Strategies for Sustainable Design
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Lecture – 9
Climate Change Mitigation and the Way Forward

Hello everyone, so we will discuss today about climate change mitigation and the way forward. So, we will see how this whole phenomena of climate change is happening across the world, and what is the way forward to deal with this. If you see this world cloud, it is a collection of several terms and several activities and phenomenas which are occurring in and around this topic. So, it gives us a sense of this thing how complex this whole process is, this whole phenomena is. So, it is very difficult to deal with this, but yes there are solutions; of course the direct one search to cut down the emissions.

Reduce the resource consumption and then try replenishing and restoring the natural resources in their place. And they apart from these the major ones, there are several other small scale efforts, which you and me can take at our places. And we can help restoring this whole devastation which is going on at the global level.

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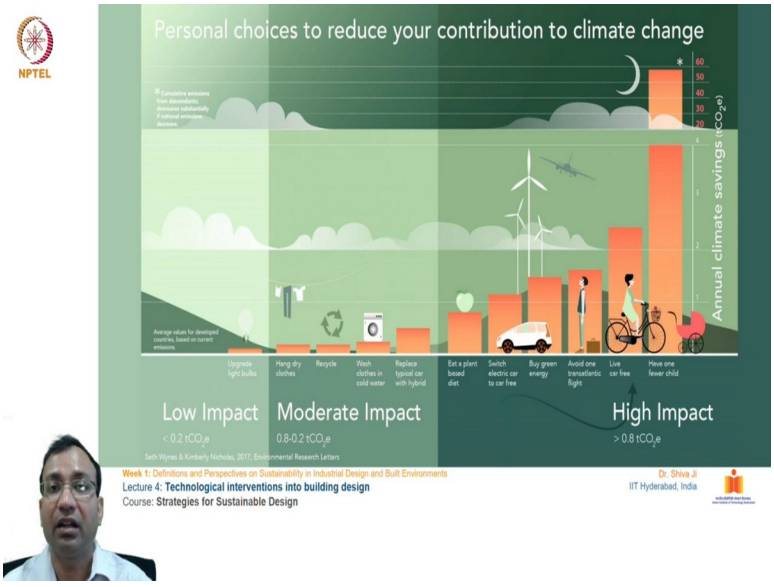

So, let us see this slide over here; so this talks about our personal choices. With which we can reduce this contribution to the whole climate change; it will be whole phenomena of this climate change. So, there are several small everyday activities which are listed out in this diagram over

here; which talk about what is the percentage, what is the contribution. It is making in this overall this phenomenon, and how rectifying on them. With the help of that we can actually give our contribution in not making it worse. So, if you see this x actually dimension, first of all it talks about upgrading the light bulbs.

So, and this data is taken from the average values for the developed countries; so based on the current emissions, so the first one it talks about upgrading the light bulb. So, we saw in the previous lecture what is the difference of power consumption, between bulb, incandescent bulb, and the LEDs and LCD. So, LED is the current trend, with this technology we are saving tremendous amount of energy. And we are getting light by investing very little energy into this. So, maybe if one incandescent bulb used to take 100 watts; so the one teeny-tiny this LED consumes even a fraction of 1 watt.

So, in just 100 watts in just power consumed by 1 incandescent bulb, we can have like hundreds and thousands of LEDs running in the same amount of energy. So, the second one comes hang dry clothes; how much difference it can make? One must will question by hearing these things, these are so small things to be taken consideration for life. So, these are very normal activities what we actually carry out in our everyday life in our houses. So, as simple as one small we are going to hang drying clothes. So, what happens when we dry our clothes in the dryer? It consumes power.

And all of these machines, they are not, they are all than in and around they consume power of 2000 watts. So, 2000 in 2000 watts just imagine how many LEDs we can run in hundred watt; and what will happen in the 2000 watt? So, if you see at the scale, there maybe thousands of thousands LEDs which can run in that the same amount of energy; which we are using for drying our clothes. And drying a cloth is not such a difficult task; it can easily happen in the outside in the open air; which we have been our families have been doing it traditionally for a very very long time.

Well, all of these appliances, they have come very recently in our lives. But, even if they have come recently, they have had very lasting very catastrophic effect on the whole phenomena of this climate change, which is occurring across the globe. So, this has some effect and the equal amount of effect is there in the recycling also. If we recycle stuff and then comes

washing clothes in the cold water instead of the hot water. Because again heating the water from cold to hot, it is going to consume the same amount of energy; because all of these heater rod and heating rods are also they consume approx like 2000 watts.

