



Plastics and Human Health Workshop  
24<sup>th</sup> January 2018

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Summary

# Section 1: Background and introduction

## Objectives

On 24<sup>th</sup> January 2018 in London, Common Seas convened a working meeting on 'plastics and human health'. A multi-stakeholder group comprising 33 people from 23 organisations attended, involving scientific leaders, medical practitioners, lawyers, funders, policy shapers, communications specialists and business entrepreneurs.

The overall purpose of the workshop was to pool the knowledge of participants from different backgrounds to explore the threat(s) posed by plastics to human health and then identify additional compelling, and potentially, new ways for raising public awareness and radically changing our relationship with plastics so that they neither pose a threat to human health or that of our planet.

Specific objectives for the workshop were to enable participants to:

- Connect with peers from different backgrounds and learn from each other.
- Understand if, how, and to what extent, plastics represent risks to human health.
- Identify the gaps in our understanding and thus what the research priorities should be.
- Develop a strategy that tackles the issue, while also proposing near-term interventions that will both support the scientific process and engage government, business and the public. To include, regulatory investigations, human rights angles and the communications narrative.
- Discuss appropriate momentum (including a consensus statement) and pressure to inform practical next steps.

## Process and participants

In advance of the workshop, participants were invited to complete a questionnaire designed to highlight existing sources of knowledge and evidence valued by the participants in order to support Common Seas in developing a workshop and working programme valuable to all.

Inputs on the day included brief 'speed presentations' by scientists each highlighting their current research in relation to examining the links between plastics and human health.

## Output notes

This document is written in two sections:

- Section 1 sets out a high-level summary of the findings, conclusions and agreed next steps resulting from the workshop.
- Section 2 (appendices) includes the list of participants (appendix 1); summary of the pre-workshop questionnaire (appendix 2); and the workshop programme, (appendix 3)
- Links to presentations given by scientists at the workshop and literature reviews are circulated as an attachment.

## Section 2: Summary of key points

It was generally acknowledged that the use of plastics has brought societal benefits in a broad number of areas, including supporting technological advances in, for example, the field of medicine.

Notwithstanding the contribution that the use of plastics makes to society, from both the pre-workshop participant input and discussions at the workshop, six broad themes emerged regarding the risks of plastics to human health:

### 1. Plastics represent clear risks to human health



The overwhelming conclusion of participants was that plastics pose a significant threat to human health. Participants highlighted several important and credible pieces of research and evidence to establish robust links between plastics and human health. The majority of the group strongly felt that the scientific evidence must be further strengthened, and there are clear gaps in knowledge concerning exposure and effect. Comparisons between plastic stressors and other stressors on human health are currently difficult to quantify. Participants referenced evidence points, including:

- Plastic particles entering our bodies through the food web, as well as via air and water-borne means.
  - For example, it was suggested that breast milk might contain plastic particles.
- The impacts of plastics on the natural environment and to humans.

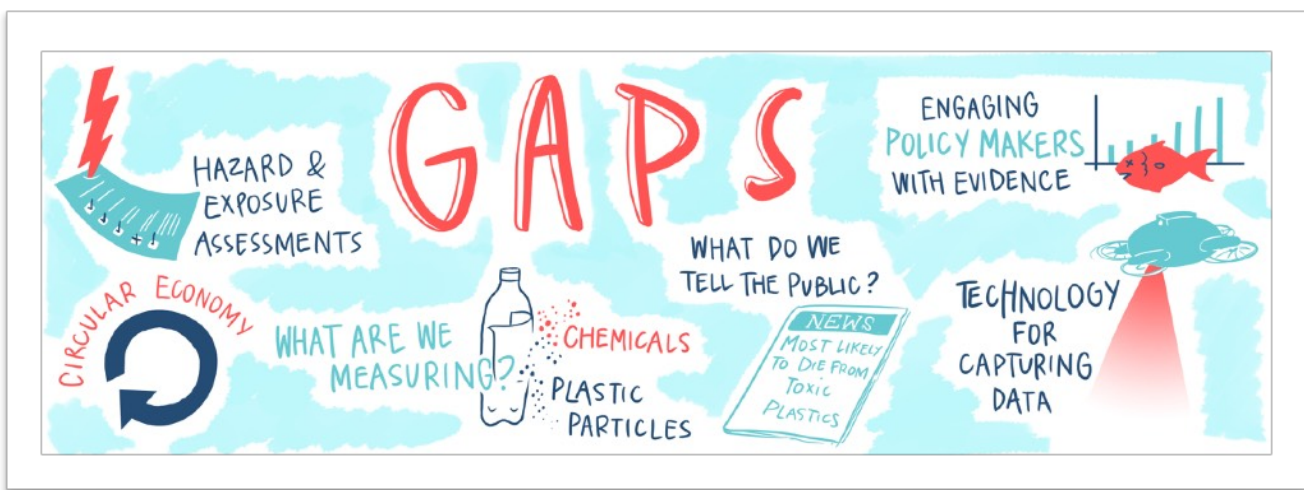
- For example, plastic waste blocking drainage systems and causing severe flooding, or ship's propellers becoming entangled in waste risking the lives of the crew.
- Plastics as transporters of vectors including pathogens and toxic substances.
- Exposure to chemicals in plastics.
  - For example, through food packaging, building and interior materials, personal care and household cleaning products, and via the seafood we eat.

