



# Environmental Impacts of Technology

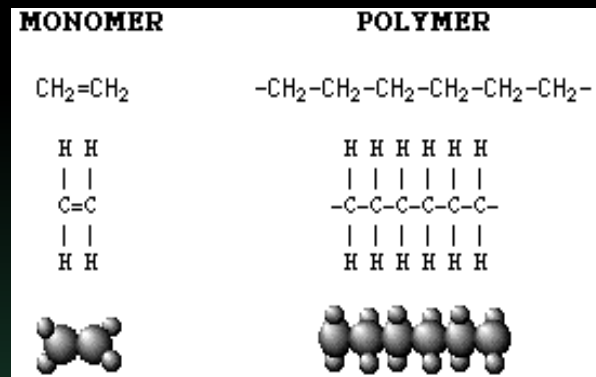
## Plastics



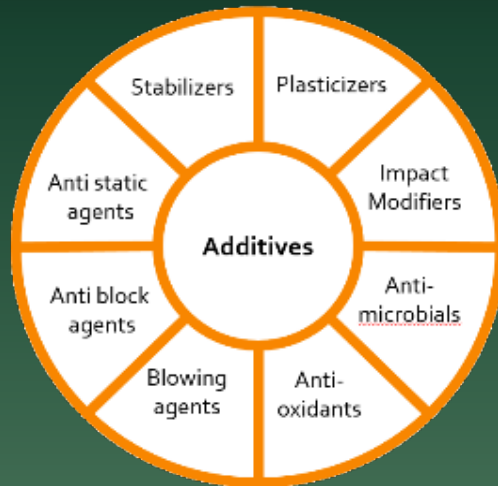
## Migration

# Plastics

## *Environmental Impact*



+



