UNITED NATIONS OCEAN CONFERENCE

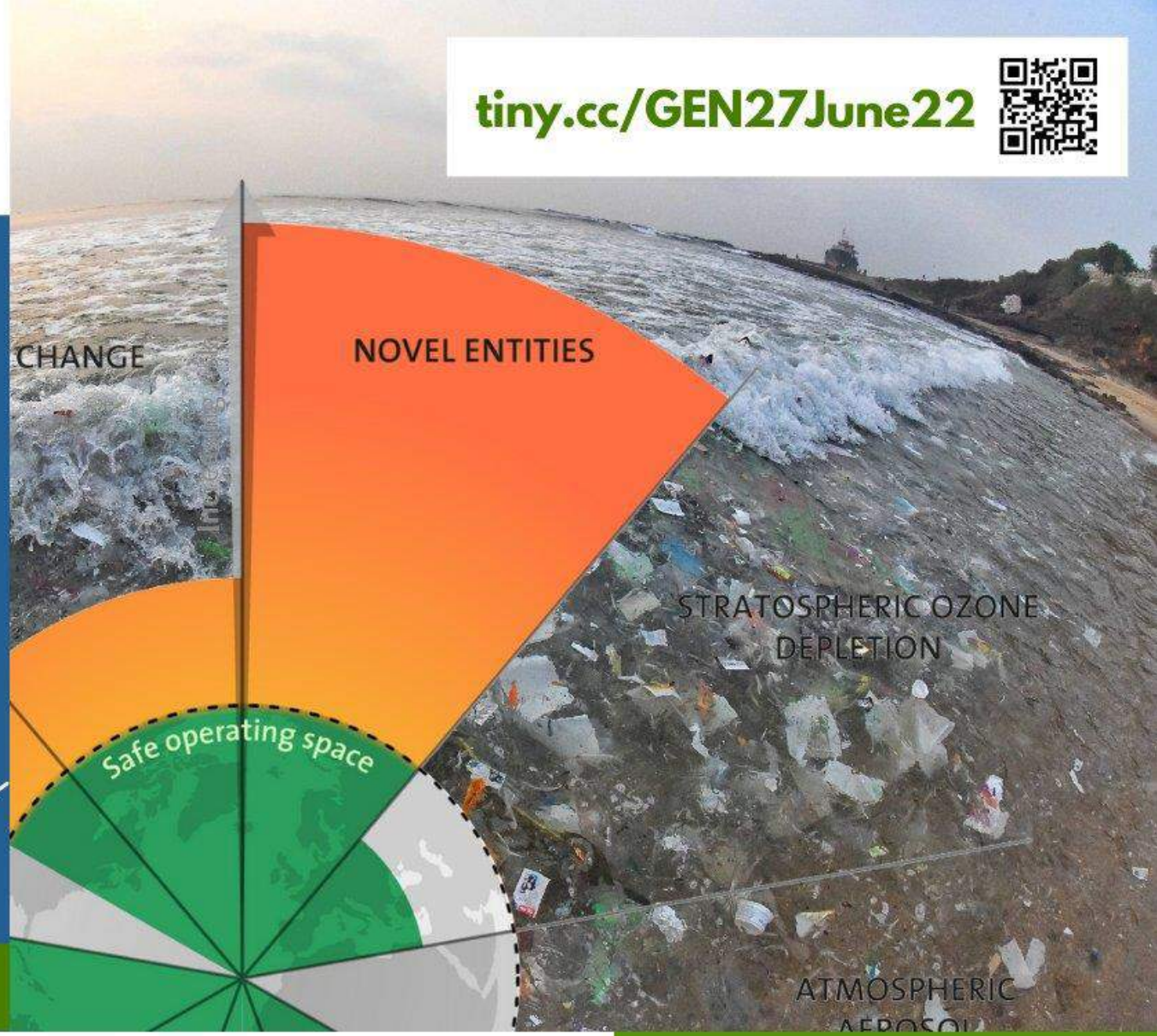
LISBON 27 JUNE - 1 JULY 2022

SIDE EVENT

tiny.cc/GEN27June22

THE INVISIBLE GLOBAL CRISIS: EXCEEDING THE LIMITS OF THE POLLUTION PLANETARY BOUNDARY

NEW SCIENCE AND OPPORTUNITIES TO TACKLE THREATS TO HUMAN AND MARINE LIFE



Lisbon, FIL, Auditorium 1 & Online

27 June 2022 | 13:30-15:00 WEST, 14:30-16:00 CEST

UNIVERSITY OF GOTHENBURG

IPEN for a toxics-free future

Swedish Institute for the Marine Environment

WIOMSA

GENEVA ENVIRONMENT NETWORK

GENEVA BEAT PLASTIC POLLUTION DIALOGUES

UN environment programme 50 1972-2022

GENEVA ENVIRONMENT NETWORK

UNITED NATIONS OCEAN CONFERENCE

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GENEVA BEAT PLASTIC POLLUTION DIALOGUES

Will be at the 2022 UN Ocean Conference

www.tiny.cc/UNOceanConference

BASEL / ROTTERDAM / STOCKHOLM CONVENTIONS

IUCN

CIEL CENTER for INTERNATIONAL ENVIRONMENTAL LAW

THE GRADUATE INSTITUTE GENEVA

GLOBAL GOVERNANCE CENTRE

TESS Forum on Trade, Environment and the SDGs

UNIVERSITÉ DE GENÈVE

Permanent Mission of Norway Geneva

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

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The Invisible Global Crisis: Exceeding the Limits of the Pollution Planetary Boundary

New Science and Opportunities to Tackle Threats to Human and Marine Life

Lisbon, FIL, Auditorium 1 & Online

27 June 2022 | 13:30 WEST | 14:30 CEST

SPEAKERS

Bethanie CARNEY ALMROTH

Professor in Ecotoxicology, Department of Biological and Environmental Sciences, University of Gothenburg

H.E. Luis VAYAS

Vice-Minister for Foreign Affairs and Cooperation, Ministry of Foreign Affairs, Ecuador

Martin HASSELLÖV

Professor in Analytical Environmental Chemistry, Department of Marine Sciences, University of Gothenburg

Jessica BROWN

Head of Engagement, Back to Blue Initiative, The Economist

Björn BEELER

General Manager and International Coordinator, International Pollutants Elimination Network

Therese KARLSSON

Science and Technical Advisor, International Pollutants Elimination Network

Lena GIPPERTH

Professor in environmental law and member of the Centre for Sea and Society, University of Gothenburg | Moderator

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Q&A

Closing Remarks

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Environmental Science & Technology

pubs.acs.org/est

Policy Analysis

Outside the Safe Operating Space of the Planetary Boundary for Novel Entities

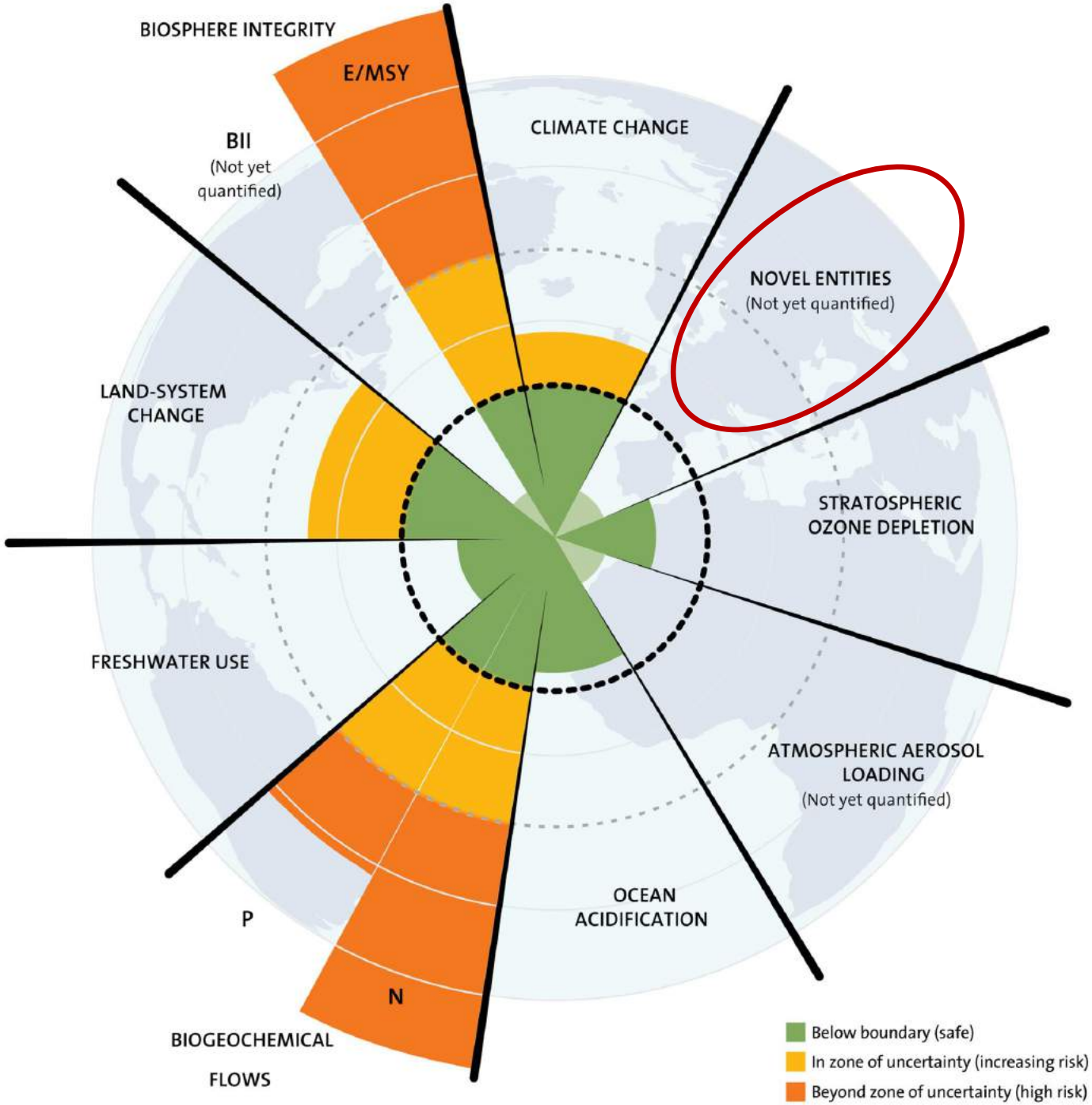
Linn Persson,* Bethanie M. Carney Almroth, Christopher D. Collins, Sarah Cornell, Cynthia A. de Wit,* Miriam L. Diamond, Peter Fantke, Martin Hassellöv, Matthew MacLeod, Morten W. Ryberg, Peter Søgaard Jørgensen, Patricia Villarrubia-Gómez, Zhanyun Wang, and Michael Zwicky Hauschild

The Planetary Boundaries

Nine anthropogenic impacts on key components that regulate the stability and resilience of the Earth system.

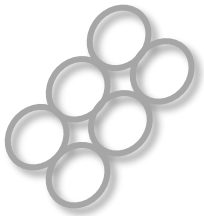
1. Ozone depletion
2. Loss of biodiversity
3. Climate change
4. Ocean Acidification
5. Fresh water consumption
6. Land system changes
7. Nitrogen and phosphorous flows to the biosphere and oceans
8. Atmospheric aerosol loading
9. Release of chemical pollution and novel entities

Rockström et al., 2009


BIOSPHERE INTEGRITY
E/MSY
BII
(Not yet quantified)
CLIMATE CHANGE
NOVEL ENTITIES
(Not yet quantified)
LAND-SYSTEM CHANGE
STRATOSPHERIC OZONE DEPLETION
FRESHWATER USE
ATMOSPHERIC AEROSOL LOADING
(Not yet quantified)
OCEAN ACIDIFICATION
P
N
BIOGEOCHEMICAL FLOWS
Below boundary (safe)
In zone of uncertainty (increasing risk)
Beyond zone of uncertainty (high risk)

Novel Entities

- New substances, new forms of existing substances
- Chemicals and other new types of engineered materials not previously known to the Earth system
- Naturally occurring elements (for example, heavy metals) mobilized by anthropogenic activities



Rockström et al., 2009; Steffen et al., 2015
Persson et al. 2013, Villarubia-Goméz et al. 2018, Arp et al., 2021

Pollution of an entire Planet?

