PCA, Oblimin rotation with Kaiser Normalization

Frame Elements	*Frame Variables*	Ocean Plastic Percentage %	Component 1	2	3	4	5
Problem definition	*Human Health*	29,55	-,073	,030	,155	-,083	**,837**
	Economic	11,36	,171	,013	-,395	-,403	,412
	Biological	77,27	,116	,072	,036	-,597	,184
	Non-Biological	28,41	-,129	**,893**	,018	,055	,091
	Treatment	18,18	,118	-,120	-,258	**,633**	,115
	Conflict	4,55[1]	x	x	x	x	x
	Opportunity	2,27[1]	x	x	x	x	x
Moral evaluation	*Opporutnity due to treatment*	9,09	-,398	,097	,093	**,784**	,017
	Responsible for treatment:						
	Actor: Politics	11,36	,325	,152	-,241	,264	,262
	Actor: Society	22,73	**,830**	,055	,127	-,112	-,045
	Actor: Countries	4,55[1]	x	x	x	x	
	Actor: Industry	5,68[1]	x	x	x	x	
	Actor: Other	3,41[1]	x	x	x	x	
	Urgency to take action	18,18	**,777**	,235	,000	,087	,010
Treatment recommendation		43,18	**,679**	-,291	-,040	,345	-,036
Causal attribution	*Ocean plastic*	100,00[2]	x	x	x	x	x
	Climate change	20,45	,199	**,862**	-,052	-,050	-,126
	Responsible for cause:						
	Actor: Politics	1,14[1]	x	x	x	x	
	Actor: Society	23,86	,320	-,021	**,773**	-,259	,005
	Actor: Countries	13,64	,235	,016	-,603	-,225	-,398
	Actor: Industry	5,68[1]	x	x	x	x	
	Actor: Other	2,27[1]	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)[2]. [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.

[2] Stevens, J. P. (2002). Applied multivariate statistics for the social sciences. 2002. *Hillsdale, NS: Erlbaum*.

Table 9: Structure matrix ocean plastic press releases, PCA, Oblimin rotation with Kaiser Normalization

Frame Elements	*Frame Variables*	**Ocean Plastic** Percentage %	Component 1	2	3	4	5
Problem definition	*Human Health*	29,55	-,058	,153	,166	-,170	,842
	Economic	11,36	,219	,131	-,390	-,378	,453
	Biological	77,27	,076	,193	,071	-,612	,244
	Non-Biological	28,41	,024	,879	,027	-,077	,214
	Treatment	18,18	,206	-,161	-,337	,674	,060
	Conflict	4,55[1]	x	x	x	x	x
	Opportunity	2,27[1]	x	x	x	x	x
Moral evaluation	*Opportunity due to treatment*	9,09	,276	,033	-,015	,781	-,016
	Responsible for treatment:						
	Actor: Politics	11,36	,429	,213	-,324	,279	,285
	Actor: Society	22,73	,805	,197	-,002	-,050	,014
	Actor: Countries	4,55[1]	x	x	x	x	
	Actor: Industry	5,68[1]	x	x	x	x	
	Actor: Other	3,41[1]	x	x	x	x	
	Urgency to take action	18,18	,824	,353	-,140	,130	,080
Treatment recommendation		43,18	,669	-,228	-,184	,451	-,069
Causal attribution	*Ocean plastic*	100,00[2]	x	x	x	x	x
	Climate change	20,45	,338	,883	-,085	-,126	,018
	Responsible for cause:						
	Actor: Politics	1,14[1]	x	x	x	x	
	Actor: Society	23,86	,163	,059	,744	-,299	,031
	Actor: Countries	13,64	,297	,027	-,618	-,119	-,361
	Actor: Industry	5,68[1]	x	x	x	x	
	Actor: Other	2,27[1]	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 organization 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.