GREENHOUSE GAS EMISSIONS & PLASTICS:

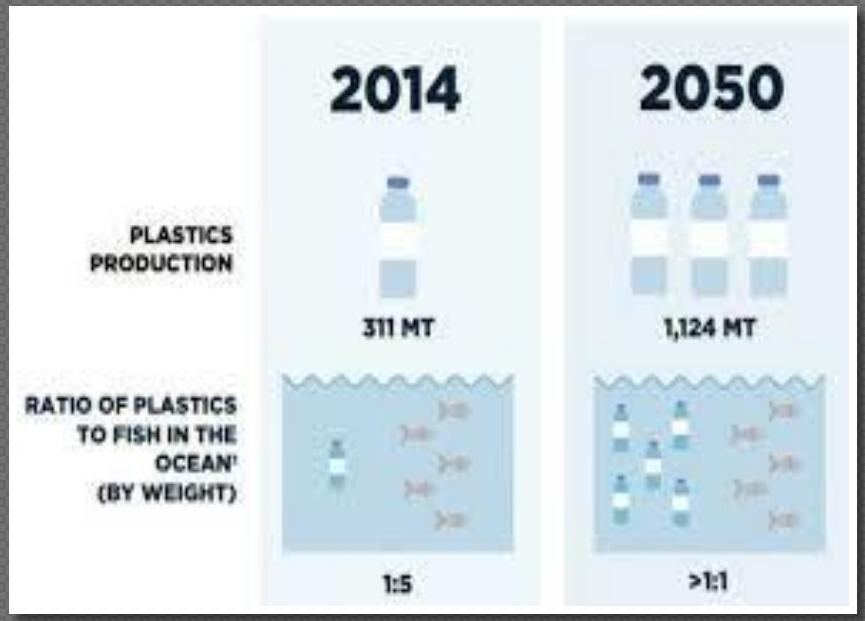
Presentation to

Minnesota House of Representatives
Environment & Natural Resources
Finance Division

