

From a virus, Ankila worries if we will learn,
Of being in the field, Aravind does yearn
Same as TG, a bit uncertain
As RG reminisces of heritage, in turn.

Shrini at home anxiety ridden
For the underprivileged, as Nitin
While Durba concerned for the women
As RG revisits traditional medicine.

Jagdish balances many a narrative,
Sharad contemplates the ways we live,
While Madegowda sees no tourist throngs,
And Harisha hears no temple songs.

Ravikanth digs into virulent origins
Nirmalya asks how urban life has been
As does Soubadra who wants butterflies to
be seen
While Siddhartha ponders of risks
unforeseen

Priyan questions who owns the virus
And Priyanka dwells on interventions
Shikha wishes instead for prevention
As Veena demands better communications

Sarala seeks resilience through diversity
Siddappa looks for positives in adversity
In zoonosis, wondering if 2+2 is 4?
Abi says "I told you so"

- Nitin Pandit

LOCKDOWN ESSAYS FROM ATREE



The background of the entire page is a watercolor-style illustration of various microorganisms. It includes several large, round viruses with prominent spikes or surface proteins, rendered in shades of purple, blue, green, and yellow. There are also smaller, more irregular shapes that resemble bacteria or other cellular structures, scattered throughout the light-colored background.

Preface

When identified, the one thing patient zero will know instinctively is that we all are connected. That there are certain containment strategies nature has in place which balances these connections. And that in our relentless pursuit of unchecked 'development' we continue to evoke its reaction. This is what ATREE and others of similar ilk have been saying for years. It has taken an unprecedented global shutdown to create a silence in which the cautionary voices may be heard. Our researchers take time off from analytics and manuscripts to write about how it must be better than 'business as usual' when we get to a new normal.

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I know this is not the time to tell you "I told you so". But I told you so! WE told you so. A whole range of scientists, epidemiologists, veterinarians, public health practitioners – all working together, under a framework called "OneHealth" have for years been cautioning against the Next Big One (the NBO); the next big pandemic that would threaten humankind. And, we have said that this one will most likely be a virus, and it will most likely be a zoonosis. I.e. a pathogen that originates in animals, and can also infect humans. In fact, we've had some early warning signs. SARS, MERS, H1N1, H5N1 – all of these had the potential to be the NBO. Now, it's here – and we are woefully unprepared. We've been doing the science, and we've seen the signs. For decades we were urged to protect the world's natural habitats from destruction, because they may hold cures for humankind's worst ailments! That we may one day find a cure for cancer! What people ignored, however, was that the continued destruction of forests and other ecosystems through widespread land conversion (mining, oil palm, dams, industrialisation, irrigated agriculture, logging etc.) could also unleash new nightmares that the world would be unprepared to face. We conveniently forget that viruses, bacteria, fungi, and other parasites, are also part of biodiversity. Indeed, they

make up most of it. So why is it surprising that the most biodiverse places in the world, will also have their fair share of parasites and pathogens? Thankfully for us, most of them are completely harmless to humans! They have co-evolved with a host of other species, and pose very little danger to us. However, as we mess with these ecosystems, we also disrupt internal transmission chains. So, once in a while, a nasty bug "emerges" and crosses the species barrier to infect humans. This can happen directly from the native reservoir host, or via something called an amplifying host, i.e. another animal species that is naïve to this pathogen and therefore gets very sick, very quickly, and often dies. Some pathogens have a more complex life-cycle that also involves a vector, such as a mosquito, tick, flea or other biting insects. We need to be able to respond quickly to such emergence events that are inevitably going to recur. To begin with, let's know the enemy! Let us conduct systematic surveillance in areas where high human density interacts with areas of high biodiversity. Where there are a range of potential host species and their accompanying entourage of pathogens and vectors. Where humans and their animal companions (cows, goats, dogs) are likely to come in to contact with wildlife. Where we have altered natural habitats and created conditions that

allow for some species to thrive at the expenses of others (e.g. bonnet and rhesus macaques that have adapted to human habitations). Let us do massive-scale pathogen discovery studies across the entire wildlife/domestic/social spectrum. These studies will allow us to map potential hotspots of disease emergence or map populations that are at greatest risk. And identify little known zoonoses that are at present localised, but might have the potential to spread wide if conditions change. We also need to arm our scientific community with the necessary tools. Invest in new regional labs, improve the surveillance infrastructure, have better training facilities, and develop a broader range of skills. But, if there is one thing that this pandemic teaches us – it is that we can no longer work in silos. We need to promote team science. Medical professionals, public health professionals, biomedical scientists, taxonomists, veterinary scientists, animal health professionals, ecologists, social scientists, epidemiologists and disease modellers need to come together to understand these problems and find solutions. We now have exemplars of this kind of work – projects at ATREE that investigate the dynamics of rabies in multi-host systems, and in understanding risk factors that contribute to the rise of Kyasanur forest disease are excellent examples of team science, working with an extensive

network of partners from academia, government agencies, public health workers and the non-government sector. We have to stop being the proverbial six blind men. The elephant is now in the room, and we need to open our collective eyes so that we can begin to understand the sheer size of the problem we are facing.



REFLECTIONS ON COVID-19

ANKILA HIREMATH

I sit at my desk at home, enveloped by an unreal silence broken only by the sound of peacocks calling in the heart of the city. Completely absent is the constant thrum of traffic on the street, punctuated by the occasional plane passing overhead. Who could have imagined, even just a few weeks ago, that the world would suddenly be catapulted into a scenario akin to a futuristic science-fiction movie? A world where country after country has been locked down, where city streets are deserted, except for those few masked individuals tending to essential services, where ones contact with the world outside has been reduced to the phone and internet, and where thousands have suddenly been rendered refugees in their own country, jobless, with no means to get home to their families. Though COVID-19 has taken most of the world by surprise, epidemiologists have been predicting a pandemic such as this for some time. The numerous relatively localised disease outbreaks we have witnessed in the last couple of decades—Chikungunya, or Ebola, Nipah or Zika, SARS or MERS—have been a series of red flags. The opening acts before the headliner.

In my work as an ecologist, I study invasive species. These are plants, animals, diseases, typically brought from elsewhere, so-called 'alien species.' Arriving in new environments, and finding release from factors that would have kept

them in check at home, they spread uncontrolled, causing significant ecological and economic damage. It isn't only alien species that can become invasive. Native species become invaders too, given a chance. For instance, a relatively inconspicuous light-demanding herb or fern, surviving in forest clearings, could very quickly become rampant if extensive deforestation were to reverse the balance of habitats—more clearing, less forest—allowing it to thrive. Some of the diseases that we have seen in recent years are no different. Our growing human footprint is increasingly disrupting natural systems, giving adaptable organisms an opportunity to invade new habitats (or hosts, in this case)—whether it be the Ebola virus jumping from chimpanzees to people, or the Nipah virus moving from fruit bats to humans. Add to that our unprecedented interconnectedness today, and a local outbreak can very quickly encircle the globe.

Some ecologists have likened invasive species to symptoms signalling an underlying malaise. That apart from the particular characteristics that confer on a species the ability to be invasive, invasive species are aided by disruptions (disturbance, or degradation) that make habitats vulnerable to invasion. It has parallels in the emerging field of planetary health. This area looks at humanity's growing ecological footprint

to ask whether our continuing disruption of earth's systems are undermining resilience, bringing it to a tipping point that could threaten our own life on earth. An example is that of increasing atmospheric carbon dioxide and global warming. While warmer temperatures and more carbon could increase agricultural productivity, we are already starting to see a reduction in the nutritional content of staple crops. This could translate to significant protein deficiency for millions of people—a widespread 'hidden hunger' that could compromise immunity and make people more vulnerable to disease outbreaks in the future. Unlike the silent, unseen reduction in the nutritional quality of the crops we consume, the COVID-19 pandemic is a more strident wake-up call to us as a society. And as we tide over the current lockdown, and in the weeks and months that it will take us to recover from it, we have a chance to reflect on how we as a society will move forward. Will it be back to business as usual? Or will we have learnt something not just about the proximate driver, SARS-CoV-2, but about the ultimate drivers that have brought us to this point? Will the tremendous human and economic costs that this pandemic is exacting from us give us pause to reconsider the economic and technological growth trajectory that we are on, in light of the sustainability and resilience of earth's systems? One can only hope so.

