EXHIBIT

EARTH DAY

Canvesha

The Heart of the Problem: A Journalist's Perspective

Earlier this month, Anvesha had the opportunity of interviewing Mr. Nityanand Jayaraman (NJ), a writer and activist based in Chennai. He primarily focuses on reporting the exploitation of human and environmental resources. The following is an excerpt of the interview which was hosted by Balaram Vishnu Subramani (BVS) from Batch '17. Akshita Mittal (B'19), Subrabalan Murugesan (B'17) and Shreya Venkatesan (B'19) transcribed the same.

BVS: Could you start by telling us a bit about yourself and what you currently do? What inspired you to take up the cause?

NJ: I'm a journalist, that's my livelihood. I teach and I write. I'm also a social activist engaged in local civic issues, environmental justice and social justice issues. I am part of a voluntary collective, it's an anti-corporate collective called *Vettiver Koottamaippu,* and we work with young people, engaging them in extending solidarity to the community struggle. I don't think there was any epiphanic moment of inspiration, it's just the way things are. Some people question, and some people don't; some people want to question, and some people don't want to question. I guess I fell into the group of people who want to question.

BVS: As a writer, you try to raise awareness in the public domain regarding the dangers of exploitation. How would you grade the current awareness in the general public?

NJ: As a writer, I primarily write to make a living. Some of the writing is based on the issues that I work on. Currently, on awareness, I think society as such might be literate and people might know things about mathematical formulas and stuff like that, but there is very little in terms of common sense and accumulated wisdom. That is not in evidence, not even amongst the most literate people. This is nationwide, not just over here [in Chennai]. I think that the ability to understand slow-moving disasters, risks that are creeping, that might have a high impact, is virtually not there. I think that it's probably the nature of the human mind, our inability to appreciate dangers right in the future, even though there might be a scientific certainty to it. As a result, we do not take action to avoid the danger. Instead, we tend to put in a lot of investment in trying to engineer ourselves out of the danger. So, I would grade our collective awareness at a very, very low level.

BVS: At what point do you think they will start taking the situation seriously and act toward these disasters?

NJ: After the disaster strikes! Although it won't be taken seriously, we will start acting. The coronavirus epidemic that we are currently living in is a classic example of that. The entire world is in lockdown. We have virtually brought our economy to a standstill in responding to this because we don't know how to respond. Even if this were to happen again, we would still not know how to respond. Every disaster we learn, and generally, this happens after the disaster. Take the corona situation for example, we knew that it was happening in other countries, but did not think it would affect us until the very last moment.

BVS: When consumers find out that a company exploits labour and the environment, would the economic boycott of them be sufficient to cause the company to reconsider its actions or are government regulations the only solution?

NJ: No, the average consumer of the products and services of these corporations are not the ones who are exploited by them. The bulk of the people who are at the low-consumption end, who tend to suffer the gravest effects of our economy, do not hold purchasing power over these companies, and are alienated from such boycotts. Secondly, I don't think you can change the system with the master's tools. The economy is set up as a consumerist economy. We can't be tinkering around by boycotting each and every corporation. I do not know of any listed corporations in the stock exchange that actually act responsibly towards the environment and workers. None of them are responsible socially or environmentally, and they don't look after their workers. They're all required to turn in profits legally. Even that minimum requirement is often flouted, and people make a profit illegally, or by squeezing the workers, the environment, the communities and consumers. And in many cases now, we also find that they squeeze the shareholders. So, I think that if we give up our rights as citizens, and start asking for *consumer* rights, then we have already lost the plot on democracy.

BVS: The capitalistic system that has been the dominating force throughout the globe is seen as the leading cause of climate change. How can we better the system or adopt better alternatives? Is there any country or state that you have in mind that has an effective system?

NJ: No, I think that currently most of the nation-states are wedded to the capitalistic economic model, be it China, Cuba, USA or India. There might be some amount of socialism involved in it, but then the idea of accumulating profits, and squeezing the worker is something that is pretty universal. Besides, this economy is also a growth-led, corporate-oriented economy. There is no future for it, in the sense that there is no future for the economy and there's no future for this planet with this economy as the dominant factor. When does the earth breathe, when do the skies clear, and when does the river run clean? When we shut down our economy, which means that our economy is the cause of our environmental distress. So, if you want to address the environmental problem, you will have to redesign your economy. You cannot tinker around with the same thing saying that we're going to have green energy, green products or efficient lighting and address the problem like that. That's not going to work, we're too far gone for that.