Discussions on the type of risks posed by plastics to human health highlighted:

- Risks of inflammatory conditions and toxicology, including endocrine disrupting. Micro spectrology was repeatedly highlighted as an important area requiring further exploration.
- The risks posed by plastics to human health apply across all demographic groups and regions, from pregnant mothers to be and the unborn child, to old age pensioners, whether in advanced economies or in emerging economies in the Global South. It was, however, recognised that exposure levels may be elevated in certain sub-groups, such as those living in close proximity to poorly managed plastic waste, those dependent on a seafood-heavy diet and people who spend significant time in the Ocean, such as fishers and surfers.
- Innovation in technology to detect exposure and effect of Nanoparticles was cited as a key barrier to understanding risks concerning the accumulation of plastic particles. Specifically, to understand if plastic particles build up in lungs and in digestion systems.

It was strongly recognised that the scale of risk arising from plastics to human health is escalating, given the relentless consumption and poor disposal of plastics. Whilst further work is required to provide more robust scientific evidence to boost what is already known about the threat of plastics to human health, participants highlighted the need to: “Avoid paralysis by analysis”. All agreed that there exists an imperative to act now, to stem the risk of plastics to human health.

**2. Gaps in securing further robust scientific evidence regarding the threat of plastics to human health should be keenly addressed.**



The following were identified as key gaps in establishing robust evidence of the linkage between plastics and human health:

- Understanding impacts of exposure and effects of particles and associated chemicals. To include:
  - Disease etiology & dose-effects; e.g. clarifying if exposure to particles correlating to inflammatory disease.
  - Kinetic behaviour.
  - The development and use of detection methods to identify particle size and distribution is a key barrier.
- The current and then forecasted routes of plastics waste into our bodies; associated exposure and effect levels; risks comparative to other environmental pollutants. E.g. via the food chain, air, and our natural environments.
- Understanding impacts of inhalation of particles, which may cause more harm than indigestion.
- Establishing the scale of risk associated with plastics as a transporter for vectors of pathogens and toxins, including relationships of flooding to outbreaks of pathogens.

**3. A review of the emerging priorities and an attempt by the assembled scientists to explore strategies for addressing the key priority gaps, led to the identification of the following as emerging priority areas for focusing some *near-term* scientific enquiry:**

- Researching the volume and toxicity of plastic particles across the entire food basket. For example, does plastic volume and associated chemicals load up across the entire food web. We know plastic is in our dinner, but how much and does it impact our health enough for us to care and change social norms. What are the effects, including considering reproductive impacts?
- The presence and the effect of plastic particles in the air we breathe, for example, can we detect fibres in lung tissue?
- An applied study into the role plastic waste plays as a vector to be focused in a specific community that has high exposure levels; likely a tropical climate and emerging economy.



Prioritising development of methods and technologies for detecting particles and understanding accumulation impacts should be a key focus of points. Scientists cited lack of lab time to use existing technology, as a barrier to improving evidence.

**4. In parallel with efforts to deepen scientific understanding, immediate non-scientific actions should be undertaken to address the risks posed by plastics to human health.**

Building on existing scientific knowledge, and to avoid the risk of paralysis by analysis, participants agreed that action should be taken now to:

- Inform public opinion, raise awareness about the risks of plastics to human health, drive behaviour change and secure political backing.
- Identifying the regulatory framework that will indirectly result in less plastic in the ocean is key to focusing investment.