Novel entities: global concern when exhibiting persistence, mobility across scales with widespread distribution and accumulation in organisms and the environment, and potential negative impacts on vital Earth Systems processes or subsystems

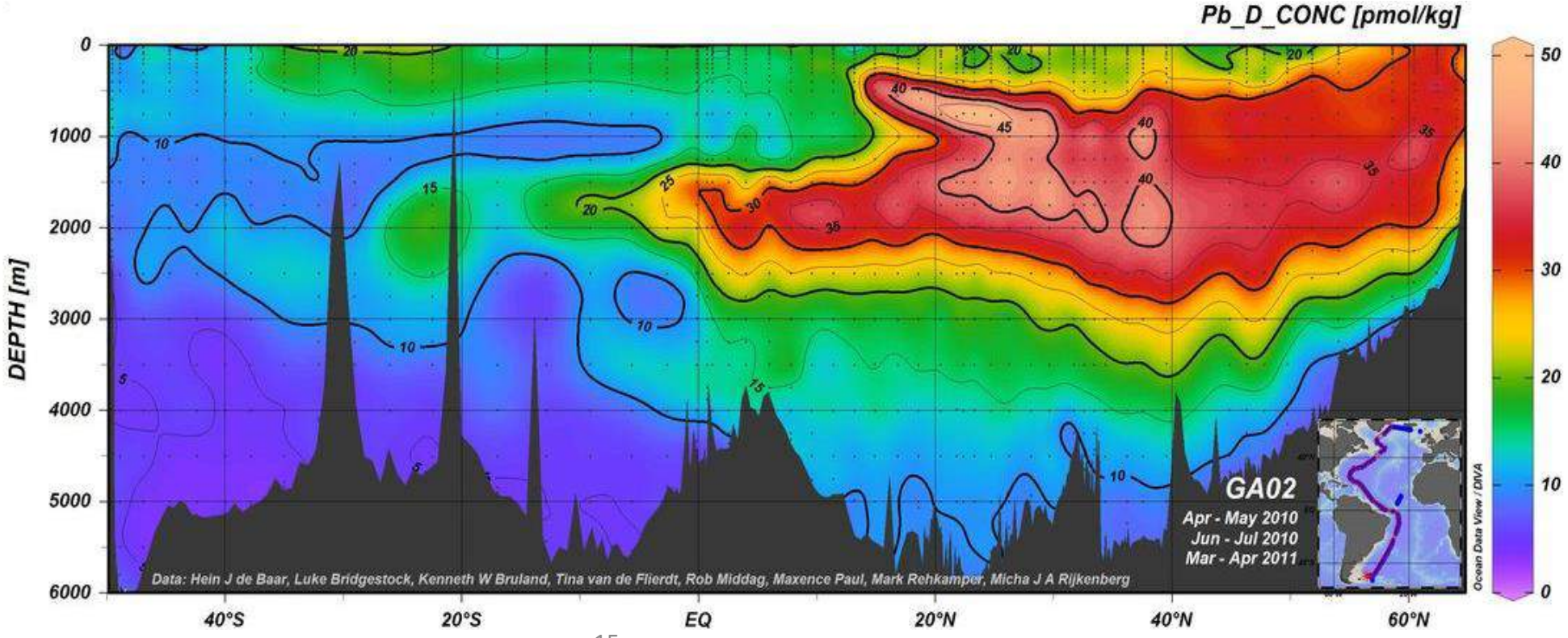
Steffen et al., 2015

Henderson Island

Human population zero
Distance to nearest continent (>5000 km)

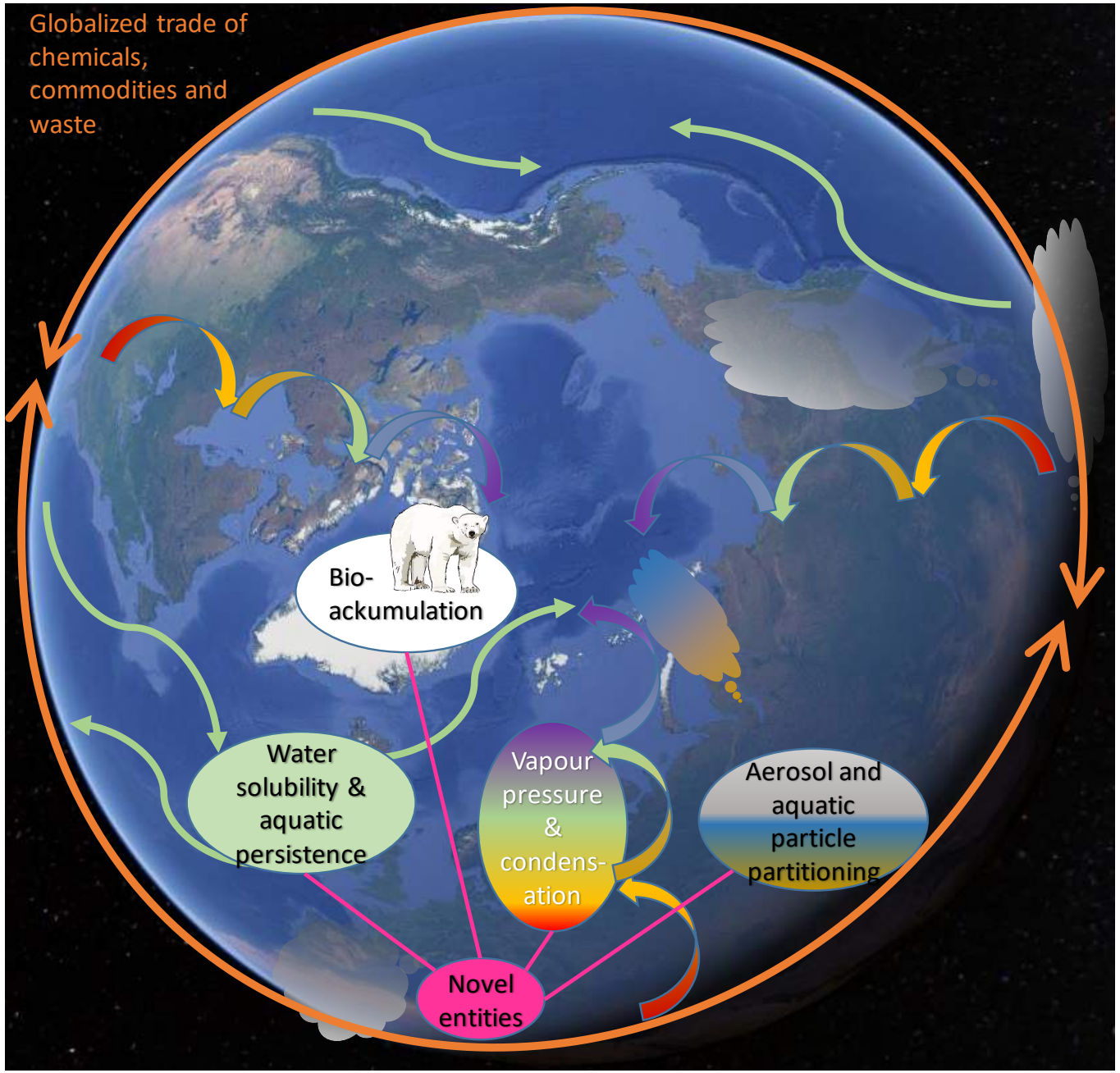
Global pollution measurements

- Limited global chemical measurements
- Lead (Pb)
- Main source is gasoline



Geotraces.org
Harremoes et al. (2001)

