# Consumer Risk Perceptions about (Micro)Plastics in Food and Water

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Picture credit: Juan Baztan



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# Conflicts of Interest

None (100% university-employed academic)

**Collaborations** with and **talks** for science, public, government, NGOs, industry and mixed groups

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# EU public perceptions of threat from Marine Litter (data ~ 2012)

Marine Litter in European Seas - Social Awareness and Co-Responsibility

MARLISCO
Stopping Marine Litter Together


Hartley et al., 2018, Marine Pollution Bulletin (EU public, N ~1,100, *not a representative sample*)

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European Centre for Environment & Human Health

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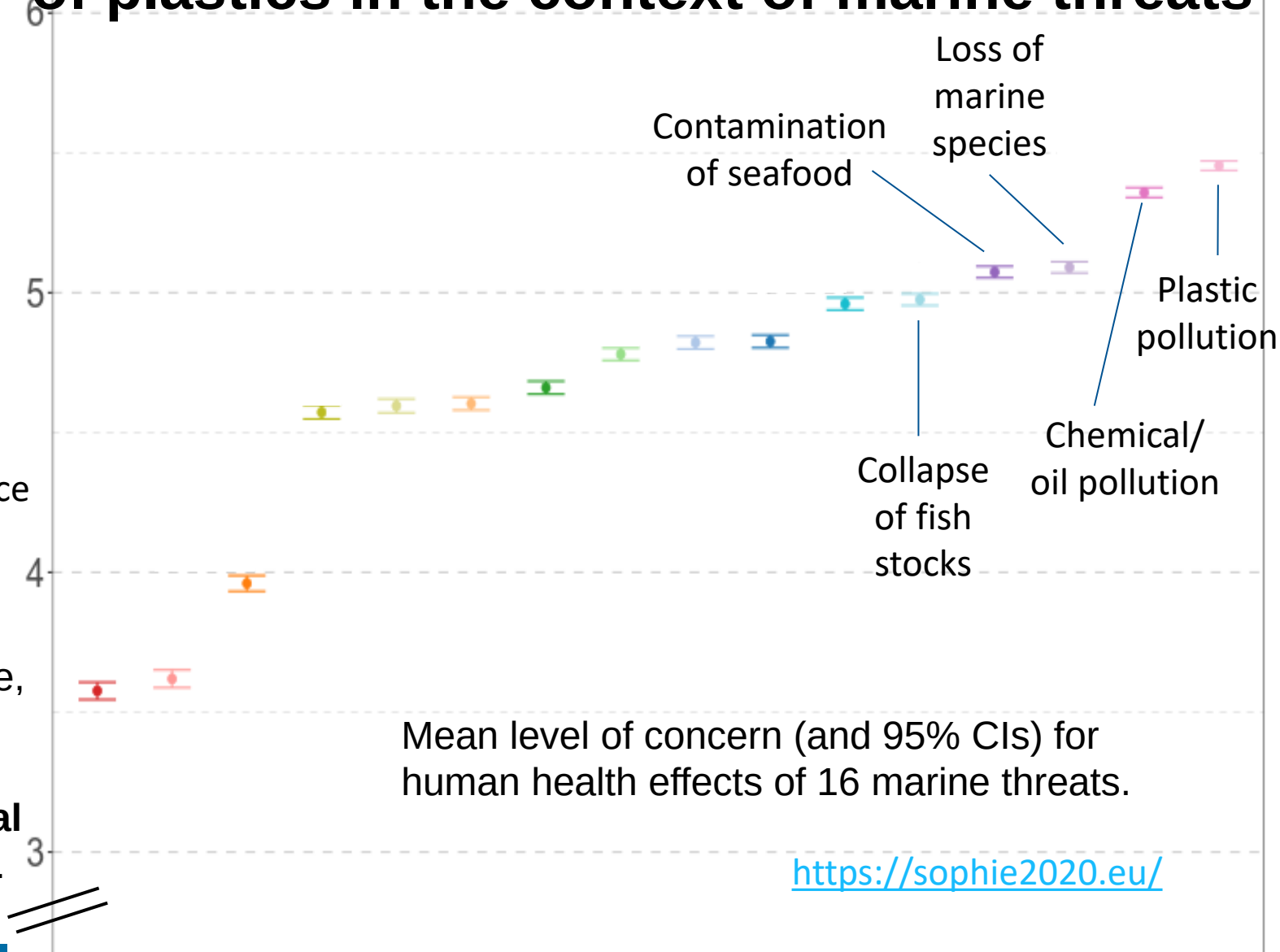
Seas, Oceans & Public Health in Europe
Linking oceans and health research

# EU public concern about human health impacts of plastics in the context of marine threats

0 = not at all concerned;
6 = extremely concerned

Same pattern across 13 countries; for Poland & Greece 1&2 reversed




Mean level of concern (and 95% CIs) for human health effects of 16 marine threats.