- Influence and secure changes in public policy to support the reduction of risks posed by plastics to human health. Initiate this by assessing policy opportunity and required evidence.
- Influence and secure changes in business practices in the design, production, distribution, and disposal of plastics so that they support the risk reduction agenda. Standards to regulate the diversity of plastic types used and drive greater value in supply, use and recovery of plastic was highlighted to be a key theory of change.

**5. Whilst the plastics and human health threat topic is distinct, it is also highly interconnected with some wider systemic challenges facing humanity. Important links should be kept in mind, and synergies should be harnessed where appropriate.**

It was observed and acknowledged that the plastics and human health threat is strongly connected to major ecological, economic, health and social issues facing humanity. Plastic pollution is connecting everyone to the degradation of nature globally, it is critical to consider plastic as a gateway topic for wider none visible issues – e.g. mass loss of biodiversity and the demise of coral reefs.

It was agreed that there is a need to focus on the specifics of the plastics and human health threat, but also an intention to work in ways that:

- Harness opportunities to support the achievement of wider systemic goals (reduction of climate change, ensuring the wellbeing of waterways and oceans; improving human health, supporting economic development), and
- Draw on the experience and insights from other major policy and behaviour change campaigns, (such as those against smoking, exposure to asbestos, and others) in order to speed the pathway towards elimination of the plastics and human health threat.

It is important to note that the meeting was focused on raising an alert on the impacts of plastics to human health as a tactic to reduce marine litter and micro plastic particles. Therefore, the ultimate objective driving a campaign strategy must evaluate potential reduction in the flow of plastic into the Ocean. For example, Common Seas is unlikely to catalyse a campaign focused on regulating the use of a certain chemical additive, as the end result is unlikely to reduce the volume of plastic produced or motivate improved waste management.

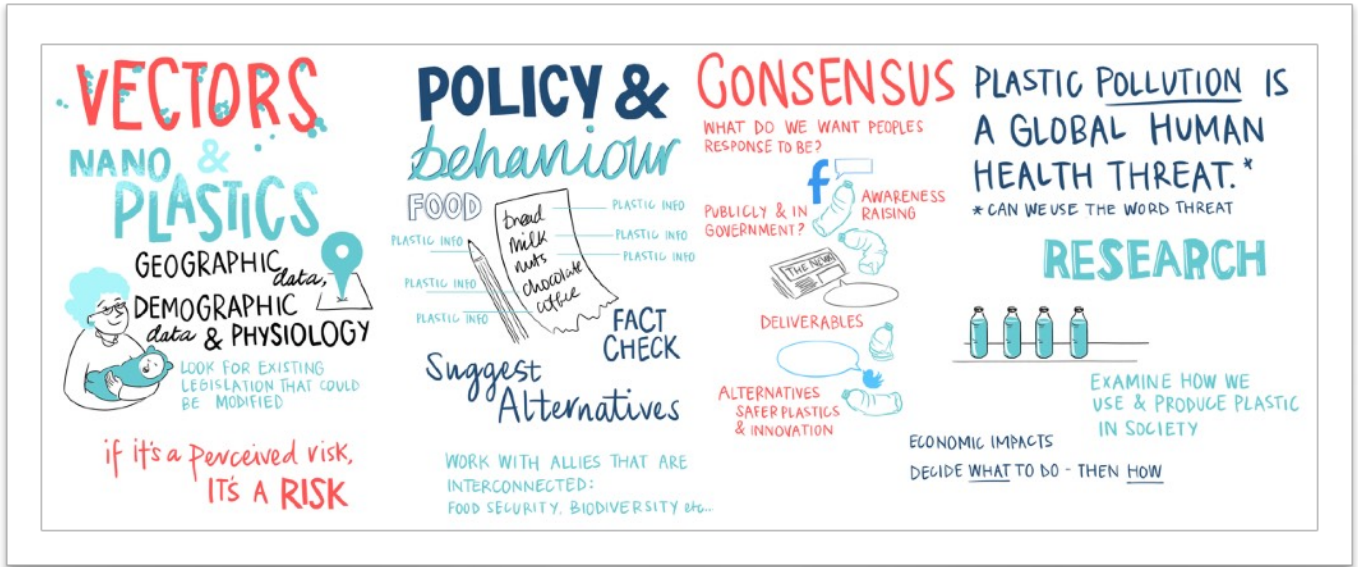
**6. Addressing the plastics and human health threat will require the commitment of individual actors, as well as effective collaboration across multiple stakeholder groups.**

With this in mind it was particularly encouraging, that in an anonymous exercise, all participants at the workshop committed themselves – and in principle, their organisations – towards working in alliance with workshop colleagues to address the plastics challenge.

