



Risk perception and risk realities in forming legally binding agreements: The governance of plastics

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ABSTRACT

The effectiveness of a legally binding treaty to manage plastic pollution will depend on how people perceive the risk of the problem in terms of both whether and how much they fear it. Plastic pollution caught the attention of the global public owing to uncertainty surrounding potential human health impacts. Despite an initial concern about human exposure, especially to microplastics, scientific evidence started emerging that the risks of ingesting and even inhaling microplastic was relatively small, suggesting low levels of personal risk. Still, at UNEA5 in Nairobi in 2022, a resolution was passed to start negotiations towards a legally binding agreement for the governance of plastics throughout its life cycle. We compare the trajectory of marine plastics as an environmental governance issue with other global challenges and do a comparative analysis using culture theory to assess how individual risk perception and worldviews inform collective attitudes on governance. We conclude by considering how different risk perceptions may have changed when even more knowledge became available concerning the implications of microplastics breaking down further into nanoplastics and being registered in human blood samples. We argue that this may have contributed to shifting public perception about personal risk and given the requisite push for coordinated global governance of this material.

1. Introduction

“...Just one word...Plastics...There’s a great future in plastics.” (Meikle, 1995). This was the advice given to Dustin Hoffman’s 21-year-old character Benjamin Braddock in *The Graduate* from the 1968 movie. We now know these infamous to be true words. By 2018, the annual global production of plastics had reached 359 million tons (Plasticseurope, 2019), an 8.7% annual increase from 1.7 million tons per year in 1950 (Gourmelon, 2015). Approximately 30% of all this plastic is estimated to currently still be in use. However, owing to its durability, a high proportion of the remaining 70% continues to exist in some form. This is often in the form of waste, with some of it eventually reaching the marine space (OSPAR, 2009; Geyer et al., 2017; Kubowicz and Booth, 2017; Booth et al., 2018). In fact, plastic waste has become a critical environmental challenge for ocean biodiversity (Derraik, 2002; Pawar et al., 2016; Phelan et al., 2020), as well as its cultural value in terms of

litter on beaches. Furthermore, of the top 20 plastic waste producing countries, 16 were from the Majority³ world with fast economic growth that lack waste management infrastructure (Jamebeck et al., 2015b). Given this, one would have expected faster global action towards the resolution made at UNEA 5.2 to end plastic pollution and forge an internationally legally binding agreement by 2024 that addresses the full life cycle of plastics (UNEP.org, 2022).

The road is now at least envisaged towards an encompassing global governance regime with legally binding targets to manage this environmental challenge in a coordinated effort to control the fragmented and inadequate policy responses that have taken place to mitigate it so far (Cowan and Tiller, 2021b). It’s been 25 years since the public was first outraged by the initial shocking images of the “discovery” of the Great Pacific Garbage Patch in 1997 and their initial framing as “Trash isles” (Parker, 2018). These negative associations were linked to the impacts both visually, and on wildlife, especially charismatic megafauna

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³ We sometimes choose to apply the term “Majority/Minority” world when we are unable to name specific countries, rather than other options such as Developed/Developing, Western, Global South/North, reminding the Western world that we are a small part of the global population. We understand there is great divergence in these significations of socio-political-geographical designations in the literature.

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in the marine environment – such as plastic bags in the stomachs of whales – but that did not seem to sway policy makers or individuals into moving the issue to the global negotiation stage. Why is it that some environmental challenges, like that of plastics, were not considered *enough* of an environmental challenge to warrant a comprehensive global effort, like that of closing the hole in the ozone layer or mitigating the effects of climate change? The answer may lie in the concept of *personal risk* and a perceived sacrifice that is associated with a given policy (Rudolph and Evans, 2005). The severity or seriousness of the consequences of a given event is considered the most important driver in terms of forming policy attitudes of individuals (Sjoberg, 2000).

Considering this, the current article therefore examines the individual risk perception literature, and use the cultural typology suggested by Cultural Theory specifically, to explore diverse worldviews that inform individual and collective attitudes relevant to plastics governance to assess how the formation of policy attitudes towards environmental challenges like that of plastic pollution is affected by the public's understanding of how dangerous it is at a personal level. This method has also been used previously on climate change (Pendergraft, 1998). This provides us insight into how the environmental challenge of plastics are moved to the global governance arena and deliberations towards an international legally binding instrument (ILBI) can start. We assess where risk perception for a long time fell for the plastics challenge in terms of an individuals' understanding of the product of both *knowledge* about the future and *consensus* about the most desired future scenarios within this context. We use the theoretical framework of Cultural Theory as presented by Douglas and Wildavsky (1983) to explain how individuals perceive different kinds of personal risk related to plastic pollution specifically - and whether and how they fear something, and in which case, how much they fear it. We then use the Comparative Method (Collier, 1993) to bring into focus similarities and contrasts with a different case of governance scheme that have been implemented, namely the Montreal Protocol, allowing us to sharpen our powers of description looking to a comparable phenomenon that exhibits the attributes of interest that we are considering.