Davison, White, Pahl et al., **Global Environmental Change, 2021**

https://sophie2020.eu/

N > 15,000 Europe +

Potential marine threat (highest to lowest in order of concern)

- 5 Plastic pollution
- 15 Chemical/oil pollution
- 3 Loss of marine species
- 14 Contamination of seafood
- 9 Collapse of fish stocks
- 1 Human & animal sewage in bathing waters
- 13 Drug-resistant microbes in seawater
- 4 Ocean acidification
- 11 Harmful algae
- 6 Coastal overdevelopment
- 12 Invasive marine species
- 2 Sea-level rise
- 16 Flooding & storms
- 10 Jellyfish swarms
- 8 Drowning
- 7 Sunburn & sunstroke

# Exploring UK perceptions of MP in cosmetics -> food

| | Beauticians | Students | Environmentalists |
|---|---|---|---|
| **First response** | *"**Oh my god**"* | *"seems a bit fake"; " weird"* | *"**Oh my god**"; "**Oh my goodness**"* |
| **Thoughts on general impact** | *"**it's quite dangerous** for the world around us basically"* | *"**Does it** physically harm the fish? Obviously I know it's in their stomach but **does it** like poison them or something?"* | [already talked about impact before] |
| **Thoughts on human health** | n/a | *Concerns about **MP in seafood**:*<br>*Get digested by animals. (S)*<br>*And then you eat the animals. (S)*<br>*You're eating those. (S)*<br>*Cos you can't afford to eat plastic can you? (S)* | *[…]so that was a moment for me of just thinking that zooplankton, that's the beginning of the **food chain**. (E)* |

**+ Competing issues**

Anderson, Grose, Pahl, Thompson & Wyles, Marine Pollution Bulletin, 2016

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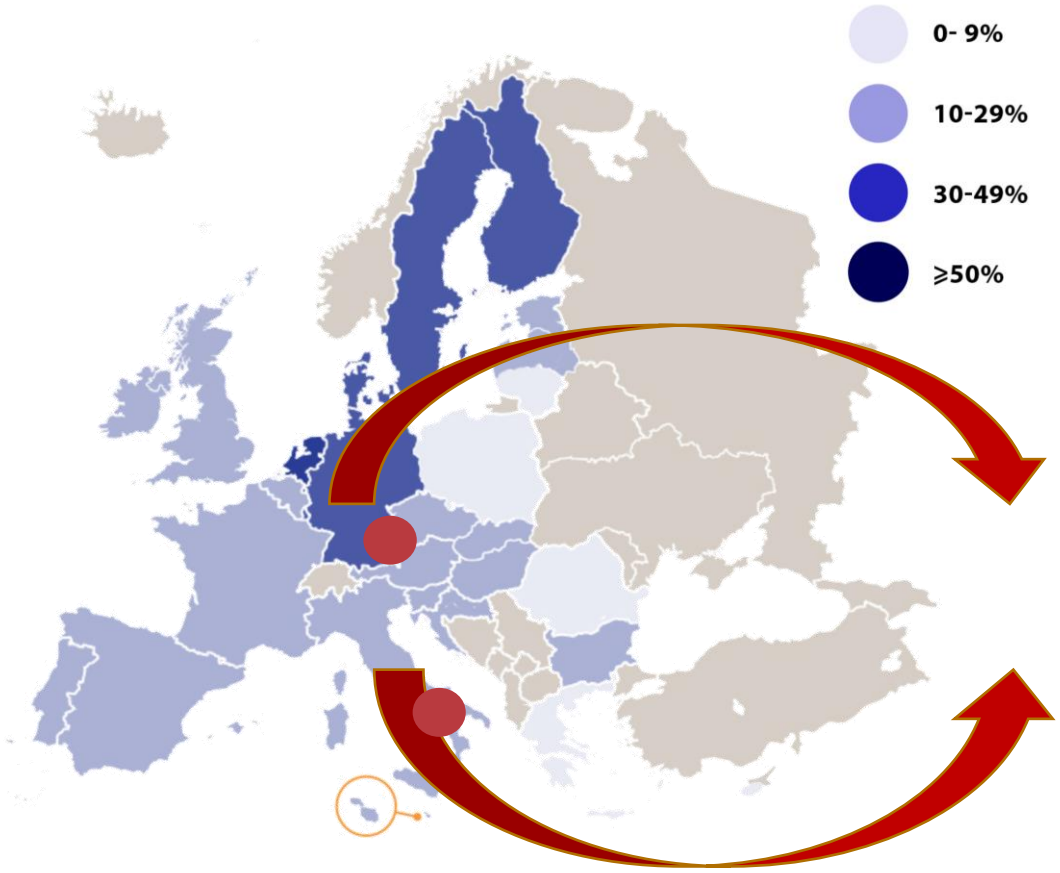
# Microplastics & Food Study in progress – preliminary findings