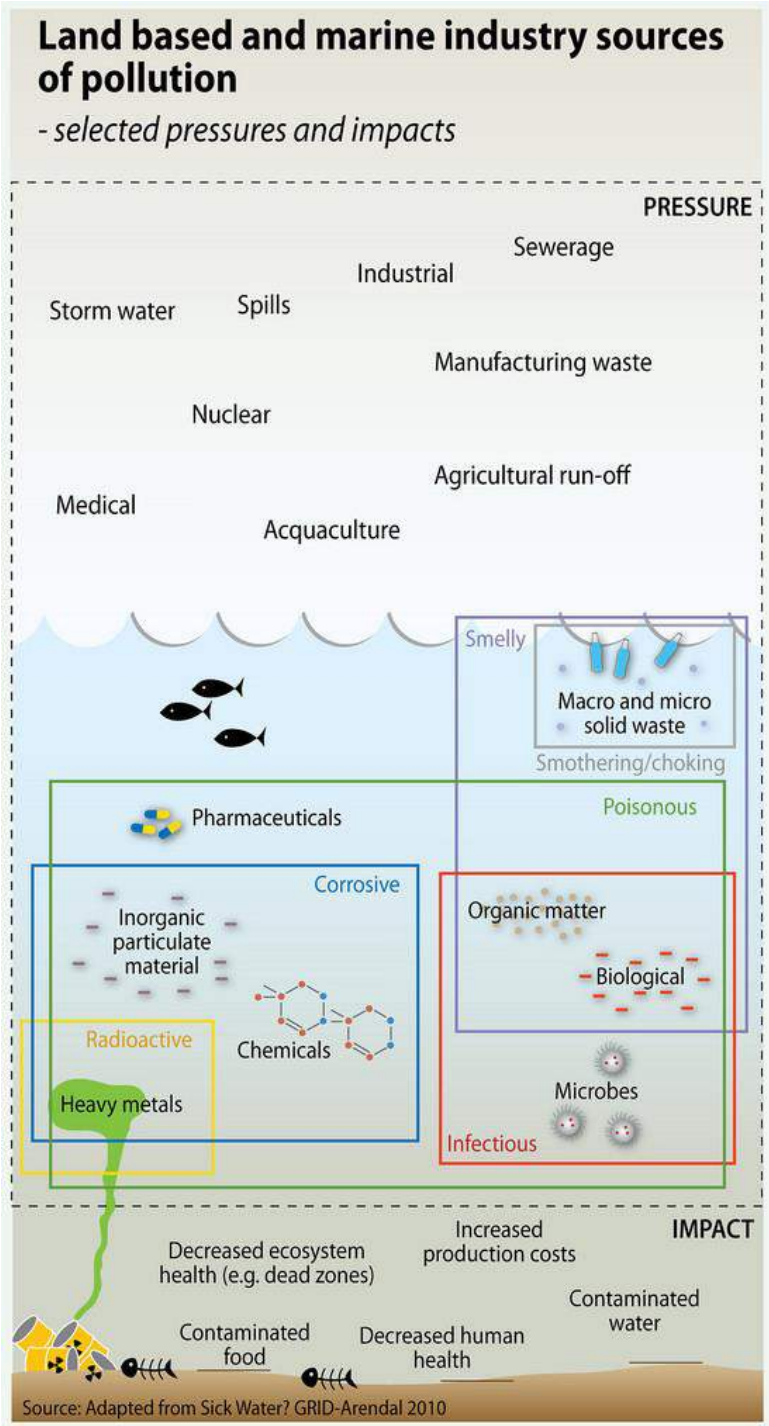
Spread of chemicals to polar regions



Gouin et al., 2004

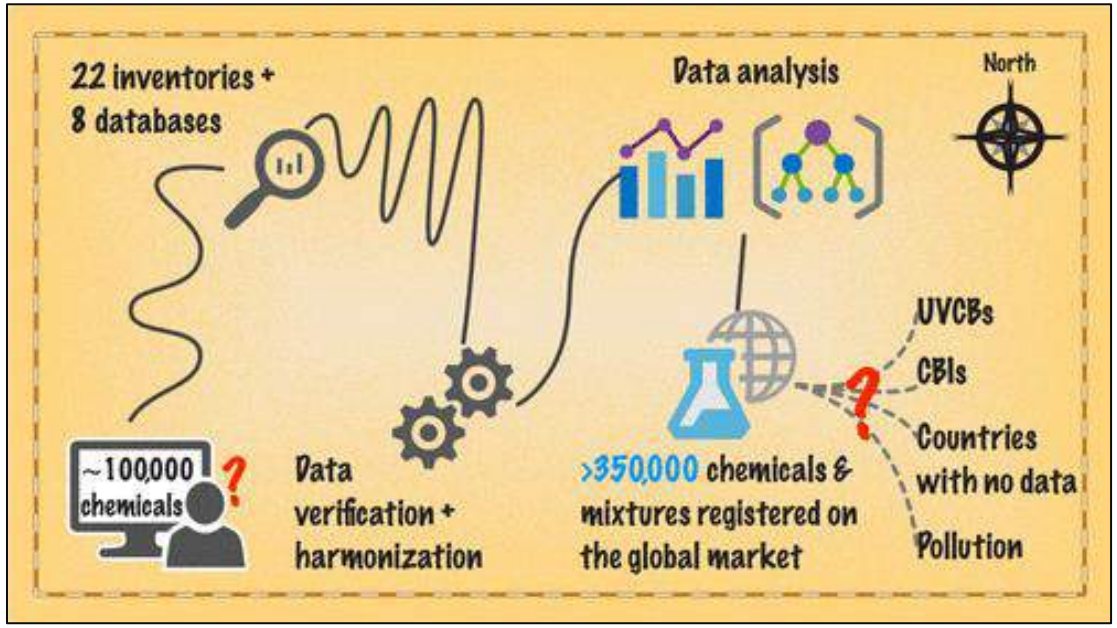
Barbapapas, 70s

Changing pollution perspectives…



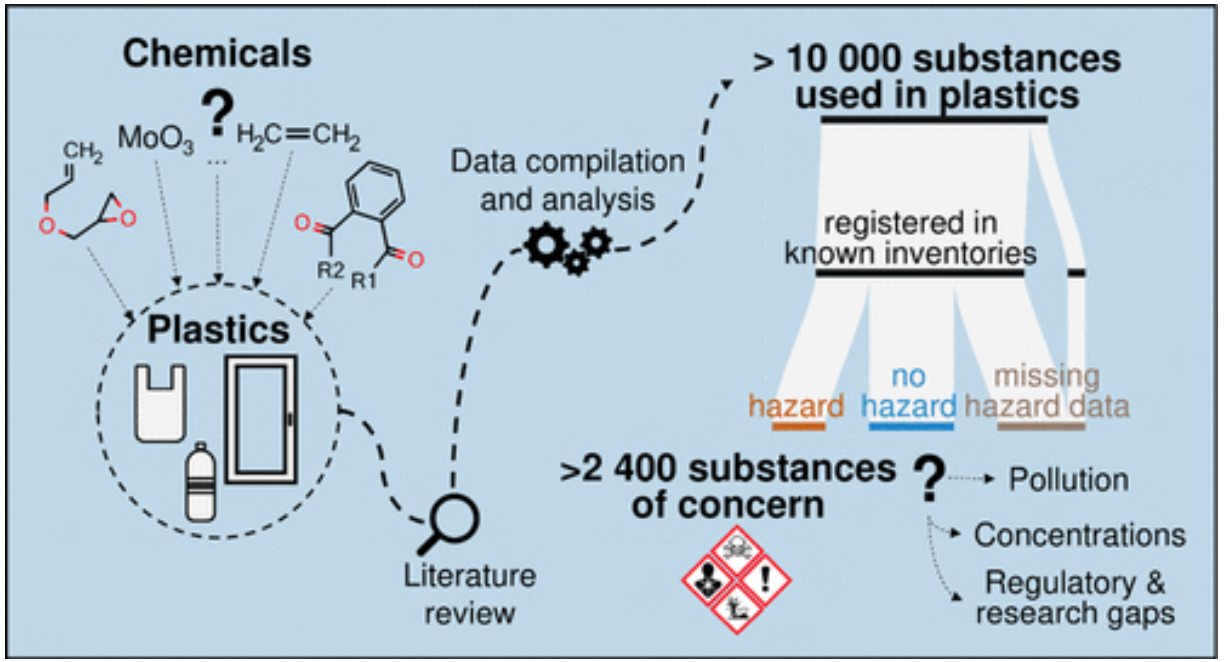
350 000 chemicals and mixtures

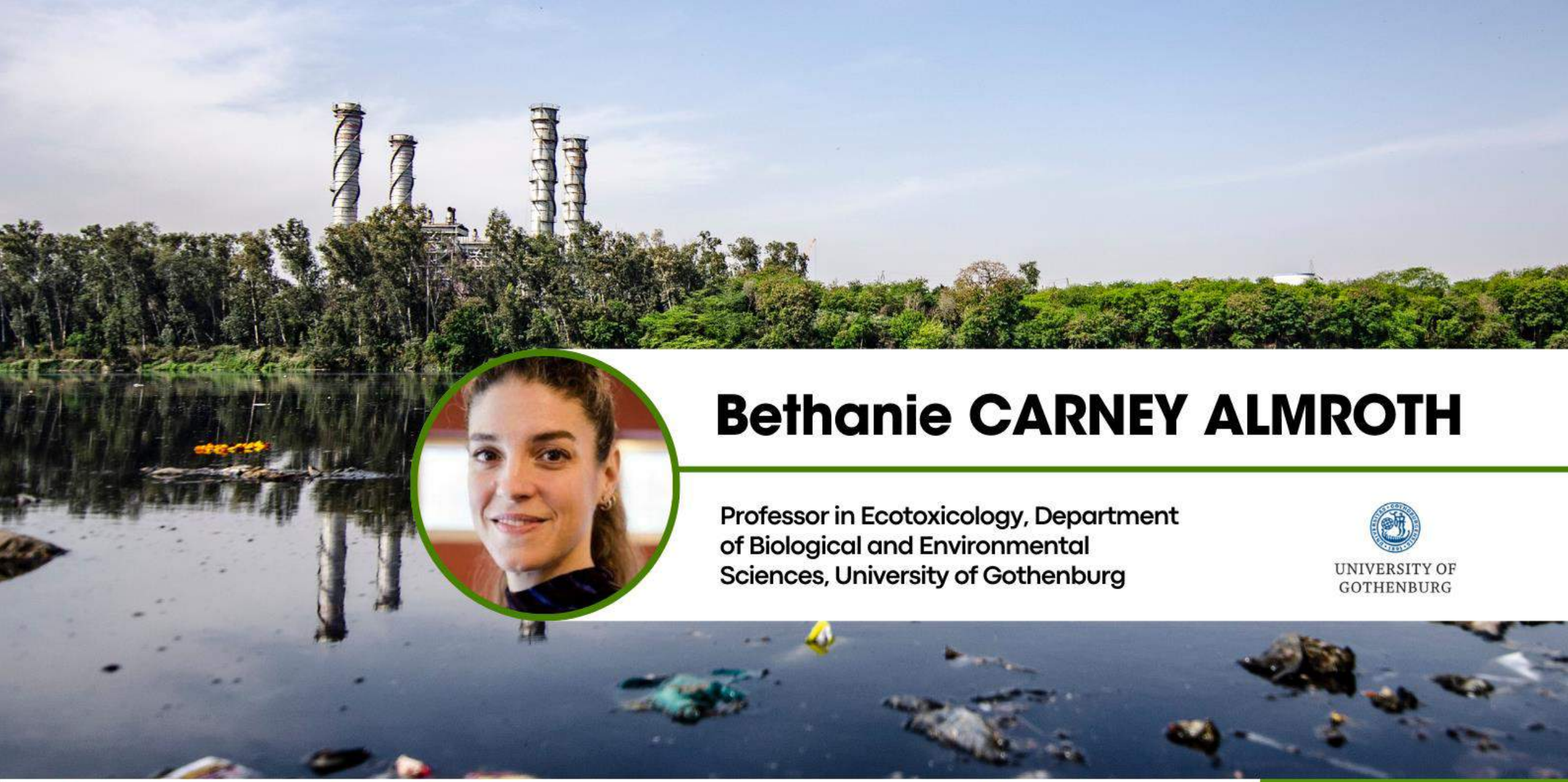
- Wang et al., 2020, ES&T
- 22 chemical inventories, 19 countries
- 50 000 confidential
- 70 000 ambiguously described



10 000 substances used in plastics

- Weisinger et al., 2021, ES&T
- 63 industrial, scientific, and regulatory data sources
- 10 000 substances used in plastics
- > 2400 chemicals of concern





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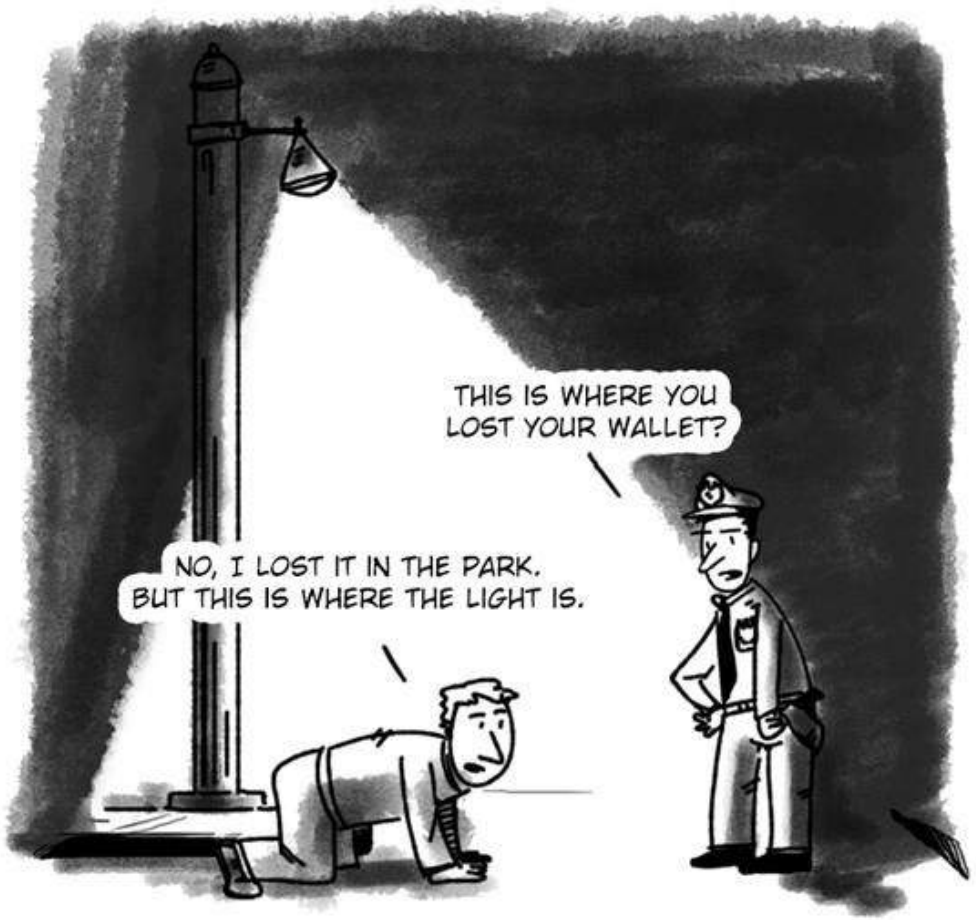
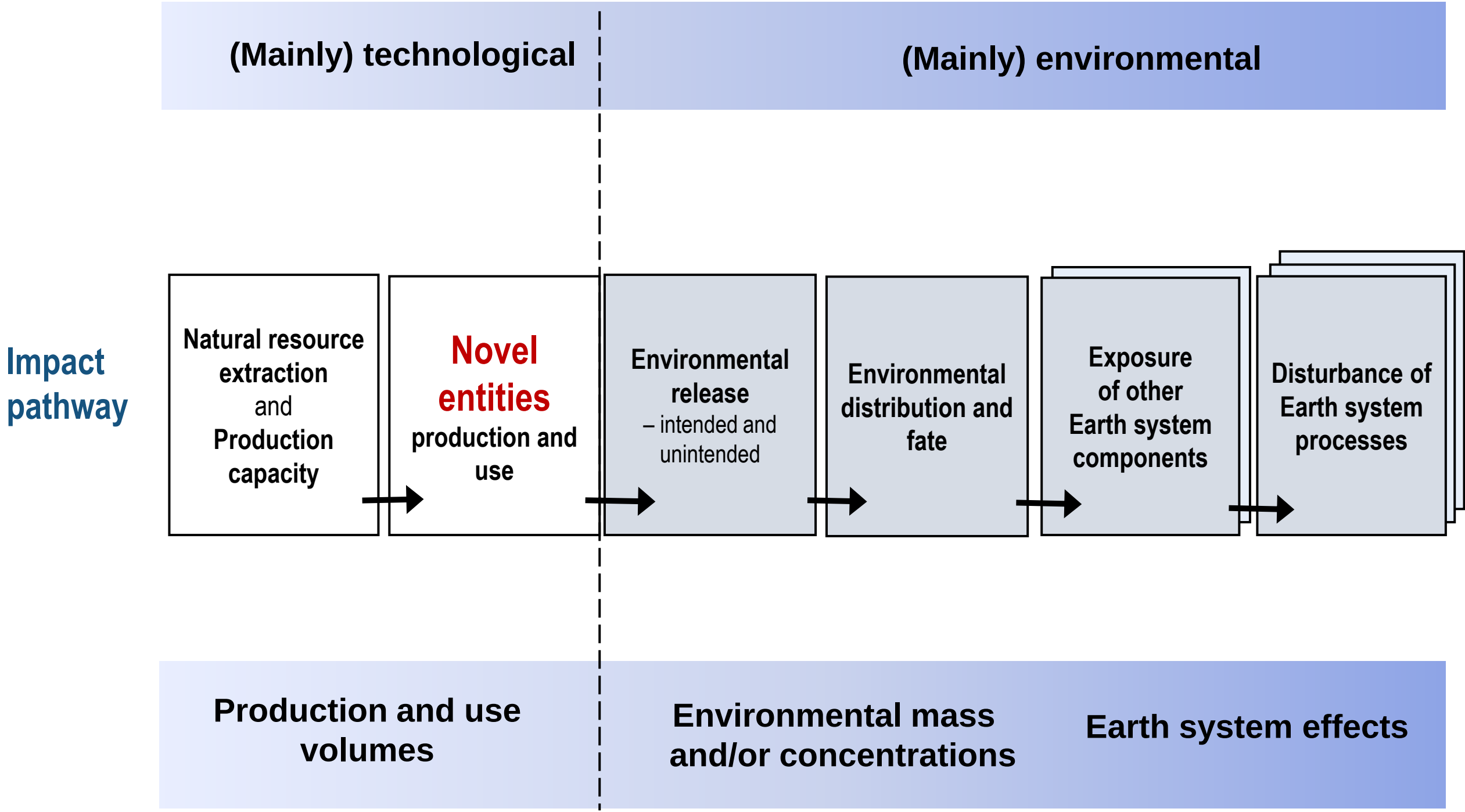
Ecotoxicological research has focused on 65 chemicals

- Kristiansson et al, 2021, Envir Sci Pol
- 3500 chemicals in 130,000 papers
- Pharmaceuticals, biocides, metals, plant production products, REACH substances



Life cycle of Novel Entities

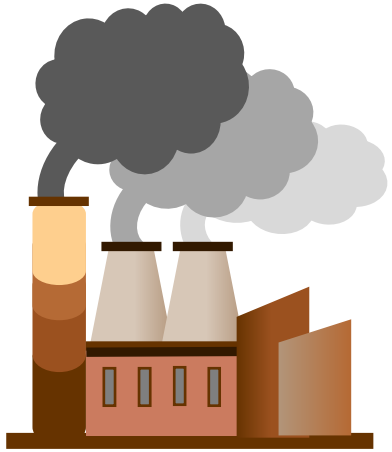

(Mainly) technological
(Mainly) environmental
Impact pathway
Natural resource extraction and Production capacity
Novel entities production and use
Environmental release – intended and unintended
Environmental distribution and fate
Exposure of other Earth system components
Disturbance of Earth system processes
Production and use volumes
Environmental mass and/or concentrations
Earth system effects

How to inform selection of control variables???

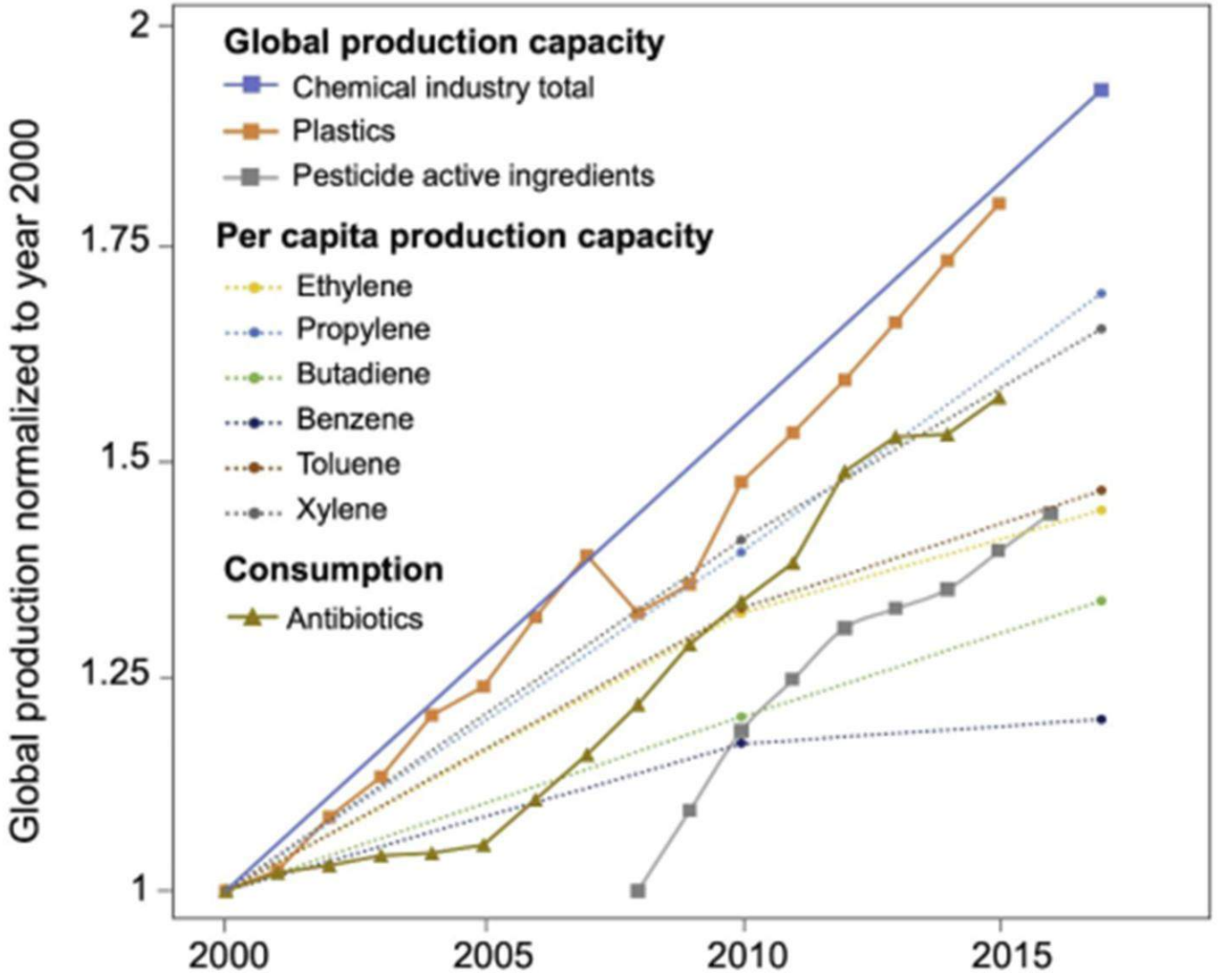
- **Feasibility**: Can it be measured?
- **Relevance**: Can it be robustly linked to effects?
- **Comprehensiveness**: Does it capture the planetary scale of the problem?