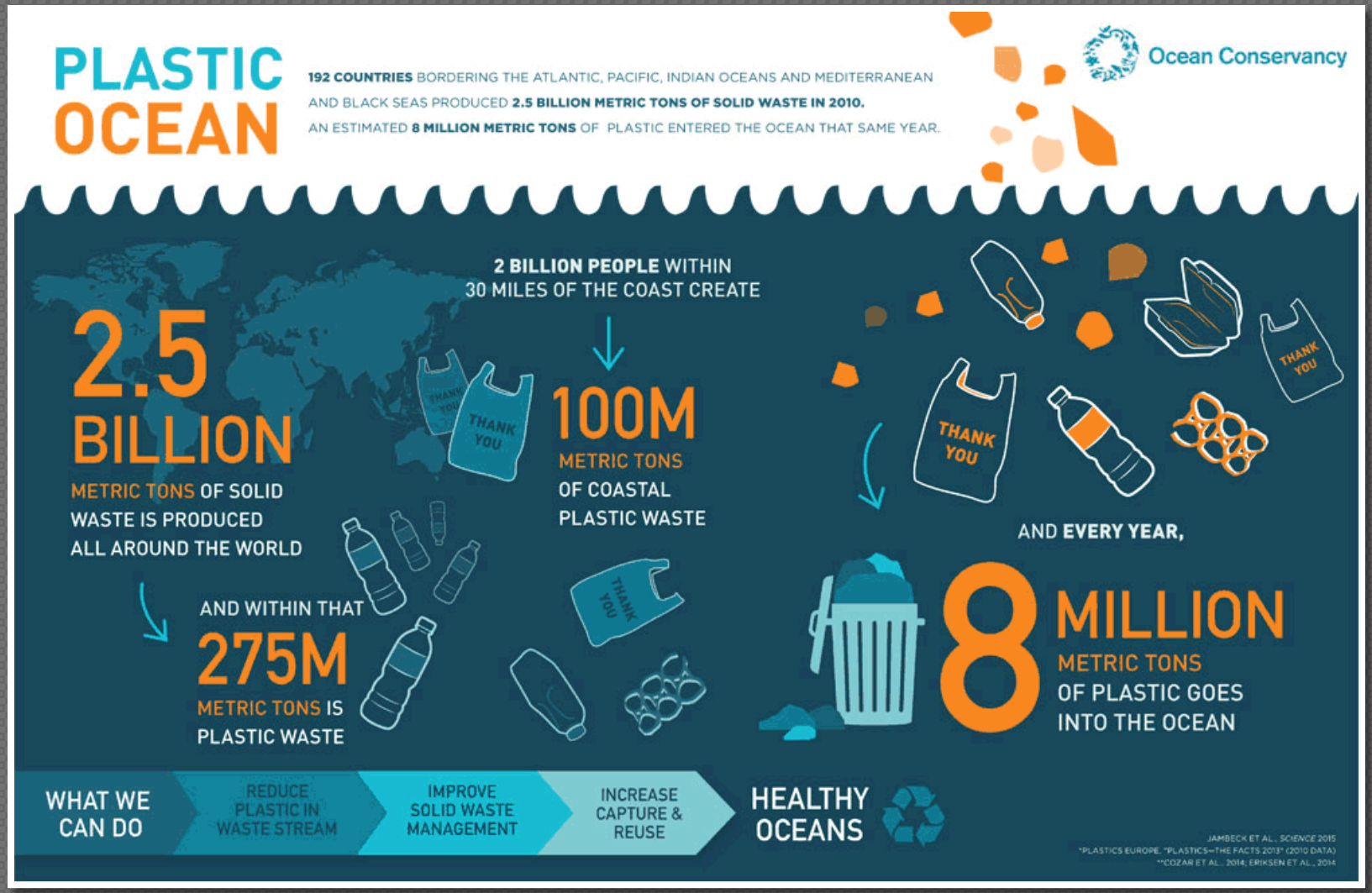
MARCH 7, 2019

CIEL
CENTER for INTERNATIONAL ENVIRONMENTAL LAW

Lisa Anne Hamilton, Director
Climate & Energy Program



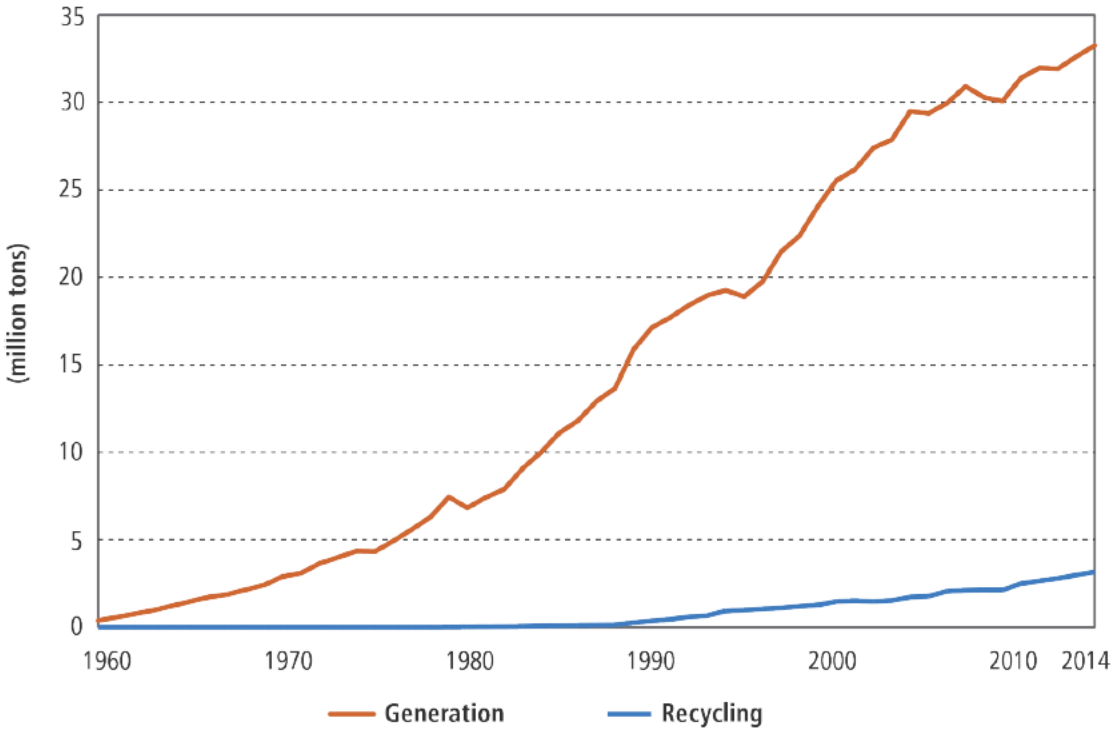
Today, more than 8 million metric tons of plastic goes into the ocean every year.