BVS: What in your opinion is a better alternative to capitalism?

NJ: I don't think there is one golden alternative. There are many systems, and capitalism is one of them. So, you will need to have context-specific economies. I think localisation is the way to go, and we are already seeing that happen. Right now, during the pandemic, we are only consuming as far as we can reach out, and our ability to reach is not very much. We are living through a disaster situation and we realize that what is in our immediate

surroundings is the most important thing for us. What does your local government look like, what do your roads look like, do you get food nearby, and is there a way of distributing that? These are the current concerns. So, localisation is probably the one thing we would require as opposed to globalisation. I think globalising ideas is a great thing, but a global marketplace for materials, goods and services may be overrated. You might have to relook that to see what are the aspects that we have to retain, but I think in terms of food, employment and water, we should be looking at local solutions. We should also have an economy that is not linked to growth. We need to find a way to improve our living standards and our quality of life without necessarily having to consume and exploit in an ever-growing trajectory.

BVS: Are ecosystems benefitting from the current lockdown that is imposed worldwide? What are the key strategies that we can learn from this and can be applied even after the lockdown is revoked?

NJ: Well, as I said, the lesson is very clear: if your economy is the cause of this environmental distress, change your economy. That's the lesson we can learn from here. How we change the economy and replace it with multiple local economies, will vary from place to place. These are all challenging things we have never dared to explore. But right now, we are living through a time where there is hardly any international travel. There are no international conferences and there are many challenges. But those challenges also existed prior to this, just that it was hidden, and now we can see that the most vulnerable are out on the streets. So, this is a party for people like us and it's a headache for the people on the streets. So, I think what we can learn from this is that our economy is doomed to self-destruct, and we would need to address that now and also question all the assumptions that we have made which is the growth model, the GDP, etc.

BVS: The 2017 CDP Carbon Majors Report claimed that a hundred corporations are responsible for 71% of global emissions. This leads people to conclude that their individual efforts such as cleaning drives, taking public transportation instead of using private vehicles and using green energy are pointless in the big picture, unless these companies are restricted. What are your thoughts on this?

NJ: That is correct. I think that cleaning drives, which involve picking up garbage and plastic trash from here and there is meaningless, because industries plan to double their production capacities, and chemical plants will also double

Mr Nityananand Jayaraman (image source)

their production capacity of polymers. So, the world production of plastic is going to be increasing and you will have a lot of misled individuals thinking that they are doing a great job with their inadequate initiatives. If we are not working towards shutting the big corporations down, then we are a part of the problem.

Somebody once called private cars '*weapons of mass destruction*'. So what if they are battery powered and green? The fact that you have so many small cars running around that could be replaced by one large public transport vehicle is alarming. We can even avoid public transport altogether by redesigning the layouts of our homes and working places. All these things can be innocuous because, at the end of the day, you are not going to be able to have this economy running on green energy. We can't have an inherently unsustainable economy running on green energy.

BVS: The US Centre for Disease Control estimates that 75% of new infections come from human-animal contact, which is mostly triggered by humans encroaching and urbanising natural habitats. Ebola and MERS were caused due to this. Similarly, the COVID–19 epidemic was caused by humans selling wild animals. Will this epidemic change the way corporations and governments behave, with regards to deforestation and the like? Could this be a valuable lesson?

NJ: Yes, it could be a valuable lesson, but lessons are for people who care to learn. What we found is that, during this epidemic, that while The Guardian and other news sources were putting out articles about the consequences of going into such natural spaces, governments have initiated clearing several thousand hectares of prime forest for development. My outlook on the two most powerful entities on this planet today, which are the corporations and the

political infrastructure, is that neither of them is equipped to appreciate the danger and take us away from that.

BVS: As researchers and students of science, in what way could we contribute to aid the cause of environmentalism?