The great plague ravaged London in 1665, Issac Newton, a student of Cambridge was confined to the house, and incidentally, it marked an intensive and productive year wherein he discovered calculus. Many researchers have shared the opinion in the various social media outlets about how social distancing had led to the discovery by Newton. With recent COVID19 outbreak globally, the academics felt that this would be a fantastic opportunity to increase research productivity, be it writing research papers or generating new ideas for the near future or developing research ideas for grants. The idea that working from home increases productivity probably emerged in the Western world, that the isolation increases creativity and thus productivity. I've always been a field person and never have I spent as many days within the confines of the same walls. The coronavirus pandemic has bought the whole world under a standstill; lab and fieldwork have come to complete stop. My classroom teaching has had to be postponed. But more than that, on a personal note, much-needed support from colleagues and friends is now harder to find, at least face-to-face. But, this lockdown came as a blessing in disguise, if not for many for me at least. I will be sharing some experiences of being at home for two weeks now and another two weeks more to go. The constant thought was running on my mind when I

heard the news that we have work from home, was how to be more productive? What did I do for two weeks now?

This COVID19 experience is affecting our research work in many ways, both positive and negative. The positive side of this "house arrest" is that I got to complete a few long-pending manuscripts. Some are over three years old and required quality time to reanalyze, write and submit. I could do that for four papers. Another important thing was catching up on the latest literature related to my field, which otherwise was not possible given the meetings, admin work, and so on. More or less a productive two weeks, I would say. On the flip side, some ongoing projects needed solid lab work, such as examining the specimens with the microscope, comparing with other materials, etc. All these have come to complete halt. Some research papers which are in the final stages required different types of microscopic work and wet lab work. Also, March and April is the short field season for aquatic biodiversity survey; a lost opportunity now, I have to wait for next season to complete the work.

What will I be doing for the remaining part of the lockdown? Or god forbid, how am I prepared for a possible extended lockdown? Given my varied interest ranging from field ecology to taxonomy to big data analytics, I could generate some exciting ideas and work on it; supplemented with fast internet and

some beers, of course! As I write this, I have developed a new plan for a manuscript and completed it in three days flat!

COVID-19 has arguably altered our understanding of and interactions with our surroundings in far-reaching ways. In the WASH sector, there is an ongoing discussion on the importance of access to water for washing hands frequently and how the lack of proper access to water and soap leaves marginalised communities disproportionately exposed to COVID-19. There is no debate that the ongoing pandemic raises new challenges for the water and sanitation infrastructures. However, to address the COVID-19 requires us to mind the gender, age, caste, class, and religious dimensions to the infection and this requires depending not only on emerging data on COVID-19 but also relying on the existing data and literature on the gendered impact of infectious disease and respiratory illness (Wenhem et al., 2020). At the outset, it is important to understand that the impact of the infection and the impact of the lockdown are related but not identical. For example, the severity of the virus as experienced by individuals depends on individual immunity. However, the ability to mitigate its impact – for example, access to water and soap, the ability to practice physical distancing – are an outcome of underlying socio-economic and gendered differences. Here, I discuss the distinctive impact of COVID-19 on women and access to water. Gendered norms imply that women are required to

continue their domestic responsibilities such as making meals, childcare, and managing cleanliness and hygiene for other family members (elderly, disabled, unwell, children) and their overall homes even under the current pandemic. Women from poor communities often depend on public taps for their domestic water needs and make multiple trips during the day to collect water. Carrying out water collection puts them at risk of contracting infections from frequently touched surfaces such as the taps and lack of adequate physical distance. While physical distance is required to stop the spread of the virus, policymakers have overlooked the apparent class-dimensions of distancing. As has been evident in the past few days, poor migrants have been hit hard by the nation-wide lockdown. Even as thousands of migrants are stranded or walking towards their villages, their access to adequate water is questionable. Moreover, women and children are especially vulnerable, and vulnerability increases for women who are pregnant, breastfeeding and menstruating. Furthermore, institutions for the socially vulnerable people such as nursing homes, homes for destitute or abused women, and others are faced with the impact of COVID-19 on their residents with limited resources to alleviate the risk of infection. The COVID-19 pandemic can be a turning point for humanity. Moving

towards a future where every citizen has a decent life – including access to adequate water and sanitation – requires us to move away from the current implicit biases against various groups of people based on their social and economic identity. At a fundamental level, we must believe that every citizen has equal value and then design policies and build infrastructures – including water and sanitation – from that underlying shared ideology.

COVID-19 has affected livelihood activities of the Soliga tribes significantly, especially wage labourers who migrate to coffee estates (Kerala and Kodagu), construction and stone quarry workers in Bangalore, Mysore and Tamil Nadu. A few managed to get back home with difficulty while others remain stuck in the workplace due to lockdown. People staying in coffee estates have been taken care of by the estate owners. However, families of the migrants are not aware of the health status of the people who stayed back, especially of those who contracted COVID-19; this has created anxiety between in their families in MMHills.

The health department is very active and carried out corona testing for the entire group of people who got back from different parts of India and kept them under observation for 15 days. No positive cases of coronavirus infection are recorded in MM Hills so far. People in the villages pass their time playing local games like Pagade, Anekatti, Chowkabara, etc. They are aware of the COVID-19 and have stopped encouraging visitors to their villages. Families are being taken care of by public food distribution packages (PDS) in advance. Household-level work such as preparation of farmland, grazing and collection of forest produce for their subsistence continue. Grocery shopping is allowed with social distancing rules. Health .

workers have been visiting villages regularly and monitoring COVID-19 status. Lantana workers were ready to work at Lantana Craft Centre (LCCs) even after lockdown, but ATREE decided to shut down live size elephant sculpture unit as done by a team of 7 to 10 people, till 14th April 2020. However, some of our artisans are engaged in producing Lantana furniture at their household level. MM Hills is a popular pilgrimage site in Karnataka, with the temple receiving visitors from both Karnataka and Tamil Nadu. Last year around 50 Lakhs pilgrims visited this temple. The lockdown has impacted hundreds of local shopkeepers and livelihoods.

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In the beginning, the first thoughts were about the zoonotic origins of the pandemic and found expression in the responses of various communities. The animal rights and welfare communities used the opportunity to draw attention to the hideous torture and abuse of animals (both wild and domestic) in the wet-markets of China and elsewhere. The vegetarian lobby reminded us of the adverse effects of non-vegetarian food production and consumption, from GHG emissions to consequences on human health, hinting that zoonotic disease is an outcome on top of all the other impacts. The biodiversity and wildlife conservation groups drew attention to the horrific toll that illegal wildlife trade has on species such as Pangolins which are also linked to the origins of the current pandemic. Climate change-related discourse included a renewed emphasis on a shift to sustainable plant-based foods to reduce the negative impacts of the commercial meat industry on emissions and human welfare, both diet-wise and zoonotic disease wise. All these different concerns and lobbies converged to articulate their stakes and their take on the pandemic in ways that would confuse the issue for the lay public. The initial excitement that perhaps this global shock could change paradigms gave way to pessimism. The sudden misery of unemployed migrant workers left to trudge home as well as concerns over the

impact of the lockdown on rabi harvest and farmers, brought home to large sections of the urban rich that not everyone was getting a much-needed break from their work. Then news stories emerged from India and abroad (some genuine and others fake) of real and fake take-over of the now-empty farms, fields, forest roads, parts of towns and cities and even harbours and beaches by wildlife. The pollution-free skies resulted in the fantastic spectacle of the Himalayas in towns a few hundred kilometres away in the plains, something not experienced in many decades. Even the highly polluted Yamuna in Delhi showed dramatic improvement without the industrial effluents. Researchers working on river dolphins speculated on whether the reduction in fishing activities and boat traffic during the lockdown would result in reduced mortality. However, hopes for a better survival rate of adults and juveniles in the coming season was tempered by reports that fishers were desperate to get back to fishing. There were reports on forest fires being unattended, leading to major fires, resulting in the ongoing discussions on the role of managed fire in the health and productivity of savannah-woodlands. However, the devils lie in the details of the role of more significant fragmentation, invasive species and climate change compared to the

processes a century ago. On the research side, there was speculation that though ecological and environmental field research and monitoring have been hit hard, could we possibly benefit from using the current state of the environment and ecosystems as a base-line for understanding the impacts of human footprints better?

I had tweeted on 31 March "I wonder whether post this COVID 19 crisis we can collectively influence a relook at and foster changes in our economic and development paradigms as well as our interactions with nature? Wishful thinking perhaps". The responses I got summarised that it was, in fact, wishful thinking. That the 'business as usual' lobby, will push even more aggressively for development and resource consumption, to make up for the losses sustained during the pandemic. That there will be no changes in individual or collective choices made by governments, societies and citizens.