Anticipated Rate and Volume of Pollution is Staggering

Enough is Not Enough: Recycling Efforts

Figure 10. Plastics Generation and Recycling, 1960 to 2014

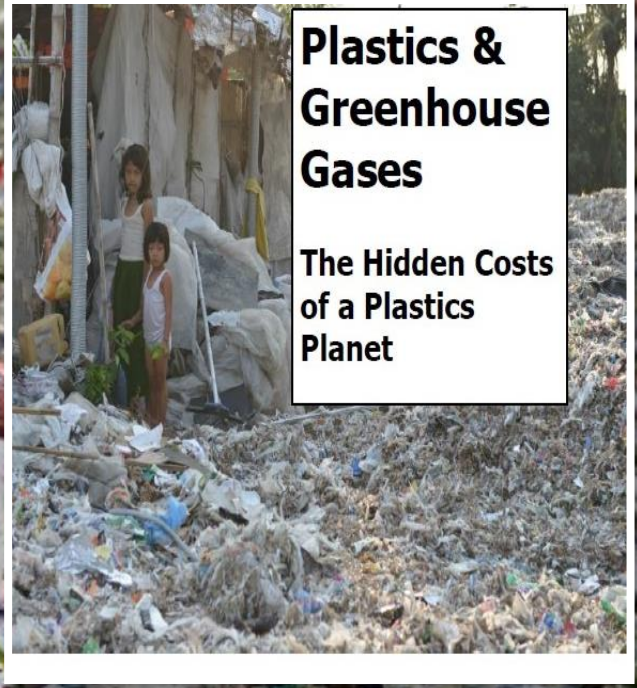


US EPA: Advancing Sustainable Materials Management 2014

LIFECYCLE IMPACTS OF PLASTICS

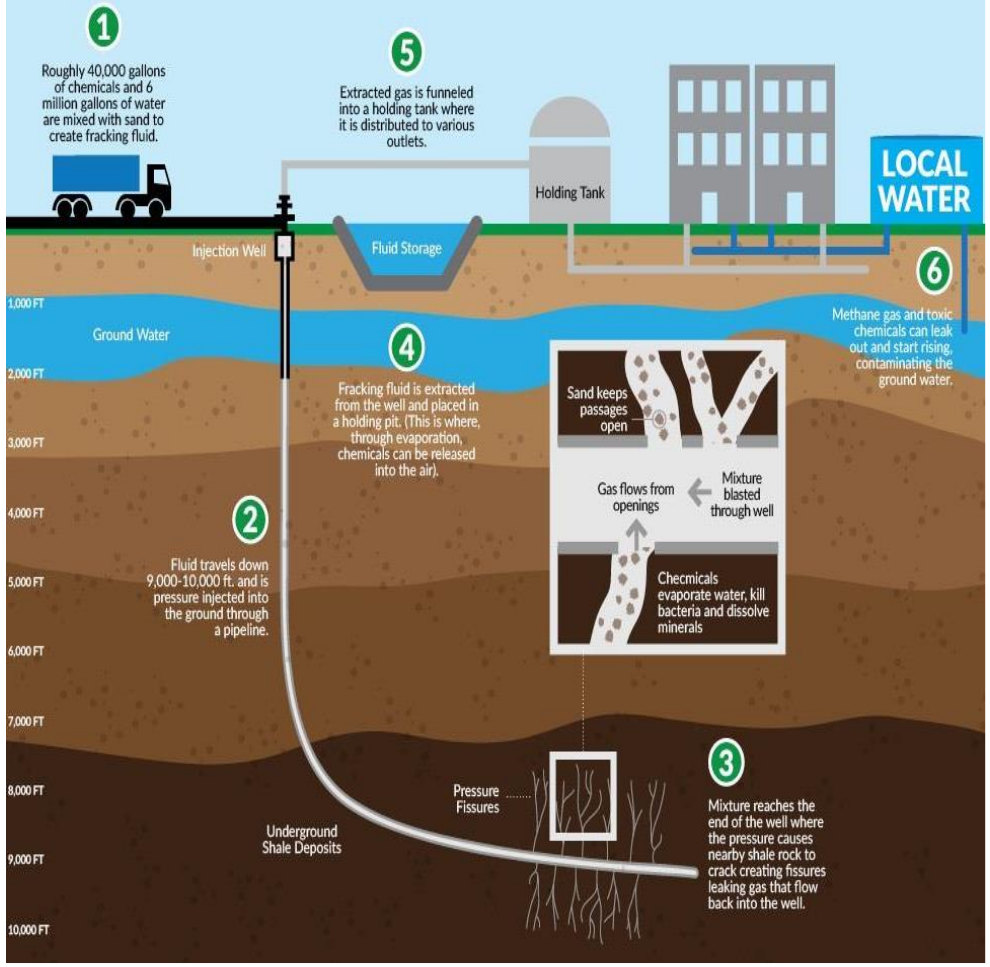
As of September 2018, the American Chemistry Council Projects 333 Projects and $202 Billion in investment.

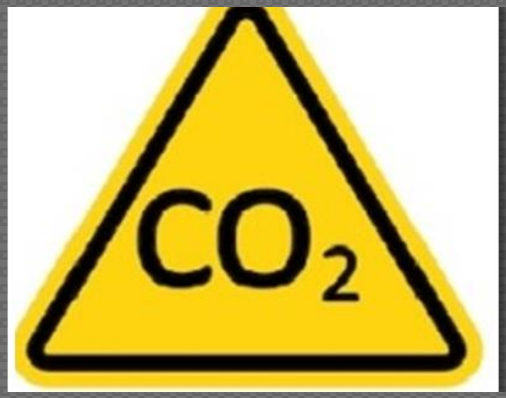
TWO NEW REPORTS HIGHLIGHT LIFECYCLE IMPACTS