## Section 3: Consensus conclusions and next steps

### 7. Consensus conclusions

Participants united around developing a cross sector group dedicated to driving increase evidence, awareness and innovation on the impacts of plastics to human health. To change the way plastics is valued by society. Consensus regarding the following conclusions emerged from the group:



Plastic pollution is a human health risk. It is a perceived risk, so therefore it is a risk.

There is enough evidence about the risks to start raising awareness today. At the same time, further research is required to build a robust case on the health implications resulting from our exposure to and effects of plastic waste. The impacts of plastic particles through the food we eat and the air we breathe is an emerging and concerning theme.

We identified three areas of scientific focus to further understand the risks of plastic particles in the food we eat; air we breathe; and, as a vector for pathogens and toxins. Investment into developing and using methods to detect small particles of plastic in tissue is key to unlocking a significant body of evidence. Alerting business, government and the public on the risks plastics poses to our health could be an incredibly valuable lever to stemming the flow of plastic into the Ocean.

In order to effect long-term change and plausible policies it is important to align investment into scientific research to specific regulatory leavers. Policies should consider regulations to; significantly reduce the production and use of single-use plastic; implement standards to decrease the diversity of plastics types used and drive greater value across the plastic value chain; motivate collaborations that deliver new materials and systems that replace plastics but do not introduce new pressures to the ecosystem or our health.

Human health has proven to be the most powerful motivation for human change; leaded petrol, Ozone and DDT are examples. Now is the time to capitalise on the media and public engagement around Ocean plastic pollution to influence systemic-change and long-term solutions.

We conclude that raising the alarm on the health risks associated with plastic waste has the greatest potential to impact lasting policies and behaviour change to solve this environmental crisis in our generation.

## **8. Near-term next steps for Common Seas:**

Since the workshop, Common Seas is:

- Commissioning a journalist to produce a briefing for businesses, government and the general public.
- Meeting with foundations and NGO's to discuss developing a funding collaborative to enhance evidence and deliver the awareness campaign.

Is considering:

- Commissioning research to identify the UK and EU policy leavers.
- Developing a call for proposal to identify innovative and applied research into plastic particles in the food we eat and air we breathe. Research supported should have the potential to unlock the significant funding required from research councils and larger trusts.

Please see appendices below 1) Attendee lists, 2) Summary of the pre-workshop questionnaire, 3) Workshop programme.

*For further information please contact [jo@commonseas.com](mailto:jo@commonseas.com)*



# Appendices

## One: Attendee list

Name	Title	Organisation
Manny Amadi	CEO	C&E Advisory
Will Anderson	Creative director	Keo Films
Laura Boardman	Director	Outdraw
Jamie Buchanan-Dunlop	Director	Digital Explorer
Giulia Carlini	Staff attorney, Environmental health programme	Center for International Environmental Law (CIEL)
Stephanie Cherington-Rimmell	Senior development manager	University of Exeter
Tessa Friend	Senior programme officer	International Sustainability Unit
Professor Tamara Galloway	Professor of Ecotoxicology, College of Life and Environmental Sciences	University of Exeter
Dr. Christopher Green	Visiting researcher	Brunel University, London
Christopher Groves	Partner	Withers LLP
Simon Harrison	Board director	Common Seas
Alice Henley	Producer	Keo Films
Stephen Hockman QC	Barrister and head of chambers	Six Pump Court
Dr. Susan Jobling	Head of the Institute of Environment, Health and Societies and a Professor of Environmental Toxicology	Brunel University
Tony Juniper CBE	Executive director for advocacy and campaigns	WWF-UK
Anastasia Kantzelis	Legal programme Development	Track 0
Andonis Lemos	Director	Common Seas

Filippos Lemos	Director	Common Seas
Dr.Heather Leslie	Senior researcher. Dept. of Environment and Health	Vrije University Amsterdam
Dr. Ceri Lewis	Senior Lecturer in marine biology, biosciences. Marine biologist and ecotoxicologist	University of Exeter
Ogi Markovic	Co-founder and chief strategy officer	Surfing Medicine International
Martijn Meijer	Programme manager people and nature	Adessium Foundation
Annemarie Nederhoed	Project manager and fundraiser	The Plastic Soup Foundation
John Pedersen	Group CFO	AFENEL
Emjay Rechsteiner	Producer	Staccato Films
Jo Royle	Founder, director	Common Seas
Cath Schuttervaer	Knowledge transfer & strategy	The Netherlands Organisation for Health Research and Development
Kristian Teleki	Board adviser	Common Seas
Professor Dick Vethaak	Endowed professor of ecotoxicology	Deltares and VU University
Tim Viles	Managing partner	Doxa Partners LLP
Maria Westerbos	Founder and director	The Plastic Soup Foundation
Dr. Stephanie Wright	Early career research fellow MRC-PHE Centre for Environment and Health. School of Population Health & Environmental Sciences	Kings College, London