Technological control variables

Trends in production of novel entities



- Production volume of chemicals
- Production volume of plastics
- Share of chemicals on the market that have safety data or regulatory assessment


Global production capacity
Chemical industry total
Plastics
Pesticide active ingredients
Per capita production capacity
Ethylene
Propylene
Butadiene
Benzene
Toluene
Xylene
Consumption
Antibiotics
Global production normalized to year 2000
2
1.75
1.5
1.25
1
2000
2005
2010
2015

ECHA
EUROPEAN CHEMICALS AGENCY

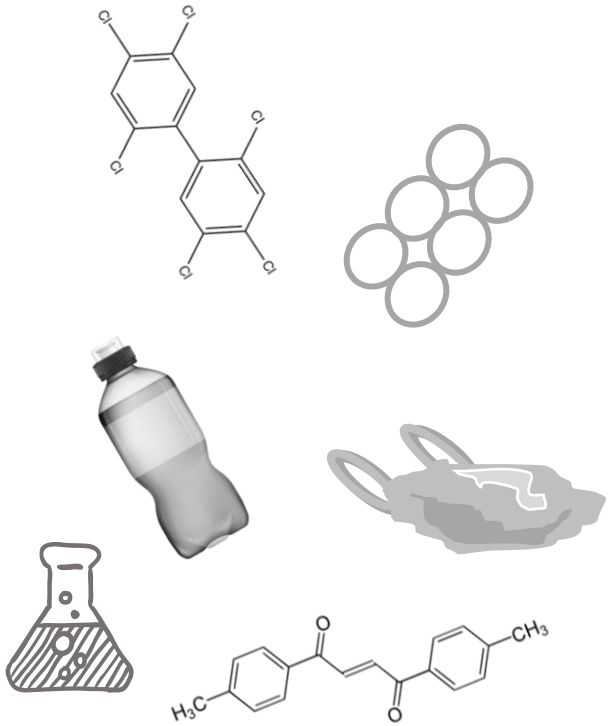
REACH: European chemicals legislation

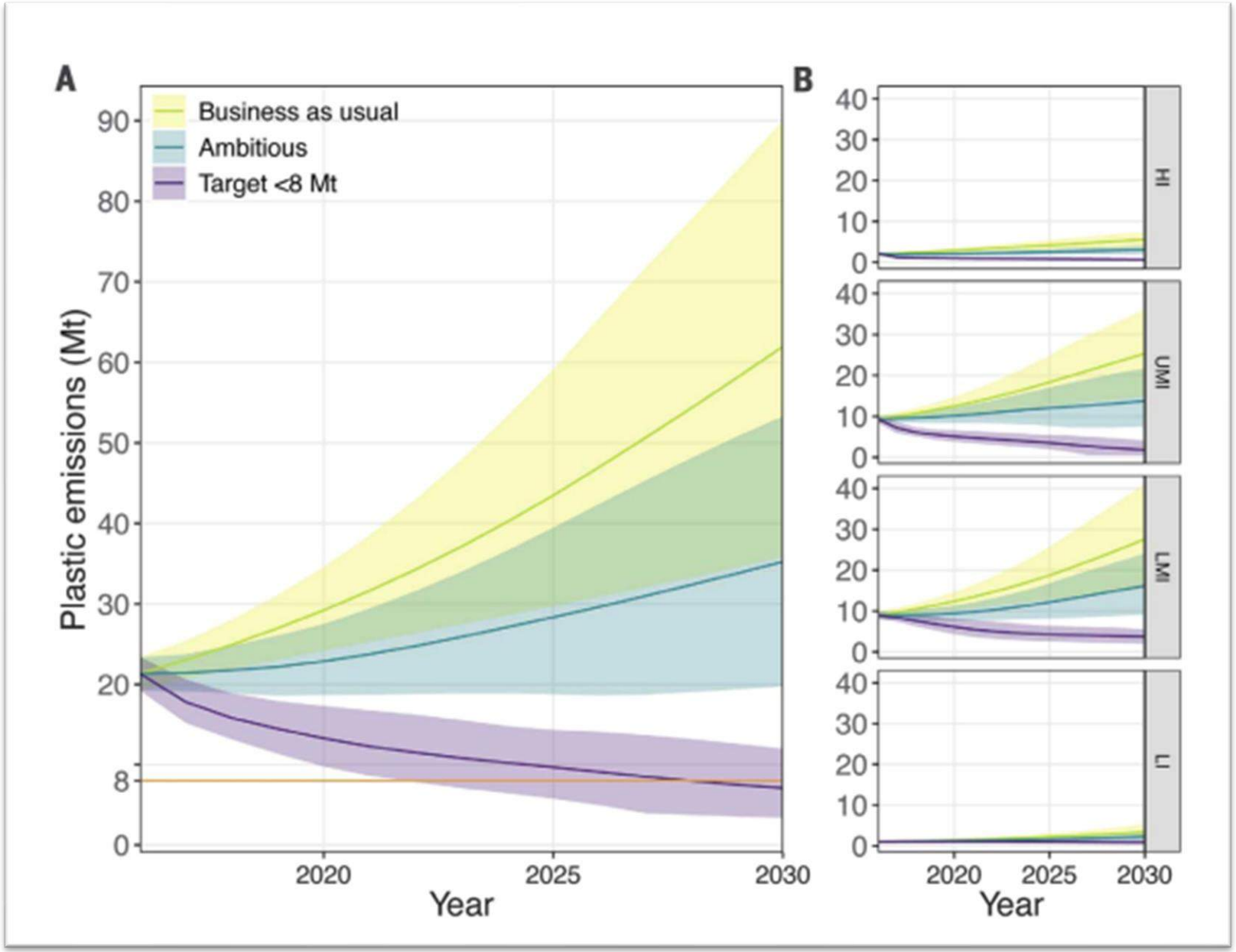
- 143 000 chemicals on European market
- Registration of chemicals >1000 kg/yr
- 48 000 dossiers have been submitted
- ECHA only checks app 25% of dossiers, 74% fail to provide “important safety information”

Environmental control variables

Trends in release of novel entities

- Emission quantities of hazardous chemicals
- Release quantities of plastics into the environment





Annual global plastic emissions into aquatic ecosystems

Borrelle et al., 2020

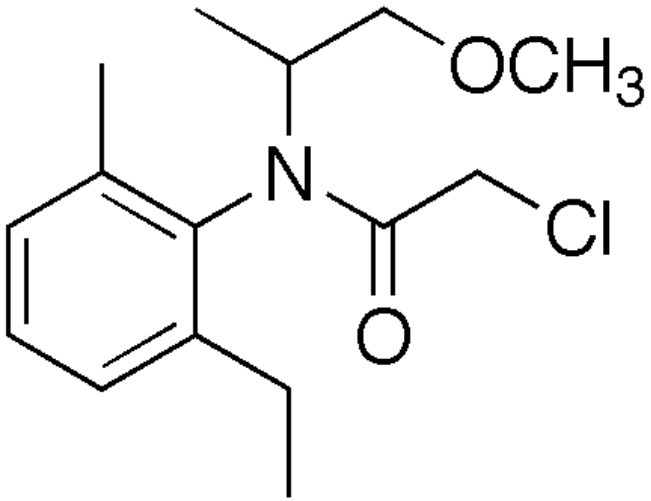
Environmental control variables

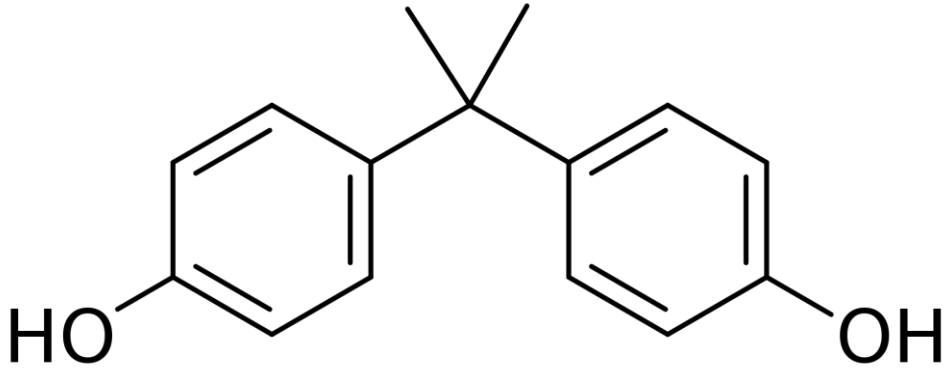
Unwanted impact of novel entities on Earth system processes

- Toxicity of chemical pollution
- Disturbance to biosphere integrity by plastic pollution

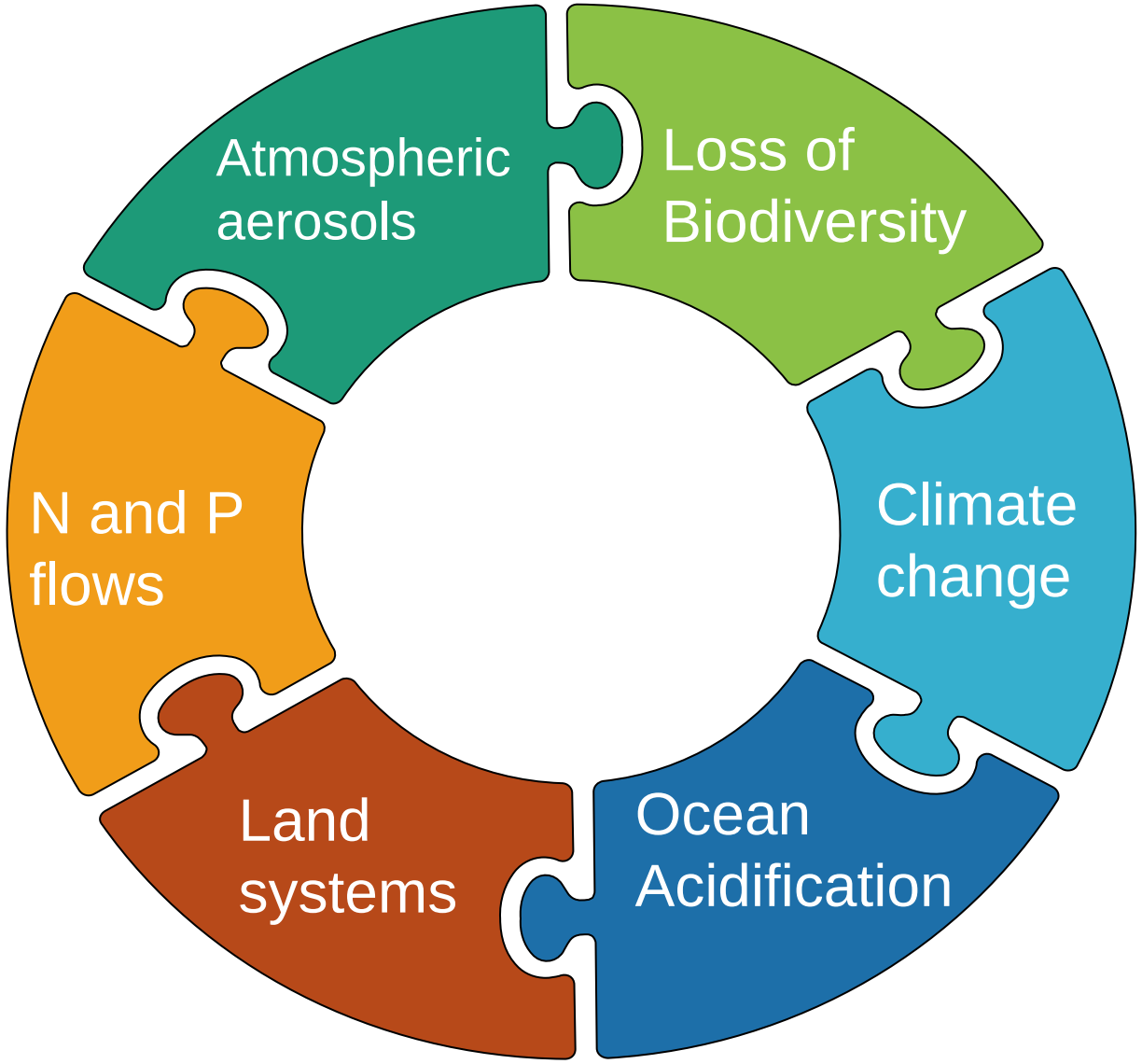
The solution to pollution is dilution?

Metalochlor (pesticide) and **BPA** (polymer/plastic additive) occupy 1/1000th of the available 'space' in fresh water systems in Europe.