We limit our analysis to the Minority⁴ world and democratic nations specifically for the purposes of this study. We also limit our analysis to the concept of personal risk perception as an agenda setting driver for plastics governance in isolation from other explanatory factors around the issue. We choose for example not to focus on the plastic producing industry as an opposing driver of keeping the issue away from getting on the agenda (Clapp, 2012), or on mitigation measures such as recycling, reducing and reusing that others have discussed before (Hopewell et al., 2009; Petzet and Heilmeyer, 2012), or enhancements of waste water treatment plants (Jambeck et al., 2015a; Freeman et al., 2020). We conclude by considering how different perceptions of personal risk may change when more knowledge becomes available concerning health implications of ingesting plastics once it breaks down further into nanoplastics. During the 2022 UNEA5.2 conference in Nairobi, the UNEA5 president, Espen Barth Eide gave a moving speech to UN delegates in his opening statement affirming that his blood had been tested in Norway and large traces of nanoplastics including ones known to cause harm to humans were found. We hypothesize that health concerns like this could be one of the factors that shifted public perception about personal risk, affecting public policy and the agenda setting processes of bringing the plastic crisis to the global table as demonstrated in Nairobi.

2. Theoretical framework

We know that plastics are an environmental crisis for ocean biodiversity, as well as cultural values by littered beaches, and how this pollution disproportionately and negatively effects the majority world who are least responsibly for its production (UNEP, 2021). Policy

makers are nevertheless faced with making difficult management decisions while weighing social and ecological concerns against each other in a political setting (Bunnefeld et al., 2011; Liu et al., 2011; Tiller et al., 2014), making assessments on what issues will reach the top of the agenda for governance purposes. They therefore often look to identify trends, assess different possible or plausible future scenarios and evaluate the information to see what changes could be critical in the future to mitigate, or prepare to adapt to, environmental challenges. For a given social or environmental challenge to be managed by policy makers, the issue has to capture their attention (Liu et al., 2011). The process by which these 'attention getting' issues are prioritized for action – bypassing that of other issues - by any state or individual policy maker is that of agenda setting (Jones and Baumgartner, 2005). Though there is a strong argument, especially considering the recent resolution passed at UNEA5.2 (UNEP.org, 2022) that plastics have already grabbed the attention of both the public and policy makers globally (Tiller et al., 2019; Cowan et al., 2021; Cowan and Tiller, 2021a), this issue had previously resulted in fragmented and uncoordinated individual governance, which are in some cases viewed as insignificant as plastics are a transboundary material. Until recently, at UNEA5.2 concrete efforts towards commencing the process towards negotiating an ILBI to curb plastic pollution were non-existent.

The concept of personal risk in given situations concerns not only the perceptions of a probability for an event happening. It also concerns our perceptions of what the consequences of this will have on a personal level, based on our experiences as well as facts (Brown, 2014). There is also a difference between *objective* and *perceived* risk. The former is based on knowledge about the issue, while the latter refers to the individual's perception thereof; and there is an unbridged gap between these two groups. When there is a substantial amount of divergent scientific literature on an environmental topic and its effect on human health, and no consensus about whether or what mitigation measures need to be taken, we may get cultural constructions of given risk events that can differ greatly within society (Adams, 1995).

Several theories consider risk perception in individuals (Ronald, 1977; Wildavsky and Dake, 1990; Johnson, 1993; Chauvin et al., 2007). For the purposes of this study, we chose to focus on the overview by Wildavsky and Dake (1990) who detail a selection of these. For example, *Knowledge theory* expects people to consider risks within their own context in terms of their own knowledge of the topic of how they perceive that the issue threatens their current situation (Johnson, 1993). *Personality theory* (Chauvin et al., 2007), on the other hand, looks at personality types to assess how risk-averse or risk-taking a given person is. For example, in a US study, white males – if we consider gender part of one's personality - were found to perceive risks to be generally much lower than other groups. The males in this study were in general also better educated, had higher incomes per household and were politically more conservative than the rest of the sample in the study, but it was their white maleness that was the explanator compared to other categories (Finucane et al., 2000). *Economic theory* ties into this, in that we expect more affluent people to be more shielded from the negative risks associated with a given situation, even experiencing potential gains from risks and therefore more willing to take them. *Post materialistic theory* also ties into this, but these are the newly rich who fear environmental pollution and chemical contamination because they value their health. In contrast to *Economic Theory*, the predictor here is that people in this group are less interested in capitalism or their own influence and more focused on health aspects (Ronald, 1977). *Political theory* grounds risks perception in interest conflicts, basing itself on political party lines and social demographics – which is similar to economic theory, where the white males had better education and higher income, and were also more politically conservative (Buttel and Flinn, 1978; Dake and Wildavsky, 1991). Finally, *Cultural theory* explains differences in risk perception in terms of the individuals themselves and how they will choose what to fear and how much to fear it based on the way of life they have chosen – which in turn is based on patterns of social relations with