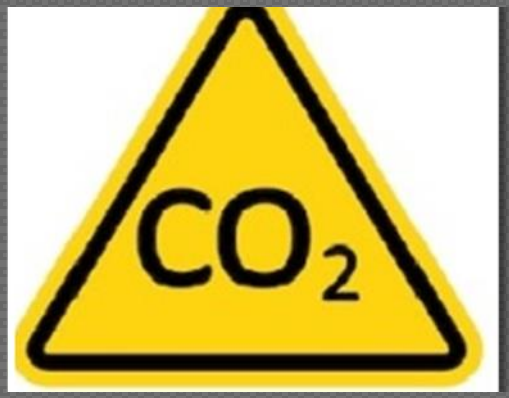
HYDRAULIC FRACTURING

Hydraulic Fracturing, often referred to as simply "fracking," is a process where thousands of gallons of water, sand and a mixture of chemicals are injected at extremely high pressures underground. This mixture is used to extract and harvest the natural gas from shale rock formations deep in the ground. This process has become controversial in the news today. While it has many positive benefits, such as a quick solution for increasing the supply, it also may poise risks to the environment and communitites.

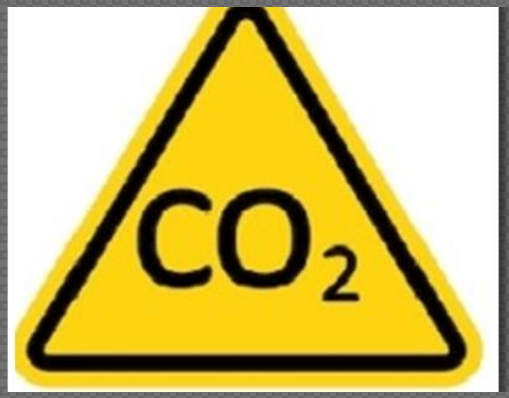




ETHANE CRACKERS FOR PLASTICS



Open Burning & Incineration of Waste



Plastics in Oceans & Waterways

FIGURE 2

Plastic & Health: The Hidden Costs of a Plastic Planet

Humans are exposed to a large variety of toxic chemicals and microplastics through inhalation, ingestion, and direct skin contact, all along the plastic lifecycle.

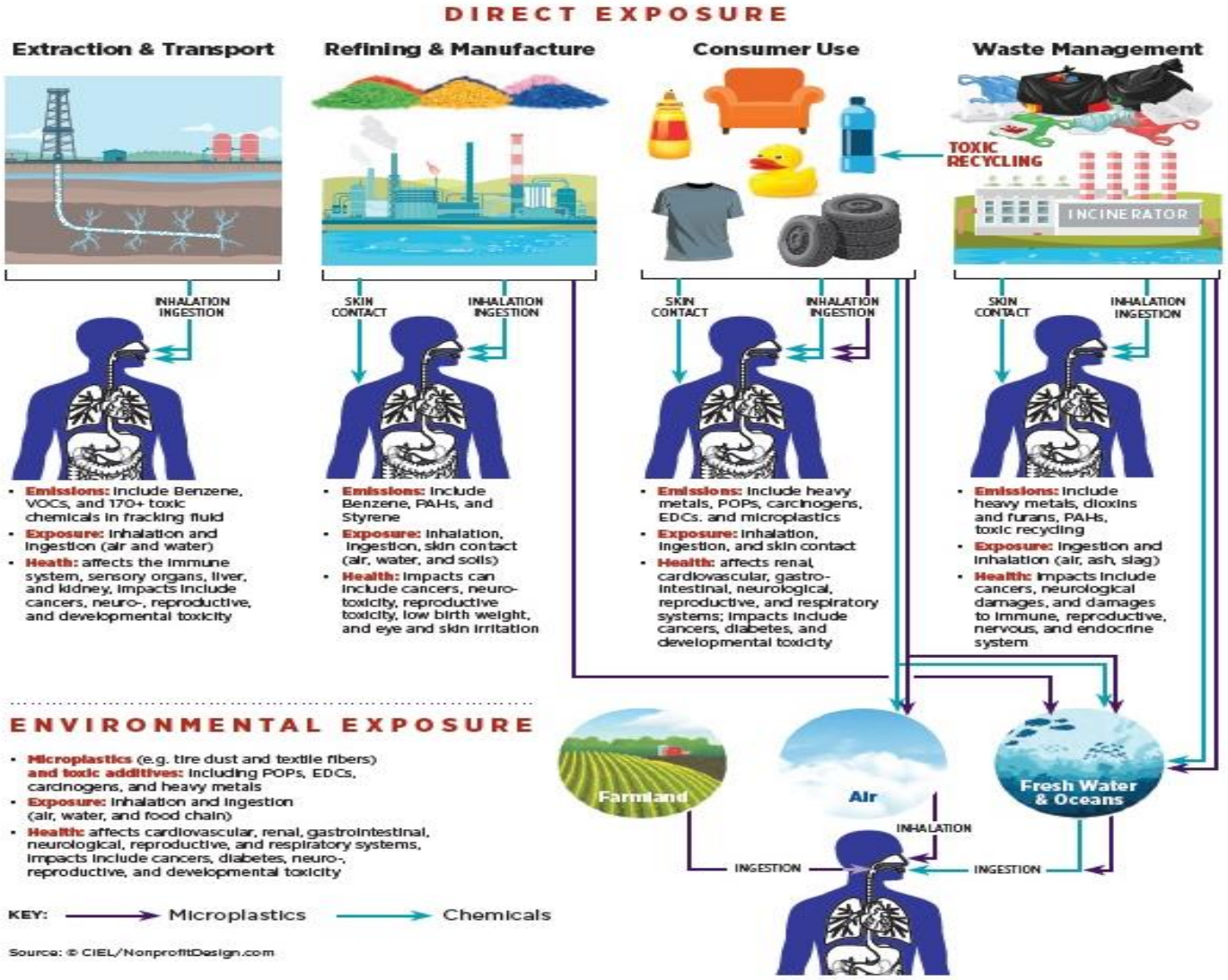
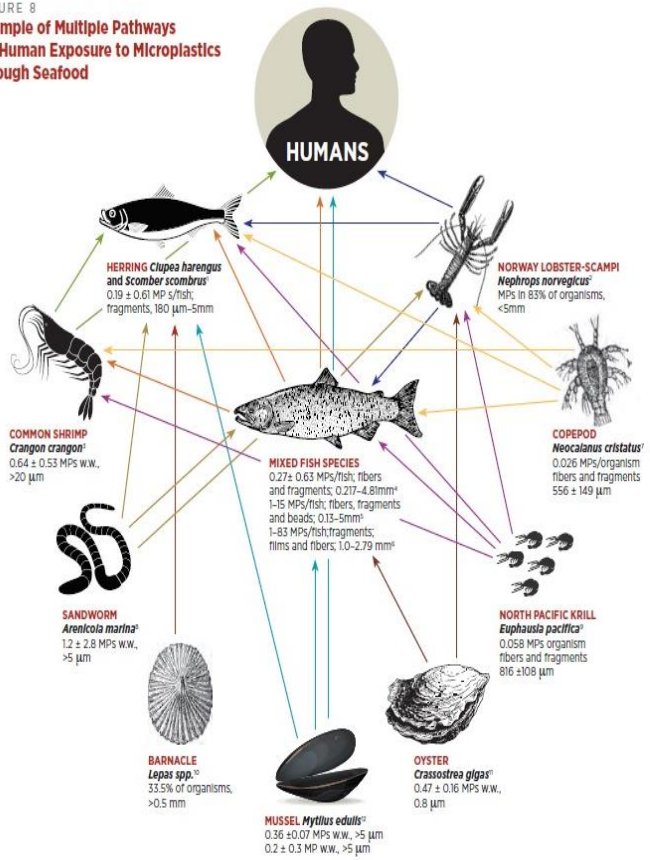