## Two: Summary of the pre-workshop questionnaire

By, Amy Brooks, New Materials Institute 22 January 2018

Q3a. Do you feel our prolific consumption and disposal of plastic poses a significant threat to long-term human health?

- The vast majority of attendees had a resounding yes to this question. They referenced...
  - Chemical exposure
  - Impacts to the natural environment, human rights, industries, and economies
  - Plastic can be a transporter for vectors and toxic substances
  - Plastic is entering the food chain as well as air and water
- Those that were more unsure of how they felt said that more research is needed and that we need to make comparisons of plastic stressors with other toxic stressors
- Two people pointed out that plastics have societal benefits in the form of technological advances, medicinal uses, and that it provides clean water to those who may not have access

Q3b. If yes, what do feel is the key plastic and human health narrative that will alert Government, industry and consumers to reduce single use plastics and drive a circular economy?

- Research & development will drive policy and industry and consumer decisions
  - Need to scientifically show that exposure is causing harm
- If we do nothing, the problem will only get worse, resulting in catastrophic events
- If we show that our ecosystems are degrading maybe people will listen
- We can point to similar cases (smoking, exposure to asbestos, fibers, etc.)

Q4. What 3 things would you classify as key gaps establishing robust evidence of linkage between plastics and human health?

Gaps in Evidence	# References in comments
Exposure levels	17
Disease Etiology & dose-effects	5
Current levels in food chain	5
Predictive modeling	3
Plastics as a transporter (for vectors, toxic chemicals, etc.)	3
Particle size distribution	3
Exposure seen in natural environments	3
Routes of exposure	2
Awareness, Funding, Political Backing	2
Kinetic behavior	1
Detection methods	1
Comparisons with other toxins and stressors	1

Q5. In your view, what are the 3/4 most important credible pieces of research / evidence in efforts to establish a robust link between plastics and human health?

- Lithner et al. 2011. Environmental and health hazard ranking and assessment of plastic polymers based on chemical composition.
- Van Cauwenberghe and Janssen 2014. Microplastics in bivalves cultured for human consumption.
- Willert, H.G. and Semlitsch. 1996. Tissue reactions to plastic and metallic wear products of joint endoprotheses.
- Lang et al. 2008. Association of urinary bisphenol A concentration with medical disorders and laboratory abnormalities in adults.
- Lovekamp-Swan and Davis. 2003. Mechanisms of phthalate ester toxicity in the female reproductive system.
- Wright SL, Kelly FJ. 2017. Plastic and Human Health: A Micro Issue?
- Perspective papers by Dr. Steph Wright and colleagues
- Review by Wright & Kelly in ES&T
- Theo Colborn's letter to the White House
- Tamara Galloway – Micro- and nano-plastics and human health
- Bouwmeester H, Hollman PC, Peters RJ. 2015. Potential Health Impact of Environmentally Released Micro- and Nanoplastics in the Human Food Production Chain: Experiences from Nanotoxicology.

- Koelmans, et al. 2017. All is not lost: deriving a top-down mass budget of plastic at sea.
- Various other topics (unspecified research)
  - Epidemiological studies
  - Degradation of the environment
  - Toxicity of micro/ nano plastics
  - Health of scavengers at waste sites
  - Effects on in vitro human cell systems
  - Detection of plastics in food chain

Q6. In your view, what evidence would be most likely to secure the health minister's interest and engagement in the plastics pollution problem?

Type of Evidence	# References in Comments
Evidence of exposure	10
Link between exposure and disease	9
Framed policy recommendations based on scientific evidence	3
Impacts to reproductive health, pregnancy, and children	3
Costs and financial burden to healthcare systems	1
Effects on food availability	1
Lessons learned from other toxic exposures (tobacco, asbestos, etc.)	1
Focus on susceptible populations	1

Q7. What are your expectations for the workshop?