Coronavirus created real tension among the Soliga community in Chamarajanagara district after they got to know of the lockdown. Awareness is being spread by local Panchayath, health staff, and Asha workers in several villages. Knowledge related to symptoms and precautionary measures were disseminated widely with the collaboration of community organisations such as District and Taluka Soliga Abirudhi Sangha (SAS), ATREE and Vivekananda Girijana Kalya Kendra. Soligas who had migrated to Kodagu to work in coffee estates were stuck. SAS communicated this to the government for their health, safety and food. Soligas in the district received special food distribution packages. People who cultivated indigenous food crops are under doubly comfortable; an added advantage being the Soliga community consumes food only twice a day. Lack of public transportation has also had some impact.

A minimal number of people go to the forest to collect tubers and some work in agricultural land as it is a pepper harvest season. They are giving importance to health, eating only freshly prepared food while maintaining general cleanliness. But COVID-19 seems to be having a considerable impact on wage labourers and their earnings.

It's the traditional festival season, but visitors, pilgrims, tourists have stopped

coming to BRT tiger reserve. It has reduced sound and air pollution. ATREE has had to stop field research and training of coffee growing Soliga farmers has been postponed.



As late as 1950, the majority of the world's nations were rural, except for a handful of Western European countries and North America. The most populous nations – China and India, have either just become majorly urbanised (China, 2017) or projected to do (India, 2047) so in a couple of decades.

In these times of unprecedented global concern about zoonotic disease outbreaks and epidemics in a hyper-connected world, we ought to ask ourselves, that even though humans have populated almost every available ecological niche, how close are we to saving ourselves as a species.

As a field scientist, the ongoing COVID19 pandemic related lockdown in India has severely limited our field visits to collect data and meet with our collaborators – both human and otherwise. We work in landscapes with degraded soils and vegetation, mostly driven by human encroachments and interference. Suffice to say, there is no dearth of landscapes to study, and perhaps potentially save, from our own, very human rapacity. Through the 20th century, human population ballooned. As we rapidly expanded arable and grazing land, clear cut forests, and made industries over ostensibly "degraded" grasslands and scrublands – we pushed out and eventually wiped out a great many other species. Many of these were just the "visible species", the invisible that live

along and among them have now started looking for new hosts and homes. Thus the current trend in zoonosis – epidemics of which have become major causes of human mortality and disease in the 21st century. As we get more complacent and arrogant in our belief in the ability to control nature, even erstwhile diseases are making comebacks.

In this context, it is crucial to keep in mind how human-dominated landscapes – currently around 5 billion hectares (or a full 50% of global habitable land) differ from natural landscapes. The landscapes we live and work on are reflective of how we construe it – in perhaps fifty shades of grey or worse in black and white. Nature-dominated landscapes, in contrast, have at least a couple of million shades: this has been enumerated and is likely just a small fraction of the actual totals. It is this lack of understanding of the variety on our part, which is problematic for the sustainability of human life on Earth. It is said nature abhors a vacuum; we can only guess what role each species – known and unknown plays in its entirety, but suffice to say it is probably not just to provide us, humans, with food, fodder and fibre.

Perhaps the danger lies not in being too close to nature or wild species as we think, the danger lies in being too arrogant to live amongst and within the collective of Life and leaving too little for the others as evolution ordained. After all,

as Yivon Bar-On et al. reviewed in their comprehensive paper on global biomass – the virions outweigh us 3-to-1000, leave alone the rest of the biomass they call their home: we can project only so much before getting blind-sided on all fronts.

The current emphasis on 'social distancing' invokes the societal structure of Hindu India, which for centuries has experienced caste-based discrimination and a range of behavioural rituals based on 'distancing'. The slightly different notion of 'distancing' or keeping people away, has determined the way forests have been governed for over a century. The idea that forests and people have to be physically separated has been the backbone of Indian forest policy for the past 150 years. Forest dwellers have been evicted or restricted from using forests based on the premise that their use of the forests is detrimental to the health of the forest. The parallels to the ongoing fight against the virus is striking both in the state's racialised opposition to forest use by local people and the criminalisation of such use. The building of a 'cordon sanitaire' around the forest has led to a range of socio-cultural and historical erasures of attachment to the forest. The forest is 'protected' to keep it 'healthy'. The use of such medical metaphors is in line with what we are seeing today: the forest as a source of contagion and therefore to be kept away from society. Such a redrawing of lines between the forest and people has implications for the democratic governance of India's forests. The COVID pandemic is now giving fresh lease to coercive conservation ideas. Conservationists are now taking the idea

of forests as repositories of zoonotic diseases to police the boundaries between people and forests. A recent essay in the journal *Science* titled 'Permanently ban wildlife consumption' lends further heft to the idea of separation between people and forests. The assumption behind these separations is that the COVID 19 pandemic is the singular result of the virus escaping its wildlife host and infecting people. It does not account for the heavily industrialised and globalised context within which this transfer occurred. Providing a more nuanced perspective is an essay titled 'Social Contagion' in which the author says that the 'sale of large tracts of land to commercial agroforestry companies entails both the dispossession of forest-dwelling locals and the disruption of their ecosystem-dependent local forms of production and harvest. This often leaves the rural poor with no choice but to push further into the forest at the same time that their traditional relationship with that ecosystem has been disrupted. The result is that survival increasingly depends on the hunting of wild game or harvesting of local flora and timber for sale on global markets. Such populations then become the stand-ins for the ire of global environmentalist organisations, who decry them as "poachers" and "illegal loggers" responsible for the very deforestation and ecological destruction that pushed them to such trades in the first place.'

The selective telling of the story of the easy transfer of viruses from animals to humans took an interesting turn in the first week of April 2020 when a tiger in the Bronx zoo in New York tested positive for the virus. This predictably stirred the Environmental Ministry in India into action by issuing an advisory to all forest managers in the country asking them to take 'immediate preventive measures to stop the transmission and spread of the virus from humans to animals and vice versa in National Parks, sanctuaries and tiger reserves'. This included actions such as restricting the movement of villagers and reducing human-wildlife interface. This has been the established practice of the forest department for decades and the Bronx story seems to have provided them with a virus given opportunity to flex their conservation muscle and place restrictions on forest dwellers who are already reeling under the economic outcomes of the lockdown. COVID is providing the context for a return to an alarmist conservation rhetoric as witnessed in the 2nd April edition of the *Deccan Herald* which screamed that '2,000 forest fires in Karnataka as miscreants exploit lockdown'. The lockdown is being exploited by the state to increase surveillance and impose restrictions by amplifying the instances of fire and poaching. These are difficult times which regimes are exploiting for their ends. The forest governance regime

in India has shown itself time and again to be authoritarian and has marginalised local interests and perspectives. The COVID pandemic comes at a time when forest dwellers were gaining strength in their fight for rights to forest land and forest use. We need to strengthen that fight by laying the blame for the pandemic on a globalised, industrialised, and growth-centric world and not on the local forest users who are once again bearing the brunt of a world going mad.



Wherever the sun could peep in, the unmanaged land on my homestead is carpeted with wild lily flowers. A pack of grey mongoose come out from the woody greens and engage in boisterous merrymaking in the morning twilight. Panic-stricken jungle babblers attempt to chase them away through shrill calls and aggressive displays. The squirrels, white-eyes, warblers and sunbirds also join the chorus. Royally lounged on the ledge of the farm shed, Makkachi (jungle cat) who has established her kingdom around my ancestral home throws an arrogant glance occasionally at this encroacher. A colony of thousands of flying foxes shriek from their high roosts on the canopy of an Anjili (*Artocarpus hirsutus*) tree. Comfortably slanted on the old canvas chair in the front porch, I try to ignore the sceptic neighbour's demands to chase these virus vectors away! Still, dubious of the potential viruses transferred to it from the bats, I deny the delicacy of sour and sweet golden fruits and chestnutty white seeds of Anjili to my children, which I have relished a lot in my childhood. Almost all of humanity today is locked up in their abodes, for the first time in history, to escape the pangs of the most basic life form, - a virus. Being a person who has spent a good part of his professional time over the last 15 years, discussing the ownership and rights of human on biological diversity, I lay wondering who owns this tiniest,

immensely powerful biological molecule, that nobody wants to stake a claim on. When the President of the United States, Donald Trump called it a 'Chinese virus', his statement had created a lot of hue and cry all over the world. But the Convention on Biological Diversity -1992(CBD) signed by 192 countries except for the USA, reaffirms the sovereign rights of States over their biological resources. So, as per the CBD, the Peoples Republic of China has the sovereign rights on COVID-19, as it originated on China's soil. Moreover as per the CBD and its subsequent Nagoya protocol the country of origin can claim for a 'fair and equitable share' of benefits arising from research or development on genetic resources, including when it leads to the commercial use of a developed product. So, whether it is a plant, microbe or fungus with therapeutic value, disease-causing bacteria or pandemic creating virus or any knowledge associated to it is a source for making monetary benefits for the country/ community where it originated. The CBD and Nagoya Protocol inspired many biodiverse nations to entertain unrealistic expectations regarding the commercial value of their native biodiversity and have put stringent measures on sharing biological resources and knowledge across their borders. This has largely stifled research in agriculture, health and conservation. The Food and Agriculture

Organisation (FAO) has renegotiated and adopted the "Seed Treaty" (The International Treaty on Plant Genetic Resources for Food and Agriculture) to ensures worldwide public accessibility of genetic resources (GR) of essential food and fodder crops through a multilateral system (MLS) for access and benefit-sharing.

