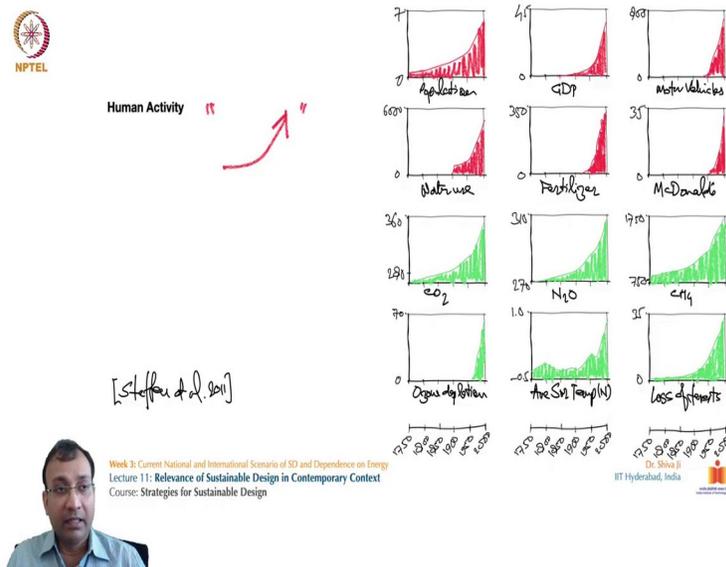


Strategies for Sustainable Design
Professor Shiva Ji
Indian Institute of Technology, Hyderabad
Lecture 11
Relevance of Sustainable Design in Contemporary Context

Hello everyone, we will discuss today about Relevance of Sustainable Design in Contemporary Context.

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So if we see the impact of human activity on any of these graphs given over here on this slide, so it is really astonishing to see all of these graphs are showing an exponential growth happening in them over the time. So for example if you see the first one actually chart shows the progression of the population, how the population is increasing over the time in billions, so this data is actually taken from the year 1750 to 1800, 1850, 1900, 1950 and the year 2000.

So there at an interval of 50 years it is being observed in the last 250 to 300 years how it is taking place in the different domains of human lives. So the second actually graphs shows over here a (01:18) real GDP, so if you see it was almost very close to the zero in the beginning year of 1750, in the 10 to the power 12 a dollar, so it was very nil very small very smaller amount was there, but in the recent time and the recent decades this year of 2000 it has reached almost 35 billion, trillion dollars.

So this is a huge amount actually, this is a huge amount 10 to the power 12 if you see and yeah, so how tall, how high it is going to go is really astonishing to understand. The next one comes transport and the number of motor vehicles, so you can see there is a sudden actually jump observed in the year after 1900, so around at the year 1900 30, 40 okay and 45 there is a huge actually jump which occurred and now it is going exponentially high and high so now there are over closed to 700 actually million number of transport motor vehicles in the year 2000.

So that is a mind boggling number actually which was almost a level of nil okay and suddenly so much, next is Water Use, so how the consumption of water use has increased significantly over time. So from the decades from where does manufacturing and these processing and these things factory based actually output was proposed. So there was a huge requirement of resources and water is one of the resource which is used for anything and almost everything.

So for processing of any such materials, water is always an integral part whether it is for the main chemical composition or even for supporting activity such as cleaning and stuff okay or for transferring effluents or making some medium so water is mostly used for any and every kind of supported requirements in any lab manufacturing unit. So the consumption of water has increased tremendously resulting into scarcity of water at almost everywhere.

So it is not only the domestic requirement, it is the industrial requirement also of water which has increased significantly, so as you can see over here in this graph, this is from your 2000, so this is the stark, you know the rise, the steep actually angle which we can see is self-explanatory how much is the consumption has suddenly began and the next one is a fertilizer consumption.

So how the fertilizers have become actually intergral part of our food production in the agriculture fields because traditionally these food production use to happen over the natural fertilizer such as the cow dung or composts created from agricultural waste and vegetables et cetera but in the recent times to give boost to the agricultural yield the use of the fertilizer size increased tremendously.