⁴ Ibid

associated biases that define them. As said by Wildavsky and Dake (1990), in this theory, the "...individuals...[are]...the active organizers of their own perceptions.", and their levels of risk aversion (or not) is based on their own personal cultural biases or worldviews. We therefore use Cultural Theory for the purposes of this study, and combine this with the knowledge-consent vs. certainty-uncertainty table (Table 1) adapted from Wildavsky and Dake (1990).

The top left box represents a scenario in which individuals have both complete certainty around the knowledge about a given topic as well as complete consent within the whole group of affected individuals that this is the complete amount of knowledge. The alternatives are known, and the objectives are agreed upon, and as such, finding a solution is a matter of calculating the most efficient outcome that will ensure that the problem is solved. In the bottom left, we also have certainty concerning the problem in terms of scientific knowledge around it – but there is disagreement regarding consent and some contest the value of this knowledge with respect to the cost-benefit of the consequences of a given action. In turn, the top right category represents a scenario where there is complete consent that there is a problem, but that the knowledge about the risks of this is limited and there is insufficient information to assess it and more research is needed. Finally, the bottom right category is one when there is neither enough knowledge in place, nor consent on the cost-benefit of consequences. Different social relations groups fall into different groups in this table when it comes to perceptions of personal risk around environmental issues. We then use the comparative method to assess the case of the path towards the recent plastics governance resolution against different governance schemes for other environmental issues where some form of risk perception has led them to reach the global governance arena. Finally, we couple this with Cultural theory and consider individual risk perception within the context of the four patterns of social relations identified by the theoretical framework presented by Wildavsky and Dake (1990): hierarchical, egalitarian, individualistic and fatalistic. Those individuals that adhere to (a) hierarchical social relations place emphasis on hierarchy in society. The argument is that if nature is properly managed, it will be good to humans, and that this is established by facts. They also have strong faith in strict regulatory and safety regulations within this hierarchical pattern of social relations. On the other hand, those that belong to (b) egalitarian social relations place emphasis the precautionary principle and the fragility of nature and how we need to share our resources. In terms of (c) individualistic social relations, people in this group are characterized by self-regulation and the freedom to bid and bargain. They consider nature to be cornucopian, or a "horn of plenty". Nature, to these individuals, is stable and robust and only limits to exploitation through for example regulations stops us from reaching the full potential of nature. They place a lot of trust in institutions and businesses as governance owners and place the burden on these to interfere so that they can control and compensate if there are challenges on the way, for example uncertainty around safety. Finally, adherents of (d) fatalistic social relations see no point in getting politically involved and rarely

Table 1

Risk perception, problems and solutions as products of knowledge and consent adapted from Wildavsky and Dake (1990) "Four Problems of Risk". The term "consent" is used by the original authors. We understand it as having the meaning of "consensus" or "agreement". However, generally, we understand that "consent" implies a lack of objection, whereas "consensus" is an active agreement to something.

		Knowledge	
		Certain	Uncertain
Consent	Complete	Problem: Technical Solution: Calculation	Problem: Information Solution: Research
	Contested	Problem: (dis)Agreement Solution: Coercion or discussion	Problem: Knowledge and consent Solution: ?

participate in public debates, considering nature to be unpredictable and human life to be unforeseeable and a lottery over which we have no control. We discuss how these patterns of social relations apply to the plastic litter narratives to see how these have influenced the move towards the mandate to start negotiations towards a treaty for plastics governance across its entire life cycle as seen in Nairobi in March 2022.

3. Global plastics governance

Articles on the governance of plastics are many and detailed, and an overview of the various initiatives and fragmented governance responses and mitigation measures around these are meticulously studied elsewhere (Borrelle et al., 2017; Löhr et al., 2017; Xanthos and Walker, 2017; Dauvergne, 2018b, 2018c; Haward, 2018; Lam et al., 2018; Mendenhall, 2018; Ogunola et al., 2018; Raubenheimer and Mcilgorm, 2018; Raubenheimer et al., 2018; Schuyler et al., 2018; Tiller and Nyman, 2018; Vince and Hardesty, 2018; Cowan and Tiller, 2021a). A common theme throughout the literature was how the international laws and agreements that have been developed this far have failed to match the scale and severity of plastic pollution (Chen, 2015; Dauvergne, 2018c; Haward, Vince and Hardesty, 2018; Schröder and Chillcott, 2019).