So, again the same similar amount of energy when little more than that than the drying ones; they are going to consume. And then the next one if you see, you replace a typical car with the hybrid car; a typical car runs on a hydro carbon based fuels petrol, diesel, gasoline, et-cetera. But, hybrid car actually utilizes both systems; it has battery power system also, which it runs on generally. But, at the time of ignition or if battery runs out of the power; then it switches on to the hydro carbon. So, to minimize the consumption of hydro carbons, so the use of these hybrid cars in these days is mostly (())(5:56) approach in the automobile industry.

And then the next one is eat a plant based diet. We have discussed in the previous lectures how the processed food, how the red meat, and how the high fat contained based foods; they are lot more in energy consuming things. So, how by depending more on the increasing the volume of our dependence on the vegetable based diet; how we can minimize the energy consumption, so this is more than the previous ones. So, we can certainly we should either think of power our improving our food habits and the items, which we generally keep in our diet. And the next to this if you see switch electric car to car free.

If it is needed of course we need to go for these like we saw in this trio electronic e-car. So, in that slide, I talk about even if you need it; first you try to avoid it. Then you go for the efficient one, then you go for the renewable one; so it is like that. In case if it is not necessary to have to own a personal vehicle or to utilize a personal vehicle. You must switch over to the public transport; because to see the amount of contribution, it is a going to make in this overall climate change. And buy green energy: buy green energy means these days energies are also which is being produced from different sources.

The conventional sources are of course are the hydro carbon based and coal based; hydel power based. But, these new generation energy rules which are renewable resources; those are solar power plant based, hydel energy and these wind farms. So, these we can if we source our energy; so somewhere we will be contributing in the safeguarding our climate. And the next to that is avoid one transatlantic flight; it seems very catchy, but avoiding unnecessary flying will save a

turn of carbon emissions. Because even we saw in the overall carbon emissions per flight between New York to San Francisco; it exerts a lot of carbon dioxide.

So, avoiding unnecessary consumption, unnecessary flying will improve this question significantly; and then live car free. So, if we are living in neighborhood if we have to travel for nearest locations; we can I think go for much greener options such as cycles, bicycles or tricycles; to in order to avoid the personal transport. Then the next one it talks about controlling the population. As we saw population is the single largest a culprit; because the number of mouths are increasing, the number of feed is going to increase certainly, number of all requirements are going to succeed to increase.

So, as a final suggestion in this slide, it talks about reducing the population. So, having a fewer number of kids and children in per family, I think it is going to certainly decrease the number of rate at which the population is growing at this point of time. And once the population is stabilizes, I think we can still learn to manage the resources in the supply whatever we have on this planet.

So, these are the actually tentative ones, which we discussed over here; how we unit families, unit individuals can contribute to our safeguarding our climate change. Because the more we go, more we involved into such activities; our higher input of higher contribution will be there in terms of impact carbon dioxide and other emissions.

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So, if we see what are the strategic options what we have at like a different level? So, at the reason why it at the upper catchment in the south of the region gold fields, broadacre farming in the west, irrigated areas of the northern plains. So, it is taken from one particular place which talks about the strategic options what we can adopt in the different places, different geographical places. And what are the key actions which can be taken up for the overall improvement of this whole thing. So, in this one if you see in the region wide here, it says research and developments.

So, how we can go for developing improved land management options, that maintain in an improved the natural asset based under the future climate change; including extended periods of reduced rainfall and extreme climatic events. So the knowledge brokering: the coordinate information provision and delivery across agencies and institutions. North Central CMA to play the lead role in the provision and integration of climate related information across the NRM sector. Capacity building: North Central CMA to continue providing support for increased community participation in NRM, and asset protection under the variable climate change.

If you see the discussion the point over here is to manage natural resources through local authorities and manage them properly; so that they serve the purpose in an strategic manner. So, how region can play further improvement for the safeguarding of the resources, which are available in that particular region? So, this slide over here, it talks about different strategies and

the action points in the country USA; and how they are dealing with it, how they are strategizing on the different aspects of sustainability, either locally over there.