When China, Russia and Indonesia (allegedly) refused to share data and sequences of the virus to other countries, the development of a vaccine against the bird flu (H7N9 influenza), was delayed for more than 20 months. Similarly, development of a vaccine for Ebola virus was delayed by several years due to the unwillingness of nations to share data, even after Ebola explosion in West Africa caused major loss of life and socio-economic disruptions in the region. Subsequently, the World Health Organisation (WHO) had reached an agreement in 2015 on the need for open data-sharing. It established Global Initiative on Sharing All Influenza Data, (GISAID) in 2018, to promote the international sharing of sequences, clinical and epidemiological data associated with human viruses and for assuring free and open access of this data to all. As a result, during the emergence of COVID-19, China shared the genetic sequences of the COVID-19 virus through GISAID, and this resulted in the development of diagnostic kits and

vaccines (though still under trial), in a record time of 42 days after obtaining the first genetic sequence.

The cases of H7N9 and the novel Coronavirus strengthen the level of confidence in our arguments for establishing biological resources as a common heritage of humankind.

Intrinsically GR is a public resource – non-rivalrous and non-exclusive – very similar to knowledge resources; hence, GR should be retained as a common heritage. This is imperative to safeguard global food security and mitigate pandemics such as COVID-19, to ensure the survival of humankind.

Now Makaachi is on her morning prowl to inspect the wellbeing of her citizens. She pauses for a bit and throws me a glance as if asking how I am faring in her kingdom. I feel ashamed at the inability to think beyond the anthropogenic concepts of rights, powers and capital – the three elements that alienate humankind from the rest of the world. Confined to this old, canvas reclining chair for most of the day, I feel I am an old dethroned king (like my conspecifics!); but still, I feel comfortable, relaxed and sheltered.



There is no doubt that COVID 19 has affected research work. Project deliverables involving sample collection and monitoring from the field site and the lab has been severely affected. On the other hand, the lockdown has also provided an opportunity to sit back and reflect on the research questions, data analysis and work done so far collectively with the team. During the lockdown, we plan to assess the impact of COVID -19 on chicken production at one of the project sites in Baramati. We intend to collect primary data and evaluate the resilience of farmers to such calamities. Presence of COVID-19 or any other outbreak in the community contributes to the biological quality of domestic sewage. The gut of an infected person contains viruses which eventually finds its way into the wastewater treatment plants (WWTP). Identification and quantification of viruses/emerging contaminants in domestic wastewater indicate spread of infection in the population connected via the urban drainage system. Regular monitoring of sewage for the novel viruses will help with a) assessing effectiveness of intervention (social/technical) in addressing the outbreak and b) informing about the re-emergence of an epidemic at early stages.

While all this suggests that monitoring domestic sewage is an effective way to gather information on an outbreak, the

exposure to raw sewage could be one of the pathways to exposure to contaminants. It is true for developing and undeveloped countries, where more than 90% of the domestic wastewater from urban areas is discharged directly into the surface water bodies.

In rural and peri-urban regions, both blackwater and greywater are disposed of locally. Blackwater is disposed into the soakaway pits, and untreated greywater is discharged directly into open stormwater drains. This method of wastewater disposal makes both local groundwater and surface water resources vulnerable to contamination. Especially in areas where groundwater is shallow, or the aquifer is located in the hard rock region.

Intermittent water supply is practised both in the urban and rural areas across India. Due to the nature of supply, the water distribution systems are vulnerable to cross-contamination via domestic sewage or groundwater. Several studies have reported the growth of viruses in biofilms present on the surface of pipes in the water distribution network.

Slum-dwellers residing near the Nallah, people working at WWTPs, farmers using untreated wastewater for irrigation, consumers procuring vegetables irrigated via raw sewage are few of the several communities/ groups that could become the centre of a new outbreak. Therefore, understanding the fate and transport of

COVID-19/emerging contaminants in hydrological systems and possible pathways/routes to exposure is essential to develop interventions (Social/Technical) to address and reduce the risk to human health.

15 WHERE DID COVID-19 ORIGINATE FROM?

RAVIKANTH G

My first experience of working from home, with the entire family around! I thought it would be great at first, that I would be spared the inconvenience of navigating traffic over the long commute to work. No noise from the traffic, no distractions from the students and the RA's, oh! I would be entirely at ease. Little did I realise that my 10-year old son would bombard me with questions. He had been reading a lot of mystery stories of late, thanks to the lockdown, and believed that COVID-19 was lab-made and this entire episode was a handiwork of few countries to gain global dominance. How else do you think these countries are not affected as much while the whole world is suffering, he asked? With so many conspiracy theories circulating in WhatsApp, I was not entirely surprised by his questions. I tried to debunk his theories one after the other. While the first reports originated from Wuhan, Hubei province in China, there have been considerable discussions on the origin of this COVID-19 virus (also referred to as HCoV-19). Recent studies, however, have clearly shown that the coronavirus pandemic encircling the globe is caused by a natural virus and not one made in a lab. The studies also reveal that the genetic makeup of human-made viruses is usually a mishmash. The COVID-19's genetic make-up shows that it is similar to the viruses present in the scaly anteaters, the pangolins. The study

published by Andersen and his colleagues in the recent edition in Nature medicine debunked the theory that the virus came from infected animals in a sea-food market in Wuhan or from an accidental or intentional release from the virology institute in China. Other researchers too, have confirmed that the virus, seems to have jumped once from an animal to human and then spread human to human since mid- November last year.

Comparison of the genetic make-up of the COVID-19 with other coronaviruses found in nature including the SARS viruses found in the bats and the pangolins revealed that the present COVID-19 could be a mix of bat and pangolin viruses. Other researches, including those in the University of Hongkong, who investigated this further from the Malayan pangolins showed almost 92% similarity with the SARS-CoV coronaviruses present in these animals. However, what makes COVID-19 (now labelled as SARS-CoV-2 due to its similarity to CoV) unique is the gene encoding the spike-protein. The gene binds more tightly to human cells than any of the earlier viruses such as the SARS virus, enabling it to be more infectious and also making it harder for the existing treatments to act on the virus.

While the lockdown continues, I am sure further research will reveal more about the origins of the virus. I'll continue to explore this research further to convince

my son that this was a virus which originated from nature. Not a deliberate release from the labs!

In short, as a research professional, I work on documenting biodiversity, monitoring biodiversity changes and disseminate this knowledge with the rest of the world. The larger goal of my profession is managing the biodiversity for human wellbeing in the long-term.

CoVID 19 - I can call it both a 'bane and boon', and others may feel the same way. Biodiversity, especially the plants, which are my focal group of organisms, is everywhere, and each one of us connected to them. At present, my efforts in documenting plant diversity, monitoring the changes and disseminating the knowledge happen primarily in the two biogeographic ranges - the Western Ghats and Northeast region of India. I also work with implementing agencies and private organisations, mainly in urban areas like Bengaluru, in managing the green cover.

It is clear now that my profession is linked to plants, their habitat, and the relationship humans have with the plants and their habitat. The outcome of my research is connected with the wellbeing of humans. However, my primary research domain is about plant wealth and its habitat. It means that I have to interact with plants, their habitats, and the custodians such as a) forest-dependent communities for their livelihoods, b) forest managers, c) urban dwellers and the d) policy implementing agencies (e.g., BBMP, State Forest officials, Legal

authorities, publics, Linear project managers)

Now the question is how the CoVID outbreak and the globalised lockdown could influence my research activities. The boon, I could consider is synthesising or packaging the existing research materials into the knowledge products that could benefit the community who are the custodians of conserving the plants and their habitats.