The field of uncoordinated multilevel – and largely unsuccessful – governance of plastics we have seen thus far, however, did in fact lead to increasing calls and suggestions for architectures of a comprehensive ILBI - such as a treaty - to govern plastics at the global level. The aspiration for such a treaty, which the UN international committee will now start negotiations towards, is that it will lead to efficient enforcement and measurable targets throughout the life cycle of plastics, and encourage compliance and a corresponding reduction in plastic pollution (Gold et al., 2014; Raubenheimer and Mcilgorm, 2017; Vince and Hardesty, 2018). Though ILBIs and agreements with a global reach are considered by some as only thirty percent solutions (Bodansky, 2010) in terms of their actual effectiveness, the new treaty has the ambition to be adopted in 2024, and could still be a solution in terms of uniting the many initiatives around plastics around the world even if some argue that international law "...encourages and enables, but does not require, cooperation". An ILBI on plastics will still play an important role in shaping agreements that have state sovereignty as a given and work towards building scientific and normative consensus, addressing compliance issues related to trust (or lack thereof) and in capacity building for developing states for example (Bodansky, 2010; Selin, 2014).

To what degree did individual perceptions of risk and fear of plastics push policy makers at the national level to commit to demand negotiations towards a global treaty? And what can we learn from using the comparative method to look at an already existing and arguably successful agreement on other environmental challenges in these regards, and the types of social relations that drove risk in that case, within the framework of Culture Theory? Although some are skeptical of the degree to which international law in and of itself is even something to strive for given its lack of rigor, there are still examples of global environmental agreements that are considered effective, and that were pushed through via public individual perceptions of fear for own health. In fact, authors on plastics governance have already argued that for significant changes to be able to occur, a treaty such as the one that will now start being negotiated, would have to be on the scale of the Montreal Protocol on Substances that Deplete the Ozone Layer (Gold et al., 2014; Chen, 2015; Haward, 2018).

The Montreal Protocol is an infamous and oft-cited international agreement that is considered successful, even dubbed the "...world's most successful multilateral treaty..." (Persson and Dastidar, 2013), and is as such a much coveted case for comparison (Desombre, 2000; Green, 2009; Raubenheimer and Mcilgorm, 2017). The origin of this agreement comes from publication of the first scientific papers on ozone depletion resulting from ozone-depleting substances such as chlorofluorocarbons

(CFCs) (Molina and Rowland, 1974). The “hole” in the atmospheric ozone layer led to global public outrage at the time because of the fear of millions of new skin cancer patients and other human health effects (e.g. infectious diseases, suppression of the immune system and eye disorders). The human health risks associated with a decrease in the protective ozone layer led to the topic of ozone depletion being taken seriously in public and political arenas relatively quickly (Morrisette, 1989) (Fig. 1). This demonstrates how environmental norms gained strength and diffused as scientific evidence of the negative effects mounted (Haas, 1992; Dauvergne, 2018a), but arguably also because the hazards or effects of the environmental challenge were evenly distributed and did not differentiate between minority and majority nations. This agenda setting for ameliorating the hole in the ozone layer even came about *despite* the anti-regulatory campaigns conducted by the CFC-producing industries and industries using CFCs in the United States. By the mid- to late 1970 s, several countries had in fact banned the use of CFCs in aerosols, including the United States, Canada, Sweden, Norway and Denmark (Morrisette, 1989) – minority nations that all used these products. In 1985, the *Vienna Convention for the Protection of the Ozone Layer* was ratified by 193 parties and officially declared that there was a need for the global community to protect the ozone layer, though there were no obligations yet with regards to mitigating the use and production of CFCs. The door was left open, however, to resume negotiations. Soon afterwards the Antarctic ozone hole was discovered (Farman et al., 1985), increasing public fear even more and leading to a new sense of urgency. This put greater pressure on both individual states and global arenas, which led to negotiations resuming.

