Education for Sustainable Development
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Lecture - 34
Sustainable and Clean Energy (Contd.)

Welcome back viewers to this ESD course on Sustainable and Clean Energy. So, in the last class we are discussing about the policy, ESD policy for energy education. So, policy 1 we have discussed, now we will go to the policy 2.

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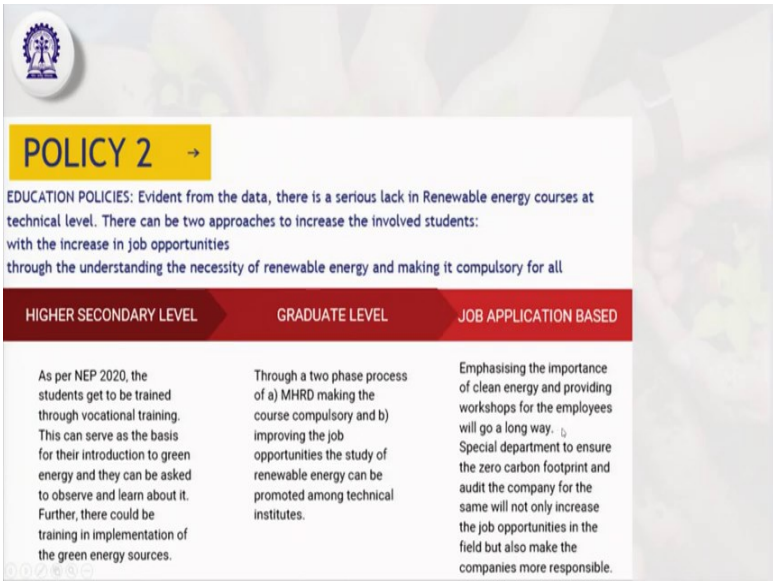

So, the policy 2 advocates for like education policies would be; that means, there should be; that means, introducing should be the existing education policy serious lack in renewable energy courses and no such specialized courses are available; so, at the technical level.

So, there can be two approaches to increase this to involve the students as the major stakeholder by increasing the job opportunities; the more like for example, more and more job opportunities can be created with the with solar energy sector, hydro energy sector or wind energy sector or you can say bio-fuel energy sector. If job opportunities can be created then and it can be introduced in the technical institutes, then definitely there can be definite improvements, substantial improvement in the consciousness and awareness of the sustainability.

So, through the understanding of the necessities of the renewable energy and making it compulsory for all; that means, from school education onwards you can say from the secondary level to higher secondary to higher education, it can be made as a compulsory subject for all the students, for all the students from the school level to the higher education.

Because, you know like the environment when we are studying about the environment education to how to take care of our environment, our planet, our ecosystem etcetera; similarly energy is such a energy is such a factor, such a resource which directly affects the environment and climate. So, how we must all of us we must have the basic idea about how to create the renewable and clean energy and how to save energy, how to consume energy sustainably so, that we can save it for the future generation.

So, this kind of awareness and education should be inculcated developed from the very beginning of our education system. So, the higher secondary level; so, at the higher secondary level National Education Policy, 2020. So, it has also introduced already introduced the vocational training that is the students can be trained through vocational training. So, this can serve as the basis for introduction to the green energy, green economy, green market, green jobs.

So, they can at this level students can be asked to observe them, to learn them to and then to by introducing them to some mini projects, mini social projects, geographical projects, environmental projects. So, that could be add that could be added in their curriculum and they would be exposed to this kind of you know hands on activities practical activities, field activities as a part of the training and training. So, that even in the vocational education also it can be incorporated the training can be incorporated as the mini projects, mini projects for how to create the green energy sources.

So, these things can be introduced from the very beginning. At the graduate level similarly the MHRD; that means, now the Ministry of Education can make it compulsory, compulsory like the our students are studying this you know physics, chemistry, mathematics, biology as a foundational science subject.