Manufacturing



Use



Disposal

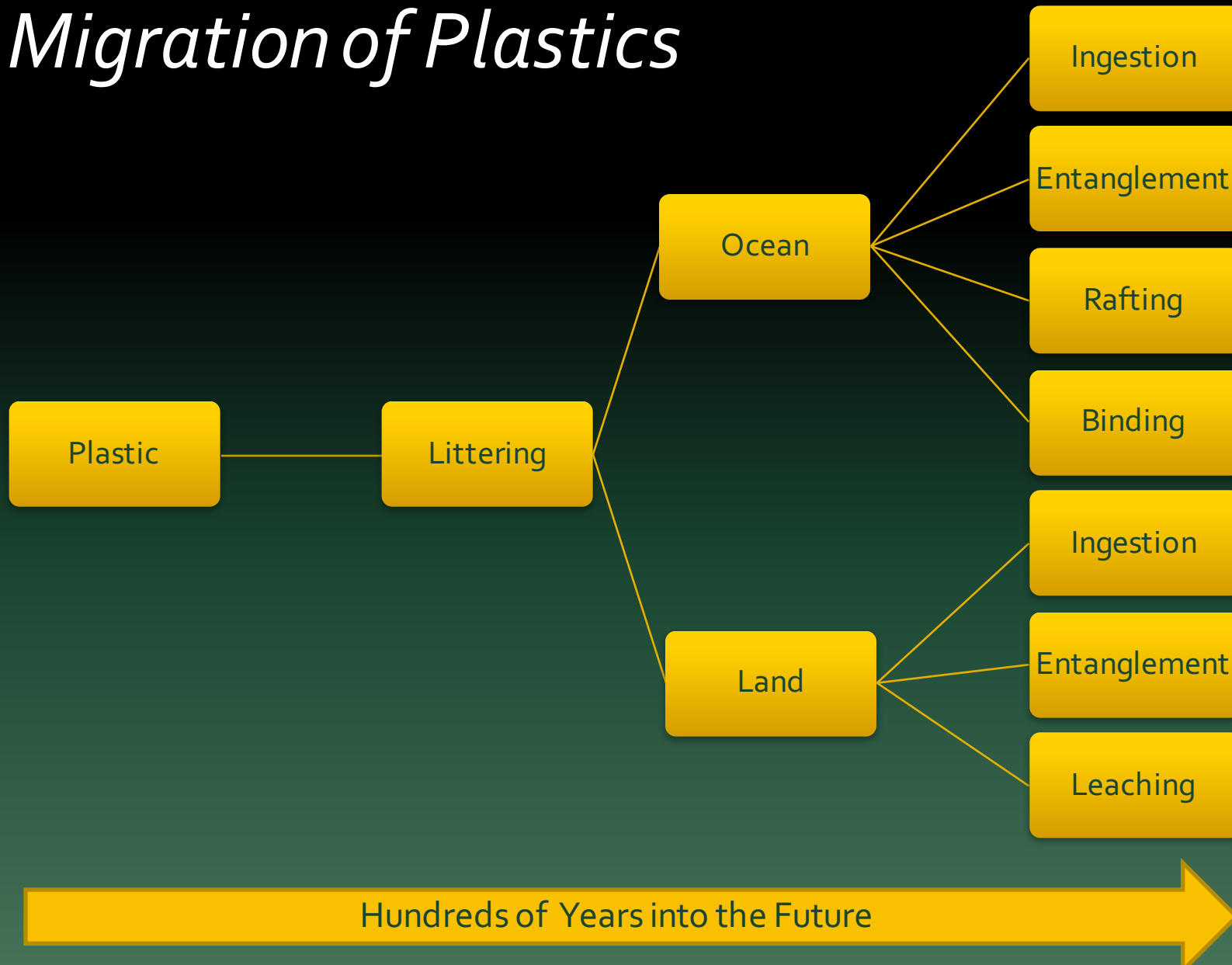


Degradation



Migration

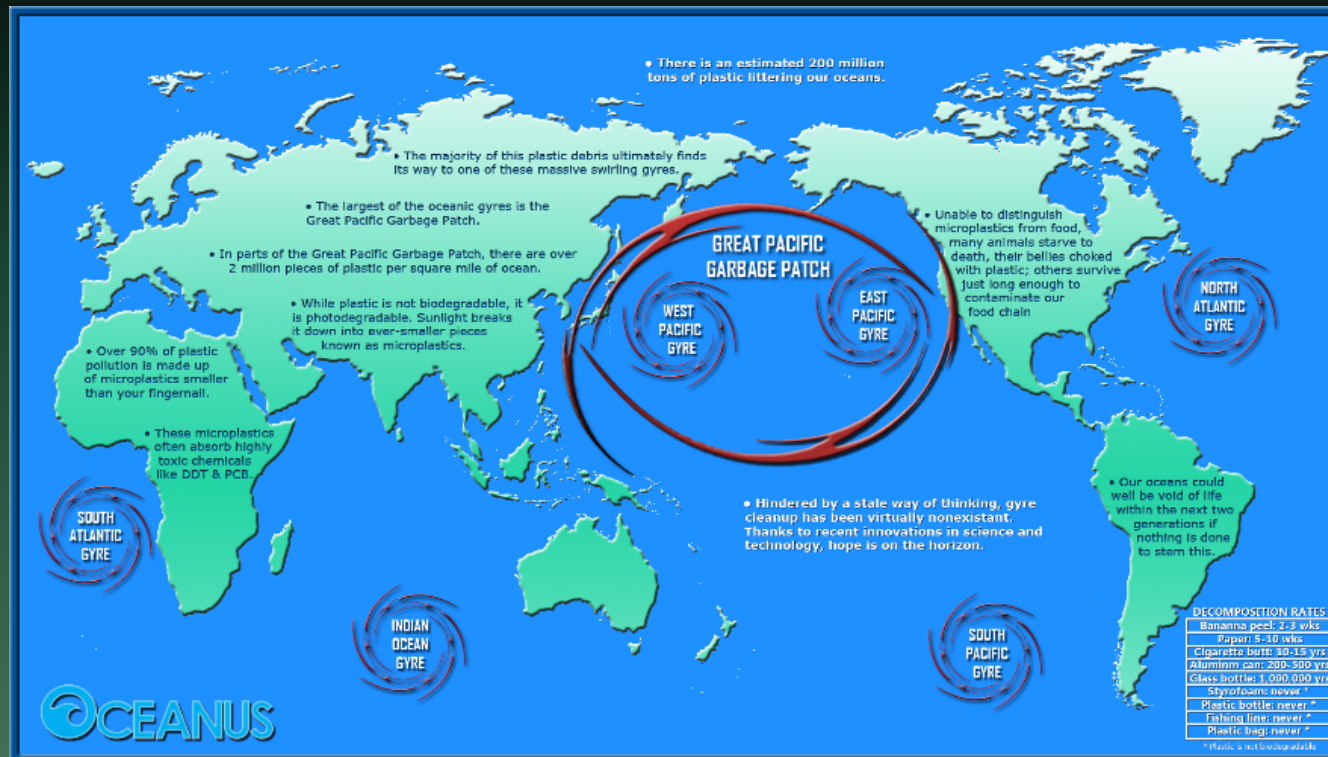
# Environmental Impacts of *Migration of Plastics*