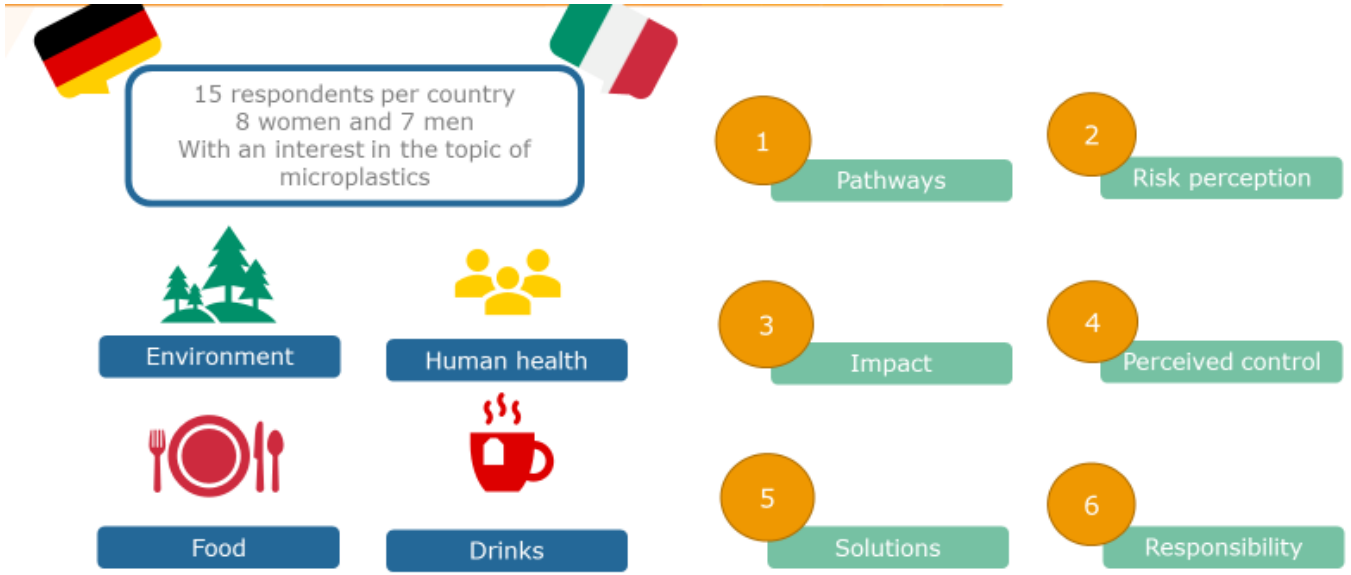



Colours represent % of citizens who are concerned about microplastics found in food according to Eurobarometer, see https://www.efsa.europa.eu/en/interactive-pages/eurobarometer-2019

**Joint BfR-EFSA research project on understanding perceptions of microplastics and improvement of risk communications**

(under Framework Partnership Agreement)

Social Science Research Team




Methodological framework
**Mental Models Approach**

# Phase 1 | Preliminary interviews findings

**1. Microplastics perceived as small, artificial/man-made, and chemical → harmful and worrying**

"So, plastics are the objects created for everyday use, microplastics I think are more **something related to chemistry**, so **they are not perceptible to the eye**, so they are **hidden**, you don't see them but you know they are there."

**2. Microplastics mentally associated with other environmental issues, human health, and food safety**

"No, I haven't come across this subject, but I can draw an **analogy with asbestos cement**, which was used on a massive scale in the 1950s and 1960s, only to discover decades later that it is carcinogenic."

**3. Microplastics found in "blue" environments, food, drinking water and commercial products (e.g., cosmetics)**

"In my opinion there is a correlation between a **high temperature and what is the container that is wrapping the liquid** and that slowly obviously ends up with the liquid itself."

**4. Impact of microplastics perceived as negative for both environment and human health**

"They make a mess, unfortunately yes, like anything unnatural you put in a person's body, then they cause **disease, leukaemia, cancer, plastic is carcinogenic**."

**5. Low perceived control over microplastics spread, except for personal buying choices/habits**

"I think **we don't have the control**, it's so widespread now that how do we control that in that little **bottle of water** there's none? Or in that fountain, or in the **fruit, the fish, the meat we eat**, that there's no residue?"

**6. Responsibility lies with governments (awareness raising, ban) and industries (production change)**

"In my opinion, it certainly has to start at **government level**, and then attention will be paid to the individual, but first it has to start at **national and European level**, and the various countries have to focus on this and perhaps finance **recycling projects**."

# Phase 2 | Survey (Planned)

- Awareness and Knowledge
- Concern and Media coverage
- Perceived sources/exposure/impact
- Behavioural intentions
- Perceived responsibility
- Information needs
- Demographics and Individual characteristics

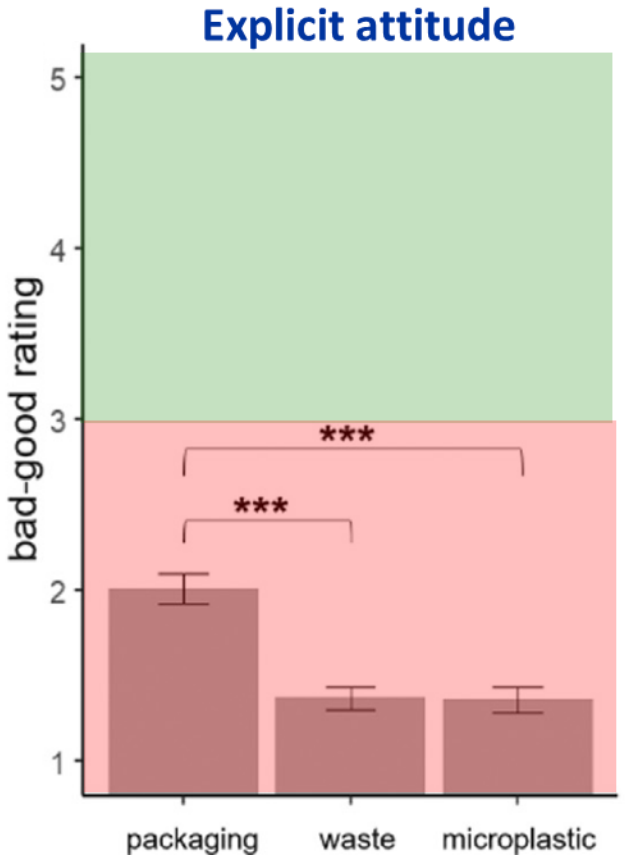
# Menzel et al. (2021) Implicit and explicit attitudes towards plastic in D

**Consumers have „love-hate relationship“ with plastic**

Test different representations of plastic against each other: **packaging, pollution, microplastic**

- **Implicit and explicit methods**
- *Explicit* = Rating (1=bad; 5=good)

**Study 1: Bad-Good**




N = 103 convenience sample, mostly young females

Menzel et al. (2021), Sustainable Production and Consumption. https://doi.org/10.1016/j.spc.2021.08.016

