



Novel Entities

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Dear Friends,

This month, we shall discuss the 8th Planetary Boundary: Novel Entities. In common parlance, we may call them chemical pollution caused by the release of man-made toxic substances into our environment, but it is not only toxicity but something more that cannot be captured by the term 'chemical pollution'. This is why scientists decided to use the term 'novel entities'. Essentially, we are dealing with the release of these toxic substances into the environment. But one may ask, "So what? There are so many toxic substances that occur naturally like salt, kerosene, snake venom etc. Why should we worry?" Let us see why?

What are Novel Entities?

All naturally existing toxic substances break down over time naturally. In addition, all living organisms have had sufficient time to co-evolve along with these natural toxic substances, in order to develop immune systems within their metabolism. However, we humans are creating new compounds in our laboratories at such a rate that no living organism, including us humans have got the time to get

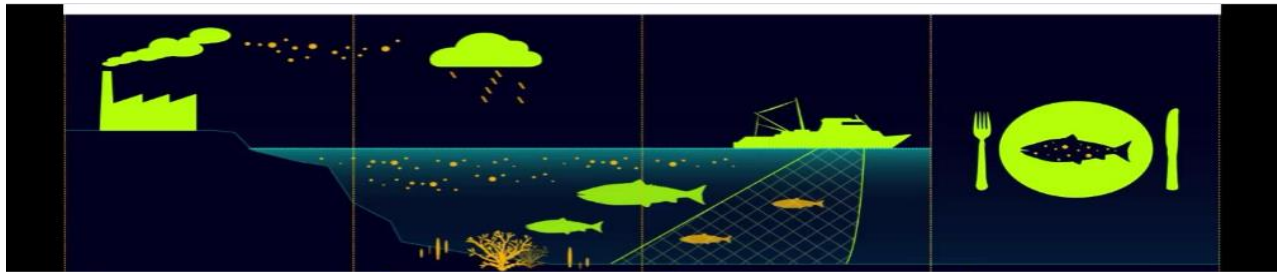


adjusted to their presence in the environment. Another problem related with these substances is that we are not even aware of their potential impacts, till it is rather late. We can cite two examples: CFC and DDT. We have already discussed the impact of CFCs on the ozone layer, leading to the Montreal Protocol banning them; but it took more than 3 decades and many scientific studies before it was detected. One common feature of all these substances is their ability to get distributed all over the atmosphere, oceans and beyond, creating a permanent mark on the environment. DDT was invented to kill pests in our agriculture, but they kill many other friendly organisms as well, and long after we have banned them, their effect is still present.

Another feature of these toxic substances is the process of bio-accumulation. A good example is mercury. Different manmade compounds having mercury gets distributed all over the atmosphere and oceans. These are absorbed by plants, and as they move up the food chain, their concentration increases. This process is called bio-accumulation. Finally they end up in our dishes.

Why do they qualify to be a Planetary Boundary?

According to scientists (more specifically toxicologists who deal with the effect of toxic substances on human beings, and eco-toxicologists dealing with the same on our environment), we are concerned how these man-made substances “*fundamentally alter the way that biogeochemical, ecological and physical processes happen at the global level*”. We are introducing at very fast rates, ‘*completely new synthetic substances*’ with an unknown risk of ‘*interfere(nce) with the physical and ecological processes on which all of the other Earth system functioning depends*’. There are three basic groups of these substances: all new synthetic compounds, toxic or radioactive heavy metals and persistent organic pollutants (POPs). As mentioned above, a common example is mercury based compounds.



1. Elemental Mercury Emission

2. Transport of Atmospheric Mercury

3. Food Chain Contamination

4. Harmful Effects of Exposure

The problems become more complex as the effects are virtually irreversible, their effects having spread widely all over the globe, even far away from their source; and we have crossed a ‘tipping point’.

In summary, the problems arise due to:

- i. Toxicity, ii. Persistence, iii. Global transportation, iv. Systemic effects and v. Irreversibility

What can be done?

Scientists are recommending the application of the ‘Precautionary Principle’ more widely. This principle, in simple terms states that just because we do not have enough proof of adverse impacts, we should not hesitate from taking precautionary steps to prevent release of these substances. This becomes necessary as many business establishments have financial interests in continuing to use these compounds. To quote Prof. Sarah Cornell of Stockholm Resilience Center:

- “SRC, and many global change partner organizations, are encouraging dialogue about this new area of research.
- It requires new interactions between science, and policy, and business.
- Actually it requires interactions between everybody in society, because we are all exposed to these new global risks and we need to deal with them together.”

Source: PB MOOC | 5.2.2 | Novel Entities

<https://www.youtube.com/watch?v=Hag3OIO1lhc&list=PLExYXELRcSgGsOBrE2GCdLggbuR4yopxq&index=32>