I have more time to guide the research staff in a) organising the databases related to plant distributions (field notebooks, herbarium collections, photographs and scanned images of herbarium collections available through online portals (e.g., Kew and NHM-London, NHM-Paris, RBG-Edinburgh, Leiden, National Herbarium of The Netherlands herbarium through JSTOR Plants) b) analyse the data and extract the outputs in the form of manuscripts, etc. (data collected from the field from transects)

In addition to supervision, long pending work related to manuscript contributions, inputs, and comments on the content has progressed steadily. However, bleak the current situation, there is always the opportunity to learn from it. The knowledge gleaned from it will allow us to highlight the importance of biological diversity and its management. This experience will prove invaluable in the coming years when more epidemics, crop

losses, famine become more commonplace thanks to climate change and urban economic developments. The bane is the inability to conduct field-based activities related to:

1. Documenting new or additional knowledge about plant diversity in India that supports four of the global biodiversity hotspots.
2. Training the new generation of researchers which is critical to sustaining the effort of conservation of plant life and their habitats.
3. Enhancement of their capacity in managing the biological resources (e.g., upscaling the practices of the traditional knowledge in managing biological resources)

By disrupting the field events calendar and schedules built around it, COVID19 has affected research work significantly. Our wings were clipped before the official lockdown, with the precautionary cancellation of workshops, courses, and curtailment of entry into forests; but now the outbreak has us grounded. The biggest loss though is the inability to do lab work- the critical connection with herbarium collections and the microscope, which is a lifeline for a researcher like me, has been severed. Still, online sources give me hope to practice my science, however partially. I am not fully satisfied with the role of supervising project staff and mentoring students through IT-based tools. It would

have been efficient through personal interactions and more productive. However, I am taking it positively and hope to become more efficient in the future when a similar situation may arise. Not that I want to face this situation again.

We know that invasives, diseases, pandemics could become prevalent because of climate change. While interacting with my grandparents, parents and older people, I learnt that the epidemics were not entirely uncommon in the past and exploded now and then and in the form of bacterial (cholera) and viral diseases (smallpox) or vector born diseases. Following those epidemics, people would abandon their villages and migrated to newer pastures to avoid further loss or strictly followed social-distancing. Also, the transportation modes available then curtailed the vagility of pathogens and did not necessitate global lockdown.

Epidemics are not common to humans only but also to crops (paddy blight or potato blight, locust plague) and wildlife (foot and mouth disease) and have enormous implications in human wellbeing. As part of traditional farming practices, farmers used mixed cropping methods and practised shifting farming. These farming practices were not only meant to avoid outbreaks of diseases but also to maintain biological diversity that took care of on-farm diversity for

nutritional security in addition to restoring the biological diversity in the farmland-forest matrix. IPCC (2007) and the World Agroforestry Centre (2006) have identified the above practice as one of the best options that could bring about resilience to the human community from global changes. The epidemic - CoVID19 - became a 'pandemic' because of urban-centric development where large human populations congregate at a few locations of 'economic development' leading them to become hotspots. There is another extreme of spread out or diffused development called rural development or village-centric development. I would equate the rural environment to the biologically rich forest-farmland matrix that demonstrates a high level of immunity when the situation arises, such as the CoVID19. The high level of immunity is not only for human health but also for the wellbeing that includes the livelihood options -the backbone of the economy. Food security-wild crop plants: Maintenance of farmland-forest matrix help the farming communities get food substitutes during the non-farming or lean seasons, and extreme cases such as famine. British botanists documented the wild plants that have been used as substitutes by the survivors as -spin-off knowledge-based products of great famines of India. In the process, farmers grow to appreciate the value of diversity of plants and animals

for their wellbeing. When settled farming practices become prevalent among humans, they still inherited the valuable knowledge of wild plants and their benefits to wellbeing. The knowledge was embedded into religious beliefs or taboos so that the practices stayed relevant and the human wellbeing secured.

For example, in some parts of Karnataka, Andhra Pradesh, Telangana, at the end of the monsoon, people celebrate 'Tulsi Pooja' with tulsi plant and a twig of amla (Indian gooseberry) plant with fruits. Following this, the lady of the family will offer leaves of tulsi and amla fruit to every one of the family. The offering of tulsi leaves and amla fruit is supposed to be a blessing from God to the entire family secures a sense of prosperity. It is also an acknowledgement (scientific) of the inherited knowledge of the 'anti-viral and anti-bacterial property' of tulsi leaves and the 'immunity boosting property' of amla fruits. The combination of appropriate antidote against various viral and bacterial diseases offered during the festival coincides with the oncoming winter season. The traditional health practice embedded in religious practice will safeguard the entire family from various diseases; this is the 'prosperity' every family should look for in the form of blessings and as a practice of biological resource management.

I envisage that in the future, one or the other epidemic outbreaks will happen as

in the past and could turn to be a pandemic as we see in the case of CoVID19. The constant interaction between organisms shapes the Earth, which we see today. From my domain expertise, I view the words 'pathogen, pest, invasive, and wildlife conflict' are created/coined for human understanding of the interactions between humans and the rest of the biological world. Human interaction with the rest of the organisms made us a 'superorganism' - by developing immunity inherited through the selection pressure. As a firm believer in evolutionary principles, I will resort to Charles Darwin's 'natural selection' and Herbert Spencer's 'survival of the fittest' and keep my fingers crossed until we develop antigens. We, humankind, had withstood the test in the past by developing therapeutic methods when major epidemics such as smallpox or cholera ravaged us. We also endured with the help of disease-resistant crop varieties when diseases almost decimated staple crops (such as rice and potato). I am optimistic that the situation will return to normal soon, and I will be able to highlight the importance of biological diversity and natural resources for human wellbeing.



In the light of past experiences of epidemics such as cholera, smallpox, plague, in India, I revisited the situation following COVID-19. In the past, when viral diseases –smallpox or chickenpox– were experienced by a family member, the head of the family, the mother or grandmother (matriarchial wisdom in practice) in the house would bring in, or rather impose, unwritten rules at the household level and immediate surroundings. The first thing is the announcement from the household itself about the infectious disease in the house to the village; followed by 'self-quarantining and social distancing from the rest of the community, today, most of us would be worried about getting stigmatised. This is visually demonstrated to the society (flagging) by inserting a bunch or sprig of neem leaves in the roof right above the entrance. It is the same as today's poster pasting on the doors of those who are under quarantine or mapping of the household with GIS facilities. The house will have low roofing, and the person who intends to enter the house will have to see the neem leaves and be cautious. It is general knowledge that the 'sprig of neem leaf' at the entrance of a house during the non-festival season is an indication to be cautious. The visitor will avoid entering or will enquire after the family member from outside. The entire household will avoid mingling freely with the neighbourhood.

The men in the family will also practice social distancing by not visiting the neighbours; this is the first level of social distancing. Surprisingly this is not dictated by the community, but exclusively by the older matriarch, followed religiously by her family. We may wonder about sourcing the resources to run the household, especially income generation activities. Generally, the household will have buffering resources to take care of food on their own to some extent. Here the community or 'friendly neighbours' come to the rescue. They provide the essentials like milk or vegetables and grains to the household, and they have been told generation after generation by the community that helping the ailing family is a way of appeasing the deity that guards the community against misdeeds. Let us take a peek into the household and the activities of the family that has a member with smallpox or chickenpox. The neem leaf placed at the entrance of the house is, in fact, omnipresent. The bedding (no mattress or pillow) is made of a spread of neem leaves with a raised wood plank as the headrest. The fan is again a bunch of neem twigs, with the grandmother or mother doing the fanning – an ordeal, only they seem equipped to perform. Lukewarm water with neem leaves and turmeric powder is used to cleanse the infected. The water is not heated on the fire but instead placed in

the sun to give enough time for the neem leaves and turmeric leaf to diffuse into the water. The sun and UV rays are known for killing germs and are a natural disinfectant. Every morning, the person is given a dollop of the ground paste of young neem leaves with a pinch of turmeric. The diet is lean – largely porridge, rice and dhal mix with turmeric powder, buttermilk (butter removed to the extent possible).' Food is medicine and medicine is food' – yet another wisdom in the indigenous health practice, that shielded our ancestors. In extreme cases, the mother will not season or fry spice while preparing food for others in the family because the piquancy of the fumes following seasoning could induce coughing or sneezing– a discomfort to the patient; also, the droplets from a sneeze or cough could lead to others get infected.

All the family members will be cautious in maintaining cleanliness. A container of water is kept at the entrance for family members to clean their feet, hands, and face. This is basically, not to bring in additional germs to the patient, whose immunity is low. If there is a rear entrance to the house, they use it for entry and exit purposes. The whole social distancing and the quarantining process is followed 'regimentally' under watchful matriarchial eyes until the person is cured. Following this, the family performs a 'thanksgiving' to the deity of the village by offering a

paste of rice flour mixed with jaggery syrup. It is also a declaration to the village that the social distancing has come to an end following the successful recovery of the family member.