Similarly, energy science can be also be made compulsory for every kind of job that for technical students for creating the more job opportunities for them as a mandatory

subject for every student to learn from the very beginning from the first year of the technical things.

So, the study of renewable energy can be promoted among the technical institutes all across the country by introducing it from the very beginning from the first year under graduate level, making it mandatory and compulsory and to learn. So, that if they learn all of them they learn as a mandatory subject basic subject, science subjects definitely the awareness can also be enhanced increase.

And so, in future also they whenever they go for interdisciplinary research or any higher studies, they can very well blend this they can blend this kind of aspect this energy aspect, this sustainable energy aspect in their future research and job skills also. So, then job application based, similarly enhancing the emphasizing on the importance of clean energy; because energy is the source of all kinds of activity human activity, be it technical, be it manual, be it agriculture.

So, energy is everywhere, it is the like the nervous system of the whole economy, whole the environment system. So, emphasizing importance of the clean energy sustainable energy. So, we can also provide the workshops for employees from time to time as a part of the continuous learning, training.

So, similar special department to ensure the zero carbon footprint even at the school level also even at the school level for the school children also we can introduce the zero carbon footprint audit by the schools, by the institutes, by the companies. So, that it will create a kind of awareness among the stakeholders that is how much we are how much we are carbon footprint we are creating and how to decrease it, how to lessen it, how to go down come down to the zero carbon or zero carbon target etcetera.

And similarly so, similar job opportunities can also be created for them. So, in the field so, that more and more companies will take the responsibility and more and more students will be interested for you know interdisciplinary research and sustainable and the especially the research and the sustainable and clean energy.

So, to make our citizens feel about the importance of this clean and sustainable energy, we have to educate people, we have to that incorporate this education and training from

the very beginning of not only of our school system education system, but at every level or at the grassroot level.

We have to educate people, create that kind of awareness that how to sustainably consume energy and how to use how to use clean energy, how to and at the government level industry level how to create the renewable energy and how to focus and focus on zero carbon footprint.

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So, the next is that next is like for example, what would be then what would be the responsibility is of us as the global citizen, because all of us we are the global citizen what would be our global our responsibilities?

So, responsibilities of as a global citizen the policy 1 is that bio energy, yes first is the bio energy. It can be the heart of the any revolution in India the world is waiting for that. So, spreading the awareness about the bio energy by using the biofuel so, implementing; that means, kind of you know implementing at the household level also serves the two purposes; introducing this bio fuel bio energy at the household level.

The first two it serves the two purposes; first thing is that to reduce the dependence on the grid power electricity or other energy resources. So, it helps to cope with that; that means, transitional or the transition phase or shifting towards becoming more carbon

neutral. So, if we can depend on the this bio fuel; so, we can gradually shift towards the zero or carbon neutral energy sector.

So, similarly it also gives every individual a sense of responsibility towards the global crisis; not to waste energy, to save energy and how to use it sustainably. Then policy 2 will be yes solar panels can be installed for the agricultural practices, for small business, houses, small entrepreneurships, some small you know business and small businessman's like the coffee shops, restaurants, small business houses, small public space and.

So, with the idea of you know sustenance and of sustenance of the affordable and clean energy. So, the solar panels not only be can be introduced in agricultural sector, but in the rural sector for small time businessmen and the other kind of you know vendors. Vendors of you know stationary products, coffee shops, restaurants etcetera, etcetera with the idea of how to use it sustainably, sustainable and affordable and sustainable and affordable and clean energy for the sustainable use of energy sources.