NJ: In terms of what they can do, students need to understand that what is learnt in college is inapplicable in most situations. Oftentimes, it moves us away from where we need to be looking. We are not taught to question. So, if students can come out of their schools and colleges still retaining the ability to question and to doubt, then I think that we would have escaped the designs of our flawed education system. I think you need to have a certain amount of irreverence to be able to question the most obvious things. For example, people say, "Oh, but growth is important." You need to ask them, "Is it really that important? Is it possible? Growth is a biological concept and in biology, things are born, they grow, and they die. How did you apply it to economics, when you have no death for this whole concept?" So, I think we take a lot of things without questioning, and as a result of that, we are stuck in answering the wrong questions.

In pure-science, you are at the heart of questioning, and any theory that's brought out is always up for revision if new evidence comes in. That's why I think that there is a possibility of good, healthy pedagogy, in science education, but I don't know. I mean, the number of letters behind your name and the degrees does not really matter, and does not make you a scientist. I think scientists are people who can question, who can pursue a way of knowing and make some sense out of the world around them.

BVS: The situation seems so dire now. Are there any final hopeful words you could give us regarding problems?

NJ: Hope is always there, but hope is not something that you want to cling onto. Hope is what you have when you board a plane; you hope that you come down because you have no control over things. Our economy, our planet, all of these are things that we have control over. The course of how we shape our future is in our control, so that is what you need to question, you need to participate in democracy. You need to be prepared to get beaten up, you need to be prepared to get jailed; all these things are required. If you say that's too much of a price to pay, then I think you will take all of us down. But whether it can be changed, of course it can be changed. Since humans caused this problem, we can also *un-cause* it. If you think it is dire, then I think that the challenge is greater; it will be more fun, and it will give a few more answers to the big corporations.

BVS: That's all the questions, thank you for your time.
NJ: Thank you.

Pollution and COVID-19

It's hardly a secret that air pollution is a health hazard. A major risk factor for cardiovascular disease mortality, it causes around 5.5 million premature deaths annually. However, professionals think it isn't getting the attention it deserves in the context of the ongoing pandemic. The link between prolonged exposure to $PM_{2.5}$ [a class of fine particulate matter that contains solids and liquid droplets so small that they can be inhaled] and disease has been well-established. A recent study by the Harvard T.H. Chan School of Public Health suggests that there is a 15% increase in mortality rate for just a 1μg/m^3 increase in $PM_{2.5}$.

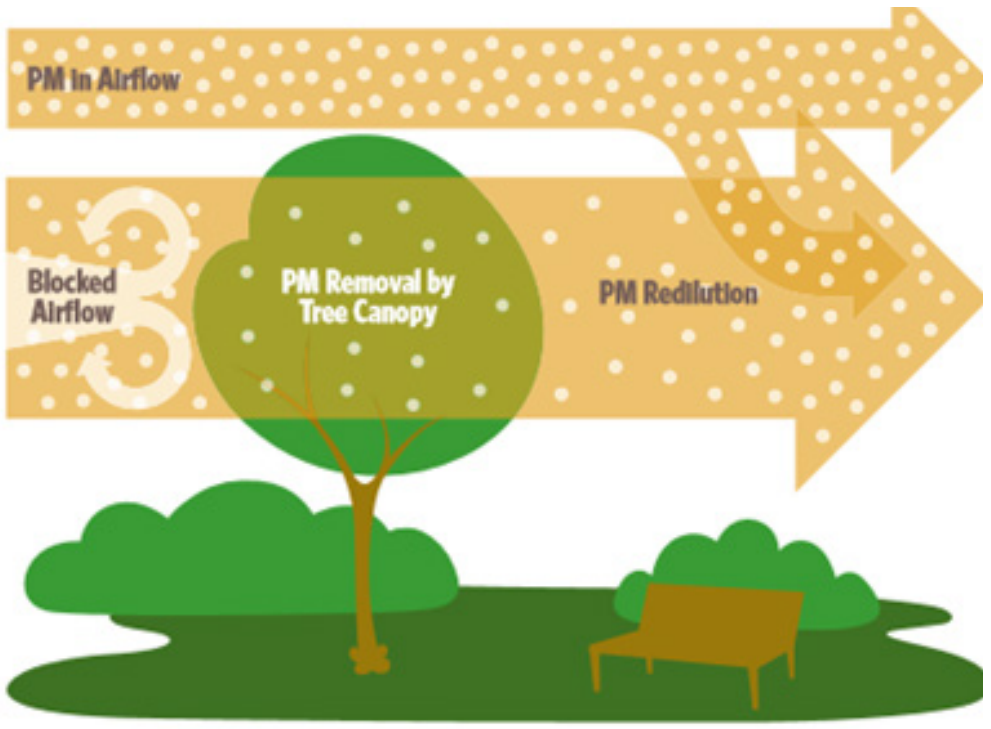
The study used data from the USA, covering about 98% of its population, but the conclusion remains valid globally. In a new study from Italy, yet to be peer reviewed, the presence of SARS-CoV-2 viral RNA on PM_{10} has been confirmed. The authors propose that in conditions of high pollution, the virus could form clusters with particulate matter, decreasing its diffusion coefficient. This is expected to lead to a surge in the persistence of the virus in air—however, the authors have held off on confirming a correlation.