And the next one comes the number of restaurants, for example, this McDonalds restaurants are taken into account over here how these restaurants have come up so many in number in just a span of 50 years from 1950 to year 2000, so that is also one of the very sharp curve that we can

see over here. So this centralizes the promotion of consumeristic lifestyle, food consumption, okay. It symbolizes the success of the processed food industry.

Because earlier whatever was been consumed in the houses as food material was processed in the home itself, but now there is a whole industrial processes being devised to process food and supply them in bulk, so how this thing having a burger in a restaurant and having a simple chapatti or rice meal at our house, they actually both consume a tremendous amount energy but the food items which are prepared at home they consume very little amount of energy what we saw in the table in the previous lecture in the food pyramid.

So all of these food item which you consume fat and which are using a processed mechanisms, so they actually exert a long of impact, so why this is that this is the region actually this graph is also given over there to remind us how consumerism has actually succeeded in the recent times. If you, let us see the other format of the repercussions which are having across the planet, so these graphs will show about the, the first one over here says about atmosphere is CO₂ concentration, so the CO₂ concentration in atmosphere okay has also significantly improved.

So if we see the concentration of CO₂, CO₂ if one of the greenhouse gases, it absorbs heat and these are the regions which are responsible for actually the global warming condition which is happening across the world. The next one talks about the N₂O concentration, so N₂O concentration, N₂O is also one of the GSG gas, CH₄ is also increasing over here.

So if you see all of these gases and ozone depletion has also happened in the recent decades. So there is the loss of very important critical gases such as Ozone and there is a high concentration of not so friendly gases for the atmosphere because the high concentration of them is going to result into a very sever condition which may increase a overall average temperature.

And the second last graph talks about northern hemisphere average surface temperature has also started to rise. So, if you see here the surface temperature of the earth in different places, it is observed, it is rising as in, if you plot a graph of their annual, temperatures, so now the tendency can be seen that it is rising.

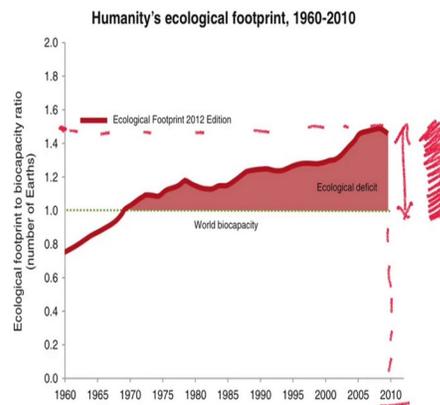
And the last one, it talks about the loss of tropical rain forest and woodland, well even if all of these were, were given for to be healed naturally using the a bio capacity of this planet, but the

loss of the lungs of this planet, which are the forest and a green cover, okay, if that is going to happen, then all of these bad effects are going to have a multiple, actually multiplied effect on this planet. Because the corrective capacity of this planet is also affected, if we see this last graph over here, it talks about the loss of rain forest covers and all that.

So, that has also happened actually significantly a faster in the recent decades, in the last 50 to 100 years, okay. So, there is a sharp actually decline which has happened. So, how the, now the question is all of these the graphs of are the resultant of the human activities are so, as a summation we can put this arrow which is always tending up is an exponentially can be represented at the human activities a footprint on this planet Earth, which is not so friendly, which is not so good.

So, the repercussions as we have seen in earlier slides the repercussions can be really catastrophic and a several fronts, whether it is the water related crises whether it is a fresh air related crisis, whether it is the availability of land for habitation and occupation and professional activities, or for industrial use or for agricultural use. So there will be a shortage of all types of resources.

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Humanity's ecological footprint through time in relation to biocapacity (Source: www.footprintnetwork.org)



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So, let us see, a well, we have been seeing, actually this impression, how the ecological footprint has actually gone beyond the actually worlds bio capacity or the time. So this directly means the

humans as a collective, one single race, they have already exhausted the capacity of Earth and their present needs can only be fulfilled by have more than one Earths, which is not practical which is not possible. So, as a resultant when there will be a little crunch and crisis of their resources and everything.

