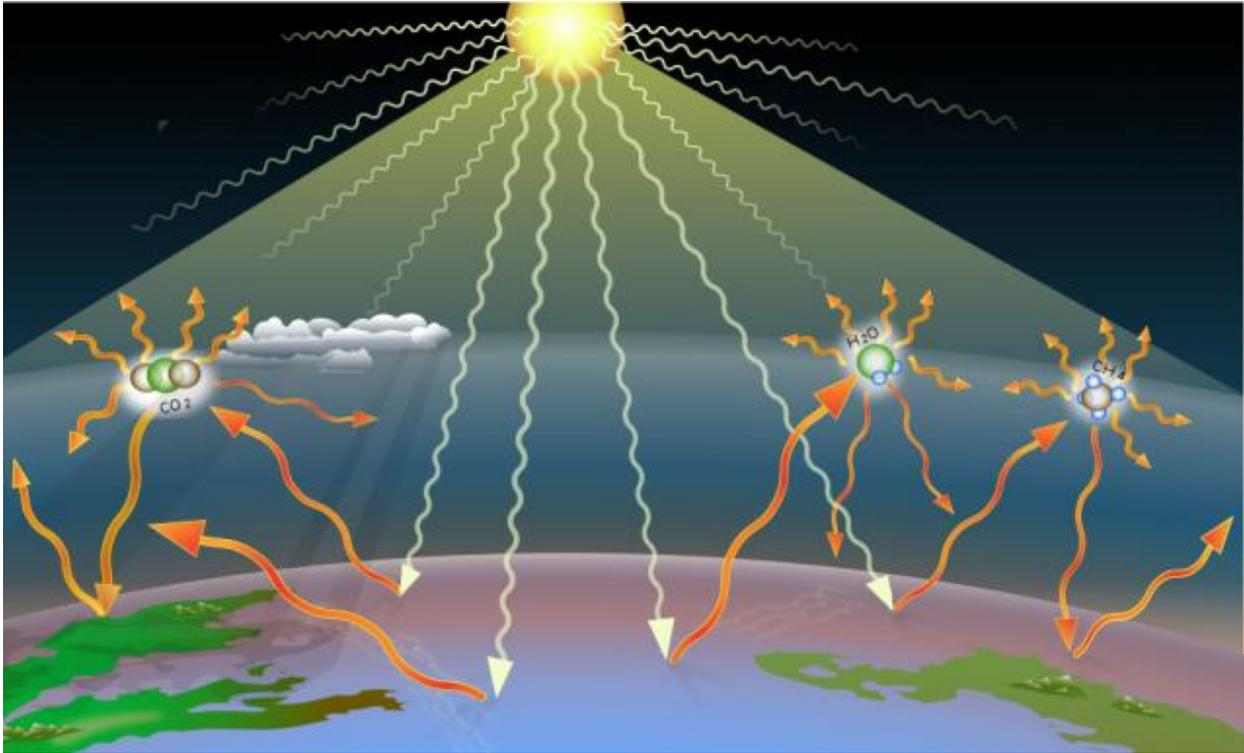


Now, what is the cause of climate change?

Climate change is caused mostly by the greenhouse effect. Even though climate change is caused directly by the greenhouse effect, should it be solely blamed for it? Now, what is the greenhouse effect itself before we pass our judgement on it, it is the natural warming of the earth that results when gases in the atmosphere, i.e. the greenhouse gases such as carbon dioxide, water vapour, methane, etc. trap heat from the sun that would otherwise escape into space.

How does that happen? Heat from the sun makes our planet habitable, while 30% of the solar energy that reaches the earth is reflected back to space, approximately 70% passes through the atmosphere to the earth's surface, where it is absorbed by the lands, oceans and atmosphere, and heats up the planet. This heat is then radiated back up in the form of invisible infrared light. While some of this infrared light continues on into space, the vast majority; indeed, some 90% gets absorbed by atmospheric gases, known as greenhouse gases, and redirected back towards the earth, causing further warming.