# Environmental Impacts of *Migration of Plastics*

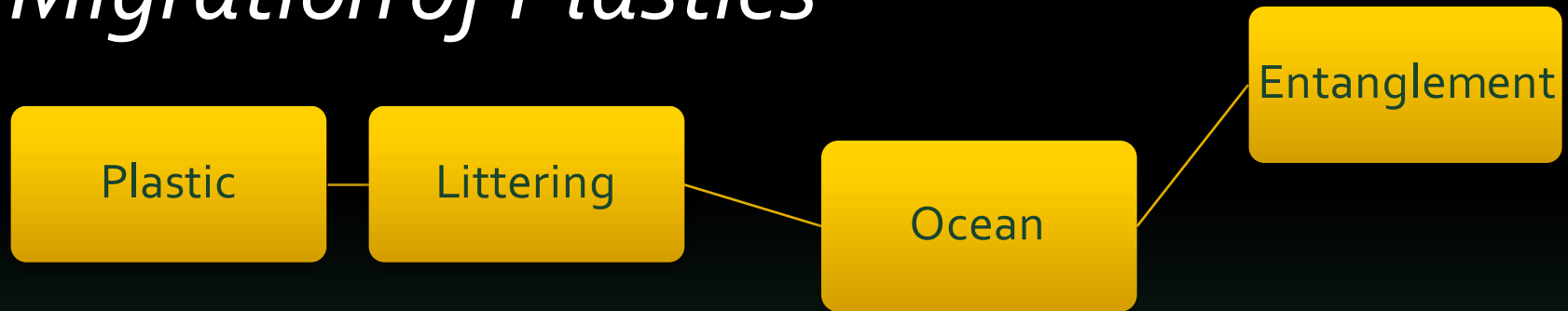
The problem in the world's oceans:

- Plastics do not biodegrade (i.e. break down into a different chemical composition over time), but they do photodegrade and become brittle, crack, and break into smaller and smaller particles. In oceans, plastic particles, from the very large to the very small, migrate all over the world, creating massive ecosystem havoc.