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Well, these are some pictures which actually depict the state of affairs today. The rain forest, the conventional rain forest which have been this, in this actually shape and form for a millions of years I mentioned rain forest from the forest from a north-eastern states of India and several other places from across the world, they are coming to an end this. So, a very high piece our growth and development processes have actually taken over these lands and these woods are actually being actually chopped off, these trees are being cutting down for consumption.

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So, this is an illustration which gives some idea about the different catastrophes, this whole actually phenomena is exerting, those are into emissions, destruction of ecological balance, exhaust. It is happening at the global level, there is a huge amount of particulate matter which is being found in the air. These effluents are very poisonous in nature; it is causing damages to the overall a well-being of this ecology and ecological systems.

And there are several species which are getting extinct as the resultant of such conditions which are prevailing across the corners of the earth and there is a huge amount of trash and waste being generated and it is really having some devastating effects, a lot of garbage collection. A lot of environmental pollution is happening, there is so much of a plastic as your waste material and the plastic is entering into several unknown areas.

Even plastic is being found these days in the bottom of the ocean floors, in the bottom of the rivers and several hundred, thousands and lakhs of animals and birds, they are actually getting affected and the plastic is reaching in the food chain also in the form of micro plastics and the effluents which are being thrown into the air, so it is creating a phenomena of a smog and cities are actually choking for the lack of fresh air.

And there is a lot of a death happening related with the lack of climate change, a lot of imbalances in the flooding pattern imbalances in the a fire pattern of, the forests are actually

catching fire nowadays more frequently. So, these are actually some of the glimpses which we actually can easily relate with the industrial, actually industrialized this industrialized age.

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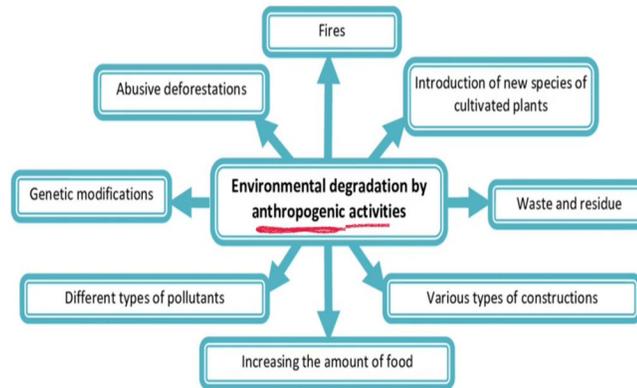
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And this is one of the very common sites in the, close to the human habitations towns and cities, even villages, these days there is lot of a plastic waste material which cannot be actually decomposed with the thermacole, with styrofoam based actually waste materials, which are simply accumulating which are just simply washing ashore in the oceans and rivers and they are actually disturbing the ecological balance of those the aquatic animals which are living in those areas.

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So, how this can be actually taken care of? So, there are some, all of these are anthropogenic activities, the repercussions caused by lack of human activity on this planet, because that traditionally, humans have used to live in this thing with the nature and there was no actually manmade objects such as plastic and polymers, which were not biodegradable.

Even if humans were able to force metals and other a mineral based actually materials, but they were not so toxic in the nature, they were not forming a bulk of the waste which cannot be recycled. So, metal was mostly always recyclable. And there are some several instances from the vernacular living styles that they have been using, a metals for the erecting structures or for the support of the structures.

But there was no actually significant waste generated out of those vernacular designs, but in the recent times, with an impression of this anthropogenic activities, there is so much of imbalance has been observed. For example, if you see over here in this, our table, so it talks about introduction of new species of cultivated plants. So, humans have interfered even in the genes and the chromosomes of the plants and other biological entities such as, even animals.

So, there are several species of living beings and plants today, which do not actually naturally exist in nature, okay. So, they are the actually hybrids, they are actually cross breeds, they are the new breeds altogether created by human beings for the consumption. So, there are several plants

which are derived from the lab, which have come out of the lab, okay and they have become the part of the ecosystems.

So, how this nature is going to actually you know, cope up with these kind of changes because any species in the nature takes a very long time to get evolved or even mutated and nature actually is all other species are surrounding that actually species they actually move in tandem, they move in the sink, and that actually species is able to cope up with the ecosystem for a longer time. But what will go wrong, if some species is being introduced suddenly in the ecosystem, and how the nature is going to actually deal with that.