The 'yarns in the thread' in the described indigenous health practice to tackle infectious viral diseases, is the rigour with which traditional wisdom inherited over generations, is followed. They are knowledgeable about sanitation practices, antidotes – anti-viral drugs and immunity boosters, eating a well-composed diet, and social responsibility-quarantining and social distancing.

Above all these is the striking ingenuity, of embedding indigenous health practices in belief or taboo, creating the need and method to appease a female deity to ward off diseases. Maybe, the society then was in a situation where it needed to be bridled by fear of the wrath of a god to contain the viral infection at a household level and not to become an epidemic or pandemic (a minuscule chance given the limited commute). Today we think of social distancing as a stigma due to unwarranted fear and social elitism. Germs are part of the environment, and in fact, regulate our immunity level with a linear relationship to germ diversity.

We take pride in saying 'friendly 'neighbourhood, but when the critical situation arises, we bring in all these filters and isolate ourselves.



Most of the projects we work on are field-based requiring the active participation of people in villages like farmers, Panchayat members and village-based organisations. In urban areas, we work with people who are technical experts as well as office bearers in government departments. Work that includes measurements of biodiversity like floral and faunal surveys and observations have also been affected. All field activities have come to a complete stop affecting the work we do in the region. However, this is less worrisome than the broader impact this will have on the people in the days to come when we get back to normalcy.

Moving ahead, I feel everything that we do in future will have the shadow of the COVID 19 for some time to come. Some of the key areas we were working on like climate change impact, halting threats to biodiversity and building resilience in communities by strengthening livelihoods are now in the back burner and discourses around them have stalled. It is not without reason that we are facing something unprecedented in modern human history. Even the world wars, the great disasters, the civil wars and terrorism were confined to different pockets. In contrast, COVID 19 has impacted almost the entire globe, and no areas have been or will be spared as the pandemic progresses.

It is hard to imagine what emergencies

we will face in the immediate future because this pandemic caught even the most developed countries in an unprepared state. However, global and local crises in the form of diseases, natural disasters, political upheavals and economic recessions are part of the world we live in. I feel that we should build a resilience factor in all the work that we do. So that "shock absorption" capacity is built into all of us. I believe it is going to be a state of perpetual preparedness for emergencies like the one we are facing now, but in a more purposeful and systematic way, and it will not be a "knee jerk" reaction.

From my observations here, food seemed to be of paramount importance to people during this emergency. Farmers who continued to farm practising intercropping, multi-cropping and growing food crops have helped us to have a continuous supply of fresh vegetables and fruits while their business has continued. Produce is brought in small quantities, carried from the villages surrounding urban areas and sold in areas without large gatherings at our corner shops and groceries. Small towns with their corner shops have been pivotal to keep the food supply constant, sustaining for all of us. I see resilience in all these small and local establishments as the size of these operations minimizes risks. Another glaring example of unpreparedness I have observed are

villages that have completely given up farming and were dependent only on tourism for their monthly income. Villages that were once the "vegetable hotspots" of the region decided to leave their land fallow because the direct cash coming in from tourism was too lucrative for farming which they considered "risky" and with "low returns". The pandemic has left these people in a state of chaos with many returning to cultivation.

Biodiversity, on the other hand, is thriving, and the air is clean with less smoke and pollutants. Therefore, if given the opportunity, nature will heal even without our intervention. I think it is us- the human race, which will need much healing after this shock and will have to be in a state of perpetual preparedness to build resilience for future shocks. As researchers, policy influencers, think tanks and implementers, we have a responsibility to take this preparedness forward.

It is said that our country is divided into India and Bharat: those who have crossed the subsistence threshold and those who have not. For those in 'Bharat', the COVID19 pandemic has been less about the virus itself and more about coping with the hasty and harsh lockdown measures imposed, and the consequent loss of livelihoods. For those in 'India', however, notwithstanding many hiccups, this has been a time of enforced working from home. Environmentalists have temporarily revelled in reports of the Yamuna or Cauvery looking bluer, and of the Dhauladhar being visible from Jalandhar. Closer to home, 'Indians' in mega-cities have marvelled at the clean air and quiet atmosphere in the absence of crazy traffic and enjoyed not having to commute long hours for work. Can this be a trigger for more reflection by us 'Indians'?

Modern life is divided into two spheres: production and consumption. A few seconds of reflection tells us that 'working from home' as a mode of production may be viable only for a tiny fraction of even white-collar workers, say IT, sector workers. But what does the lockdown tell us about our modes of consumption? That weekly shopping binge in malls, that biweekly trip to restaurants, that escape to Coorg on weekends, that spending on lavish parties or various ceremonies: haven't they proven somewhat superfluous? Is not being at home with

family, experimenting with cooking, reading a book, or playing scrabble part of the good life, maybe the better part? If supply lines of essentials continue to function, and if crazy forms of lockdown in some communities – such as no walking in gardens – is eased might it not be possible to visualise continuing in this different lifestyle? A lifestyle more focused on the essence of a good life: food, family, community and simple pleasures like music? Has cleaning our homes and cooking our food been as difficult as one visualised? Maybe even rewarding? Has the absence of the IPL, with its 50%-time advertising, been such a significant loss? Have we missed the full-page advertisements plastered all over our newspapers?

For a long time now, the 'Indians' in our country have been aspiring to the 'American way of life'; a 3000sqft house, two cars including an SUV, continuous accumulation of non-essentials, intolerance of heat or cold, and a constant seeking of entertainment, plus annual scuba diving and skiing trip to faraway places. ATREE PhD Scholar Soumyajit Bhar's research shows that the upper class in India mostly aspire, to a similar lifestyle. Can COVID19 be a trigger for us to rethink these aspirations and devise new lifestyles that are not only sustainable and equitable but also wholesome? Sustainability means respecting global limits such as the CO2

emissions budget, regional limits corresponding to water availability and water pollution, and local limits such as air pollution thresholds. Equity means that those in 'Bharat' must have access to resources as much as us 'Indians' and that meeting our wants must not come at the expense of citizens of Bharat, such as Adivasis whose lives are being devastated by mining for coal and other minerals. But most of all, COVID19 is pointing to the potential wholesomeness of a non-American way of life—benefits to our own emotional and physical wellbeing. Can we restructure our society and rethink our aspirations to make this dream go viral?

The global pandemic of COVID-19 has brought us all together in unprecedented ways. The coronavirus has also brought World leaders, the rich and the powerful, business leaders, global conglomerates and entire countries to their knees. As we go through these unexpected and unparalleled times, there is much to think and reflect on.

I work on the intersections between renewable energy, biodiversity and agricultural livelihoods with a focus on Climate Change Mitigation and Development. My research work is heavily dependent on fieldwork and travel to the field sites, often located in remote areas. I will not be able to travel for fieldwork until the dust settles on this pandemic, and instead will take this time to reflect on lessons the pandemic may have for us in the context of Climate Change and Development.

The coronavirus pandemic and the slower-moving yet perilous dangers of Climate Change parallel one another in significant ways. In the case of the virus, the danger is an over-burdening of our healthcare systems and the final collapse of the health-based infrastructure, including ruptured supply-chains. Whereas, in the case of Climate Change, the danger is that the tremendous growth in emissions will severely overwhelm our ability to respond to and manage disasters such as floods, droughts and other extreme events. Our response to

the coronavirus pandemic, globally, has been far from ideal with many countries only implementing the suggestions of health experts in a belated manner. I do hope that this puts some things into perspectives for the global community as a whole and advocates for a more urgent action related to Climate Change Mitigation and Development.

One of the biggest learnings from the COVID-19 pandemic that we can apply to Climate Change is that we are only as safe as our most vulnerable populations. The impoverished, the elderly, and the marginalised have fewer resources at their disposal and are at increased risk of contracting the virus. The nature of the pandemic is such that it does not discriminate based on class, caste, creed, ethnicity or religion. In the case of climate change, the more vulnerable populations and their livelihoods need to be protected first, and climate risk has to be mitigated for them on a significantly urgent basis. Vulnerability, however, does not fall from the sky and is a production of social and political hierarchies. Paying close attention to these social and political hierarchies, before and during climate-related disasters can undoubtedly pave the way for a more compassionate response.