The Montreal Protocol on Substances that Deplete the Ozone Layer was signed two years later in 1987 (Mitchell, 2017), making it the first global environmental treaty addressing an environmental challenge considered as still only theoretical (Desombre, 2000). This is because the cause of the Antarctic ozone hole had not yet been scientifically proven at the time of the Montreal Protocol. Nevertheless, being able to visualize the hole using model simulations was a powerful symbol that had a significant impact on galvanizing public opinion at the global level on the importance of banning CFCs, moving the treaty to its ratification (Morrisette, 1989). Ironically, there was never an actual “hole” in the ozone layer above the Antarctic, as the term was used as a metaphor to describe areas where ozone concentrations had fallen below historical thresholds. It was simply the choice of scientists to visualize the depletion as a hole that achieved the effect of public outcry. The Montreal Protocol was the first international agreement that aimed to solve a global atmospheric challenge (Velders et al., 2007), with the specific goal of a 50% reduction in consumption and production of CFCs by 1999, but with a 10 year grace period granted to majority nations. The ratification of the Montreal protocol, however, led to 90% of global CFC

production being eradicated within a decade (Solomon, 2004). The area and depth of the Antarctic ozone “hole” has since stabilized, and scientists predict that it will recover to a natural state around 2040 (Lindsey, 2016). This metaphorical “hole” in the ozone layer was the catalyst, or perturbation, that pushed the international community from the non-committal, though not unusual, language of the initial Vienna Convention to the new and successful Montreal Protocol. This drove public individual risk perception and influenced institutional change by galvanizing world opinion of its importance (see discussion section for the “hole” in this argument in terms of knowledge). Since the adoption of the Montreal Protocol in 1987 and its entering into force in 1989, it has been ratified by 193 nations.

4. Discussion

Considering this comparative case of a successful governance arrangement for a specific environmental issue, we discuss the context of a plastic treaty and assess where in the knowledge-consent geography the plastics and ozone discussion fall. Recalling Table 1 and the four patterns of social relations influencing a given individual’s perception of risk, namely hierarchical, egalitarian, individualistic and fatalistic (Wildavsky and Dake, 1990), we apply the theoretical framework to these two agreements (plastics and ozone) and include other more recent examples of human health issues and global environmental issues, such as the COVID-19 virus pandemic, parabens and the UNFCCC as well (Table 2).

We stated that the top left box represents a scenario in which there is certainty around the knowledge about a given topic and that we have complete consent about this as well. The alternatives are known, and the objectives are agreed upon, and as such, finding a solution is a matter of calculating the most efficient and effective way to ensure that the problem is solved. We argue that, to a large extent, this was the case of the hole in the ozone layer with the resultant Montreal Protocol, though arguable, the “hole” in this argument lies in the fact that this knowledge in fact still is only hypothetical. However, individuals were convinced by the arguments as factual and perceived the knowledge to in fact be certain. They considered that the problem was technical in terms of solutions, and that product development innovations were critical for problem framing and the solutions being around the calculation on how to solve it. However, one may argue that since knowledge in fact was not certain it belonged to the top right column as well.

In the bottom left box, there is certainty around the problem in terms of scientific knowledge– but there is disagreement regarding consent and some contest the value of this knowledge with respect to cost benefit analysis of the consequences of a given action. In lack of a better example, we chose Covid-19 to represent this scenario. In this case, individuals know that there was a global pandemic and that it was killing

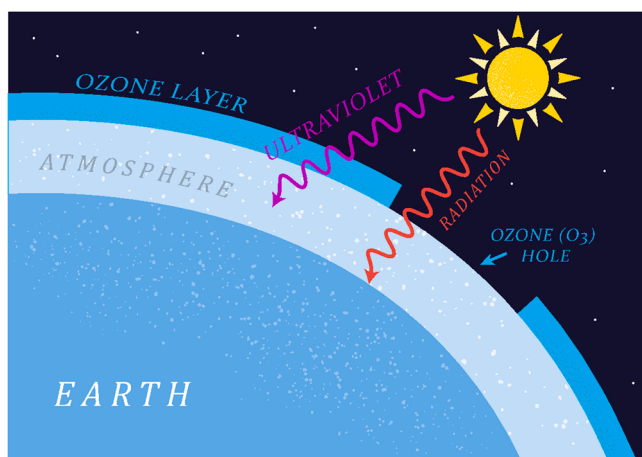


Fig. 1. The ozone layer Copyright: Adobe Stock, licensed for use.

Table 2
The 2 × 2 cross table of consent and knowledge and how it applies to the cases presented in this article, and other known challenges.

		Knowledge	
		Certainty	Uncertainty
Consent	Complete	Problem: Technical Example: Hole in the ozone layer Solution: Calculation Example: Montreal protocol	Problem: Information Example: Plastic pollution, Parabens Solution: Research
	Contested	Problem: (dis)Agreement Example: Covid-19 Solution: Coercion or discussion Example: Complete lockdowns in some countries (Italy) and limited in others (Sweden)	Problem: Knowledge and consent Example: Climate Change Solution: ? Example: IPCC, Paris Agreement, Nationally Determined Contributions (NDC)

people, but there was disagreement about how big of a problem this was in different areas/countries, whether the impacts to the economy was more important and how best to respond. Some countries implemented economically damaging coerced shutdowns (e.g. China), whereas other countries (e.g. Sweden) implemented limited or partial shutdowns that led to higher rates of mortality in the shorter-term.