And there is so much of waste and residue actually being generated these days, which is accumulating in the water, soil and air okay various types of construction activities are actually happening these days lot of in the name of construction. There is so much of capturing and of agricultural land and the land which has been traditionally a belong to the cattle, for the animals you know, birds and just it used to lie that to support the other a different species and life forms.

Now those types of lands are being taken over for the lack of human habitation and human consumption. Increasing the amount of food - So, this is one of the a traits also of when the consumerism is increasing, it is leading towards the higher consumption rates of (())(17:05) resources, even a simple thing such as food, different types of pollutants are actually coming out of a from nuclear to biological to chemical there are several types of actually toxins and several types of a pollutants which are coming in the ecosystem.

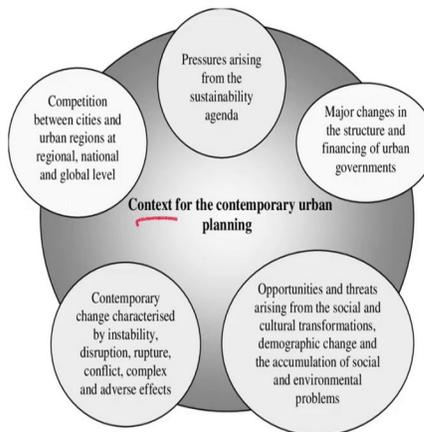
Genetic modifications are actually happening. So the several agricultural crops and several plants and fruits and vegetables, they are now actually tinkered with for their genetic structure for example, a small thing a tomato so the how the tomato used to exist earlier and the tomato what we buy in the supermarkets these days is all altogether a different species, because it has been a tinkered in its DNA in essence a jeans to make it stay longer for a human consumption, which can does not go bad so easily and all of these mostly the natural existing vegetables, they used to go bad in a very smaller a span of time.

So, how such actually tinkering and modifications are going to affect the nature is also is for major concern. And yeah, obviously the most abusive deforestation - So, forest are not just a

simple trees, they are the altogether a whole ecosystem in itself, they actually support several other life forms, they support several other animals and species of moths and insects and reptiles you know, even these species and different varieties of a fungus and bacterias and things.

So, they all together actually create the ecosystem in the forest. And there are several actually, you know, benefits of forest which is being lost these days with the loss of the trees. And the last one of course, the fire such global the activities of human anthropogenic activities, they are leading towards you know, the fires also which are very, very catastrophic some regions of the world California and the US, Australia and several other portions, they have actually faced such situations the undesirable actually fire happening in those regions.

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So, if you see what is the actually context of the contemporary urban planning how these urban planning actually should take place. So, there is one thought actually given over here, the pressure arising from a sustainability agenda major changes in the structure and financing of urban governments, opportunities and threats arising from the social and cultural transformations, demographic change and accumulation of social and environmental problems.

Contemporary change characterized by instability, disruption, rupture, conflict and complex adverse effects, competition between cities and urban regions and regional and national and global levels. So, these are the actually things which have become a kind of a context for the a

today's scenario, today's a design scenario, today's a planning scenario, so how to go about it has become a major challenge actually.