So, state wise how their going about it, the place wise how they are going about it; and what are the action points they divide by it. So, why not we can make such efforts very very local, very very rooted to the place in Indian context. So, why cannot we have strategic action points for our Indian states over here? Because on the same lines, we can take care of our local resources of that place. We can devise strategic developmental processes; how we can go about it, guidelines, et-cetera.

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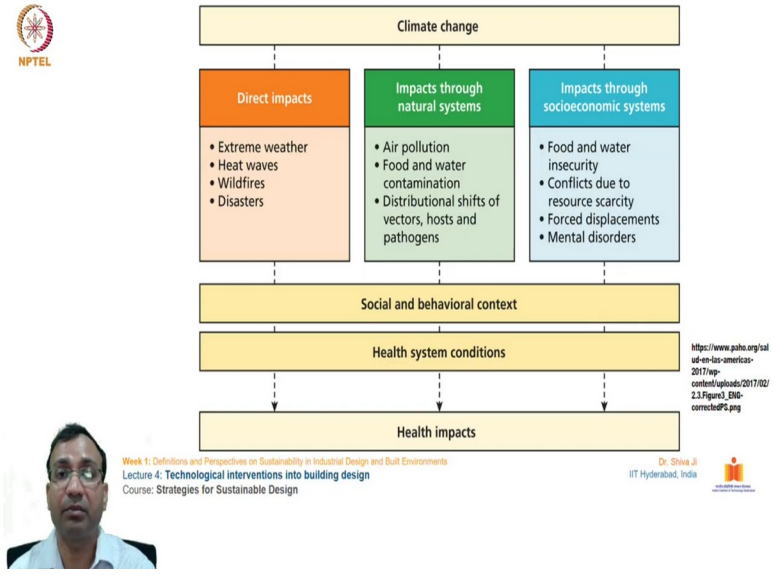

So, here if you see on the broader scale of climate change; it has a major the impact wise three types of impacts. So, one is the very direct impact, whether is one of the examples; it has become these days very extreme weathers. So, either it is getting very hot or either it is getting very cool; so in these are the actually very direct impact; direct repercussion of this climate change, which is happening at the global level. And heat waves, so now it is several swaths of land, several regions of the country and the world; they are experiencing heat waves.

So, we are experiencing heat waves and the dust storms, which are starting in this Saharan region; which is coming through across all the Gulf countries, and which is reaching even in India. So, in some months we experienced dusty brown oranges skies, which is filled with this fine dust, which is travelling from the Saharan region. So, see these kinds of effects are taking

place and it is becoming so frequent these days. So, these are the some of the direct impacts of this climate change, which we are experiencing which as a earth as a one unit we are experiencing these days.

Then wildfires: Several parts of USA, California and these states they have been experiencing wildfires very long time. And recently in the last summer in the Southern hemisphere; Australia has experienced wildfires for a very long period of time and has a huge swath of land. So, lot of vegetation is gone dry and lot of animals and other wild species have been killed; and such a catastrophic effect. Even, there was effect observed on the human settlements also; several of the colonies and settlements villages and the towns have been kind of caught in the middle of those fires.

And the kind of exhumes and smoke and dust which has risen out of that has traveled to the several other countries. For it has travelled for the thousands of kilometers, filling sky with the smoke and dust. So, these kinds of events which are causing disastrous event; they are becoming frequent and more and more in the number. So several different kind of catastrophes for example, like flooding is happening in not so regular places; where the floods used to happen. Rajasthan which is which was considered to be one of the dry states is almost flooding every year or every second year for the last several years now.

And the areas of recently there was this flooding in the areas of Jaipur and other (()) (15:23) near by towns and near cities; and catastrophic situation was arisen. So, these are the some of the direct disastrous which we are experiencing these days. The second this thing comes into this is the impact through natural systems. So, what are the impacts which are happening through natural systems for the climate change? So, air pollution. So, as we saw there is lot of exhaust which is going in the air, lot of volcanic eruptions, a lot of wildfire. So, these things are adding a fine dust and particulate matter in the air.

And it is causing like highway on havoc on several industrial sector. For example, aviation is one of the suffering industries of this air pollution. So, in some of the cities this air quality has reduced so bad; it is very unhealthy and unsafe to breath in those cities. So, air pollution is one of the major concerns. So, for example, it is very important to mention the city of Beijing, city of New Delhi and several other cities from across the world; which are experiencing very bad on

the air pollution in fact. And there is a pollution happening in the food and water based contamination also.