Major news outlets have been more focused on the drop in pollution levels due to social distancing—this change is unlikely to last or impact climate change in the long-term. Although this decrease has helped lower the mortality rate considerably—Dr Aaron Bernstein of Harvard maintains that in China, these reductions 'helped save as many lives as COVID-19 took'. Many governments are tabling conservation efforts in favour of sectors deemed more essential in these times. Pollution levels will increase significantly once regular procedures resume. We have seen that large reductions aren't impossible, and at least in the interest of public health, the time has come to take extreme measures permanently.

– Rithika Ganesan (Batch '19)
Image source

Plants vs Cities

By 2050, 70% of the world's population is estimated to live in cities. As urban planners struggle to build infrastructure to mitigate problems faced by cities, plants turn out to be a reliable ally. Here are some of the ways plants can be incorporated into cities to make them healthier and more liveable:



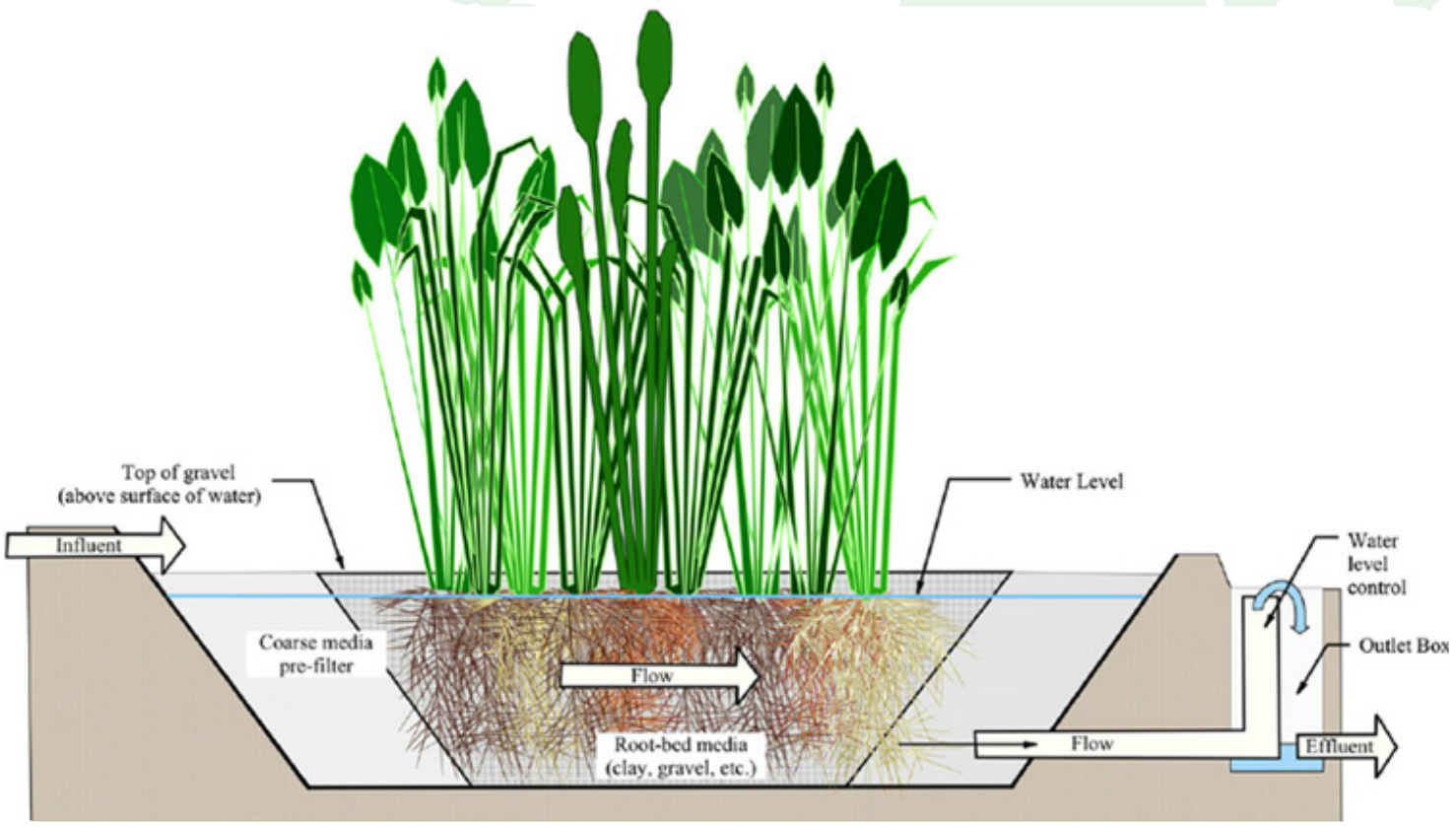
PM Removal by Trees

Particulate air pollution

Fine particulate matter poses a significant threat to urban populations; WHO estimates that $PM_{2.5}$ concentration contributes to approximately 800,000 premature deaths per year. When particulate-laden wind blows through a tree canopy, the coarser particles settle on the leaves and later get washed down by precipitation, while smaller particles get incorporated into the cuticle of the leaves. While there is considerable variability in terms of the tree species to be used, the area covered, the cost of planting and maintenance, all of which depend on the profile of the urban area, general predictions indicate that the return on investment (ROI) is high for Indian cities. If one considers the added benefits of carbon sequestration, aesthetic beauty, stormwater mitigation and healthier and more walkable communities, trees prove to be an even more attractive solution to particulate matter.

Urban Heating Effects