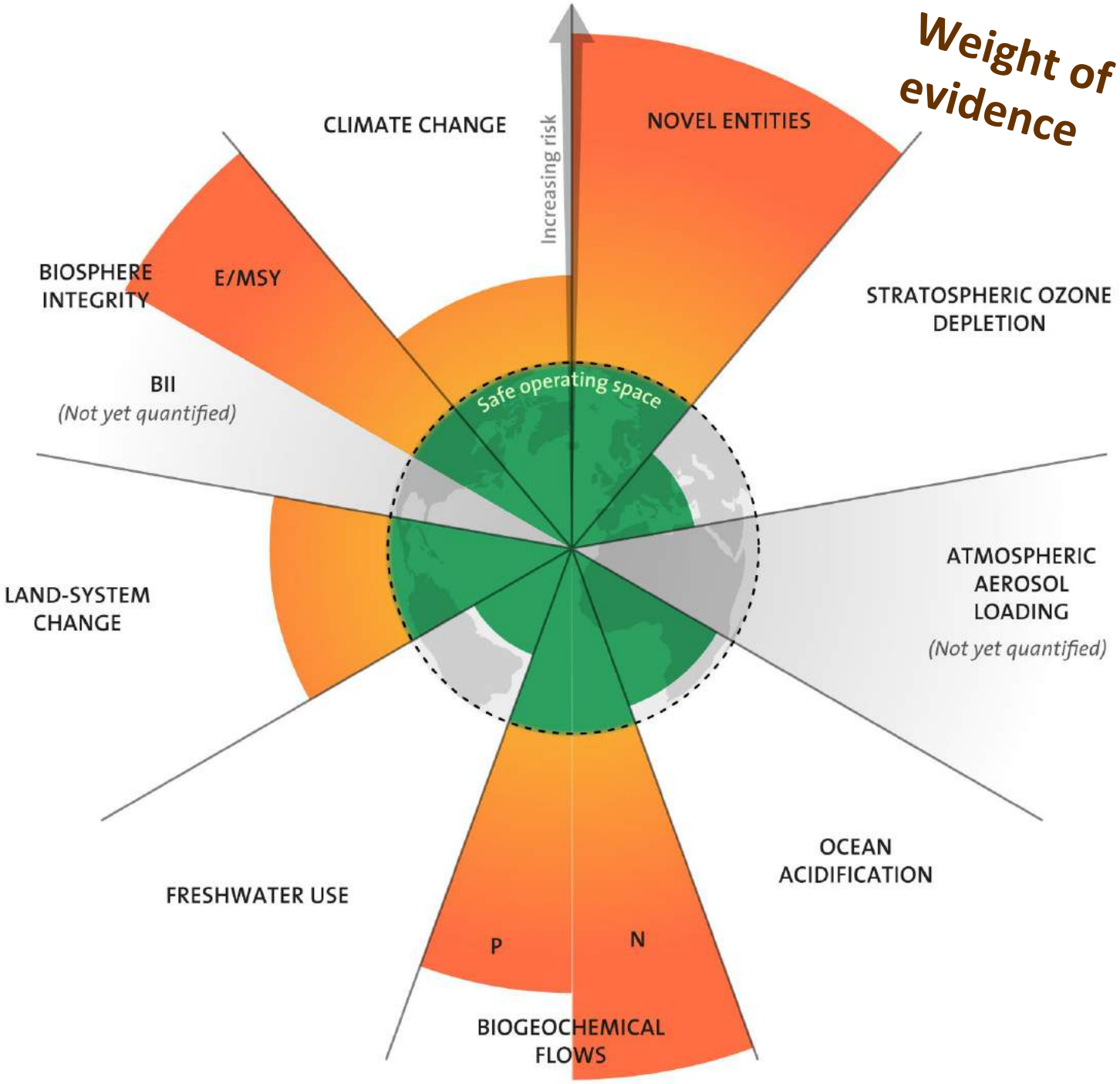


Connections to other planetary boundaries

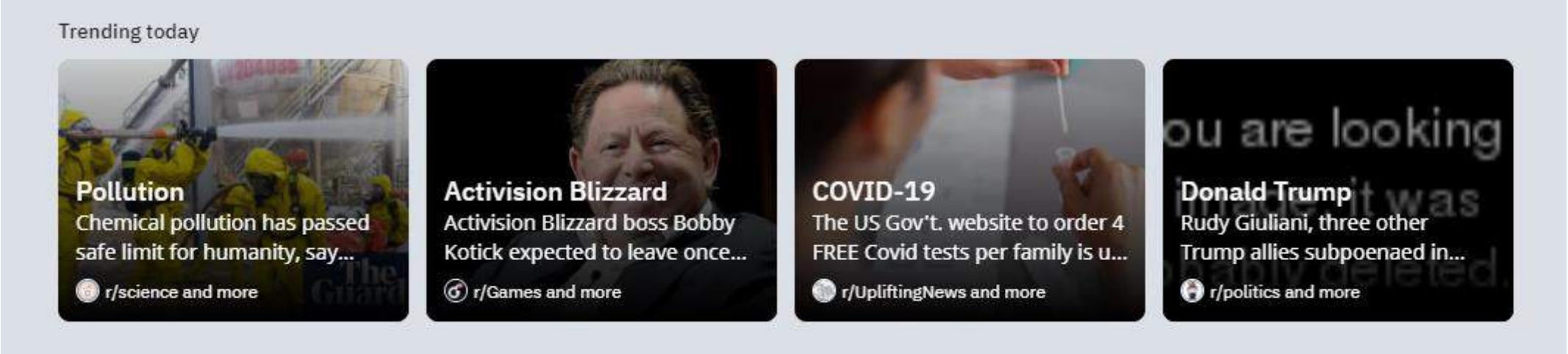


Have we transgressed the boundary for novel entities?

★ Trends in production volume of chemicals	★ **Can’t say we are safe**
★ Trends in production volume of plastics	★ **Can’t say we are safe**
★ Share of chemicals on the market that have safety data or regulatory assessment	★ **High risk**
★ Trend in emission quantities of hazardous chemicals	★ **Yes**
★ Trend in release quantities of plastics into the environment	★ **Yes**
★ Toxicity of chemical pollution	★ **Yes**
★ Disturbance to biosphere integrity by plastic pollution	★ **Yes**


Weight of evidence
Increasing risk
CLIMATE CHANGE
NOVEL ENTITIES
STRATOSPHERIC OZONE DEPLETION
ATMOSPHERIC AEROSOL LOADING
(Not yet quantified)
OCEAN ACIDIFICATION
N
P
BIOGEOCHEMICAL FLOWS
FRESHWATER USE
LAND-SYSTEM CHANGE
BIOSPHERE INTEGRITY
E/MSY
BII
(Not yet quantified)
Safe operating space

- r/science
- r/world news
- r/environment
- r/climate
- r/sustainability
- r/boringdystopia
- r/DarkFuturology



How do we move forward from here?

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BEAT PLASTIC POLLUTION
DIALOGUES

Toxic Chemicals: Invisible Harm | Health | Plastics Policy

The Invisible Global Crisis

UN Ocean 2022

Björn Beeler

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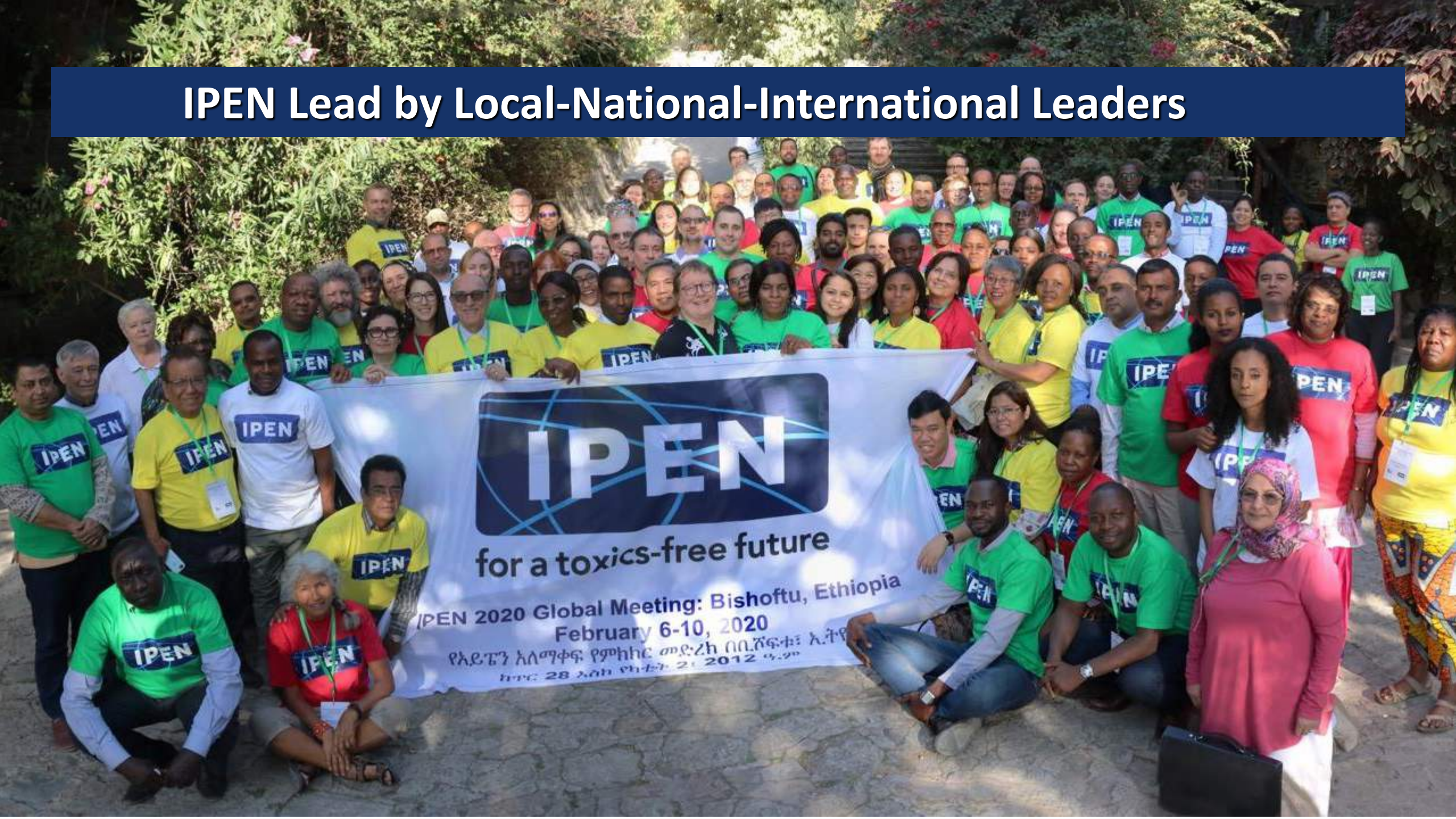
International Pollutants Elimination Network

Global network
600+ NGO/organizations
127 countries

IPEN

IPEN Lead by Local-National-International Leaders



Mission:

a toxics-free future for all

Change Theory Model:

Local to

Global to

Local

Solutions:

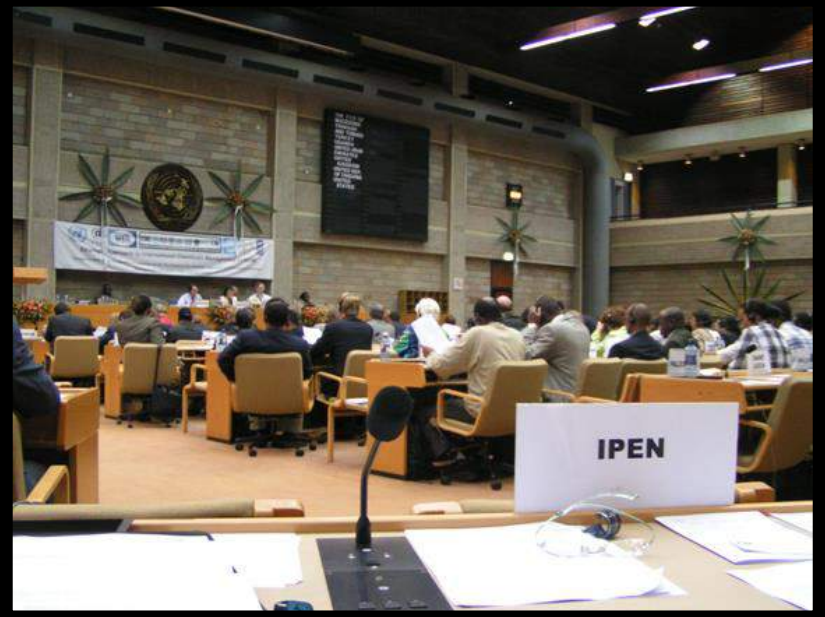
- Use Science to

Generate Data

- Create Public Policies

for Public Health

World's Worst Chemicals
Persistent Organic Pollutants (POPs)
Stockholm Convention 1998-2001



IPEN

Stockholm Convention

43 Banned Chemicals/Chemical Groups (12 + 31)

Pesticides:

Toxics sprayed directly into the environment

Plastics:

Toxic Chemicals used to Make Plastics

Toxic Chemical Releases from Plastic Wastes

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Pesticides

Poisoning the Food Web

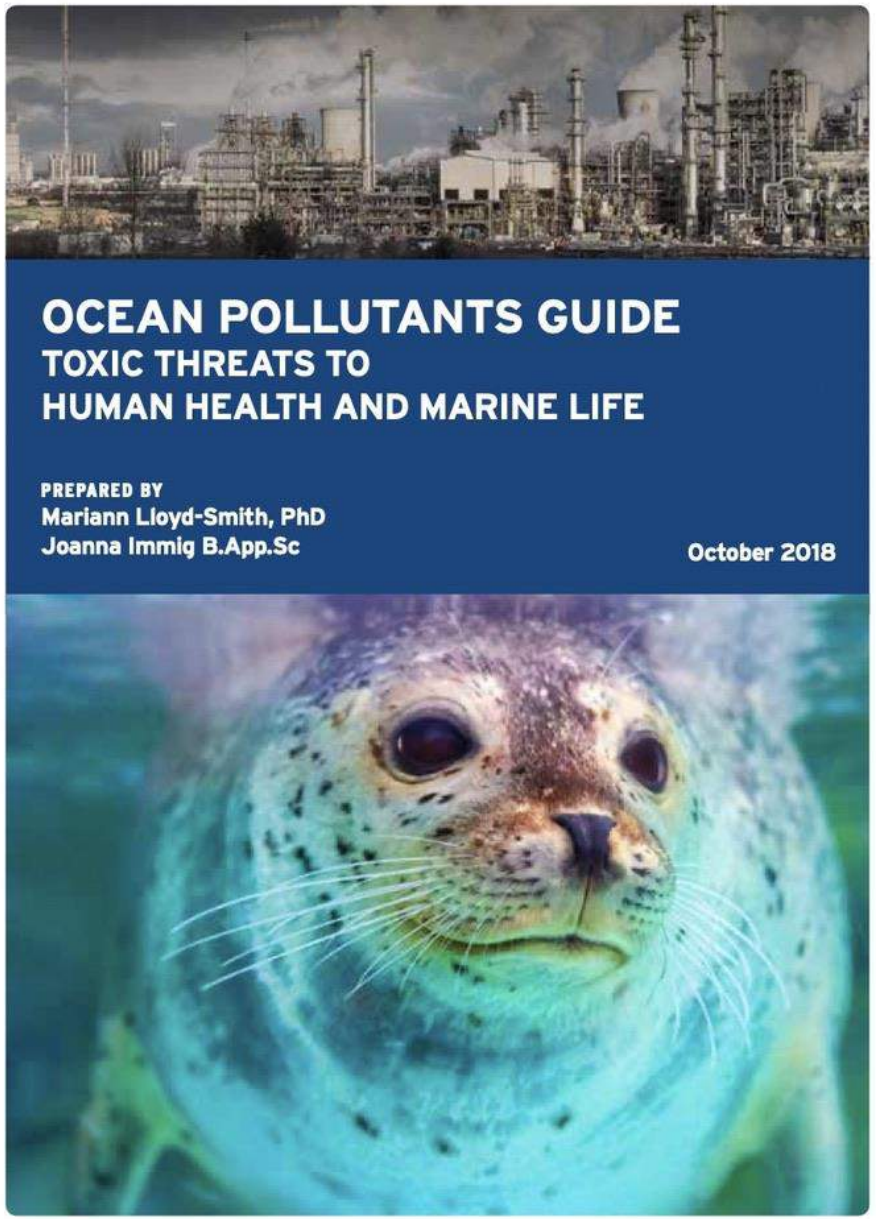
Search The Guardian US edition

Fishery collapse 'confirms Silent Spring pesticide prophecy'