FIGURE 8

Example of Multiple Pathways for Human Exposure to Microplastics through Seafood



REFERENCES

1 102(1) Rummel, C.D. et al., *Plastic ingestion by pelagic and demersal fish from the North Sea and Baltic Sea* 134–141 (Marine Pollution Bulletin 2016).

2 62(6) Murray, F. & Cowie, P., *Plastic contamination in the decapod crustacean Nephrops norvegicus (Linnaeus, 1758)* 1207–1217 (Marine Pollution Bulletin 2011).

3 98(1-2) Devriese, L. et al., *Microplastic contamination in brown shrimp (Crangon crangon, Linnaeus 1758) from coastal waters of the Southern North Sea and Channel area* 179–187 (Marine Pollution Bulletin 2015).

4 101 (1) Neves, D. et al., *Ingestion of microplastics by commercial fish off the Portuguese coast* 119-126 (Marine Pollution Bulletin 2015).

5 Lusher, A.L. et al., *Microplastic and macroplastic ingestion by a deep diving, oceanic cetacean: the True's beaked whale Mesoplodon mirus* 199 (Environmental Pollution 2015).

6 60 (12) Boerger, C.M. et al., *Plastic ingestion by planktivorous fishes in the North Pacific Central Gyre* 2275–2278 (Marine Pollution Bulletin 2010).

7 Desforges, J.P., Galbraith, M., & Ross, P.S., *Ingestion of microplastics by zooplankton in the Northeast Pacific Ocean* 69 (Arch. Environ. Contam. Toxicol 2015).

8 Van Cauwenberghe, L. et al., *Microplastics are taken up by mussels (Mytilus edulis) and lugworms (Arenicola marina) living in natural habitats* 199 (Environmental Pollution 2015).

9 Desforges, J.P., Galbraith, M., & Ross, P.S., *Ingestion of microplastics by zooplankton in the Northeast Pacific Ocean* 69 (Arch. Environ. Contam. Toxicol 2015).

10 Goldstein, M.C., Goodwin, D.S., *Gooseneck barnacles (Lepas spp.) ingest microplastic debris in the North Pacific Subtropical Gyre* 1(PeerJ. 2013).

11 193 Van Cauwenberghe, L., Janssen, C., *Microplastics in bivalves cultured for human consumption* 65–70 (Environmental Pollution 2014).