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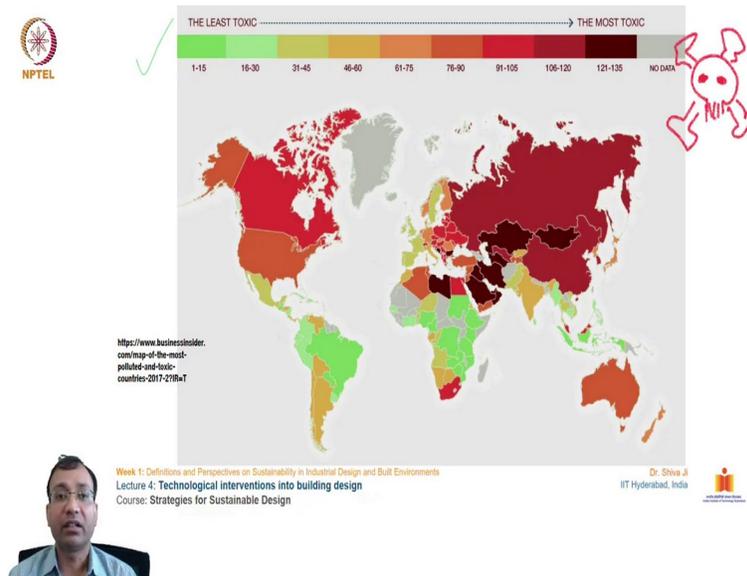
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So, scenes this are becoming very common these days you may have seen such scenes from your village if you remember how it used to be in your childhood and now how it has turned into in the recent years and the agricultural fields which used to have crops, now there are houses standing, now there are roads constructed, now there is a lot of a traffic moment. I remember seeing millions of stars in the night time in my childhood in the my village, but nowadays the sky is filled with a lot of gas smoke and light and as a resultant we cannot see those twinkling stars anymore.

So, this is a one of the very big actually examples and very evident examples which has happened in the last few years okay across a different places. So, now we have so much of abundance of light and dust and particles suspended in the air in the night time. So, we see this reddish yellowish or brownish a halo around the cities and the cities are not clear and any more for a visual treat of the, which the sky used to offer earlier.

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If you see here look at how the average countries are these days affected on the parameters of least toxic to the most toxic. So, it is very self-explanatory over here, there are several countries which are in the dark a maroonish color, they are considered to be one of the most toxic actually countries and regions in the world and well almost there are very few countries left which are in the least toxic actually area.

So, Brazil is one of them because of its Amazon forests, okay, the very fast paced rate, they are also facing destruction, but yeah fortunately till now, it is still having the least toxic actually area and some a middle African countries are there and some Southeast Asian countries are there in the Indian Ocean.

And apart from these almost every country has a some scale or some amount of a toxicity in general present in the air a natural elements such as Earth, water and air. So, leading by you can see the countries Mongolia you know and Saudi Arabia and some more African countries and Gulf countries. So, those are one of the very highly toxic actually regions and countries such as China, Russia and these have actually also in the highly toxic areas.

So, the how the ecological impacts have actually taken shape and how it is affecting the people of those places is an interesting actually exercise to see.

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Some of a such visualizations you may have actually seen okay through a National Geographic magazine and through a different other scientific explorers and enthusiast who have actually absorbed such phenomena happening in the different parts of the world. So, these are innocent birds, they do not actually distinguish between actually an organic matter and between a smaller object a plastic made and they end up actually eating them.

And obviously, a huge amount of accumulation of such smaller plastic parts has happened in their stomach and as a resultant they have died. So this is really pathetic to see actually such extent of the damage which is being caused by the plastic over the last several decades. So this is the shot actually taken from a National Geographic, which depicts, this is a picture from the Arctic to Antarctica, the ocean debris is killing marine wildlife, but we still have the power to stop the plastic pollution. So we must stop the uses of the plastic in our daily lives.

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You see this shot this is really bad to actually witness such things. So you see in the stomach of this bird. So all of these are mostly these parts, plastic parts we can relate. These are all parts of maybe a bottle, maybe a pen, maybe some screws, maybe a plastic spoons or you know or maybe a plastic ring maybe a plastic a coil maybe a plastic, an elastic body or something that you know.

So such things have a, which we generally do not care we just throw in the garbage and they land up somewhere in the ecosystem and they are being just simply ingested by these innocent birds which they cannot actually differentiate between what is eatable and what is not eatable and this is the kind of end they are receiving as a resultant of, you know the plastic.

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If you see this picture is a picture of a seal, which is somehow unfortunately tied with some polymer based some rope or something and its neck has completely gone bad so see how bad this situation.