So, it turns out that the greenhouse effect is not necessarily a bad thing, in fact, it has been warming our planet to its average temperature of 15 degrees Celsius and keeps life on earth well, livable and colourful. Without it the world would be a frozen inhabitable place like a deep freezer, more like Mars. Now if this effect has been identified as far back as 1896 and climate change only started to occur from the last century, shouldn't a question be raised on what actually triggered the greenhouse effect to cause climate change?

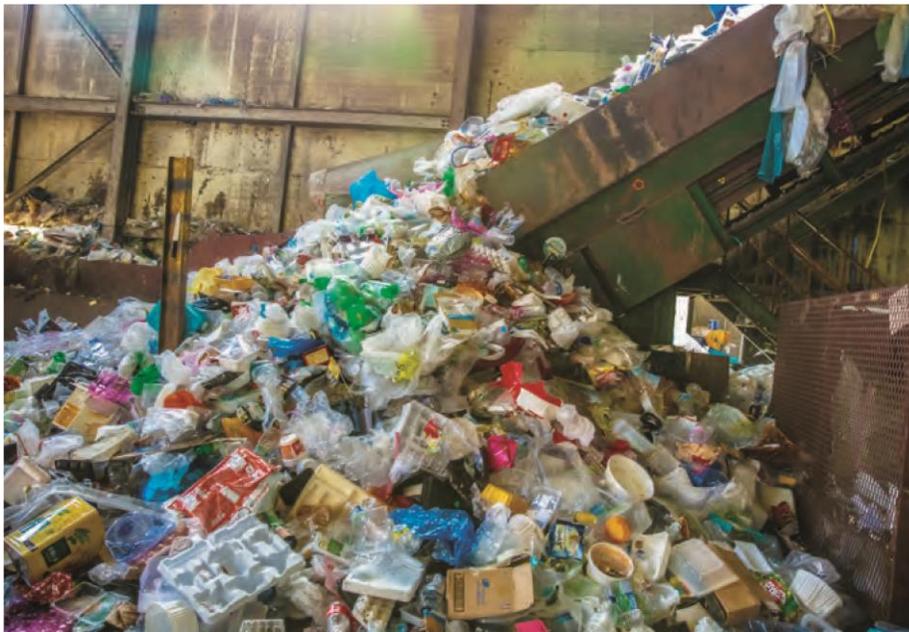
The real problem here is mankind voracious burning of fossil fuels for energy, mankind is always in a quest to search for new sources of energy and ways to manipulate energy to satisfy themselves, but we don't stop to think about what this is doing to our environment. Now, this voracious burning of fossil fuels only has one result which is amping up the greenhouse effect which directly causes an increase in global warming that is altering the planet's climate systems in countless ways.

For most of the past 800 000 years, before the human civilization, the concentration of greenhouse gases in the atmosphere was between about 200 to 280 molecules of the gases per million molecules of air. But in the past century, the concentration has jumped to more than 400 molecules per million molecules of air. This is driven by human activities such as burning fossil fuels and deforestation. The higher concentration of greenhouse gases, and carbon dioxide in particular is causing extra heat to be trapped and global temperatures to rise. So, it turns out that humans themselves are the cause of the greenhouse effect.

Accounting for about 76% of global human caused emissions, carbon dioxide's influence on climate should be taken note of, the reason being that it stays around for a long period of time, once it is passed into the atmosphere, 40% still remains after 100 years, 20% after 1000 years and 10% for as long as 10,000 years.