There are a lot of hazardous waste and toxic substances being left out in the open cycles; and they are reaching to the aquifers, they are reaching in the agricultural fields. They are getting into the food chain; they are consumed by the fish today, fish is eaten by the human. So, we know how the concentration of these substances are being found these days in the human body. So, this is reaching through the food chain, through the food, through the water; so this is becoming very critical these days to safeguard ourselves, from such catastrophic effects.

Then the third one in this category talks about distributional shifts of vectors, hosts and pathogens. So, currently our world is suffering through or is undergoing through this pandemic of this Covid which is originated in China; so, how these things are spreading across the world. This is the first such instance which has happened at the same time across the globe. I think earlier we used to earlier there are also some incidences are recorded of pandemic; but they have remained concentrated to maybe one country to one region at maximum. But, for the first time now the whole world is suffering because of this virus; which emanated in the country of China.

And now the whole world is suffering, there are lacs of people who have died already. And there are corers and corers of people who are till suffering, and the entire humanity is at the risk of getting infected with it. So, how to handle such vector borne diseases and pandemic diseases is one of the challenges; which are arising out of this climate change activities also. How the things which used to be concentrated into sunk like it is being postulated; then how this virus got transferred from the wild to the main stream life of animals. So, the animals who are like living closed to the humans.

So, this virus got transferred from the wild animals to these ones; and now it has spread to the humanity. So, how this can be consumed; so this is one of the indirect causes, how a pandemic can how such kind of medical or health emergency can arise out of the climate change. And the third one actually talks about impact through socioeconomic systems. So, the food and water security as the number of people, as the number of population is rising. There are several instances of several we have several examples of some countries, which are falling behind in being able to provide food and shelter to their citizens.

Their economy is at very bad shape and they could not actually grow. So, even if they are able to safeguard environment in absence of such industrialized activities. But, the repercussion of the not having any industrialize activity on their in their land; is to not to being able to provide food and shelter and basic necessities like fresh air and water to their citizens. So, it is very inhospitable very inhuman kind of conditions has arisen in some of the countries out of this climate change. And arising out of this, some indirect indicators are also there to inform conflicts arising due to resources scarcity.

There are fights happening these days in some places and in between happening in between two states, who are sharing a river; and between two countries who are sharing a river. So, lots of such tensions are arising out of this climate change. Because the overall water flow and the volume of water is day by day is getting decreased in those rivers.

So, it is anticipated that the then the coming decades and coming century, they it may create a very serious situation for the humanity, over the just one simple issue of availability of water. And then the as a resultant there are lot of people being displaced due to this lack of any economic activity, or lack any growth and development in some particular regions.

So, lots of displacement lot of migrations are happening, and as a resultant the humanity at that place is experiencing some traumatic condition, very some mental disorders. And is having overall effect in all aspects of the life; it is fairly is been fairly doing in bad. So, how these are known simple chain event of this climate change can have impact so varied; which can be direct which can be through natural system, which can be indirect through socioeconomic systems and all that. So, these are the diverse nature of this phenomenon, which must be controlled. So, if we see all of these events, they lead to the level of social and behavioral contacts; where there is some amount of some incidents is of like disturbances recorded across the world.

And it is taking tolled and direct human health, and overall the health of the human being, health of that ecology, health of that place is overall impacted. So, how this phenomena can be stopped, can be reduced is the matter of discussion over it.

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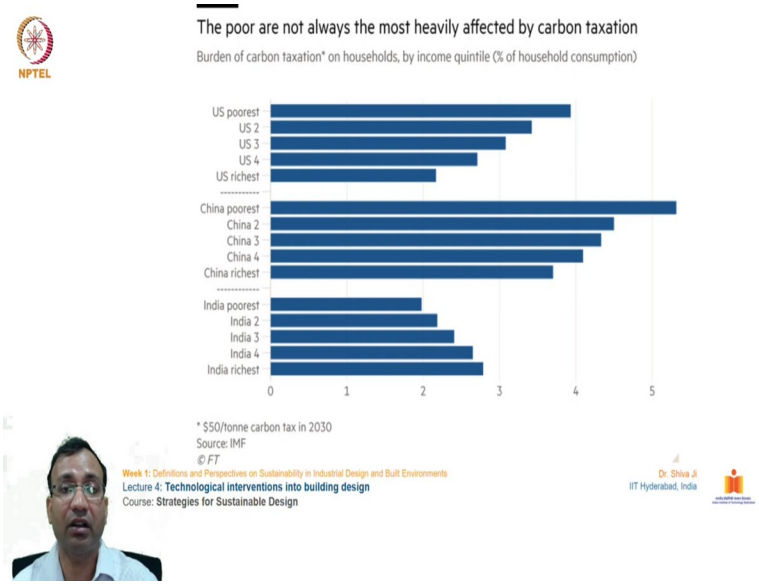