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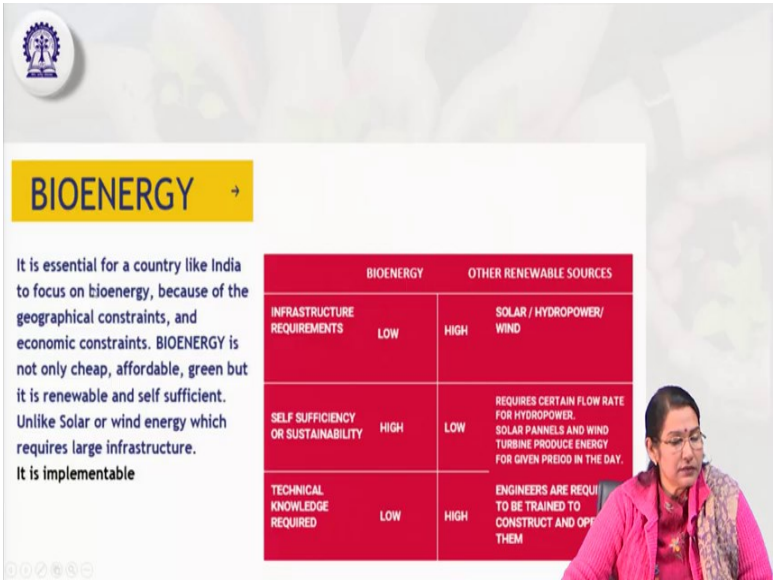

So, then the bio energy; yes it is very essential for the country like India, bio energy it is very essential. So, it is essential for the country like India to focus on the bio energy because of the geographical constraints and economic constraints. So, bio energy we can say we can it not only be; that means, we can every household can create it, can save it. So, it not only becomes very cheap, affordable and green it in its approach, but it is also

help us in creating a renew creating the renewable energy and self it made, it will make us the self sufficient.

So, self sufficient in our in maintaining our household activities so, unlike solar and wind energy which requires large infrastructure, but this bio energy sector it is you know implementable, it is implementable in the small scale starting from the rural household. So, we can say the this for bio energy the infrastructure requirements are very low as you can see. Self sufficiency or sustainability is very high and the technical knowledge required for this is a low very low, with low technical knowledge we can start this business.

Whereas, the other renewable sources like solar, hydropower, wind there the infrastructure cost is also high. And it requires certain; that means, self sustainability is low in the sense that it requires certain flow rate of hydropower, solar panels and the wind turbine. Turbine produce energy; so, the for given period in the and for the it is a time bound and in it in infrastructure is expensive and then we need the technical help for installing these things.

So, therefore, it is you know its technical knowledge required is very high. So, engineers are required to be trained and construct this kind of panel. So, for that matter we need to introduce as an education technical education discipline stream and also we can should promote the intensive research in this field in the energy sector.

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So, here the household policies, the Government of India National Capital Territory Delhi has already introduced this grid based incentives ok. Like for example, decided to utilize 31 square kilometer of rooftop space for farm for the farmer to farm so, solar energy to farm the solar energy.

So, several initiatives like the grid based incentives of rupees 2 rupees per unit of gross solar energy will be generated would be given to them households. This makes the regular households feel that yes as if they are the part of this solution and the this solution has been brought for them only for their help.

So, this kind of awareness can be spreaded. So, here we can say that we can conclude that through the pedagogical framework, we can implement it as an inclusive solution of the method of method towards the affordable and clean energy how and how India can meet its target by becoming carbon neutral or zero carbon to minus; we can say towards the minus carbon target. So, this can ensure the measures to take for the future generation also.

But, at the same time here we can say that even if; that means, the step wise like the through media then from through education institutions through governments initiatives then through industries, industries collaboration in terms of CSR projects through education educational you know research organizations collaboration. So, and by creating the employment job opportunities employment sector; so this the whole system this kind of in network, the whole system network or integrated network then we can yes definitely.

If we can extensively work on this area, we can you know give our maximum effort and we are really motivated and really motivated to invest time, resources our positive thoughts and effort in this definitely we are going to we can achieve it by 2030. So, let us hope for the best with a positive mindset to move forward to make our environment more clean zero; that means, carbon free, new carbon neutral, carbon free and with the sustainable energy system to or live our to live our life sustainably towards the future generation.

And also save energy; says not only sustainably use it, but the save energy for the future generation.