12 193 Van Cauwenberghe, L., Janssen, C., *Microplastics in bivalves cultured for human consumption* 65–70 (Environmental Pollution 2014).

SOURCE: Re-created based on Carbery, M., O'Connor, W., & Thavamani, P., *Trophic transfer of microplastics and mixed contaminants in the marine food web a implications for human health* (Environment International 2018).

MULTIPLE PATHWAYS FOR HUMAN EXPOSURE TO MICROPLASTICS THROUGH SEAFOOD

Source: CIEL, Plastics & Health, The Hidden Costs of a Plastic Planet, February 2019.

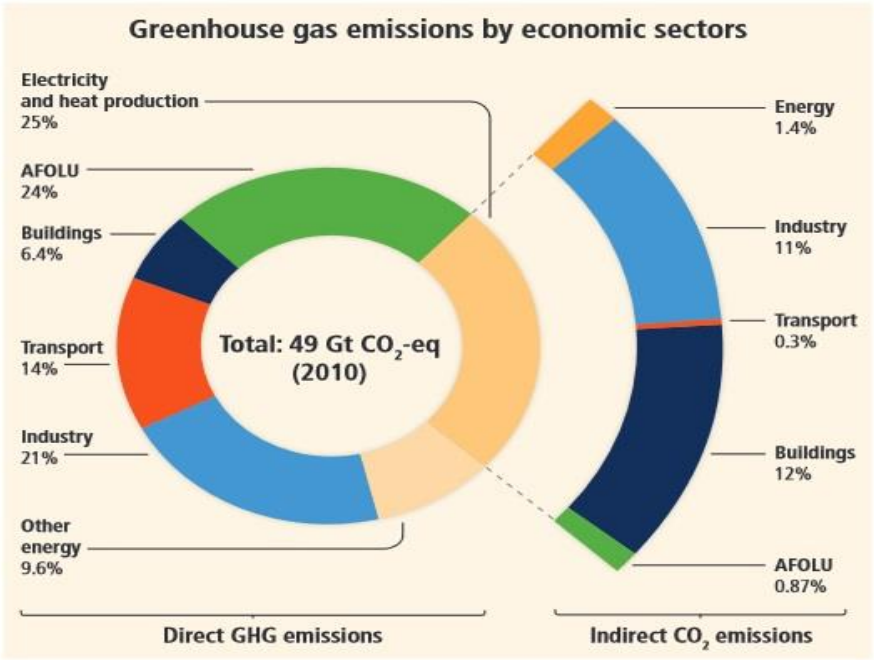
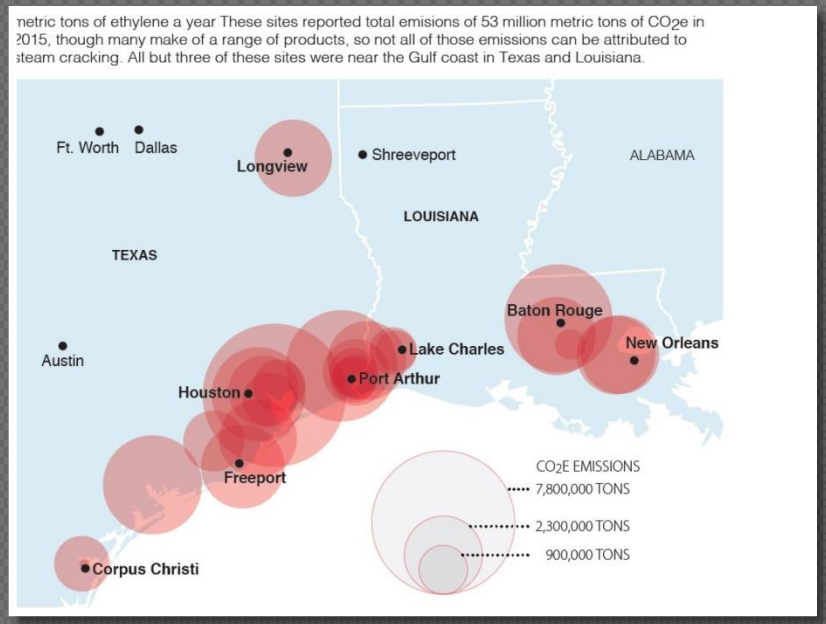


Figure 1.7 | Total anthropogenic greenhouse gas (GHG) emissions (gigatonne of CO_2-equivalent per year, $GtCO_2$-eq/yr) from economic sectors in 2010. The circle shows the shares of direct GHG emissions (in % of total anthropogenic GHG emissions) from five economic sectors in 2010. The pull-out shows how shares of indirect CO_2 emissions (in % of total anthropogenic GHG emissions) from electricity and heat production are attributed to sectors of final energy use. 'Other energy' refers to all GHG emission sources in the energy sector as defined in WGIII Annex II, other than electricity and heat production *{WGIII Annex II.9.1}*. The emission data on agriculture, forestry and other land use (AFOLU) includes land-based CO_2 emissions from forest fires, peat fires and peat decay that approximate to net CO_2 flux from the sub-sectors of forestry and other land use (FOLU) as described in Chapter 11 of the WGIII report. Emissions are converted into CO_2-equivalents based on 100-year Global Warming Potential (GWP_{100}), taken from the IPCC Second Assessment Report (SAR). Sector definitions are provided in WGIII Annex II.9. *{WGIII Figure SPM.2}*