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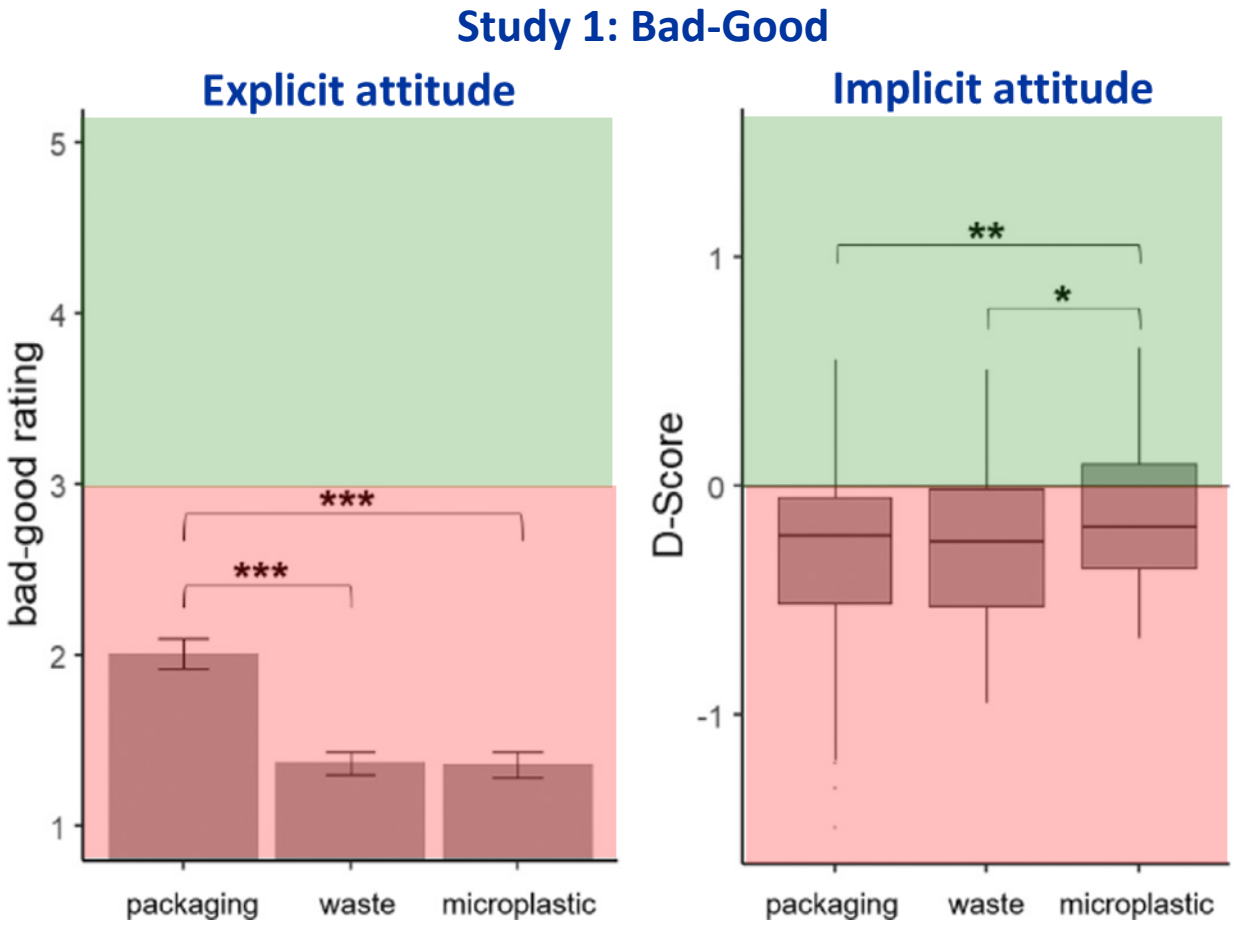
- **Implicit and explicit methods**
- *Explicit* = Rating (1=bad; 5=good)
- *Implicit* = speeded decision task of images / words, measures strength of association btw concepts and evaluations, ~~social desirability~~

  Positive D-score -> association with good, negative D-score -> association with bad