So, if we see how the, if we see in this particular slide, it talks about the poor or not always the most heavily affected by carbon taxation. So, the burden of carbon taxation on households, by income quintile, if we see percent of household consumption. So, if you see there are three countries have been taken for the example: The US the public in the US which is poorest and the US the public which is in the richest; then China poorest, China richest, India poorest and India richest. So, here if you see in the US, the US poorest is having this carbon tax is very high of near to four units of this ton carbon tax in year 2030.

It is being estimated that this is the kind of impact, they maybe exerting in this year, in the next 10 years from now. And the US richest they are close to little over like 2; on contrary to that China is toping with almost crossing this limit of almost near to 5.5, and the China richest around 3.6 or 3.7. India poorest is doing it quite fairly low, so if we see the impact caused by poor people in India. So, and the contrary to the people the poor people from US and China, it is the lowest. So, it is quite kind of a contrasting graph over here, if you compare between US-China and India. So, then India's poor are doing a fairly low carbon tax is in the same year it is projected in the year 2030.

And India richest they are closing it around the 2.8. So, this is one of the contrast, this thing I actually thought of putting up with you. So that it will have that understanding how these efforts

what we are talking about at the climate change mitigation and all. So, how these there is an some impact being experienced by the people of different economic strata.

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So, what could be the mitigation and adaptation to the climate change? So, there are some very direct and evidenced actually strategies which we can employ for this change. So, the one come from the mitigation first and foremost is of course the energy efficiency. So, energy we are today's economy is power hungry, we need energy for running each and everything. For whatever we see around us today, we are actually surrounded by the goods and the products, which are manufactured from somewhere from some company. They have travelled from some from somewhere, they were sourced from some different locations, some very remote locations elsewhere.

And they were manufactured at some some place and they were brought here our consumption. So, each and every of this stage of this process consumes energy; so saving on energy is the first and foremost effort or the strategy, which we should adopt for the reducing this climate change repercussions.

And then the next one comes in the energy going for renewable energy sources. For example, we have the surplus supply of sun, so we need this strategy to devise actually catching the sun's energy to utilize for our everyday activities. So, going for responsible energy resources is one of our very important points, which we must catch too.

And then comes electrification of industrial processes. So, how they the heavy industries, how the normal industries can go for electrification; because in absence of electrification they use several other methods for they are conducting their processes. And while doing so they end up exhuming or the emitting very toxic effluents or toxic gases or byproducts.

So, how by integrating actually those processes with the electricity we can improve upon this scenario; and of course the transport transferring our transport system on the electricity. So, if we transport our transfer our these engine based, these hydro carbon based engines, and personal transportation on the electricity based motors; then it will be very beneficial for the environment.

Because, if the energy is coming from the renewable resources, and if we are removing the hydro carbons; then the overall the carbon emissions will go significantly low. So, these are the actually some points relative with the mitigation and on the adaptation part how this can be done. So, stage-wise I would like to discuss over here, more facilities and more infrastructure should be actually designed should be like fabricated. Which can be harnessed, which can generate electricity on their own; net zero energy building we were discussing. So, why not to design and build such facilities in large numbers; so that the buildings can go independent of the grade.

And then restoring the landscape so that these lands can be used for a forestation; we can have a natural breathing lungs. The area of these breathing lungs of this planet can be increased for fresh air and we know forest reduces all sorts of like pollution. It reduces the soil pollution, it reduces the noise pollution, it reduces the air pollution; because of all of these vegetation, they help in filtering these emissions in several ways. And of course we have been for some time discussing about improving our habits of the food items. So, that also has lot of impact on the overall climate change and mitigation.