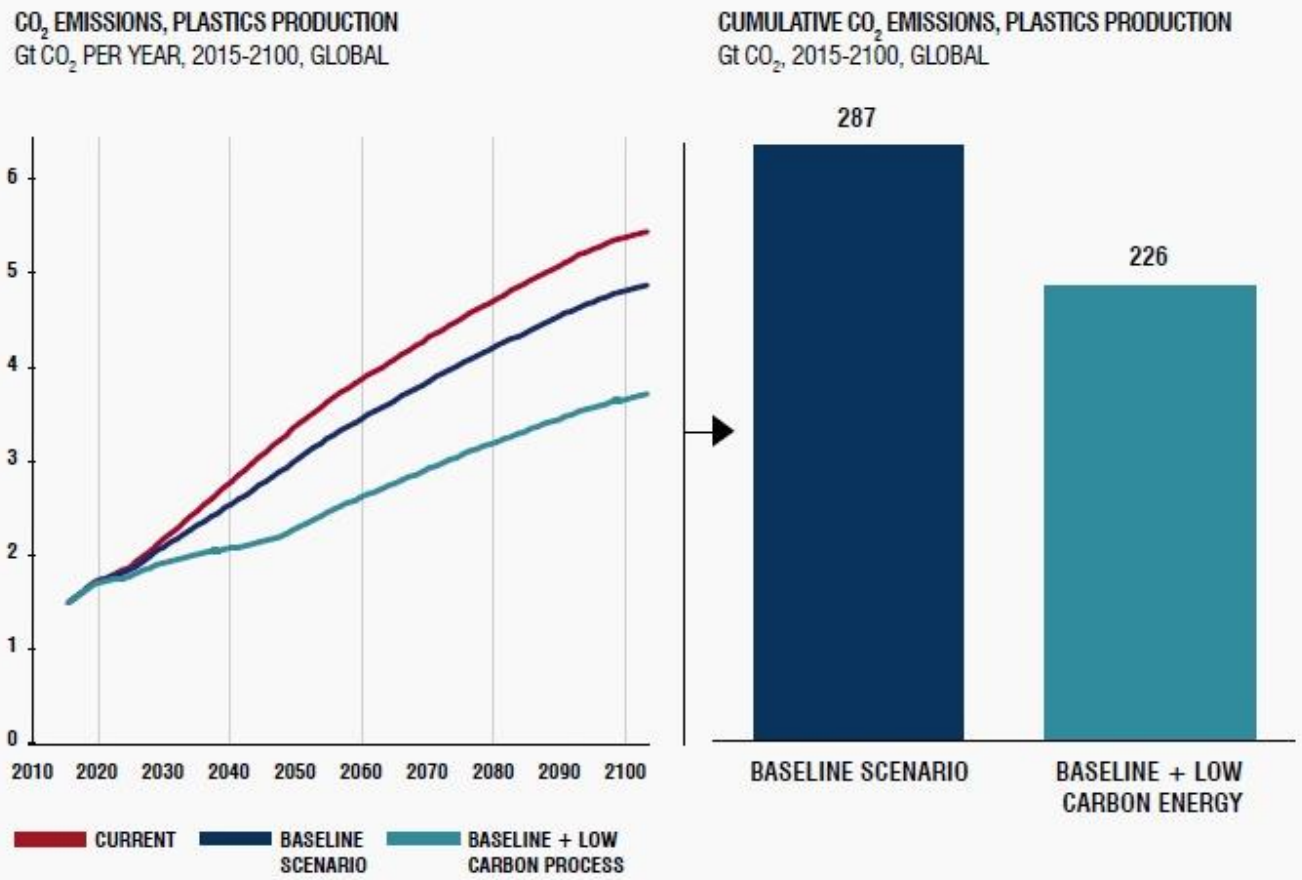
PLASTICS, GREENHOUSE GAS EMISSIONS & MEETING THE PARIS TARGETS

IPCC Special Report 1.5

UN EMISSIONS GAP REPORT 2018

Exhibit 3.2

PLASTICS ALONE RISK EXCEEDING THE CARBON BUDGET QUOTA AVAILABLE FOR INDUSTRIAL EMISSIONS



SOURCE: MATERIAL ECONOMICS MODELLING.

Plastics Ban at County Level

Plastic Ban At the State Level

Plastics and Petrochemicals are a Blindspot to Emissions Reduction Initiatives.