Common pesticides found to starve fish 'astoundingly fast' by killing aquatic insects

Persistent herbicides are believed to pose one of the greatest risks to ecosystems and organisms in the Great Barrier Reef

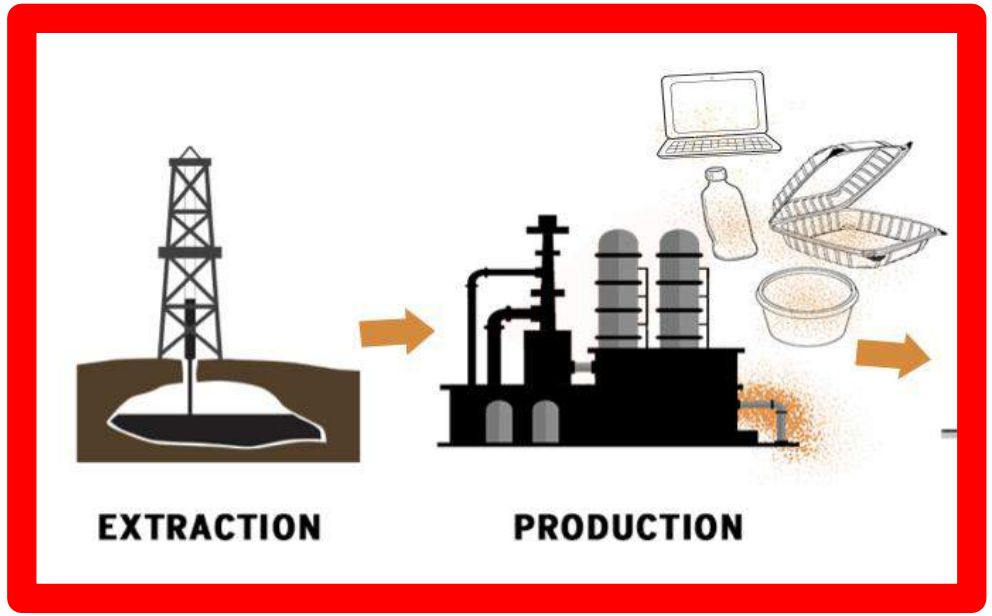
Image: Unsplash



Plastics: Poisoning Marine & Human Life

Image Carbonne Guinee

Plastics = Carbon + Chemicals



99% Oil

10,000+ Chemicals used

¼ are known hazardous chemicals

Environmental Science & Technology

Deep Dive into Plastic Monomers, Additives, and Processing Aids

Helene Wiesinger*, Zhanyun Wang*, and Stefanie Hellweg

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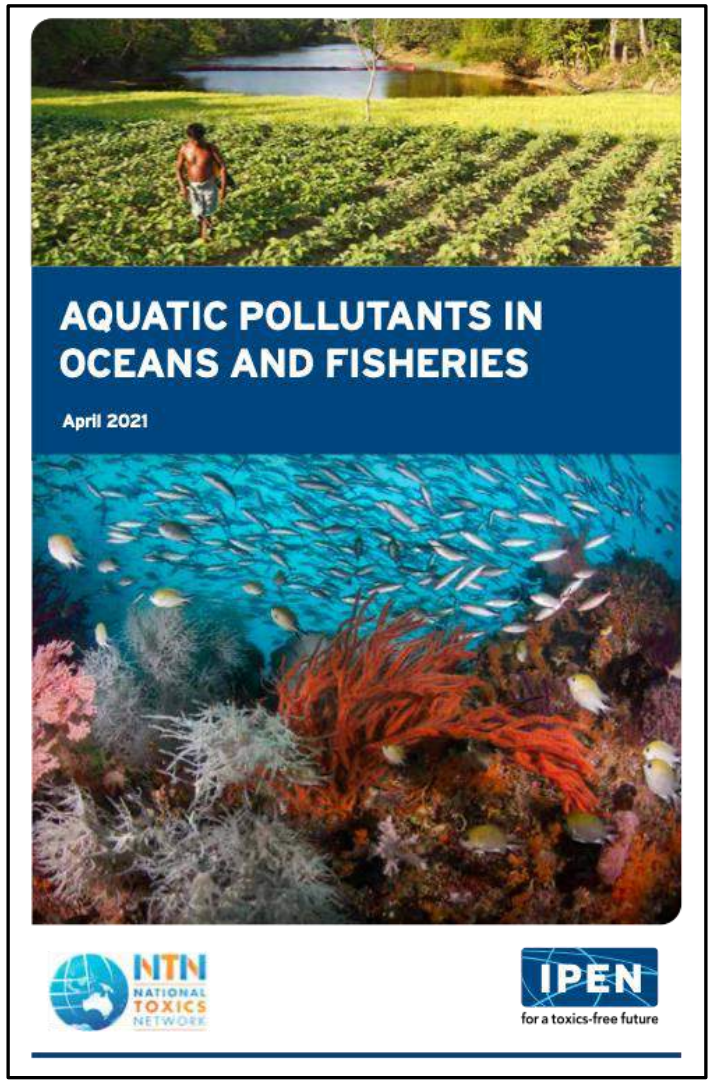
Toxic chemicals in plastics affect marine life



*"The **fertility of marine fish decreased** as they bioconcentrated persistent Endocrine Disrupting Chemicals (EDCs)"*

NTN NATIONAL TOXICS NETWORK

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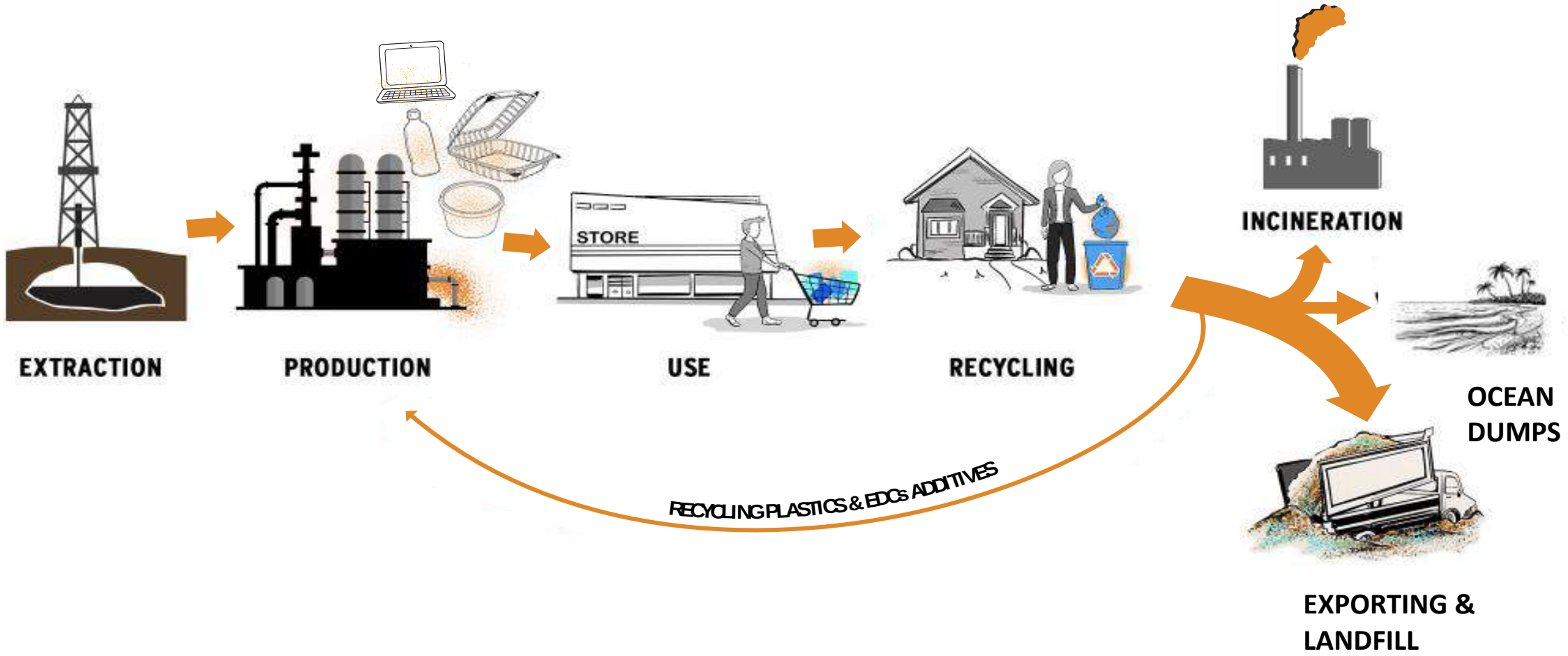
The Guardian
For 200 years

Regulators missing pollution's effect on marine life, study finds

Chemicals and plastics, not just overfishing, threaten aquatic food chain with 'disaster', report warns

Plastic's Toxic Life-cycle



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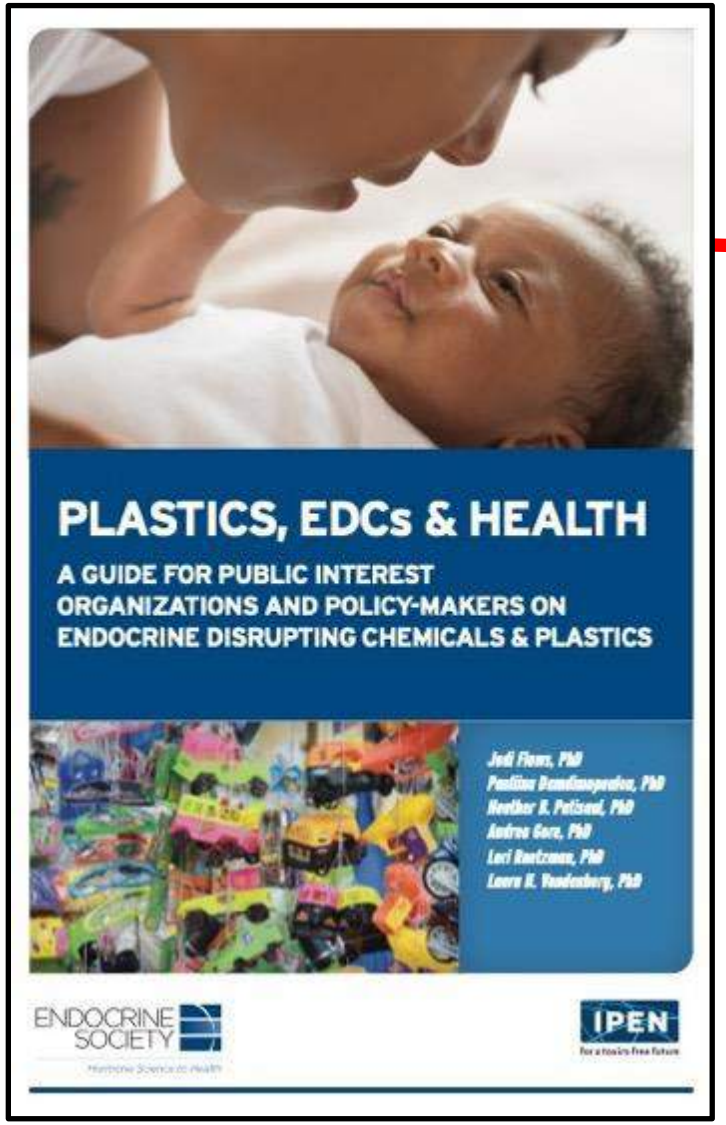
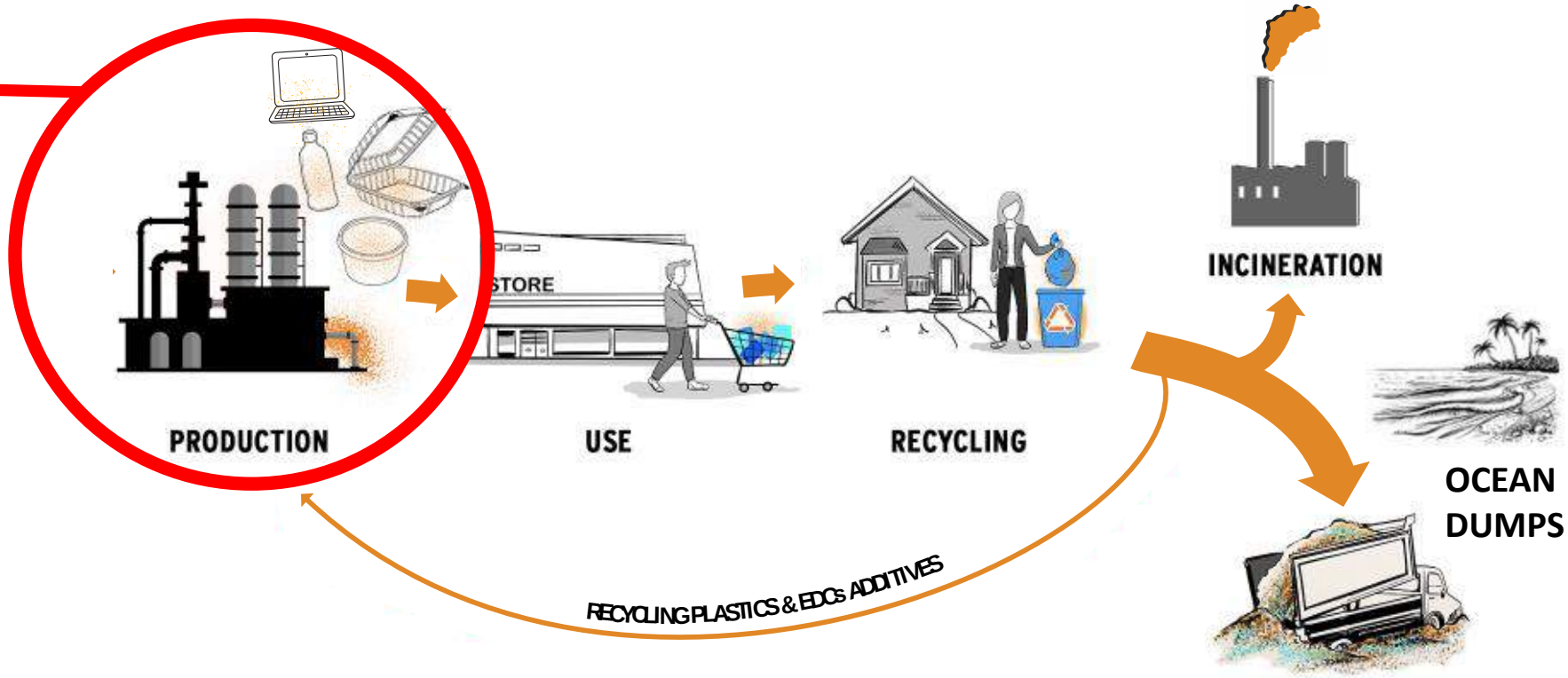
Toxic Chemicals Additives: Endocrine Disrupting Chemicals (EDCs)