The top right box represents a scenario where there is complete consent that there is a problem, but that the knowledge about the risks of this are limited, that there is insufficient information to assess the risks and that more research is needed to address the knowledge gaps. We argue this is where both the case of parabens and that of plastics is currently located and why there is not yet an encompassing treaty for either and that the solution is further research to assess to what degree they represent a risk for human populations. Parabenes are an industrial class of chemicals, widely used as antimicrobial and antifungal additives in many cosmetic and pharmaceutical consumer products, as well as preservatives in some foodstuffs, to prevent certain ingredients from rapidly biodegrading and spoiling the product. Although knowledge about the effects of exposure to parabens is still limited, including how it is distributed, taken up and excreted by humans, studies have shown reduced testosterone levels and lower sperm counts in male rats and that parabens may increase the risk of breast cancer if exposure occurs in critical developmental stages. Exposure primarily comes via the topical use of products that contain parabens, including skin creams and soaps, where they are absorbed via the skin before being excreted via urine (Tade et al., 2018). Scientific evidence with regards to detrimental human health impacts, like that envisaged with the metaphorical hole in the ozone layer, have as such been debated both for parabens and for plastics, but the human health implications have been uncertain to the public (Davison et al., 2021; Vethaak and Legler, 2021). For the case of plastics, the certainty around knowledge pertaining to personal risk was at the time of original writing of this article was still not strong enough to drive the public to demand immediate action, as was the case of the Montreal Protocol.

Finally, the bottom right box represents the scenario where there is neither enough knowledge in place, nor consent on the cost-benefit of consequences; we argue that this is where the United Nations Framework Convention on Climate Change (UNFCCC) is fits most appropriately. Though there is no clear-cut solution to a challenge where there is insufficient consent or knowledge, one of the actions that the global community put in place was that of establishing the Intergovernmental Panel on Climate Change (IPCC) to prepare comprehensive scientific, technical and socio-economic knowledge about climate change and its impacts. However, some argue that the enormous gravity of the situation and fear of the consequences of climate change is driving a fight-or-flight response in the public, resulting in their avoidance of the issue because they feel they are unable to take actions that have impact (McAfee et al., 2019).

We then consider the knowledge-consent table within the context of the patterns of social relations influencing a given individual's perception of risk from culture theory, to assess where we are in terms of risk perception and who is driving the narrative towards treaty negotiations for plastics. Individuals falling into the group of *hierarchical* social relations place emphasis on hierarchy in society, that if nature is properly managed it will be good to humans and this is established by facts. They also have strong faith in strict safety regulations within this hierarchical pattern of social relations. In terms of plastics risk perception, this implies that those belonging to this social relation group would be proponents of global regulations established by facts and that a regulatory mechanism that could ensure safety for humans would be beneficial. We argue that those adhering to this group would want there to be a top-down governance process, with an ILBI acting as an umbrella governing institution that could oversee a fragmented field currently without clear leadership in terms of plastics governance. If these things are in place, their perception of risk would be low, and as such, one would expect that if this was the group that was pushing the public agenda,

there would be a greater push towards a global treaty.

Plastics governance narratives as we have seen them thus far could also have been driven by *egalitarian* social relations to a certain extent. This group places emphasis the precautionary principle and the fragility of nature and how we need to share our resources, including capacity building and funding mechanisms (e.g. reduced consumerism and improved waste management in this case). This narrative is representative of those we often find in discussions around resource extraction topics such as the common heritage of mankind, seabed mining and marine genetic resources, rather than in a case where there is an environmental challenge that needs to be solved such as governing plastic waste (Tiller et al., 2020). This could also explain the low number of calls for egalitarian options when it comes to plastics governance. However, elements of egalitarianism are included in some of the initiatives that are presented as solutions for plastics challenges, especially in terms of the 2018 World Bank release of the PROBLUE multi-donor trust fund (US \$75 million). This fund, which is one of many public-private blue economy initiatives globally, promotes investments for economic growth in ocean frontiers by way of major infrastructure developments and governance within a blue economy framework, and includes as one of its pillars marine pollution and plastics and stopping the flow of plastics into the sea (Satizábal et al., 2020).