So, why not to improve our behavior? Why not to improve our diets? Why not to go for it? Why not to concisely make this decision? And move for the vegetable based diet. And then research and development: it is very important to understand and analyze this scenario at the world level, at the local level, at the regional level; so that the strategies can be adopted at those respective levels to help mitigate this problem.

So, these are the some measures which we can take as preventive and precautionary measure. Before hand, because we have some data there are some agencies like IPCC and UNFCCC you

know; so these agencies conducting R&D to analyze the impacts of the climate change happening across the world. They have data sets available for even country-wise; so why not to utilize these resources and work for the climate change and mitigation.

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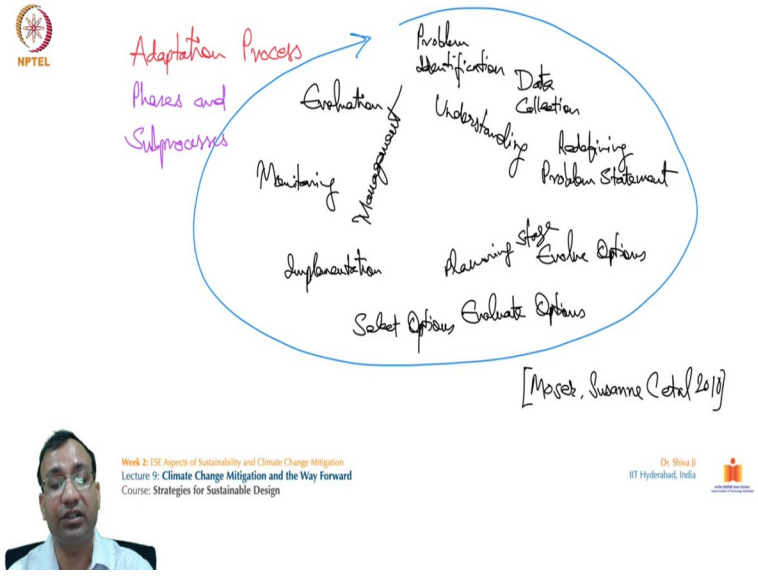

So, how these can be done in phase and sub processes for the throughout this adaptation process. So, if we start from the top, this detect the problem, what is the problem area; gather the information and knowledge around that area. Try to understand that whole phenomena, what is happening, how is it happening, where is it happening, when it is happening; so all of the w's and h's. If we enquire about that, then we will have a full set of data, which can be processed further defining and redefining the problem. Then we can develop options to deal with them, we can access those options how we can go planning around them.

Then we can select some applicable options, we can go action points; we can implement them, we can monitor and assess and we can manage how it is performing. We can have some assessment and evaluation at the end of it. We can again rectify, we can comeback and we can begin the next cycle. So, this is how actually we can go for this climate change mitigation, and this activity at the individual as well as at the national and regional levels.

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So, we must go for such this thing. I would like to mention over here, if you see that the distribution of worlds water. So, why I brought this? Because water is one of the very has become very scarce resources; these it is not readily available and several of our states and cities and towns are experiences, this actually a trouble.

So, how small this the quantum of this fresh water which we as a human and the other animals can consume; is so little compared to the salt water, the ocean water on this planet earth. That you will feel astonished; so that is why I brought this slide for your understanding. If you see the

total water distributed around the planet if you see; so the units you can see in the first column in distribution area, this in the kilometers square, so 10 to the power 3.

So, with that number if you see is 5,10,000; the total fresh water available is only 1,49,000. The total worlds ocean is 3,61,000; so the total fresh water available if you see is very little compared to the total water. So, only this is the water which we can make use of. So, if you see of the total waters percentage, this total fresh water available on the planet earth is the only 2.53 percent.

So, only with this 2.53 percent we have to undertake all our activities everything; and then the further distribution you can see how this water is actually scattered around the planet in which in the form rivers, in the fresh water land, in the wetlands, in the glaciers and all. So, you we can see which area requires what kind of attention for water preservation.

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So, satire you may have seen such climate based issues and satires; so this is satire which talks about Santa, so it must be true climate change evidence. Santa is forced to hire a camel because there are no more ice caps and very cold regions, where the reindeers of Santa can survive. So, now he has moved on to camel.

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It is “in our hands”, so we must work for it; each one of us has the potential to contribute at our own scale. So, we work for it.