Source:  
Project Oceanus

# Environmental Impacts of *Migration of Plastics*

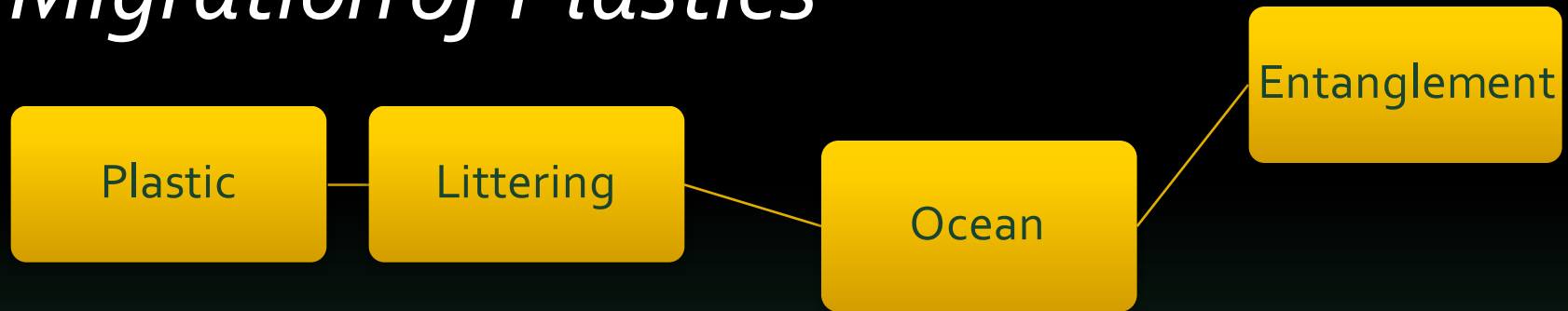


When plastics are still “large” or close to their original size, they are more likely to entangle birds, turtles, and other marine creatures. Entanglement rates are highest in convergence zones where many of certain species converge with either high fishing activity or high garbage accumulation.

**Entanglement** looks different for different animals, but estimates of how many and which marine animals get entangled are inherently too low. To date, entanglement has been documented in

- 44 sea bird species and 7 sea turtle species
- 9 cetacean species (whales and dolphins)
- 11 pinniped species (e.g. seals, walruses)
- 31 invertebrate species/taxa

# Environmental Impacts of *Migration of Plastics*



The highest total entanglements with plastic have been found in California sea lions, but the highest rates of entanglement are found in Guadalupe fur seals.

Most of the time, it is the head and appendages that get wrapped up in net fragments, fishing line, packing straps, rope, and rubber debris. Young animals are more vulnerable to entanglement than older or adult animals.

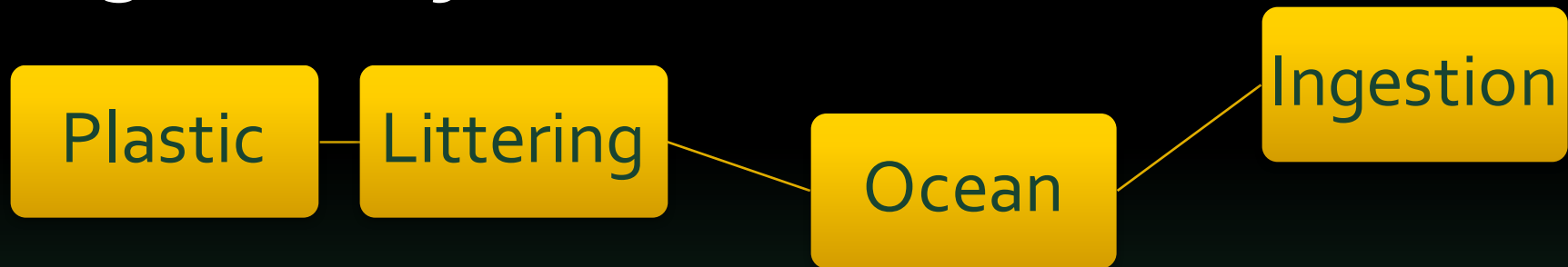
# Environmental Impacts of *Migration of Plastics*



Cetaceans (whales and dolphins) are often victims of plastics entanglement.

6 of 10 species of baleen whales are affected. Like other cetaceans, baleen whales most often get lines or nets tangled in their mouths or flippers. Fishing gear thrown away in the ocean is the most common source of these lines and nets.

# Environmental Impacts of *Migration of Plastics*



As plastics age and become brittle over time, they break into smaller pieces, thereby becoming more of an ingestion risk to marine life. Accidental ingestion happens with passive feeders (filter feeders) as well as active feeders (through direct feeding on plastics and feeding through eating contaminated prey). Ingestion risk also extends into the future for decades as plastics decompose and break down over very long time scales.