Global challenges require behavioural and systemic changes. This pandemic has taught us that change at the individual level and also at systemic levels can take

place quickly. Countries, economies, business and even our behaviour have changed so rapidly in the past few weeks. If the consumption patterns of the developed nations, especially at per-capita levels, can be reduced by fewer international flights, remote teleconferencing and other measures, it would see a significant reduction in global carbon emissions. However, this would require a consistent effort not to resume a business-as-usual scenario when things go back to 'normal'. A Reuters report states that in China, where emissions fell by an estimated 25% as the country closed factories and put in place strict measures on people's movement to contain the coronavirus earlier this year, but have since returned to normal levels. The adage, prevention is better than cure, rings louder than ever as countries and economies have been silenced. Pandemics will come and go, but what will define us collectively, is our ability to turn this chaos into an opportunity. The way forward is to find the balance between mitigating climate change by strengthening our economies and pursuing sensible development trajectories that do not wreak havoc on our fragile ecosystems. As the Earth heals, it is our responsibility to ensure a collective, fair and just response to other disasters that are waiting in the shadows.

At the office, a large portion of the day was spent on project meetings, interacting with colleagues, discussing with students, meeting visitors, and responding to emails. I would also try avoiding the cafeteria to save time; at the end of the day, I had minimal time to concentrate on my writing.

The general tendency of people who live in metropolitan cities is that they think they hardly have time for their family and children; they dream of working from home. Dealing with traffic and pollution are challenges in cities. Working from home with discipline is an advantage and can contribute a lot our official work, and if we manage our time well, it allows us to spend time with family and children. Social distancing regulates visits from friends and relatives. Perhaps balancing family and work life is not so difficult. I used to have one meal a day with family in the evening; now we enjoy all three together. The lockdown and subsequent WFH has helped me concentrate on organising long-term monitoring data and writing manuscripts. I am sure all researchers spend a large portion of their time for writing work, and a short term lockdown does not really affect them. Important/crucial official meetings happen via Zoom, Hangouts, Skype, telephone and Whatsapp calls. Very productive and time-saving. In one of the conference meetings on Zoom, we had around 70 people from three different

countries India, UK and Africa, and I felt that it conserves time, energy and travel cost for all. I am amazed by the carbon footprint reduced by COVID19.

I was indeed missing my morning walk in the park, but the switch to stair climbing at home, an average of 50 stairs a day along with mindfulness exercises helped keep me active, healthy and focused.

Impacts of lockdown:

I have been coordinating outreach activities both in BRHills and MMHills community conservation centres and decentralised non-timber forest products processing units with the community and their associations. Products like Amla pickle, honey and coffee etc. are produced under the brand Adavi. Over the last month, the community has lost around 5 Lakhs worth of sales; they had an order for 2.5 Lakhs worth products as gifts to one of our funders and philanthropists for his 60th birthday and that got cancelled due to COVID19. It would have been an excellent opportunity for their products to reach around 600 people in the form of gifts; some of them could have been potential customers for the community. Their sales outlet in Mysore zoo closed early on affecting their income further.

Lantana artisans in MMHills had to stop their Lantana elephant making as they had to maintain social distancing. Some of the artisans were able to produce Lantana furniture at the household level.

Training that we planned with Rainforest alliance for the coffee-growing Soliga farmers was postponed indefinitely, and we are not able to schedule it due to uncertainty of the COVID19 problem. Was able to complete C4A social science methods classes for our PhD students just before the COVID problem. The challenge now is coordinating their field data collection; we have discussed an online survey option and hope for the best. I was not able to visit my aged parents, and a local festival celebrated for thousands of years was cancelled in my native place.

Thoughts:

Fortunately, COVID-19 has not ventured into Chamarajanagara district and but the general lockdown procedure has been followed. I was thinking maybe an innovative method of controlling and monitoring the disease would have been better. How about the district wise monitoring and controlling the disease? It would have been more meaningful if it was "hotspot focused". Say, for example out of 30 districts in Karnataka, 15 of them (50%) have issues, and another 50% does not have any indication. Strategic lockdown could have saved the economy of our country to some extent and would have been more effective. Like Korea, India and other countries should have controlled the disease spread at airport level as it was associated with travel history; with a stringent quarantine

strategy for suspected cases. Media would have played a role in creating more awareness instead of creating anxiety. Unfortunately, we do not have medicine for the virus. However, we should be thankful to people/scientists/doctors who gave us tips to control spread of COVID19 like washing hands with soap, social distancing and symptoms for the disease to seek medical help, that was important.

Global village: Corona started in China, and within a short period, it has become a global issue. The entire world is suffering, it has a direct impact on billions of families, and many have lost their lives.

I feel it is vital for all countries to work together in achieving sustainable development goals and invest energy collectively to conserve our precious environment and reduce carbon footprints. We cannot afford distractive forces like war and terrorism in this world. Bringing peace, taking care of the health of ordinary people and feeding people who do not have food should be the global priority.



The headlines in early 2020 of deaths from a rapidly spreading new kind of pneumonia in Wuhan, China just felt like one other sad news story. Like the Nipah, KSD here or the SARS, MERC across the world – yet another random zoonotic disease that will soon or eventually go away. People– rich or poor and countries– developed or less developed have contained and controlled such epidemic several times in the past. In my case, the whole experience of grasping the harsh reality of COVID was confusing and worrying, in a different way. While I have been taunted of being hypertensive by my family and friends, this time, I felt frustrated that 'why doesn't everyone see what I see'. Hours of obsessive listening to news and sifting through articles on never read before medical research, I had my so-called facts verified. The symptoms documented by the medical research across the world for COVID19 infection– may have gotten into my nerve probably more than necessary. All of a sudden, these symptoms were showing up in me: high fever, cough, dizziness, shortness of breath and fatigue. After a few blood tests, the doctor concluded that I had contracted Typhoid and I should be fine within a week after my platelet count recovers to normal. A couple of weeks into the lockdown, self-imposed and nation-wide call, I still imagine how this tide might recede. If there will be normalcy in the lives of people soon, or

we need to shape our lives and work around a new and evolving normality. Serendipitously, the alarms went off reasonably early enough in India, especially within our ATREE community. We will only feel grateful months from now when the storm has passed that these early warnings helped us deal with this known but yet known adversary. The #StayAtHome lockdown has its maddening moments with respect to somewhat stalled or slowly progressing work. Research held up both in the field, the missing professional meetings and in the engaging with the numerous stakeholders on the ground, all of which was so unusual that it took several moments of reflections to reassert of what life was just months before. Amidst all this, I came to appreciate it as an opportunity to do things beyond the usual. To note one, this is probably the longest stretch connecting in a different plane with my teen-ageing son and working spouse, family and friends; the most I have been reading in recent years. Even within the context of my research work at the interface or water– agriculture–well-being, the magnitude of shock faced by these communities due to this pandemic is worth several research articles with new perspectives in the sustainability of resources. Hanging around in the balcony once in a while, I see on the streets under-privileged families still struggling to live their daily

lives, and yet they seem to be untouched by the fear of novel coronavirus – looks like it's not so novel at all to them. They have probably seen a different form of it in their lives. Time seems to warp randomly around days and hours –so dynamic and non-linear. Some days pass by in a flash with hopes of new vaccines and recovering patients, some stretching tranquilly, along with the sadness of COVID19 deaths across the world. Life seems disrupted beyond imagination, yet has its struggle finding that unknown equilibrium even within the chaos and the non-equilibrium state – like the GIAIA hypothesis. It makes me wonder, would one generation of humanity have ever seen, this microcosm of Darwin's evolution in such a short period? That even decades later Dawkins failed to convince Pell that evolution is inevitable and inconceivable (during the famed debate between Biologist Richard Dawkins vs Cardinal George Pell) – certainly far more than intelligent design.