Cities have a large number of surfaces that absorb heat and release it back into the atmosphere. This can increase the ambient air temperature by as much 2^{o}C compared to the countryside. These urban heating effects exacerbate heatwaves, and high temperatures have been linked to increased overall mortality rates. The transpirative cooling and shading effects of trees can substantially lower summer daytime air temperatures. Planting trees is cost-effective over other strategies such as cool roofs, cool pavements and green roofs, and is projected to deliver temperature mitigation benefits to a greater number of people. Moreover, trees also work to reduce PM as mentioned above, which increases the ROI.



Schematic of a Constructed Wetland

Constructed Wetlands

Another problem that cities face is finding effective methods to deal with municipal wastewater. When untreated sewage is released into natural water bodies, they experience eutrophication which harms both humans and wildlife. Constructed wetlands are artificial wetlands that are engineered to remove pollutants from sewage water. Plants, along with microbes, work to metabolize nitrogen, phosphorous and heavy metals out of the water and have proven to reduce the biological oxygen demand (BOD) of water. They also filter suspended solids and pathogens. When done correctly, such wetlands can also host wildlife, as seen in the case of the Arcata Wastewater Treatment Plant in California. For an example closer to home, Jakkur Lake in Bangalore has a successful constructed wetland adjacent to it that treats wastewater before it enters the lake.

These methods can prove to be both efficient and cost-effective if implemented correctly. It is also worth noting that while they do mitigate problems, they do not prevent them at the source, and cannot be a replacement for longterm strategies to reduce pollution. There really is no limitation to the number of ways plants can be incorporated into urban spaces to provide us with elegant solutions for modern-day problems.

Further reading

– Ira Zibbu (Batch '19)

The Montreal Protocol

Climate change has undoubtedly proven to be one of the hottest topics of discussion in the 21st century, with experts relentlessly foreshadowing a bleak future if man fails to change his ways. A recent study from the University of Colorado Boulder, shows promising results of the ozone layer recovering, which has been attributed to the Montreal Protocol, an international accord that was signed in 1987.