*Ingestion can :*

- damage (ulcerate) or block the digestive tract
- lead to infection and internal bleeding
- reduce the desire to feed or limit nutrient uptake
- allow acidic gastric juices to go where they are not designed to go



# Environmental Impacts of *Migration of Plastics*



Plastic

Littering

Ocean

Ingestion



Over one third of sea bird species ingest plastics. Because many seabird species can be persuaded to throw up their stomach contents and because they assemble in big flocks, sea birds serve as excellent indicators of plastics pollution and are an opportunity to more fully understand the ingestion problem.

# Environmental Impacts of *Migration of Plastics*



All seven species of sea turtles have been found to eat or ingest plastics. The most common ingested item is: The Plastic Bag.

Sea Turtles are one of the top three types of animals (along with northern fur seals and Hawaiian monk seals) to become entangled in plastic.

# Environmental Impacts of *Migration of Plastics*



Migrating ocean plastic has been found entangled in or ingested by over 25% of marine mammal species.

# Environmental Impacts of *Migration of Plastics*



As plastics break down, they attach to other things in the ocean and migrate all over the world. Plastics act as a “raft” to many species, carrying these species to ecosystems where they don’t belong and rendering them invasive and damaging.

# Environmental Impacts of *Migration of Plastics*



Plastics are hydrophobic and can bind to certain pollutants in the ocean, rendering those pollutants harmless:

- PCB (polychlorinated biphenyl)
- PBDE (polybrominated diethyl ether)
- PAH (polyaromatic hydrocarbon)
- DDT – pesticide, now banned in U.S. but still used in developing countries.
- Newer chemicals, new pesticides

This silver lining to the problem of plastics in the world's oceans can be overshadowed by marine animals eating these plastic/pollutant pairs.



# Environmental Impacts of *Migration of Plastics*



When rain or other moisture falls into a lined landfill, it passes through layers and layers of debris, collecting chemicals and toxins along the way. This liquid leachate can be very hazardous.

In a landfill, most plastic is not exposed to enough light to photodegrade, so it mummifies and can take up to 1,000 years to decompose. In the meantime, many plastics have been shown to contribute toxins to landfill leachate including Bisphenol A, Phthalates, Antimony, and Brominated Flame Retardants.



# Environmental Impacts of *Migration of Plastics*



Although entanglement with plastics is not nearly as well studied with land animals as with marine animals, land animals nevertheless entangle with plastic debris. Deer, bears, racoons, and other foraging animals can:

- Get their heads stuck in plastic containers (causing dehydration, suffocation, overheating, and other problems).
- Get their feet entangled with plastic line, beverage holders, and other plastics, restricting motion and the ability to defend themselves from predators.



# Environmental Impacts of *Migration of Plastics*



Although ingestion of plastics is also not nearly as well studied with land animals as with marine animals, land animals also eat plastic:

- Wild scavenging animals like raccoons and birds such as crows dumpster dive quite regularly. Ingested plastics can cause the same damage in land animals as marine animals (ulcerations, bleeding, infection, blockage, etc.).
- Domestic animals (e.g. cats and dogs) are just as vulnerable to snacking on plastic as wild land animals.





# Environmental Impacts of *Plastics Migration*

Plastics can travel from the point at which they are littered to anywhere in the world over tens if not hundreds of years.



These World Travellers:

- Become entangled with a large variety of bird, turtle, whale, dolphin, manatee, shark, seal, and sea lion species.
- Are ingested by an even broader range of marine animals causing havoc in the digestive track and toxifying the body.
- Break down and bond to pollutants, rendering them harmless until they are ingested by an animal, thereby delivering a concentrated dose of pollutant.
- Act as rafts to plants and organisms, transferring them all over the world where they can become invasive and damaging.

# Reducing *Environmental Impacts*