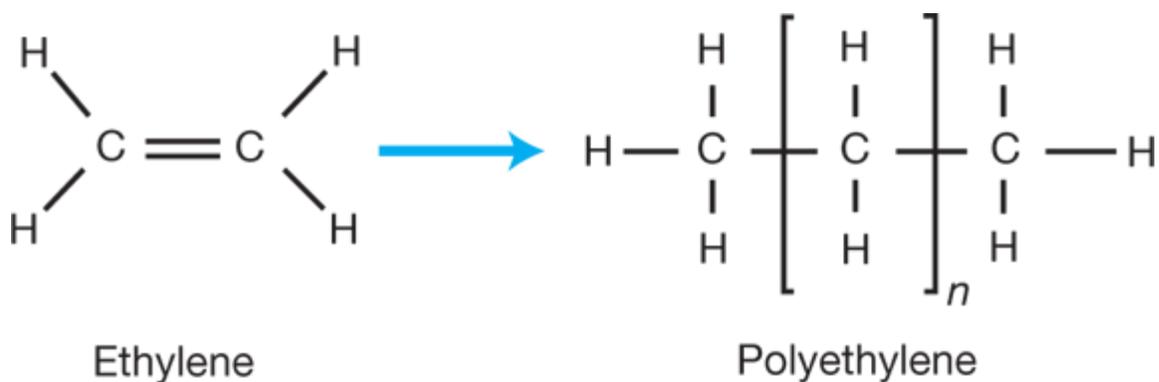


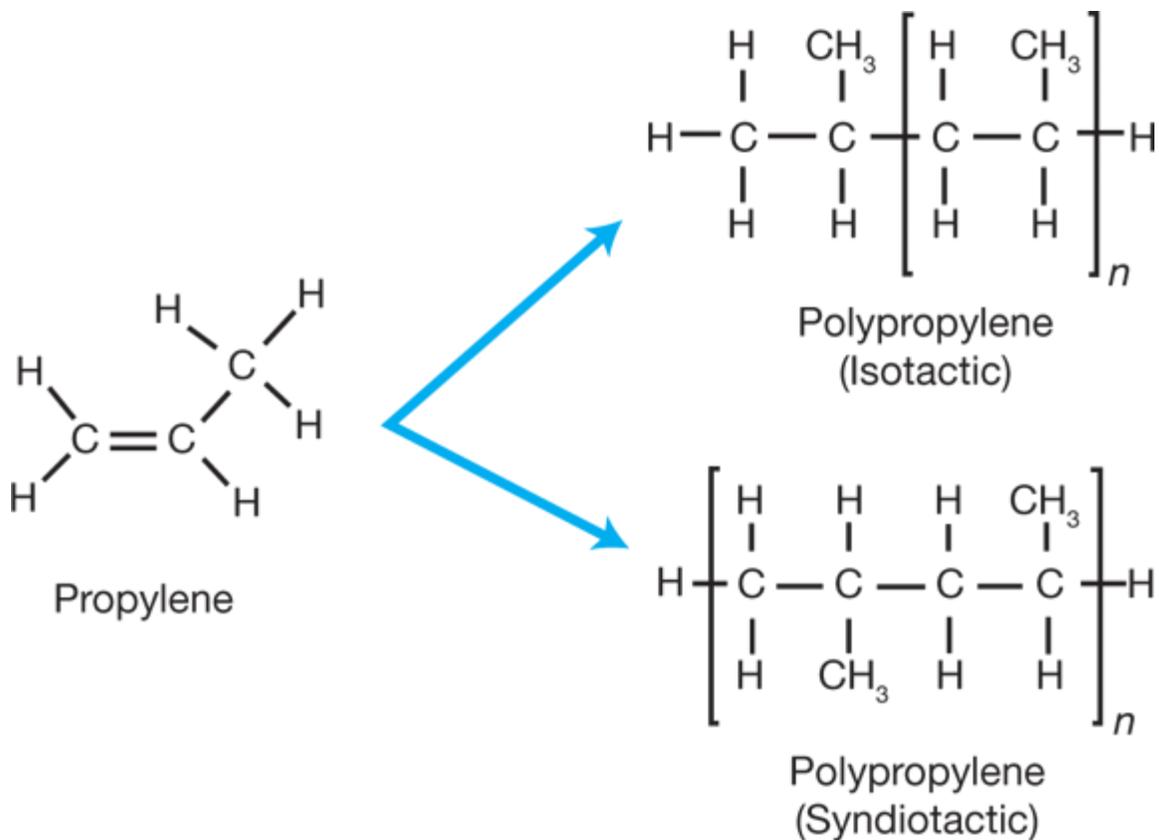
Talking about carbon dioxide emissions, a major source of this should not be overemphasized, and this is plastics. Plastics? Yes, plastics, when one hears about plastics, the first thing that comes to mind is that oh, plastics, the very useful parts of our lives, what would we do without plastics? Plastics have become essential parts of packaging because they are durable, lightweight and cheap. Hardly would you get to any industry, school, workplace, or home that plastics would not constitute the main packaging material. This is evident in rubbish dump sites where plastics are the major inhabitants.