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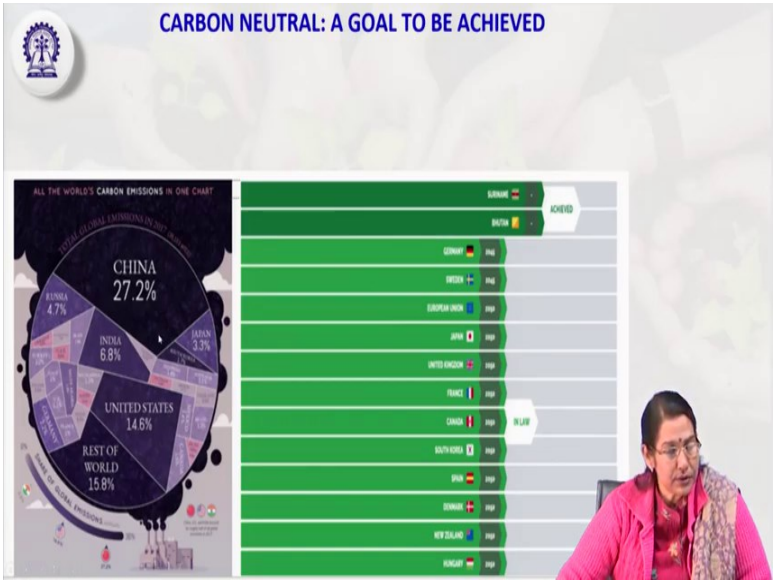

So, this is the carbon neutral: a goal to be achieved ok by different countries. Now, as you can see that China's China actually creates 27.2 percent carbon, carbon emission in this chart. The maximum carbon emission is being emission is being done by the China that is 27.2 percent across the globe. Then thereafter India is a responsible 6.8 carbon emission, United States is 14.6.

So, the developed countries are also emitting the higher percentage of carbon of course, depending on their geographical space. Then these are the Japan is only 3 percent 3.3 percent is it is eco friendly, it is very environment friendly. So, these states are actually the more eco friendly, United States.

And these are the countries; that means, you can say Russia and European countries especially European countries they have controlled very much. And, in this area also like some of the other countries Middle East countries Middle East countries, South East countries they are also very cautious in carbon emission.

But, the prominent are you can say China, United States, India is also 6.8 and rest of the world other our rest of the world with 15.8 percent. So, as per the as per the graph we can say already Bhutan like Bhutan and Suriname, Suriname they have already achieved their SDG goals; so, these sustainable and clean energy. And, below that Germany, Sweden, European Union, Japan to some extent in United Nations, a United Kingdom,

United UK, France they are they have also been successful in achieving to some extent; their targets are like this.

And, now in low are the Canada, then the following things are Canada, South Korea, Spain, Denmark, New Zealand they are also in the (Refer Time: 15:42) in the sequence. Whereabout; that means, we are China we countries like China, Bangladesh, Pakistan, India are nowhere in this list because we have to we have to go a long way in this effort, in this effort in creating renewable and sustainable energy.

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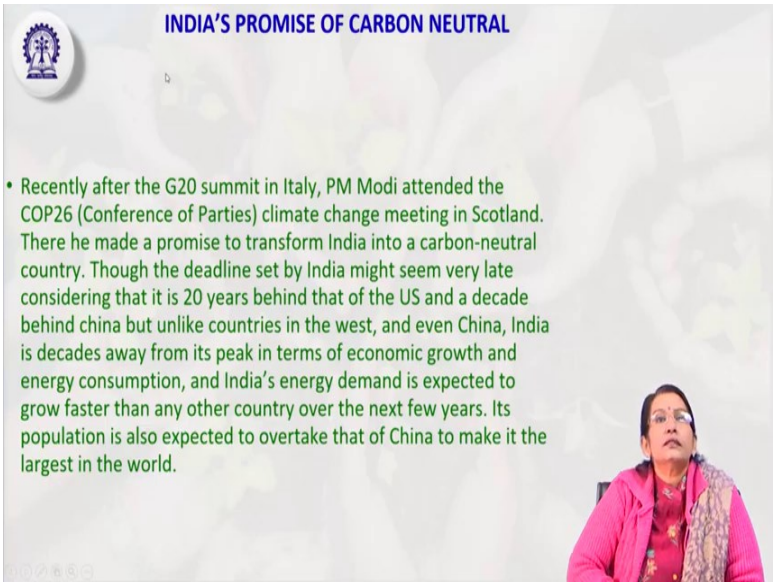