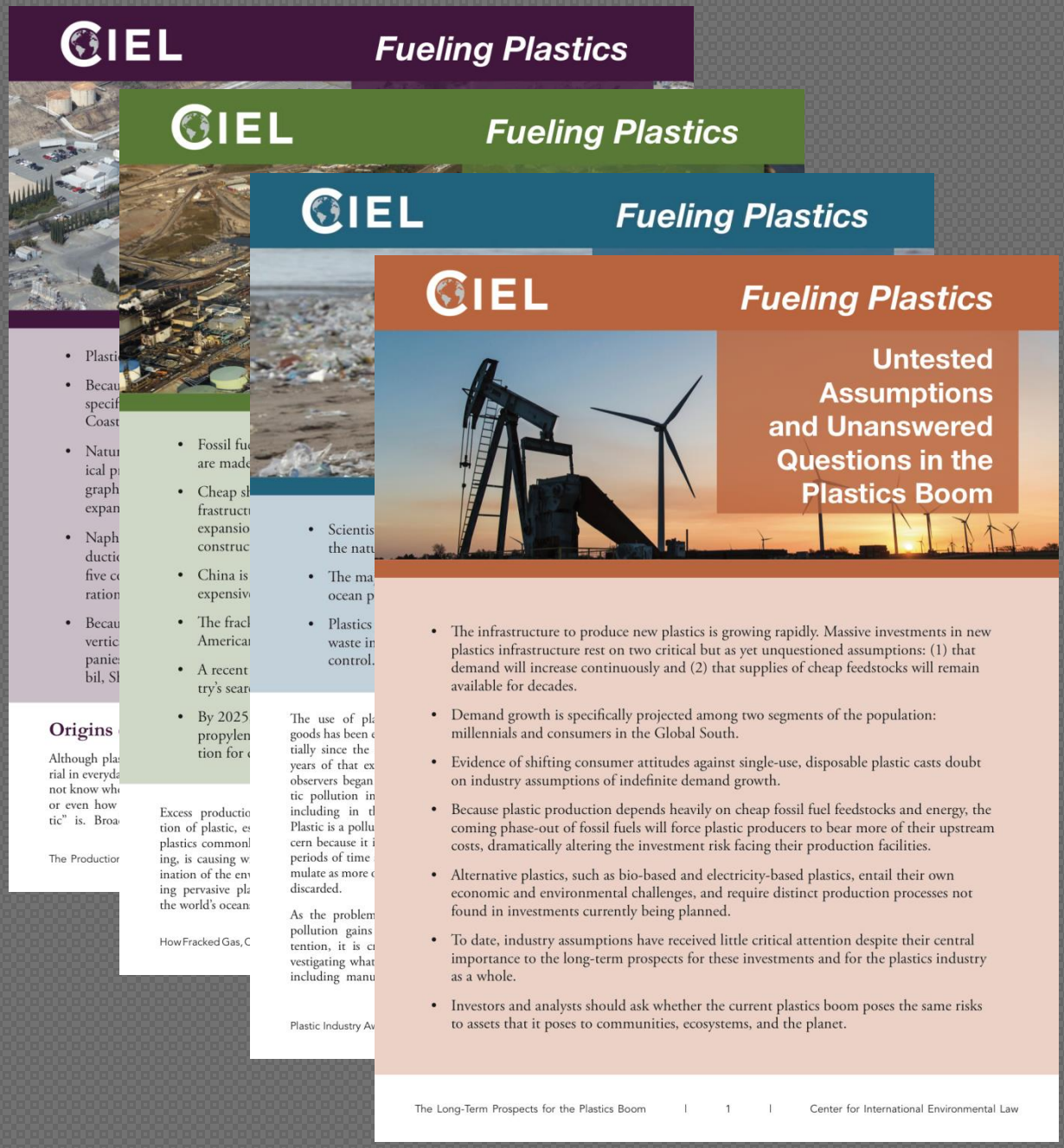
OVER 800 GLOBAL NGO'S HAVE JOINED FORCES
TO STOP PLASTICS AT THE SOURCE

With support from the Plastics Solutions Fund

Break Free From Plastics (A Global Movement)
https://www.breakfreefromplastic.org/

Learn more by reading CIEL's ongoing series on the linkages between the fossil fuels and plastics industries.

Fueling Plastics
https://www.ciel.org/fuelingplastics/



SOURCES & DATA

For more information :

- CIEL, Plastics & Health, Hidden Costs of a Plastic Planet available at https://www.ciel.org/wp-content/uploads/2019/02/Plastic-and-Health-The-Hidden-Costs-of-a-Plastic-Planet-February-2019.pdf
- • American Chemistry Council (ACC) re: U.S. Petrochemical Buildout available at : https://www.americanchemistry.com/Media/PressReleasesTranscripts/ACC-news-releases/US-Chemical-Industry-Investment-Linked-to-Shale-Gas-Reaches-200-Billion.html
- Compendium of Health & Toxic Impacts of Hydraulic Fracturing : https://www.psr.org/wp-content/uploads/2018/04/Fracking_Science_Compendium_5.pdf
- IEA The Future of Petrochemicals
- https://webstore.iea.org/the-future-of-petrochemicals
- • IPEN Ocean Pollutants Guide
- https://ipen.org/news/new-release-ipen-ocean-pollutants-guide-now-available