Cancer, Reproductive Harm & More



ENDOCRINE SOCIETY
Hormone Science to Health

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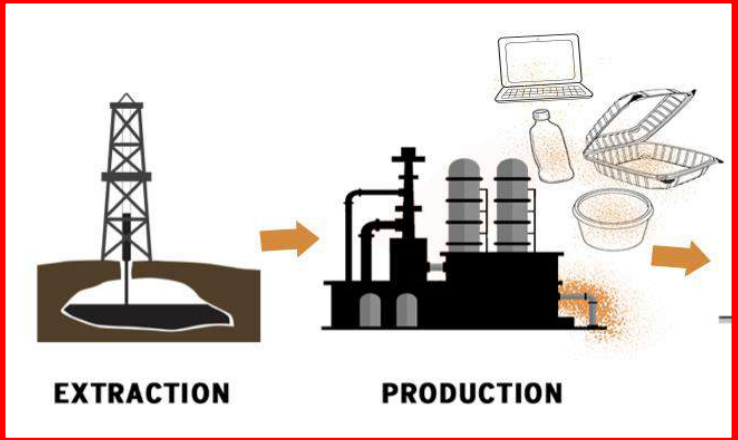

c&en

PETROCHEMICALS

Why the future of oil is in chemicals, not fuels

With gasoline consumption expected to wane, crude-to-chemicals complexes could dominate the petrochemical industry by the 2020s

by **Alexander H. Tullo**

February 20, 2019 | A version of this story appeared in **Volume 97, Issue 8**

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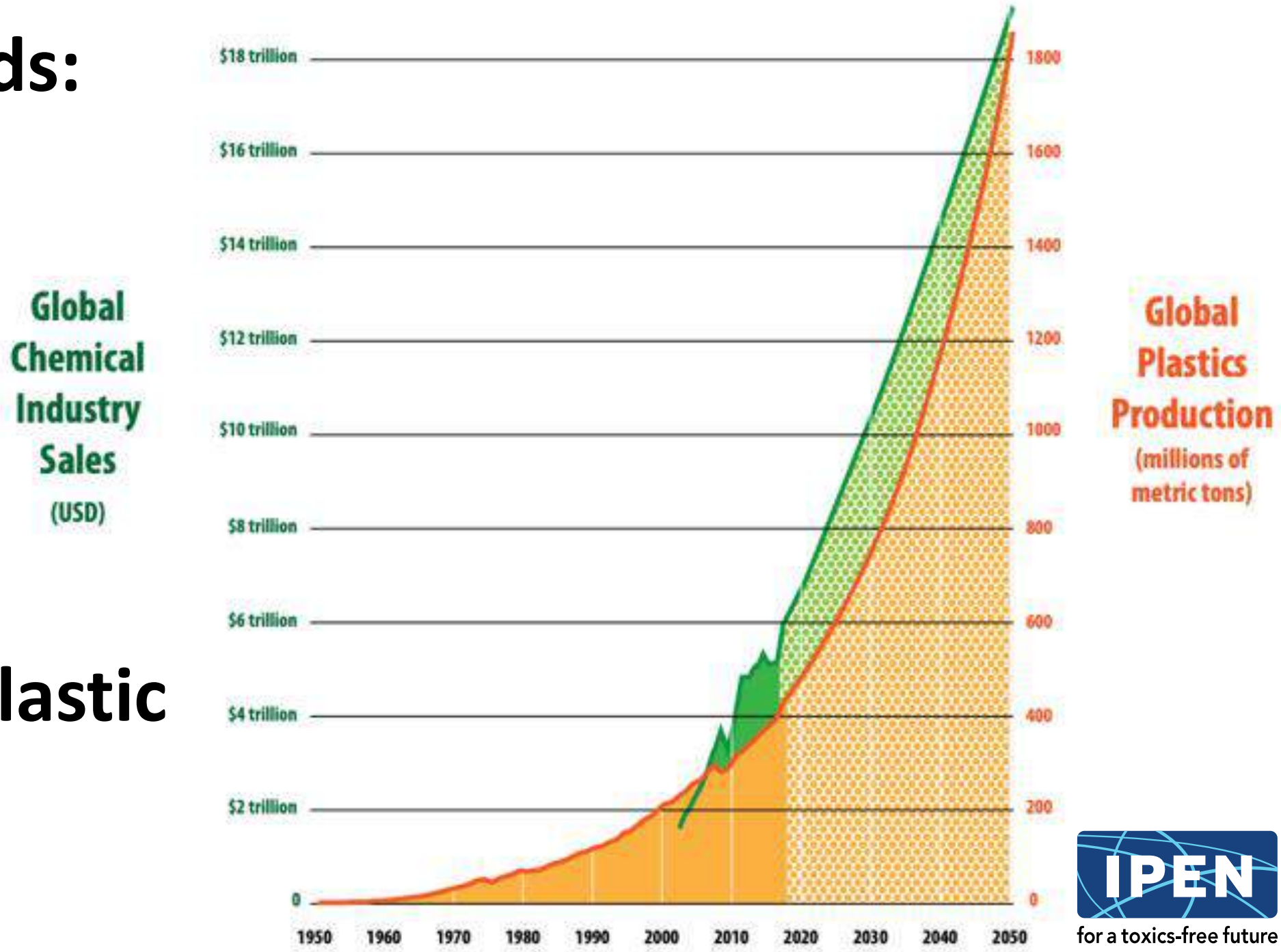
https://cen.acs.org/business/petrochemicals/future-oil-chemicals-fuels/97/i8

Global Trends:

Fossil Fuels shift from **Fuel** to **Materials/Plastic**



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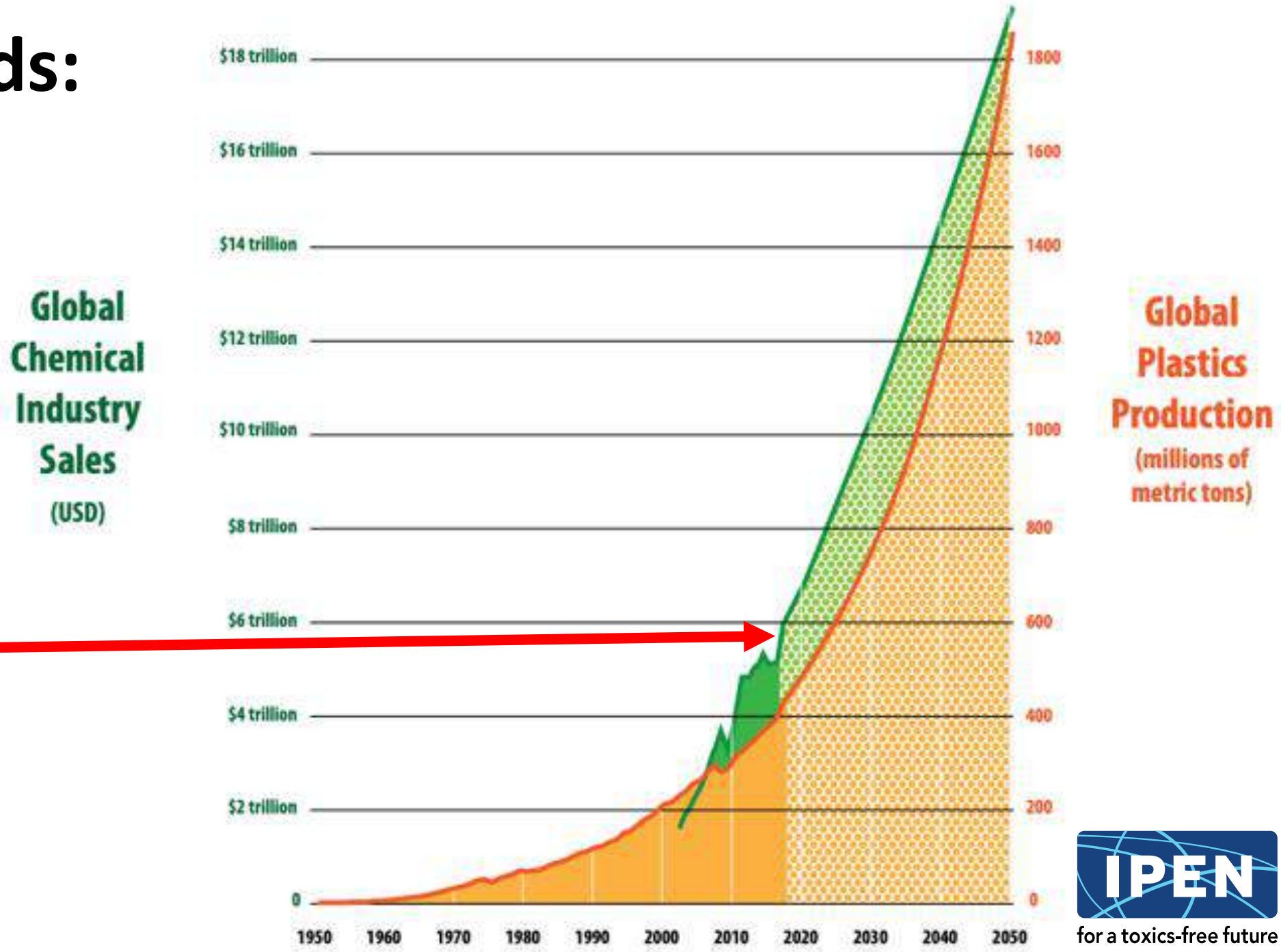
Global Trends:



You Are Here

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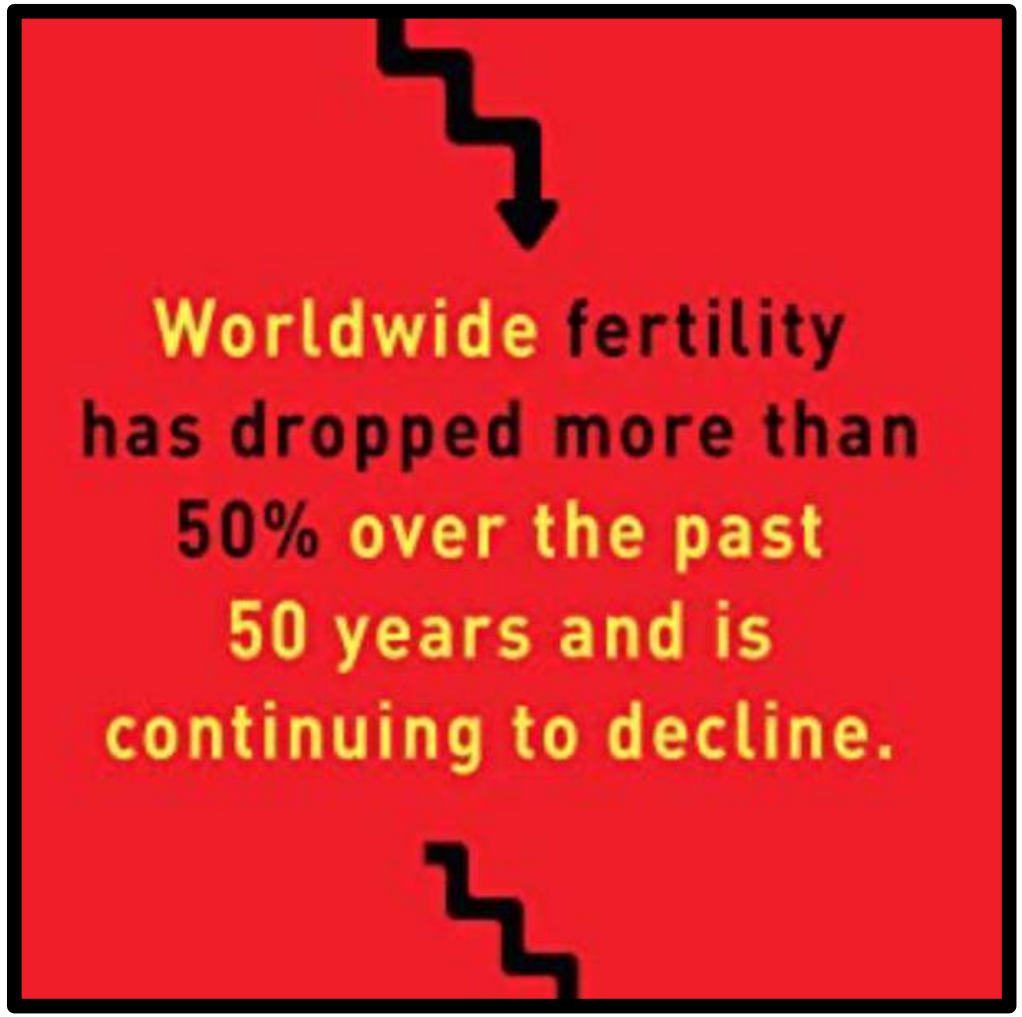
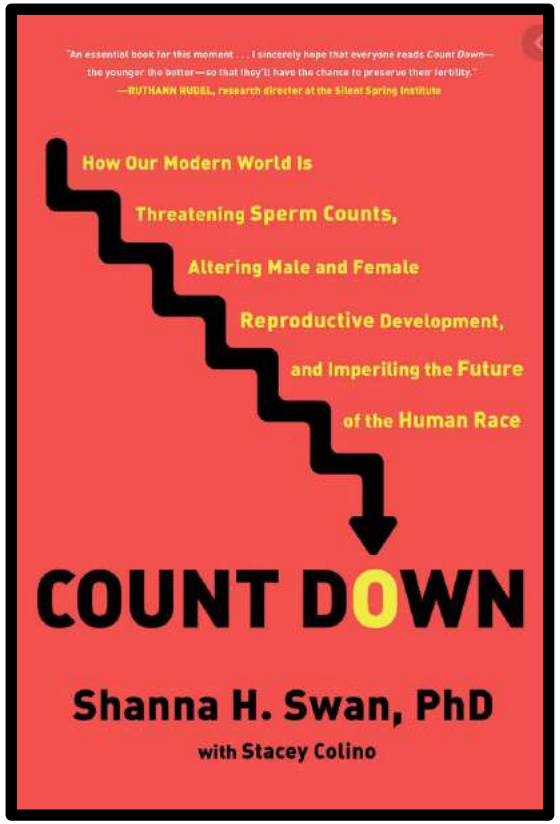
Trends: Chemical Production UP & Fertility DOWN