So, how now recently how India has statements regarding India's promise for the carbon neutral; now, recently you know after this G20 summit in Italy, PM Modi attended this conference, conference on climate change that is meeting held in Scotland. And, there they made he made the promise to transform the Indian to the carbon neutral.

So, though the deadline set by Indian, India might seem very late that it is the 20 years behind the US, behind that of the US and decade behind the China, but unlike other countries in the West and even in China.

So, India is a decade away from its peaked in terms of economic growth and energy consumption. So, India's energy demand is also expected to grow faster than any other country over the next few years. So, its population, population is also is expected to overtake China also so, that is. So, energy consumption, energy saving, sustainable

energy creation all these things are also affected by other socio economic factors like education, population, economic condition, GDP then job sector, employment sector, health sector health.

So, primarily education, health; education and health are the primary socio social sectors which are directly being affected and being affected by energy sector and also directly influence the energy sector. So, how can we maintain this kind of thing without education without sustainable health, without good health and without you know population decrease or control over the population expands and without creation of the jobs.

So, these so, that is why it is very difficult for India to reach the target. So, because as because India is already 2 decades certain decade 2 decades 20 years back. So, as because it is embedded with all these kind of socio economic problems in the in this context in Indian context so, socio economic problems, population problems then other kinds of economic aspects like low because of the low education, poor education, illiteracy, job opportunities or unskilled labours, unskilled labours; so, job opportunities are not available.

So, in this context to educate people, to create awareness, to update their living standard to and to make them conscious, conscious of this kind saving energy and clean energy; it is a really difficult task. And, it will that is why the India is much far behind comparison to China also China. So, definitely all of us all of us being the global citizen and especially being the Indians we have to make effort, conscious effort to how to update our status, how to be at the international level, how to be in line with the Paris Agreement.

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So, similar is the India and NSG that is Nuclear Suppliers Group, India's demand to be the member of the NSG group that is has to achieve the carbon neutral goal by the set of the deadline. Similarly, India also made a renewed push to the membership of this coveted nuclear supplier group that is called the NSG.

So, ahead of this COP26 climate summit, so, it underlining that its climate and development goals are also tied with this kind of entry into the grouping; so, India also want to be a member of this Nuclear Suppliers Group: NSG group. And, this is the data set the as of the 2020 the NSG has 48 participate participating governments. So, India has also become an has also pleaded to become an one member; so, this NSG group.

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So, in this context what the individuals can do? Yes, definitely as the Indian citizen as the global citizen at the government level, at the institutional level this will be the things that we are supposed to do. But as an individual what can we do in which way we can contribute? So, the major changes need to come from the governments aspects and business houses, corporate houses, by the scientists by the and, but; however, the small changes can also take place from our effort from our initiative.

So, that is why; so, how can we sustainably use energy so that it can have the limited impact on the climate? For example, taking the fewer flights. So, when it is easy when it is easy to go by cycle by the by walking or by nearby areas by the cycle etcetera, why to use the motorcycle or four wheelers or the automobile. So, again live car free or use either electric car that should be our ventures ok.

Buy energy efficient products like such as washing machines when they need the replacing. So, suppose some machines some old machines, some technology products they are consuming more energy. So, to replace it immediately with them with the low like nowadays all the fridge, refrigerators and the air conditioning, air coolers and all kinds of the electrical gadgets and the equipment are also you know are being prepared are being produced with the minimum energy consumption facilities.