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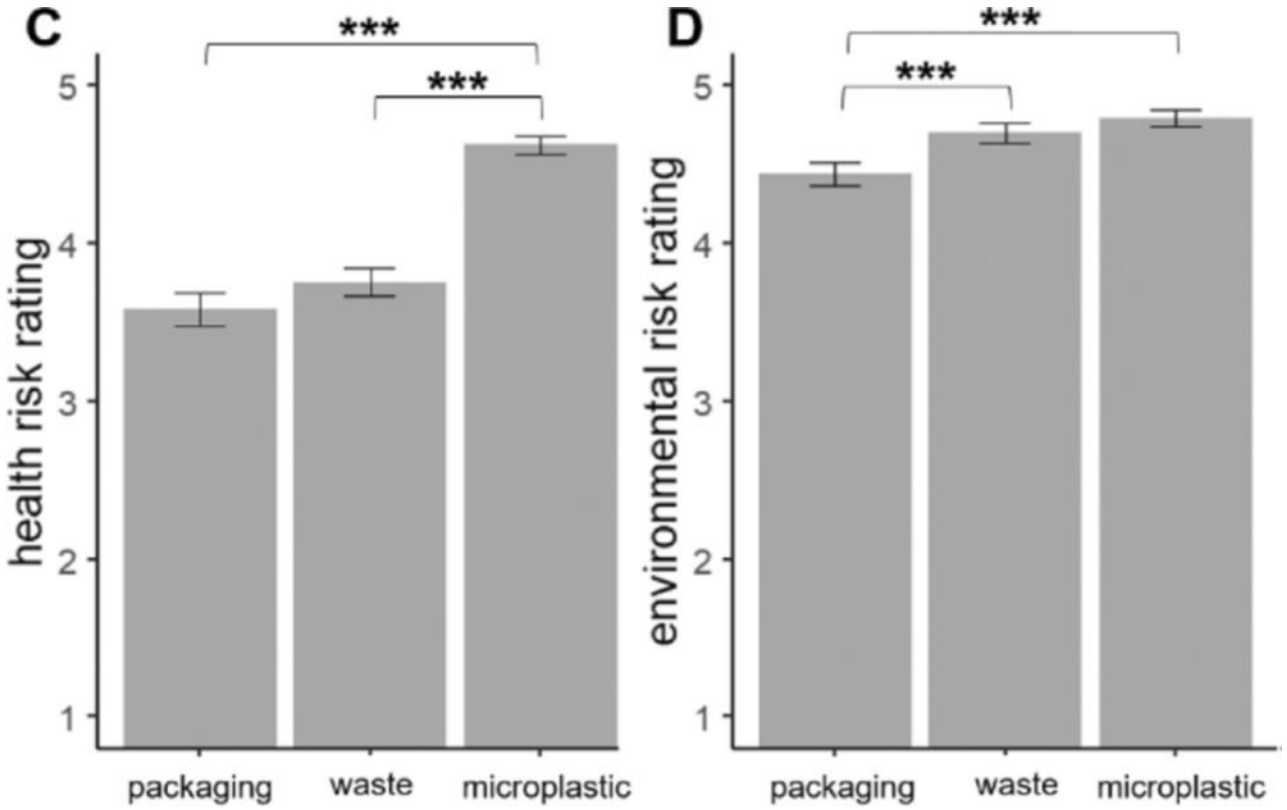
# Menzel et al. (2021) Implicit and explicit attitudes towards plastic in D

**Study 2: Degree of risk (1 = very low risk; 2 = very high risk)**

**----------Explicit attitude----------**

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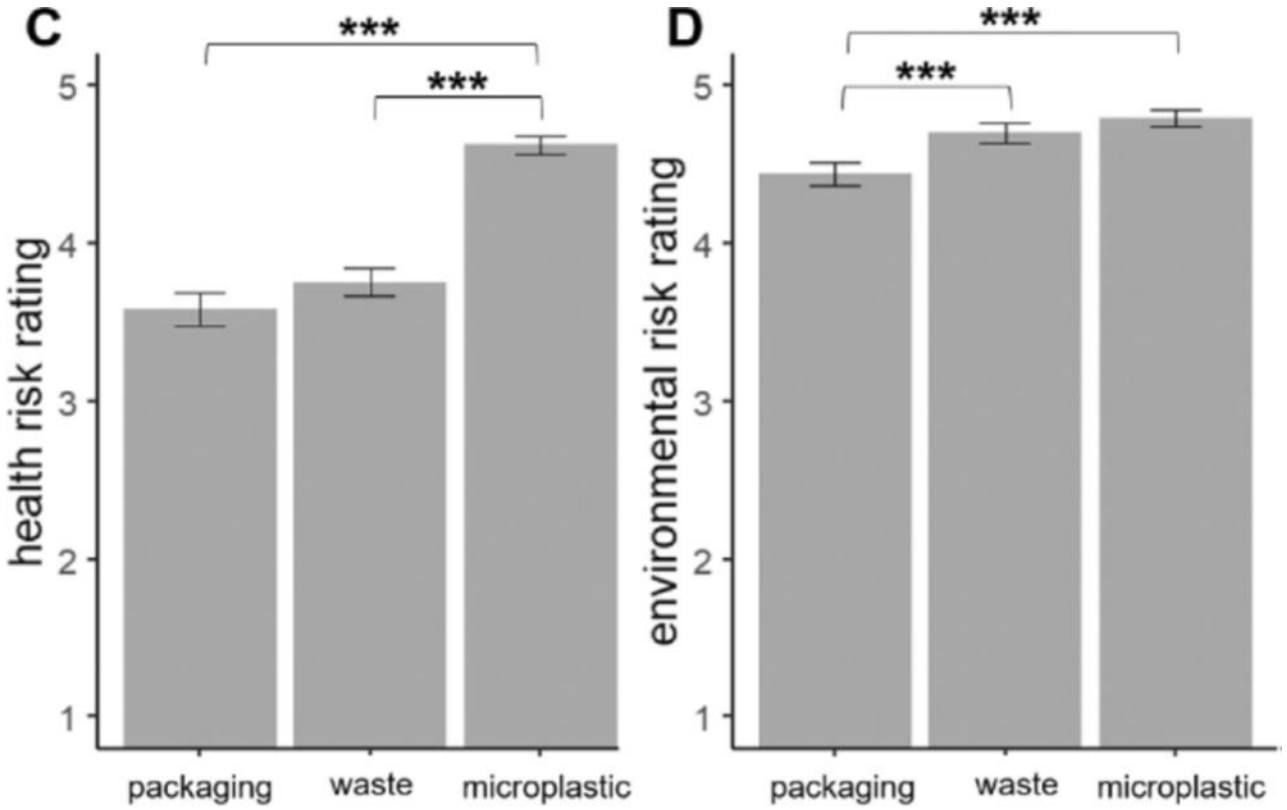
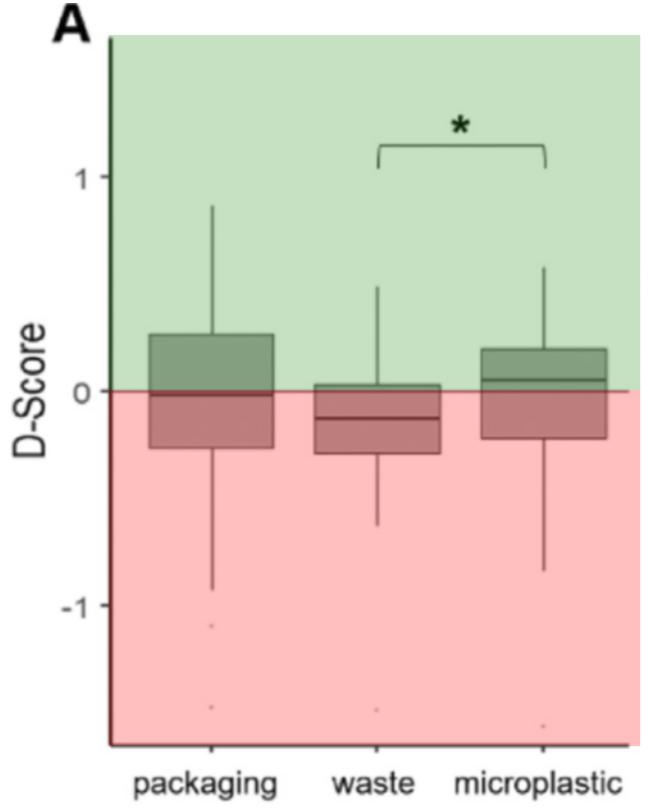