Since the 1960s, meteorologists have been observing drastic damages to the ozone layer, a phenomenon that is primarily caused due to the release of Ozone Depleting Substances (ODSs) into the atmosphere. This has led to a variety of dire consequences that directly affect human life and the climate. Ozone, a molecule that not only protects life, but was also essential for its very formation, forms a layer in the stratosphere, and absorbs a majority of the sun's UV radiation. The absorbed radiation is then emitted in the form of heat, which plays a critical role in the dynamics of jet-streams.

When holes form in this layer, lifeforms on earth become exposed to the dangers of UV radiation. In humans, UV radiation is known to lead to melanomas, other cancers and eye-cataracts. Since the stratosphere is no longer warmed by the emission of UV radiation as heat, the local temperatures drop, prompting pressure changes which cause a poleward shift in the patterns of jet-streams. This, in turn, brings about multiple changes, which include:

1. Expansion of dry-zones and increased rainfall elsewhere due to a shift in precipitation patterns
2. Changes in circulation patterns in the ocean that are essential for the cycling of nutrients, and
3. Changes in salinity and an increase in the temperature of oceans.

The changes in these dynamics have harmful effects on delicate biomes and ecosystems. Therefore, the importance of the ozone layer cannot be stressed enough. Having fully appreciated the dangers of these disturbances, the international community brought the Montreal Protocol to action in 1987, which 'regulates the production and consumption of nearly 100 man-made ODSs', and is the only UN treaty to be ratified by every country on earth.

The success of this coordinated effort cannot be overstated: over 98% of ODSs have been phased out since 1990, which has subdued a predicted 10-fold increase in ozone depletion by the year 2050, and has led to a recovery of the ozone holes. This has:

1. Temporarily paused circulation trends of jet-streams in the southern hemisphere, and slightly reversed these trends since 2000
2. Saved an estimated 2 million people from skin-cancer each year by 2030
3. Reduced greenhouse gas emissions by the equivalent of 135 gigatons of CO_2 from 1990 to 2010, since most of the phased out ODSs are also greenhouse gases, and
4. Helped avoid a 0.5 degree increase in global temperature by the year 2100. This is by far, the single largest contribution of its kind!