Now, because plastics are very useful, their effects on our climate have been overlooked. Yes, they contribute greatly to the emission of carbon dioxide from cradle to grave, that is, from production down to their use up till their disposal and even after their disposal, they contribute to climate change. So, there is basically nothing like end of life for plastic as they emit carbon dioxide, and as stated earlier, carbon dioxide sticks around for quite a while. Plastics are made from fossil fuels from which ethene and propene can be obtained which is polymerized into polyethylene and polypropylene respectively, this is what really becomes plastic.

Polyethylene is made by the reaction of multiple ethylene molecules in the presence of catalyst to break the double bond and connect the carbon atoms into a chain. Now, the longer the chain, the higher the molecular weight and plastics can have molecular weights in the millions. The same goes for polypropylene.





Plastics are made by this method, the method is not the real problem but the emission that occurs from this process. In the United States alone in 2015, emissions from fossil fuel extraction and transport attributed to plastic production were at least 9.5 – 10.5 million metric tons of carbon dioxide equivalents per year. . The manufacture of plastic is both energy intense and emissions intensive in its own right, producing significant emissions through the cracking of alkanes into olefins, the polymerization and plasticization of olefins into plastic resins, and other chemical refining processes. In 2015, 24 ethylene facilities in the US produced 17.5 million metric tons of CO₂e, emitting as much CO₂ as 3.8 million passenger vehicles. Globally in 2015, emissions from cracking to produce ethylene were 184.3–213.0 million metric tons of CO₂e, as much as 45 million passenger vehicles driven for one year.

That is during the production, moving down to after its use to when it is disposed, plastic disposal also contributes a lot to climate change. US emissions from plastic incineration in 2015 are estimated at 5.9 million metric tons of CO₂e. For plastic packaging, which represents 40 percent of plastic demand, global emissions from incineration of this particular type of plastic waste totaled 16 million metric tons of CO₂e----- in 2015. This estimate does not account for 32 percent of plastic packaging waste that is known to remain unmanaged, open burning of plastic, incineration that occurs

without any energy recovery, or other practices that are widespread and difficult to quantify. Plastic in the Environment Plastic that is unmanaged ends up in the environment, where it continues to have climate impacts as it degrades.

Burning plastic is responsible for **4.6 million tonnes of CO₂ per year**, “The incineration of plastics contributes both greenhouse gases to climate change, and a cocktail of pollutants that are toxic to human health from nitrogen oxide to furans, dioxins, metals, and ultra-fine particulates that escape through even the most advanced incinerator filters,

Microscopic plants (phytoplankton) and animals (zooplankton) play a critical role in the biological carbon pump that captures carbon at the ocean’s surface and transports it into the deep oceans, preventing it from reentering the atmosphere. Around the world, these plankton are being contaminated with microplastic. Laboratory experiments suggest this plastic pollution can reduce the ability of phytoplankton to fix carbon through photosynthesis. They also suggest that plastic pollution can reduce the metabolic rates, reproductive success, and survival of zooplankton that transfer the carbon to the deep ocean. Research into these impacts is still in its infancy, but early indications that plastic pollution may interfere with the largest natural carbon sink on the planet should be cause for immediate attention and serious concern.

What is baffling is that when plastics cause an increase in temperature, sunlight and heat cause the plastic to release powerful greenhouse gases, leading to an alarming feedback loop. As our climate changes, the planet gets hotter, the plastic breaks down into more **methane and ethylene**, increasing the rate of climate change, and so perpetuating the cycle. The effects of plastic on the greenhouse effect cannot be quantified as we can only estimate, but it is worthy to note that plastics ,in their production, use and disposal has a lot of effects on our climate.

First, when paper is not recycled, 80% of it ends up in **landfills**. Decomposition of the paper in landfills produces methane, a greenhouse gas with 21 times the heat-trapping power of `carbon dioxide (CO₂).