2021

Plastic's Toxic Chemicals: PFAS, BFRs, Phthalates & BPA

Global Community Monitoring: Toxics in Plastics

23 Countries, All Regions

International Pellet Watch Japan

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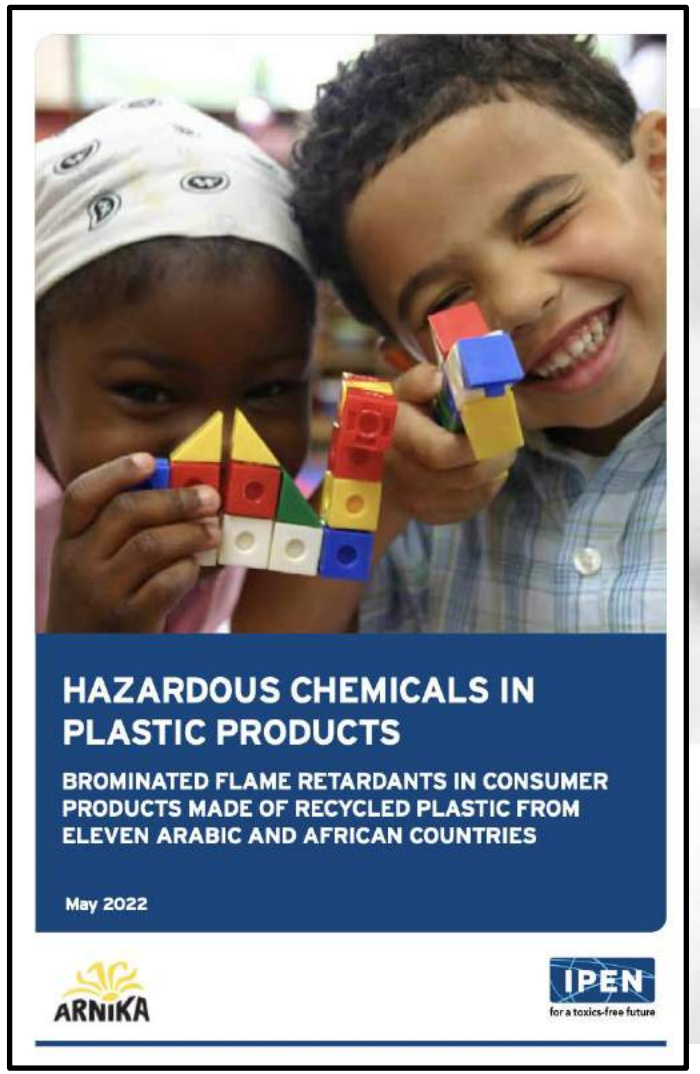
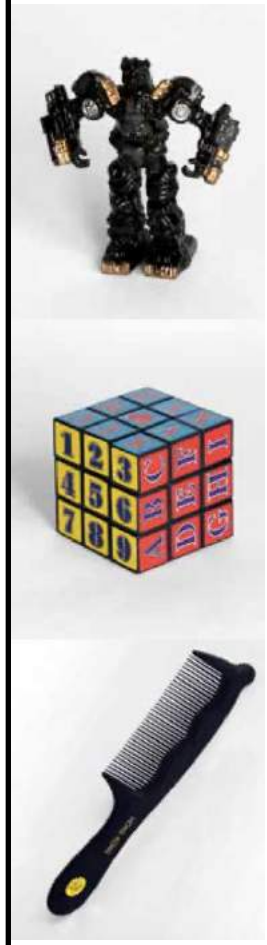
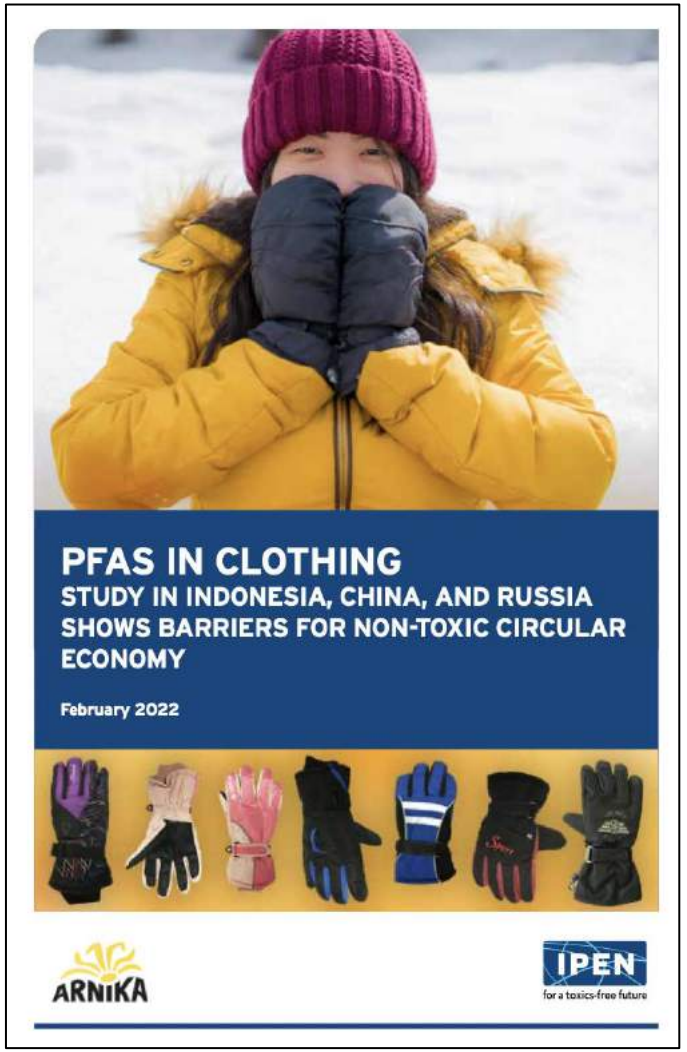
Global Community Monitoring: Toxics in Plastics

BPA in Bottles





BFRs in Toys



PFAS in Clothing

Don’t freak out:
There is hope!

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Action Plan for Hope:

1. Identify A **Common** Problem
2. Discuss Solutions
3. Create Rules (Laws)
4. Enforce Laws

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Defining the Problem, and Solutions for the Problem

Problem:

Chemical Pollutants

Solution:

Global Controls via Global Public Policies

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Progress: Global Bans on Toxic PFAS / Forever Chemicals

Stockholm Convention Bans: PFHxS (2022) PFOA (2019) PFOS (2009)

Illustration: Soohee Cho/The Intercept

17

HIGH LEVELS OF TOXIC PFAS CHEMICALS POLLUTE BREAST MILK AROUND THE WORLD

Sharon Lerner
April 30 2019, 6:24 a.m.

Opportunity: Plastics Treaty (2022 it begins)

Plastics Treaty = Global Health Treaty

Opportunity : **Protect** Human Health & Marine-life/Biodiversity from Toxics
Ban Production of Toxic Chemicals in Plastics
Shift Responsibility to Chemical & Plastic Producers to Pay

Conclusions

- Toxic chemicals increasing global threat to human & marine life
- Plastics =carbon + chemicals

  (many toxic chemicals)
- Opportunity:

  Global Health Treaty, the Plastics Treaty
- Hope: "***instead of looking for hope, start creating that hope yourself***"

  - Greta Thunberg

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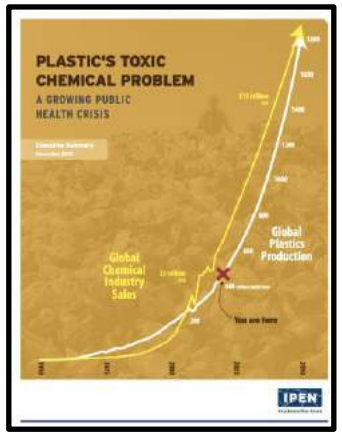
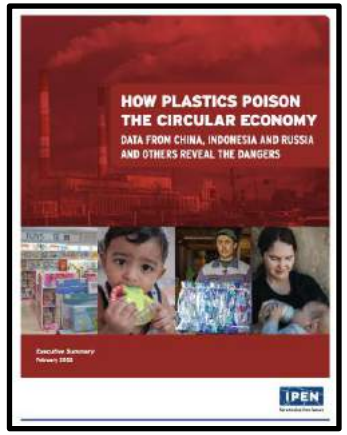
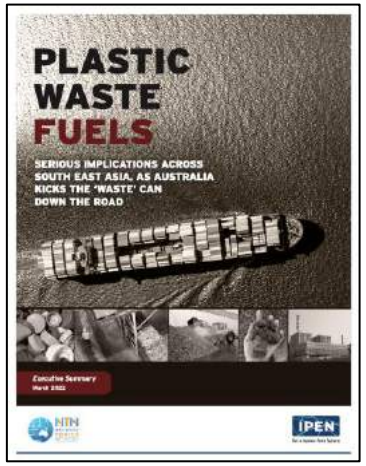
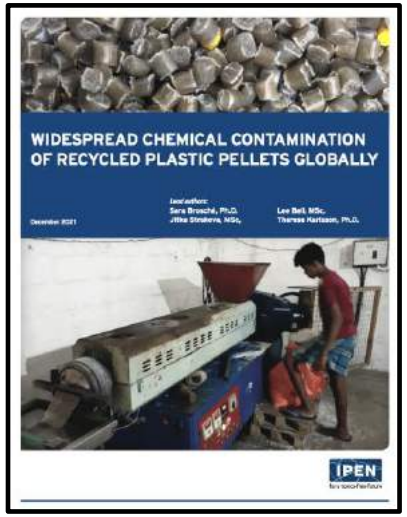
Making the invisible, visible

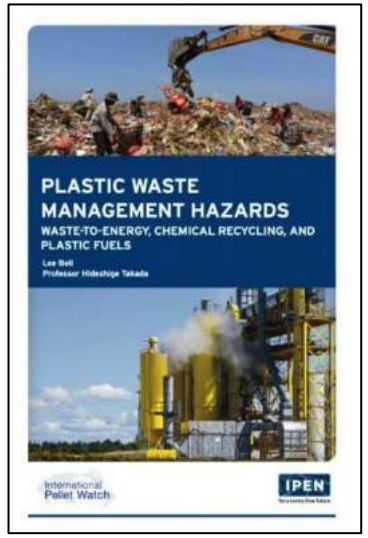






Online Access
IPEN Reports
IPEN Policy Views & Analysis
www.ipen.org





Thank you

@ToxicsFree | #ToxicPlastics. | ipen.org

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UNITED NATIONS OCEAN CONFERENCE LISBON 27 JUNE - 1 JULY 2022

SIDE EVENT

The Invisible Global Crisis: Exceeding the Limits of the Pollution Planetary Boundary

New Science and Opportunities to Tackle Threats to Human and Marine Life

27 June 2022 | 14:30–16:00 CEST

AGENDA

Welcome

- **Lena GIPPERTH |** Professor in environmental law and member of the Centre for Sea and Society, University of Gothenburg

Exceeding the Limits of the Pollution Planetary Boundary

- **Martin HASSELLÖV |** Professor in Analytical Environmental Chemistry, Department of Marine Sciences, University of Gothenburg
- **Bethanie CARNEY ALMROTH |** Professor in Ecotoxicology, Department of Biological and Environmental Sciences, University of Gothenburg

New Science and Opportunities to Tackle Threats to Human and Marine Life

- **Björn BEELER |** General Manager and International Coordinator, International Pollutants Elimination Network

Panel Discussion

- **H.E. Luis VAYAS |** Vice-Minister for Foreign Affairs and Cooperation, Ecuador
- **Jessica BROWN |** Head of Engagement, Back to Blue Initiative, The Economist
- **Therese KARLSSON |** Science and Technical Advisor, International Pollutants Elimination Network

Q&A

Closing Remarks

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Swedish Institute for the Marine Environment

WIOMSA

GENEVA ENVIRONMENT NETWORK

Luis VAYAS

Vice-Minister for Foreign Affairs and Cooperation, Ministry of Foreign Affairs, Ecuador

UNITED NATIONS OCEAN CONFERENCE
LISBON 27 JUNE - 1 JULY 2022

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GENEVA BEAT PLASTIC POLLUTION DIALOGUES

Jessica BROWN

Head of Engagement, Back to Blue Initiative, The Economist

The Economist

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CLOSING REMARKS

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Lisbon, FIL, Auditorium 1 & Online

27 June 2022 | 13:30 WEST | 14:30 CEST

SPEAKERS

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Professor in Ecotoxicology, Department of Biological and Environmental Sciences, University of Gothenburg

H.E. Luis VAYAS

Vice-Minister for Foreign Affairs and Cooperation, Ministry of Foreign Affairs, Ecuador

Martin HASSELLÖV

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Therese KARLSSON

Science and Technical Advisor, International Pollutants Elimination Network

Lena GIPPERTH

Professor in environmental law and member of the Centre for Sea and Society, University of Gothenburg | Moderator

THANKYOU

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WHAT'S NEXT?

genevaenvironmentnetwork.org

EVENT | VIRTUAL

How Plastic Waste Shipments Undermine Real Solutions to Ocean Plastic Pollution | UN Ocean Conference Side Event

28 JUN 2022 14:00 – 16:00
Online | Webex
EEB, Break Free From Plastic, GEN

Chemicals and Pollution | Plastics
SDG3 | SDG12

EVENT | AFTERWORK

Green Summer in Geneva 2022

21 JUN – 15 SEP 2022
Geneva

Nature | Science
SDG17