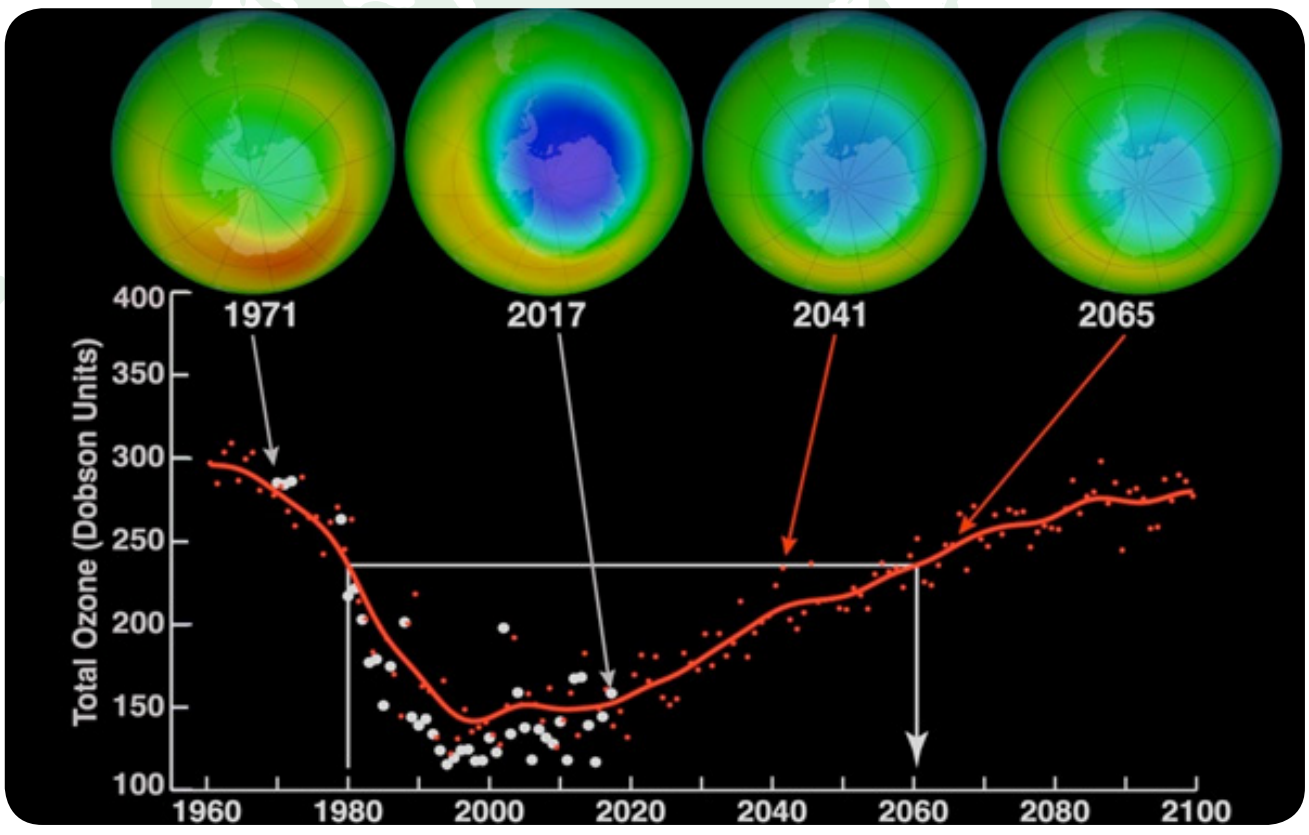


Image depicting gradual decline and recovery of ozone levels with respect to time. (White points refer to empirical data and the red points and line are model predictions) Source

As promising as it is, this is nowhere near the effort required to curb climate change. Much more needs to be done, with far greater urgency, in order to ameliorate the dire situation. The Montreal Protocol exemplifies the benefits of truly understanding the gravity of the situation, and putting efforts into executive action instead of sojourning them in political speeches. If treaties like the Paris Climate Agreement are not taken seriously, and ridiculed by major world leaders, then the path that lies ahead would be nothing but dystopian. Political discord over the realities of climate-change would serve to be the defining, and final debate of mankind. Saving our planet is still within the realm of reasonable possibilities, only if we act right now.

Sources: A, B, C

– Balaram Vishnu Subramani (Batch '17)

The High Cost of Profits

For decades, organizations and governments have been calling for global cooperation in stopping climate change and have signed various agreements and treaties to curb it. But it has become clear that those efforts have largely been futile, as year after year our greenhouse gas emissions only continue to rise in an alarming fashion and never seem to fall or even stall. And yet, global awareness of climate change and its impact today is much greater than ever before, with mass movements and protests taking place all over the world calling for immediate action by governments. So what seems to be the problem? We shall look into some of the issues below.

It is an indisputable fact that our planet has only finite resources, and that these resources are not just for human beings, but for all life on Earth. This is at direct odds with the business interests of corporations, whose bottom line is to extract maximum profits out of making and selling products and services using these resources. Our economic system is set up in such a way that if a corporation fails to increase its profits every year and thus grow in fortune, it is doomed to fail. This is simply the fundamental rule of the system. In many cases, corporations are legally bound to turn a profit, failing which they will be shut down one way or another and replaced. Corporations work on the assumption of infinite growth, when in fact such growth may not be possible or even desirable for the well-being of humanity as well as all other life. Therein lies the problem.

If you have wondered why oil companies continue to extract oil despite knowing its impact on climate change and pollution, this is your answer. While renewable energy sources are seeing greater use than before, they are still more expensive to set up than extracting oil or burning coal. Besides, the increased use of renewable energy sources has not brought down the demand for crude oil, meaning our energy needs are only going up, which is another indicator of unsustainable growth.