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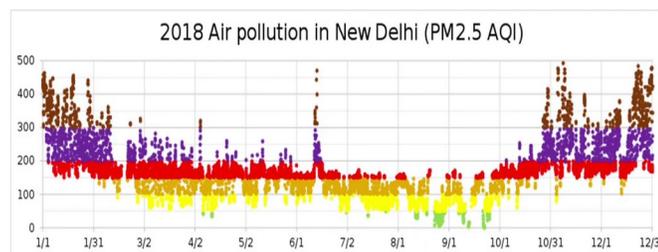
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By such objects such as these plastic bags and all you see the screen is completely covered inside this a plastic bag, so how it is going to fly the obviously it cannot fly. Okay, so maybe a with the

help of its beak maybe it can feed for some time but soon it is going to end up okay somehow and its standing on a piece of a you know, a tyre you guys you can see, those all of these place I think this picture was shot somewhere I think close to the maybe a river or some water body or someplace where there is a huge amount of pollution, polluting actually elements present.

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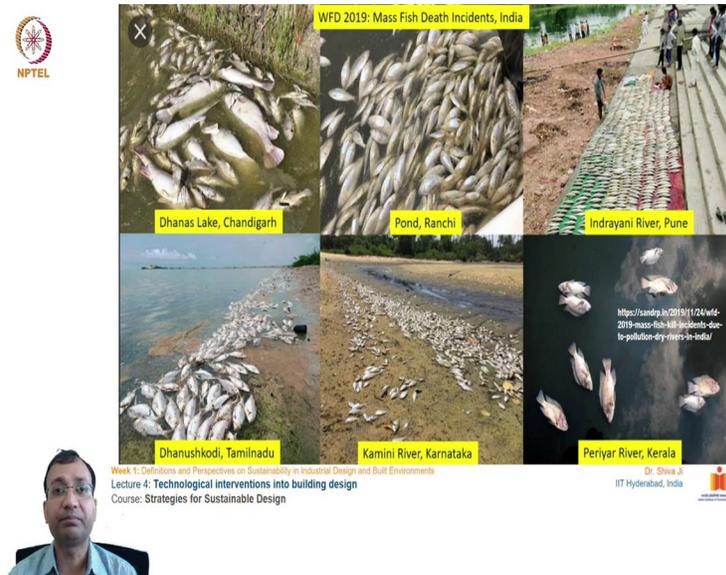
So, overall if you see of the pollution, so its not just the animals, it is the humans, it is the all forms of a species are actually getting affected because of this. So, this is actually table, this is a graph mystery which talks about the air pollution in the city of New Delhi over the period of one year over different months. So, you can see from the January 1.

So, the amount of the air quality index, I think it shows over here is 2.5 on an average. So, here if you see this, the scale of it is almost reaching 475 or something okay, on the first of January, this is the winter months. So, January, February and in the last if you see this is October, November and December again.

So, these actually three four months, the air movement actually remains restricted and due to the an accumulation of actually shoot particles and other a particle suspended in the air, the air quality actually becomes critically bad and breathing in itself becomes a very difficult thing to do and some be some sensitive patients such as asthmatic patients and all, they feel actually really terrible actually in these months in such cities.

So, it is not just the Delhi, it is not just the Beijing there are several other cities and towns are also experiencing such phenomena at a smaller scale. So, how this thing is going to take place in the next century is a real point of concern how humanity how the other living beings are going to survive in such a a bad toxic air quality actually place.

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Some of the examples of a pollution in the water and as a resultant you can see over here a number of fish have actually simply died because they cannot actually tolerate such amount of toxic content in the water and they have actually become dead and they have actually just they are floating in the river body.

So, this actually picture is taken from a different places you can see the first one is from Chandigarh, second from Ranchi, Pune, Dhanushkodi in Tamil Nadu, then this Kamini river in Karnataka and Periyar river in Kerala. So, this is a scene actually which is becoming a frequent okay from all across the India from several other countries also. So, the how this a effluents which are coming out of a factory and other manufacturing a unit is actually killing the ecosystem.