Working from home for a day or two is a privilege that ATREE researchers always enjoyed. Did this prepare me for a month –or more– long work from home during the pandemic? Did the food security of a panic-stocked middle-class home help me work as usual? No. Because panic has become our stock. The stoic are exceptional stock, and the panicky –‘anxy’– are a common class under corona’s rule. And an irritable gut and anxiety are human kind’s most vicious of cycles. I am not solely guilty of extrapolating my anxious personality. Academics and athletes, royals and ruffians, politicians and prisoners, everyone’s edgy. Relax, breathe in and out. Watch for breathlessness. Pulmonary exercises of the privileged, these. As is tweeting about how our working-class brethren are walking breathless miles to their villages, some even dying. With this privilege check, here’s a sociologist’s work from home (WFH) checklist. Zooming into committee meetings, check. Reviewing student chapters and papers, check. Book review, check. Uninstall zoom because it is malware, check. Writing your book, check. The dull rigours of academia. Prosaic digital privileges. The sociologist is alike and unlike. Alike in sharing locations– academic, middle class, data sufficient, left-liberal. Unlike in having to reflect on his craft as contingent knowledge, and himself as a ‘risk’ subject doubting experts. Being alike

finds me diligently performing my academic tasks, anxiously scrolling social media feeds and websites, expectantly posting online, wantonly reading and watching written and streamed content. As we await science to deliver on the outside –treatment and vaccine–inside our homes, art –literature, music and cinema– cure us. Paraphrasing Nietzsche, we have art in order not to die of science. I hope our virus vulnerability and social isolation makes us active and empathetic communicators of our interdisciplinary science. I am also unlike. My subject requires a constant calling itself into question. Mostly liberal, sociology was a conservative response to modern events that threatened tradition– the industrial revolution and enlightenment. Conservatism, ascendant in the last decade, is intensifying under corona. In calls to punish and isolate China. To de-globalize. In revived prejudices against Southeast Asian races. The virus has become an extra excuse for environmentalisms that seek exclusion of ‘outsiders’ competing for a country’s scarce resources. Even as sociology responds to renewed conservatism, I need to rejig my environmental, sociological research and teaching anticipating a post-pandemic reorganization of social order, or a frustrating relapse to business as usual. How I go about my field and archival

work, or my daily employee routines involves a calculation of risk given COVID-19 may never leave like its Corona ancestor– the common cold. ‘Risk’, a sociological concept referring to uncertainties arising from nature or human interventions in nature, will experience big revival. By its tenets, I as a citizen will need to navigate and mitigate risks, not leaving everything to the experts and policymakers. As a sociologist, I have ‘risk’ to incorporate into my human well-being and environmental justice research and teaching.

The COVID-19 was escalating in China towards the end of February, and a set of Indian students from Wuhan state, 'the epicentre' of the epidemic, had arrived through Cochin airport. Still, the Kerala Government quickly sprang into action, it stems from their learnings from the Nipah outbreak and KSD, although those were more localised. Around that same time, we had our last leg of the 'due diligence' of the HCL grant and the evaluation team after initial hesitance did arrive at Cochin airport. COVID-19 was not a pandemic yet - it was strange to see the airport ground staff in masks. At that point in time, I asked myself, "are we over-reacting?". The following week, I was in Delhi again in connection with the HCL grant and then at The Asian Pollinator Initiative meet in Kolkata - there again I saw people with masks. This time the Thai students were wearing them, which felt strange as they had more records than us during that time. COVID-19 was soon declared a pandemic by WHO., following which, we practised social distancing and then the lockdown.

I realised two things then - at the slightest of opportunity, we board flights to faraway destinations - indeed the flights are more significant vectors than pangolins or other wild animals that are viewed as carriers of the zoonotic diseases; the other is the huge carbon footprint. The world should--or at least I will 'rethink' travel in a major way.

It was overwhelming on the home front too. It meant managing both work from home and work at home. Many things - such as the sudden withdrawal of our domestic help made one realise the real value of them and how they subsidise our lives. The kids are at home the entire day; online courses are a saviour which keeps them engaged. With great reluctance, I lifted the moratorium on the internet, but to my surprise, some of these courses used very innovative teaching methods to unravel complex concepts for the kids. However, working out a schedule and strictly adhering to it helps us tide over this.

Cities are by far the hotspots of these pandemics, and by 2050, about 68% of the world's population is expected to be living in cities. We have certain smart/livable city projects which target more technical infrastructure. Still, we often neglect some critical aspects, such as the urgent need to reduce the ecological footprint and the ecological debt of the cities while enhancing resilience, health, and quality of life of their inhabitants. This could be achieved by the use of the 'urban ecosystem services' concept that can play a critical role in reconnecting cities to the biosphere. For example, the sudden lockdown led to a shortage of vegetables and fruits in many localities because they travel from long distances. While China has been in the news for the wrong

reasons, there are sectors in which they excel. For example, China has included urban agriculture in its smart city plan as early as in 2012, Beijing today is leading by producing 340 billion yuan worth of produce a year with a growth rate of 6.1%. Many of the crops raised in cities are vegetables and fruits; if integrated with pollinators, these can be very productive even in an urban environment. It can also enhance 'locovory' (locally grown food) with low carbon footprint with the additional benefits of having their nutrition intact as well as an inherent therapeutic value of seeing such a landscape around you. It is also time for us homo-sapiens to reduce our social and physical distance with nature.

I sit at home with some nice, hot coffee and watch my tagged harrier (bird of prey) move across states and countries on its way to the breeding ground up north. I do not have to travel; I just stay put at home and data streams in regularly even if the internet plays truant. It may seem like a luxury, but, it has taken months of waiting in the field to tag the bird and ensure protocols to get to this stage. That is not all; the crucial and often frustrating time comes when your bird disappears from the radar, and you are left to wonder what happened. At such times it's best to rush to the location where the bird was last detected to see what happened. Such missing animal data is precious, helping understand animal mortality patterns for conservation. This is where restrictions to move about as imposed by COVID19 can take a toll. It has happened to a couple of my birds, and I have remained a spectator.

While sensors, tags, markers, cameras etc. are increasingly used in field ecology, one cannot replace these with direct observations of an organism or the environment. Field ecology suffers extensively from permits issues in India in addition to restrictions due to inclement weather such as flooding, human conflicts, political instability etc. global restrictions courtesy of COVID 19 has added another dimension to this. For instance, regular phenology monitoring in

KMTR that has been on for several decades had to be stopped even with permits. Ecological processes take time, and a few months of lay off from field data collection might not affect long term research significantly. However, it can strongly affect students who want to do a summer project for their dissertation and PhD students who are in the last season of data collection. Lockdown, as imposed, has had severe impacts on field research.

Countrywide lockdowns have its own political, economic, social and health implications, and it affects people differently at different levels. While we may sit comfortably in our homes, many employed to do research, especially field assistants and students need to be supported. What happens if funds dry up for ecological research after Covid19? How do we sustain research and support staffs who are involved with it? COVID 19 has not only added another dimension of restrictions to research work, but it also brings with it fear, especially among ecologists and other natural scientists, that funding may dry up when we reconstruct the world after COVID19. However, on the brighter side, it gives us time to reflect, ponder and realign our thoughts. To get a different perspective on what we do and why and what should we do. More importantly, it gives me time to look at some hard data from the stained and brittle pages of my notebook,

circa 1990. I have miles to go, but COVID 19 may have just shortened it a bit!

For a dynamic modeller, the Coronavirus pandemic has been incredibly exhilarating. An entire global economy shut down, and public policies were put in place based on the predictions made by simulation models! Decisions were made before terrible things happened. In the early days, there was much questioning of whether the world was over-reacting. However, ultimately, the wealthiest (most travelled and connected) were able to impose restrictions on the poorest.

The Covid-19 crisis was a crisis of global proportion that took place in a short time. We experienced in real-time how social distancing, testing and isolating and treatment played out in different countries and this increased belief in models. We also saw some incredible examples of science communication that showed how effective, different approaches could be. There are other crises humanity has to face. With climate change and biodiversity loss, we do not have the luxury of seeing how different approaches to management will play out. We only have one planet, and the people that will face the consequences (the young) are not the people making the decisions (the old).

The main takeaway for me has been that governments will respond to dire predictions and even take painful decisions if the processes and outcomes are made clear enough for everyone to

understand. But importantly, the people who will be hardest hit must exercise their political will for the equilibrium to shift.

Research and work: Fragile food supply chains

The first thing we learned about the Coronavirus lockdown is about how weak our food supply chains are. Within a week of PM Modi announcing the lockdown, many of the farmers in peri-urban Bangalore began to dump their produce. The Agricultural Produce Marketing Committee yards closed, food prices in cities started to creep up, and the poor were priced out of the market.

So our team at CSEI began to reach out to apartments and farmers to understand and connect them. But the logistics quickly became quite complicated. Most farmers grew a single crop, and so had a ton of grapes or capsicum to sell. Apartments naturally wanted a mix of produce in a single truck. Where farmers were organised into FPO's (Farm Producer Organisations), everything was simpler, because they could coordinate and share transportation costs and logistics.

The second challenge was pricing. Relief organisations requested us to send surplus produce to colonies of stranded migrant workers. However, they would not be able to pay, so this raised a logistical problem of fundraising – we could not ask the farmers to pay to transport produce

to migrant colonies instead of dumping it. As we began to understand how these relief organisations were operating (most were focused strictly on non-perishable provisions), we found that many organisations were trying to do the same thing independently.

Over time, coordination between organisations improved through the creation of a Whatsapp and Facebook page and the reopening of APMC yards. To me, it raises the question of how we can coordinate better and whether such capacity can be built in a tech-savvy city like Bangalore, before disaster strikes, again.