One might point out that corporations sell products and services that only cater to the demands of the consumers, and if consumers just reduce their demands, or buy only from corporations that are more eco-friendly, then perhaps we may see a positive change in the way corporations do business. This attempts to shift the responsibility on to the consumer or the general public to make personal lifestyle changes to curb global warming, “vote with your wallet” in terms of buying more eco-friendly or ethically sourced products, etc. One might think if demand goes down, corporations will be forced to bring down their production too and make changes to the way they do business accordingly. This, as you might imagine, would go against their business interests of wanting to turn in more profits every year.

Corporations are aware of this and go out of their way to artificially drive consumer demand to increase through heavy marketing and advertisements, planned obsolescence, etc. So the argument that consumers control demand is not rooted in reality. This is what advertising is for: to woo consumers into buying more. In fact, when you think about it, the entire advertising industry, worth billions of dollars, serves no useful purpose in the functioning of society than to help corporations influence the minute purchasing decisions and expectations of the individual consumer. What’s more, corporations create demand for products and services that never existed to begin with. These include disposable fashion clothing, ornaments, processed junk food, toys and a lot of electronic goods, among many more. Planned obsolescence of consumer products also helps create demand by intentionally making them harder or costlier to repair when they break, get old, or by simply making the products less durable with low quality materials to begin with.

Obviously, there is a cost associated with all of these tactics. Almost everything we buy and use affects the environment negatively in some way, and consumers as individuals have virtually no power in influencing the business decisions of large corporations, as we just saw. For instance, while it might be desirable to own the latest and greatest in electronic gadgets such as smartphones, the environmental cost associated with them is tremendous, thanks to the myriad of rare earth metals, plastics, silicon and glass involved in making them. So then, as a society, we have to decide what's important to us: The illusion of choice associated with fancy bling, fast cars and the latest shiny electronic gadgets, or improving our overall quality of life by setting limits to the growth and exploitation meted out by corporations, by restoring our ecosystems and making sure humanity as a whole is able to live comfortably and sustainably? After all, it's the same free market economics that's causing environmental degradation that's also causing massive wealth inequality. All this is without going into the fact that corporations actively lobby governments against enforcing environmental regulations, threaten environmental and social justice activists who question their actions, run propaganda campaigns promoting climate denial, and so forth.

What is to be done? There are several ways of looking at this. Mass movements that call for tangible government action is just one of them. As Mr Nityanand Jayaram points out in his interview, localisation of production and consumption is also an important step towards sustainability. We have to move from a growth-based economy to a need-based economy, by putting the needs of the masses before the luxurious pleasures of the wealthy. For instance, public transportation has to be promoted heavily, so much so that cars become unnecessary. These are just some of many steps that need to be taken in order to promote a healthy environment for all life on earth. Our community-focused lifestyles will not only allow for the physical and mental well-being of all humans through the principles of mutual aid, but also allow for more of our minds to focus our attention towards artistic, scientific and technological pursuits, which are today accessible only to the privileged few. That is how humanity can progress to its next stage of civilization, a future that is bright for all.

– Hari Krishnan (iPhd, Batch ‘18)

Pollution Backfires Pink

In the current COVID-19 epidemic, we hear a lot of news on 'nature healing itself'—starting from the relatively dust-free atmosphere, to animals returning to their habitats. Similarly, Mumbai witnessed a storm of pink attacking its skies. Out of the six flamingo species in the world, India stands in the migratory pathway of two species: the greater flamingo (*Phoenicopterus roseus*) and the lesser flamingo (*Phoeniconaias minor*). Every year, the Thane creek of Mumbai witnesses nearly 40,000 of these birds visiting its mudflats and polluted waters, this year with almost triple the number. Last month, nearly 1.2 lakh flamingos flying from as far as France, visited this pollution hotspot. Environmentalists and ecologists found that the answer for such a large number may lie in the sewage flowing into this part. The organic waste and the flowing industrial hot water resulted in a perfect environment for an algal bloom. Naturally, the flamingos that feed on the blue-green algae were found in large numbers. The drought-like condition in the wetlands of Kutch is also speculated to be one of the reasons. It's interesting to see how the polluted land ironically hosted a spectacular wonder of nature, but it is also important to note that an increase in pollution levels would serve as the end for the very species it currently harbours.

– Megha (Batch '19)

Flamingoes at NRI Colony, Navi Mumbai (image source: The Guardian)

We hope you enjoyed this month's edition of Exhibit: A!

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