In terms of (c) *individualistic* social relations, recall that key words include 'self-regulation' and 'freedom to bid and bargain'. The context for this relation is that they consider nature to be cornucopian, stable and robust and that if there were no limits to exploitation of resources with respect to regulations, for example, the full potential of nature could be reached. They place a lot of trust in institutions and businesses as governance owners and place the burden on these to interfere so that they can control and compensate if there are challenges, such as uncertainty around safety for example, along the way. We would argue that this is the rhetoric of plastics governance in many arenas and could be contended as the reason why it took so long to begin negotiations on a plastic agreement. Nations are self-regulating plastics to the extent they can or want to. Businesses are also self-regulating, often in response to public pressure over a specific environmental concern. In the case of plastics, they often use the #CleanSeas hashtag or other initiatives to market their 'green credentials' to consumers and there is a clear push towards a private-public ownership of the challenges that we face in terms of marine pollution. In addition to high level initiatives such as the United Nations Environment Programme (UNEP) Global CleanSeas Strategy, UNEP's 2018 Global Plastics Platform, the G7 Oceans Plastics Charter published in 2018 (G7, 2018; Walker and Xanthos, 2018), the World Economic Forum's panel on ocean sustainability, the World Bank Group's PROBLUE Multi-Donor Trust Fund (MDTF) and the UN Global Compact Sustainable Ocean Business Action Platform (UN Global Compact 2018; World Bank, 2018), there are also others that involve the private sector. One example is the Ocean Plastic Charter from the summer of 2018, adopted by Canada, France, Germany, Italy, the UK and the EU. This charter laid the groundwork for reuse and recycling of plastics and ensured plastics stewardship, with members from governments, international organizations, and corporations. Later in the 2018, the New Plastic Economy Global Commitment was also launched, where over 400 signatories put into place several policy measures, including bans and incentives for research and development. In this case too, industry and key stakeholders were invited to participate in designing the future of plastics governance. Then, in 2019, the Alliance to End Plastic Waste was launched, with more than 40 companies actively participating. In this alliance, the public-private governance collaboration was shown by all signatories pledging to collaborate with community, government, and civil society to make a world with less plastic waste more possible to achieve.

Finally, the (d) *fatalistic* social relation, a group that sees no point in getting politically involved and rarely participate in public debates, considers nature to be unpredictable and human life to be unforeseeable and a lottery over which we have no control. As a result, this group

seldom drives policy and we have no expectation that they would play a significant role in the plastics governance debates either.

5. Conclusion

The momentum on narratives around plastic pollution has been building up over time. This contrasts with the immediate shock factor like a hole in the ozone layer leading to increases in the incidences of skin cancer as the driving force of agenda setting at the global level. The development of *The Montreal Protocol* bore many similarities to the plastics narratives and could be considered a prime example of a pathway for addressing the global challenge of plastic pollution: impactful visualization of a problem that leads to global public outcry and a subsequent demand for action. Such graphic images depicting the effects of plastic, not only on beaches and roadsides, but also charismatic fauna such as the infamous seahorse carrying a cotton swab (Fig. 2) or the sea turtle with the plastic straw up its nose, are widely spread on social media. The case of the turtle has, for example, received more than 33 million views on YouTube (Figgenger, 2018) and contributed to a public clamour that has pushed the topic of marine plastics to the top of the political agenda of many nations, in line with evidence suggesting the importance of images as drivers of policy makers attentions (Jenner, 2012). Yet, there remains a critical difference between these two environmental issues from a risk perception perspective in that depletion of the ozone layer had clear risks for human health, whereas the risks with plastic litter have been increasingly moving away from the marine environment only, and right into local communities on the ground.

For the case of plastics, we have seen independent national-level bans implemented and we have seen companies self-regulating, often without a robust risk assessment to justify these changes. Furthermore, the national bans and industrial self-regulation typically focus on *low hanging fruit*, where change is easy, but the overall impact is small. Microbeads, for example, are easily replaced by natural materials, but they represent only a tiny fraction of the plastic entering the ocean. In the case of plastics, we are yet to see the fundamental changes necessary to significantly reduce emissions to local environment though, and the move to negotiations will have to take enormous steps fast to catch up with emissions. We suggest the lack of action to date, from states, due to a number of factors, including lack of suitable and cost-effective alternative materials, consumerism and the 'throw away culture'. While bioplastics and biodegradable plastics *have* been proposed as solutions, both represent their own challenges (Kubowicz and Booth, 2017; Booth et al., 2018). Bioplastics, for example, are derived from crops that compete with food crops for available land and are typically comprised of the exact same polymers made from fossil fuels (e.g. polyethylene, polypropylene, polystyrene etc). Biodegradable plastics on the other hand are often *still* derived from fossil fuels and require specialist waste streams and waste handling as they do not meet circular economy requirements and are ultimately designed to be degraded into CO₂