**Risky-Safe**

**Implicit attitude**

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# Stocktake of global actions to reduce the flow of marine plastic and microplastic to the ocean

UN environment programme

Pursuant to UNEA Resolution UNEP/EA.4/Res.6 OP 7a:
*"Take stock of existing activities and action …….with the aim of the long-term elimination of discharge into the oceans"*


**Locations of at least one action (from survey)**

*Types of actions:*

1) *Legislative, standards, rules;*
2) *Working with people;*
3) *Technology & Processes;*
4) *Monitoring & Analysis*

*Snapshot of action now, non-exhaustive*

**Analysis: Julie Goodhew, Francesca Tirotto & Sabine Pahl**

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# Action is related to which type of impact or harm?

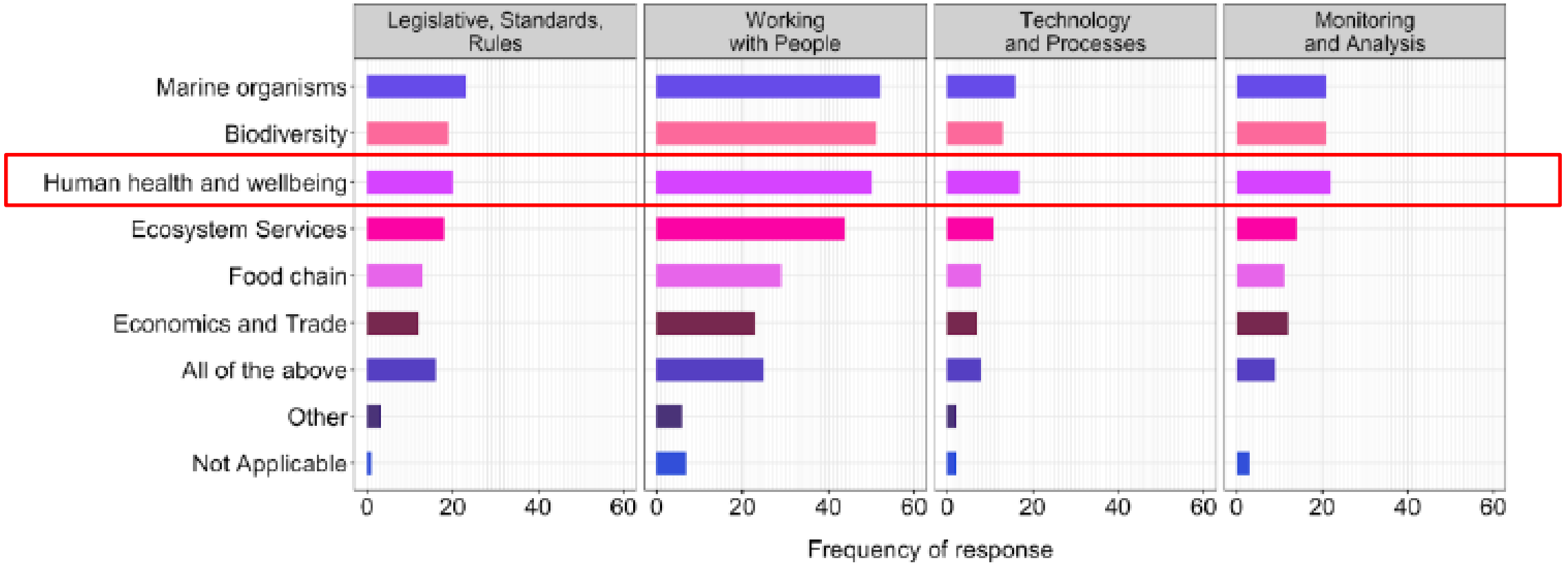


*Figure 23: Types of impacts or harms that the action is related to. (Respondents were asked to choose all that applied.*