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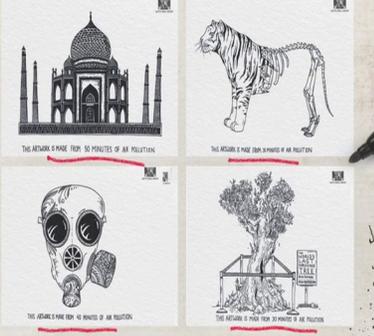
CHALLENGE
Air Pollution is an invisible killer. India is home to 14 out of 20 most polluted cities in the world. India also accounts for a quarter of the world's deaths due to air pollution. On World Environment Day, Aditya Birla Group wanted to raise an alarm about the rising levels of air pollution in the country & let the people re-look at the issue through a different lens.

IDEA
Aditya Birla Group decided to show the dark future through the most powerful expression - ART. Art made out of AIR POLLUTION. We used air-ink, the world's first ink made from exhaust pollution to paint the worst fears on the canvas. Each piece of Art focused on the adverse effects of air pollution and how it affects everything around us - from heritage monuments and wildlife to human health and flora & fauna.

RESULTS

On Facebook, engagement-rate went up to a record	On Twitter, #FilterTheFuture trends nationally with over	The campaign garnered a total reach of over	Earned Media worth
62%	11M Impressions	10M on social media.	3.5M

STAMP OF HONOR
The buzz for Art out of Air Pollution caught the eye of the United Nations Environment, the most recognized and global environmental authority and amplified the campaign across their social media handles & Website tapping onto their 2.21 Million followers on Social Media.



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So, one actually such an exercise was taken by this Aditya Birla Group and the sketches and illustrations what you are seeing here on this slide on the right side of Taj Mahal and a tiger and there is a face mask and a tree. So, these are all made by actually the ink, the carbon extracted from the atmosphere.

So the ink used here is taken from the air pollution they all actually ink is from taken from the pollution from the air, so such, this was actually done on the behest of the United Nations. United Nations a development program to create an awareness and this is some of the entries which was actually received from the illustrators and artists.

So this actually was done for creating awareness. I think we must spread this awareness among all of our peers, friends and students to increase the attention towards you know how to deal with this the environmental issues these days.

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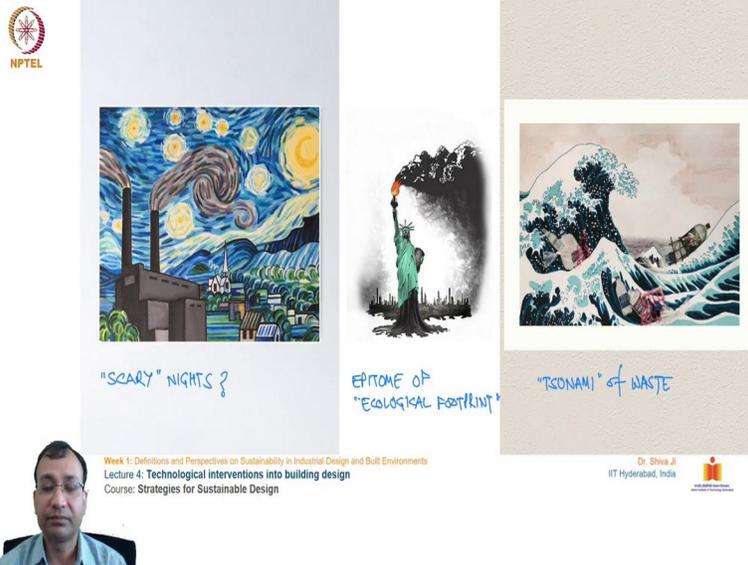


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Some of the more actually paintings I have a referenced over here which actually talks about environmental concerns. So, this is open for interpretation. This is I think artists, logic artists visualization how he or she is visualizing actually environmental situations these days.

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This last slide, actually, I would to bring the attention of everyone, every one of you towards the causes of this environmental issues which are depicted through these art actually works. These are the famous actually artworks from our respective artists, but they have been modified to deliver the message of environmental degradation. So from starry night, it says becomes scary nights.

Okay, the last one from the, is a famous painting from Japan. So with the surf of this, a tsunami, it is carrying the garbage and the other waste material also, which are floating in the water these days. And, of course, the middle one, the famous Statue of Liberty from New York, okay. So it is depicting the, the amount of a pollution and the impact the carbon emissions.