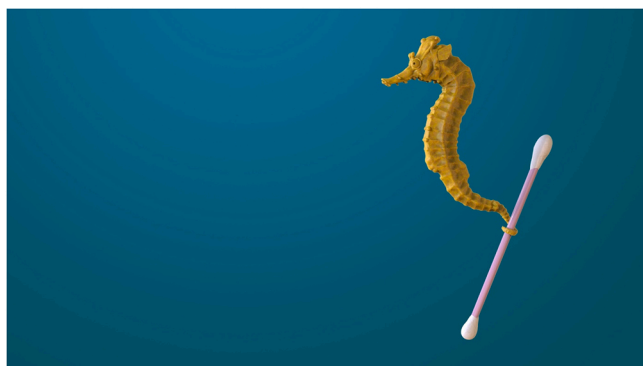


Fig. 2. Render sculpt 3d Side view of a Common yellow Seahorse with swabs. Licensed through Adobe stock.

(contributing to climate change).

We also see that there has been a slow build-up of risk perception around plastics, characterized by regional differences in terms of governance restrictions and with private companies taking independent action in response to consumer demands rather than there being concrete government action most places around the world. Furthermore, we see the EU has been taking a leading role in minority nations, in terms of implementing SUP plastic bans. However, it was in majority world nations where plastic bans started such as Rwanda and Kenya, where as a result of the mass heaps of plastic being shipped to them with no place to be properly disposed. These bans are so much so enforced that having a plastic bag in Kenya is punishable to up to four years in prison. As it is, governance of plastics has been sporadic depending on the country and consisted of a patchwork of private and public actions rather than internationally coordinated levels of planning. This is in line with an individualist social relation that does not perceive either issue as a concrete risk at present because they are taken care of at many different levels of analysis from both private and public sector actors.

We argue, that when we consider the further degradation of plastics into micro- and even nanoplastic, this may have been something that contributed to push the plastics treaty negotiations into the "complete consent" and "knowledge certainty" category where the Montreal protocol is located and contribute to its success as a treaty once implemented. While plastic particles in this size range are only beginning to be studied in detail and there has been little attention in the media, one might expect that risk perceptions of plastic pollution may shift since, in this size range, nanoplastic particles have the potential to be very mobile in the environment (especially in the air) and, importantly, are small enough to pass across biological membranes, meaning that they accumulate in the tissues of organisms, including humans as demonstrated by the UNEA 5 president in 2022, who referred to having had his blood taken and traces of chemicals related to plastics were detected, including chemicals known to be harmful to humans. He then said "...*The oceans and air move plastic all around - make no mistake it's not that my blood is unusual - the plastic cup you deposited of years ago could be the source.*" (Eide, 2022). Although we don't fully understand the full effects of nanoplastics or plastics related chemicals in our blood, it has the potential to be a game changer in the public's perception of risk related to plastic pollution in terms of personal risk moving forward.

However, for plastics, despite the lack of certain knowledge about personal risk yet related to nanoplastics, it was the *hierarchical* social relations that had the greatest power in pushing the international agenda on plastics in the end. Recall that this group places emphasis on hierarchy in society, that if nature is properly managed it will be good to humans and this is established by facts. They also have strong faith in strict safety regulations within this hierarchical pattern of social relations. In terms of plastics risk perception, this implies that those belonging to this social relation group would be proponents of global regulations established by facts and that a regulatory mechanism that could ensure safety for humans would be beneficial. We argue that those adhering to this group would want there to be a top-down governance process, with an ILBI acting as an umbrella governing institution that could oversee a fragmented field currently without clear leadership in terms of plastics governance. Which is what we saw on March 2nd, 2022, when the road towards an ILBI was adopted and will consider the full life cycle of plastics. This resolution mainly stemmed from the LB draft text presented before UNEA5 by Rwanda & Peru.⁵ After intense negotiations of the text the week before UNEA5, it was finally endorsed by 175 UN MS with the ambitious goal to have a treaty on plastics by the end of 2024. Now that the draft LBI is in the hands of the INC, an important recollection formed during UNEA5 was the need for

⁵ The draft resolution text was also co-sponsored by Chile, Costa Rica, Ecuador, the EU and its MS, Columbia, Guinea, Kenya, Madagascar, Norway, Philippines, Senegal, Switzerland, United Kingdom, and Uganda.

stakeholders from NGO, science, and industry to have their input heard throughout the treaties negotiation process.

CRedit authorship contribution statement

Rachel Tiller: Conceptualization, Methodology, Investigation, Writing – original draft, Writing – review & editing. **Andy Booth:** Writing – original draft, Writing – review & editing. **Emily Cowan:** Investigation, Data curation, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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