**Analysis: Julie Goodhew, Francesca Tirotto & Sabine Pahl for UNEP**

# Environmental Risk Perception

**"Danger is real, but risk is socially constructed"** (Slovic, 1999)

***Risk perception*** = subjective judgement about risk

- Public / non-experts often have to rely on experts -> trust is crucial
- But experts / groups in society may disagree -> uncertainty

***Heuristics and biases*** *(public **and** experts):*

mental shortcuts, e.g.,

- Availability heuristic - *is it easy to imagine or recall?*
- Overconfidence, *e.g., not realising gaps in evidence / knowledge*
- Confirmation bias, *e.g., favouring data that supports existing views*
- Affect heuristic – *the more negative people feel about sth, the higher they think the risks are and the lower the benefits*

**Slovic (1987): Perception of risk**
**2 factors: unknown**


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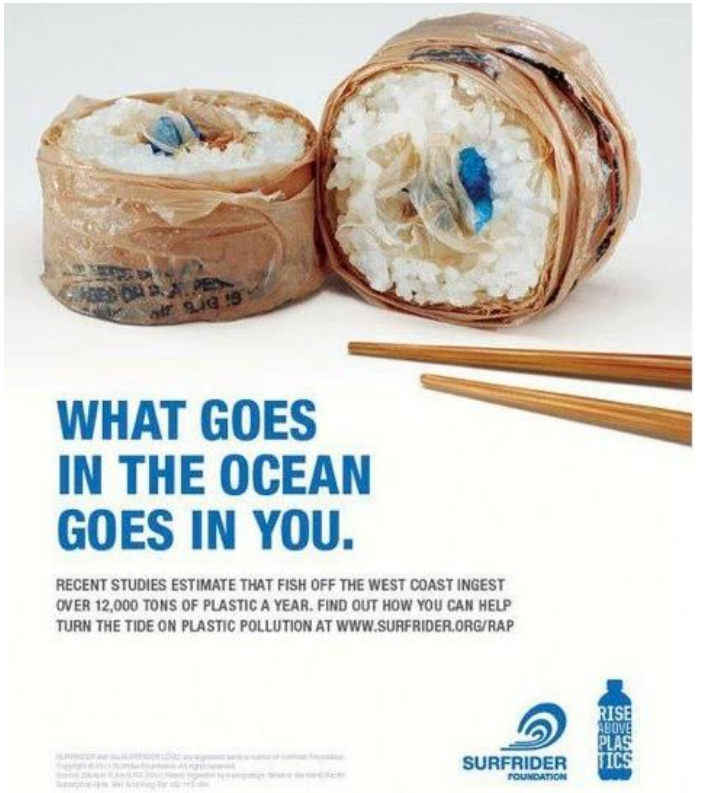
# Why are people so worried about plastic?

- Unnatural rather than natural hazard
- Risk is often portrayed to affect vulnerable groups, e.g., babies
- Exposure pathways of concern: food, air
- Large number of people exposed
- Lack of individual controllability
- Uncertainty / lack of knowledge (MNP)
- Etc.

➡ *Social amplification of risk*?

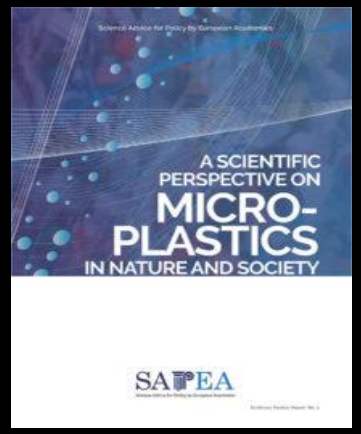
Various media communications




cf. Jenkins et al., 2020, Trends in Food Science and Technology

# What is *enough / the right kind* of evidence?

2019



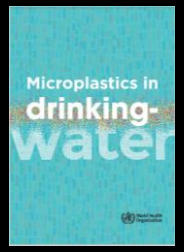

2019


2020


2020


2021


2019




forthcoming

*WHO report*

*NMP in air and food*

*(2022?)*

Others…

**What should we do?**

In the context of the precautionary principle, substantial challenges to the science needed, policy makers asking for rapid input, public concern, industry interest, economic implications…?

**Challenging situation**: Concern / Evidence

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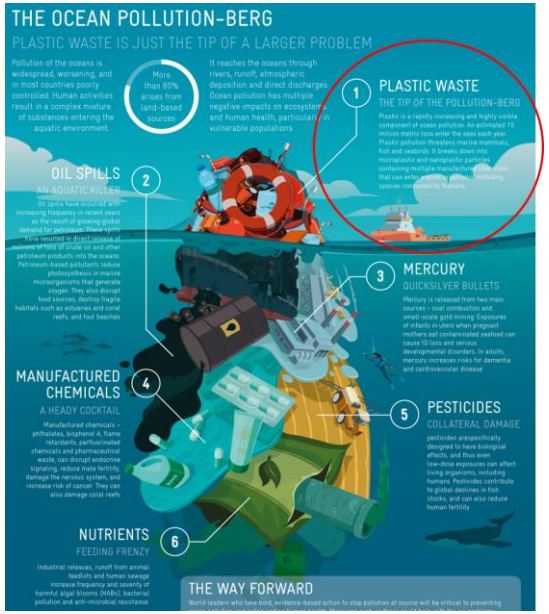
# Horizon Scanning

- Rapid development of research and debate
- Additives / Contaminants / Mixtures
- Exposure pathways of concern: **food**, **air**
- Small and smaller particles: from **micro** to **nano**
- Holistic approach (e.g., entire lifecycle, tradeoffs)
- *What is enough / the right kind of evidence?*