- Collaborate with others
- Create ideas for future research
- Learn something new

Q8. What in your view what would represent success for this workshop?

- Establishment of priorities and strategies
- Gain funding
- Collaboration and partnerships
- Development of research questions

Q9. If you were planning and guiding colleagues through this workshop what 1 key thing would you keep in mind?

- This is a broad topic
- This issue is going to take time
- Work together
- There is a large gap in evidence, data, and research

Q10. Finally, is there a question or comment you would like to raise to inform our meeting's agenda?

- They want to introduce themselves/their goals and explain why they are there, and understand why others are there
- What is the extent of plastic as a human health issue?
- Would like to explore funding sources

### Three: Workshop programme

19<sup>th</sup> January 2018

## Plastics and Human Health Workshop 24<sup>th</sup> January 2018

10:00hrs until 17:30hrs, 24<sup>th</sup> January 2018 (09:30 arrival for coffee)

Location: Groucho Club, The Gennaro Room

45 Dean St, Soho, London W1D 4QB

### Objectives

To develop an alliance of stakeholders who are committed to working together in the drive to build robust evidence base that has the potential to radically change our relationship with plastics, so that they neither pose a threat to human health or that of our planet.

### Specifically, we will:

- Connect with peers from different backgrounds and learn from each other.
- Examine how, and to what extent, plastic is a human health issue.
- Identify the gaps in our understanding and thus what the research priorities should be.
- Develop a strategy that tackles the issue, while also proposing near-term interventions that will both support the scientific process and engage government, business and the public (to include, regulatory investigations, human rights angles and the communications narrative).
- Explore a statement that reflects the census of the group.
- Discuss appropriate momentum and pressure to inform practical next steps.

### Programme

Time	Item	Activities and outcomes	Format
09:30: Arrival and coffee			
Session 1: Framing and discovery			
10:00	Welcome and introductions	<ul style="list-style-type: none"><li>• Opening remarks</li><li>• Connect attendees with co-participants</li><li>• Create a shared view of the agenda and expectations for the event</li></ul>	<ul style="list-style-type: none"><li>• Plenary</li></ul>
10:30	Plastics and human health – current state of play	<ul style="list-style-type: none"><li>• Brief input on current scientific research</li><li>• Review of pre-event input from workshop invitees and participants</li><li>• Establish a collective understanding of the relationship between plastics and human health</li></ul>	<ul style="list-style-type: none"><li>• Plenary and group discussions</li></ul>
11:45: Coffee			

## Session 2: Gaps, potential solutions and priorities

12:00	Towards a prioritised set of evidence points	<ul style="list-style-type: none"> <li>• Review of suggested gaps in evidence base</li> <li>• Identification of additional gaps and existing solutions</li> <li>• Prioritisation of key gaps / solutions that are most likely to lead to change if successfully addressed / applied</li> </ul>	<ul style="list-style-type: none"> <li>• Groups and plenary</li> </ul>
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13:15: Lunch

## Session 3: Possible strategies

14:00	Strategies: The scientific process.	<ul style="list-style-type: none"> <li>• Brief review of consensus scientific priorities</li> <li>• Identification and review of strategies to support effective development of the scientific process, including identification of barriers and enablers</li> </ul>	<ul style="list-style-type: none"> <li>• Groups and plenary</li> </ul>
14:00	Strategies: Non-scientific interventions	<ul style="list-style-type: none"> <li>• Input and alignment on the precautionary principle</li> <li>• Identification of relevant themes and strategies to drive near-term interventions designed to radically change our relationship with plastics so that they neither pose a threat to human health or the planet</li> <li>• Co-development and presentation of possible 'campaigns' to drive forward identified interventions and strategies</li> </ul>	<ul style="list-style-type: none"> <li>• Presentation, groups and plenary</li> </ul>

16:00: Coffee

## Session 4: Towards a consensus statement and forward path

16:10	Developing a consensus statement	<ul style="list-style-type: none"> <li>• Consider the key components of a consensus statement</li> <li>• Agree process for finalising and disseminating a statement on the risks posed by plastics to human health</li> </ul>	<ul style="list-style-type: none"> <li>• Groups and plenary</li> </ul>
17:00	Next steps and Wrap-up	<ul style="list-style-type: none"> <li>• Summarise and confirm clear set of immediate actions and assign responsibilities</li> <li>• Reflections on the event</li> <li>• Closing remarks</li> </ul>	<ul style="list-style-type: none"> <li>• Plenary</li> </ul>

17:30: End of workshop