  *Precautionary priciple?*
- Essential use? (law, public understanding)
  - New EU Project ZerOPM

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# Key messages

- People are concerned about plastic, plastic pollution & MP (no denial?)
- People make the connection between plastic pollution and human health (especially for MP?)
- Experts and non-experts use different criteria for evaluating risk (not a simple ‘right’ or ‘wrong’)
- Social research less extensive than natural science research
  - Many open question regarding different populations, methods
  - ➡ Large-scale quantitative social data is crucial to understanding trends
- Let’s take holistic view on problem and solutions: Trade-offs, co-benefits, (un)desirable substitutions, including social data

# Thank you

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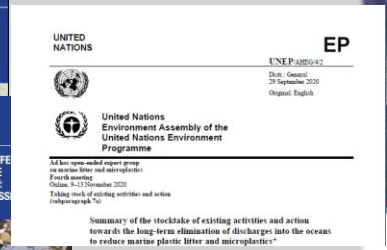
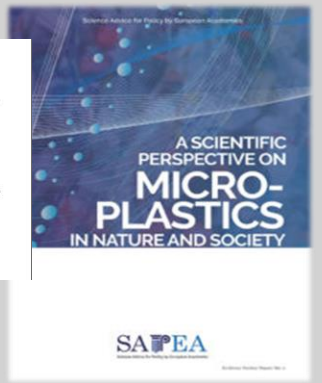
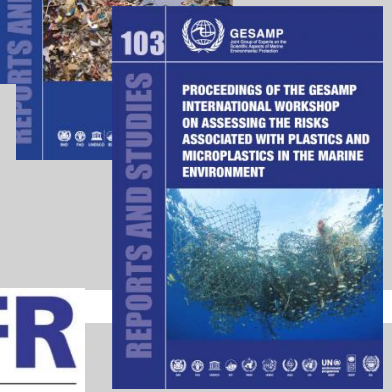
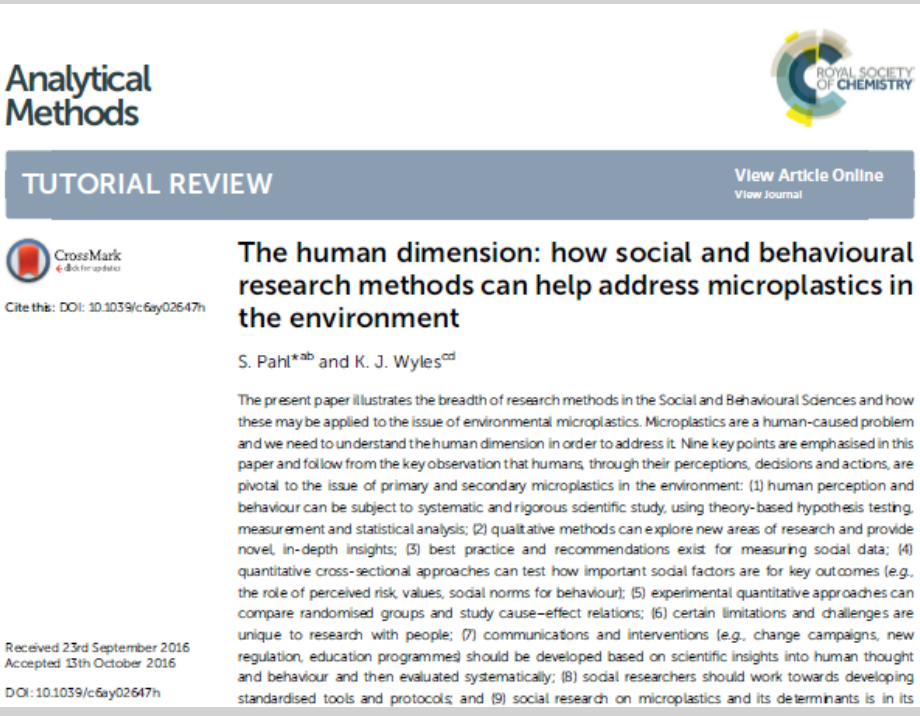




Bart Koelmans


Analytical Methods

ROYAL SOCIETY OF CHEMISTRY

TUTORIAL REVIEW

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Cite this: DOI: 10.1039/c6ay02647h

**The human dimension: how social and behavioural research methods can help address microplastics in the environment**

S. Pahl*[ab] and K. J. Wyles[cd]

The present paper illustrates the breadth of research methods in the Social and Behavioural Sciences and how these may be applied to the issue of environmental microplastics. Microplastics are a human-caused problem and we need to understand the human dimension in order to address it. Nine key points are emphasised in this paper and follow from the key observation that humans, through their perceptions, decisions and actions, are pivotal to the issue of primary and secondary microplastics in the environment: (1) human perception and behaviour can be subject to systematic and rigorous scientific study, using theory-based hypothesis testing, measurement and statistical analysis; (2) qualitative methods can explore new areas of research and provide novel, in-depth insights; (3) best practice and recommendations exist for measuring social data; (4) quantitative cross-sectional approaches can test how important social factors are for key outcomes (e.g., the role of perceived risk, values, social norms for behaviour); (5) experimental quantitative approaches can compare randomised groups and study cause–effect relations; (6) certain limitations and challenges are unique to research with people; (7) communications and interventions (e.g., change campaigns, new regulation, education programmes) should be developed based on scientific insights into human thought and behaviour and then evaluated systematically; (8) social researchers should work towards developing standardised tools and protocols; and (9) social research on microplastics and its determinants is in its

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BfR
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