So, that we have to; that means, replace all our old machines, machineries and the tech technology gadgets, technology tools etcetera with this you know new products with

efficiency energy efficient products. Similarly, switching from the gas heating system to electric heat pump to in so; that means, to minimum as per the requirement minimum use of you know use of sustainable use of water pumps, sustainable use of electricity, sustainable use of you know gas all kinds of the consumption. So, that is how we have to develop a kind of sustainable consumption style.

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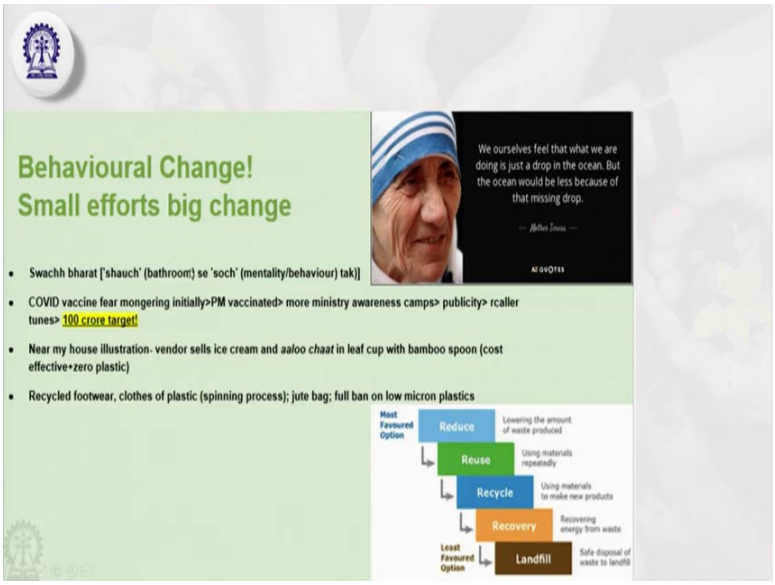

So, again behavioural change also behavioural change the are also this small efforts can also bring the big change like you know a Swachh Bharat, Swachh Bharat scheme clean India, then soch may soch mental mentality soch mentality; that means, from our mentality from our thinking from our behaviour also.

Similar, the COVID vaccines for you know for like for example, vaccines too; that means, to enhance the sustainable health like India ministry has already achieved the 100 crore target similarly. So, for example, some vendor sells ice creams and aaloo etcetera near my house illustrations like the vendors who are selling the ice creams and aaloo chaat in the leaf.

In the leaf cup; that means, using the sustainable packaging, sustainable green packaging, instead of you know plastics and a single use of plastics and instead of using the plastic etcetera. We can also have these an eco friendly leafs, eco friendly packaging systems can also be used.

Similarly, recycled footwear, recycled footwear clothes and the plastics jute bags; then; that means, sustainable; that means, progressive utilization of some of the products or maybe that the without dumping it we can also distribute these things old stuff among the poor people. So, that it can be it can be useful in their households for them also. So, how to use it, renew it and sustainability use it. So, that is a theory in economies that is called the progressive utilization theory.

So, from over the from the day of day we have purchased it how we can maximally use it, that is the progressive utilization of the same product; again and again in the in new formats. And, at the end it will how it is going to be used till the last you know till the last condition till my last condition of this product; be it the footwear, be it the clothes, be it the utensils, be it the other consumable good items, consumable items.

So, here you can say we can follow these steps, we can follow this you can say these steps: reduce, reuse, recycle, recovery and the landfill. So, and again at the end like for recycling of the waste management or either we can dump it in the safely dispose it in the waste in the waste in the sorry in the waste system that is a safe disposal of the waste to the landfill to in the landfill.

So, that can be; so, that it can be you; that means, it is a you can say that is that it can be bio degradable, the wastage it can be bio degradable. So, that is these are the steps we can follow we can follow. So, to minimize the waste to minimize the waste products and successfully processing this waste product, reusing this materials and at the end dumping it within the landfill which will be easily biodegradable in nature.

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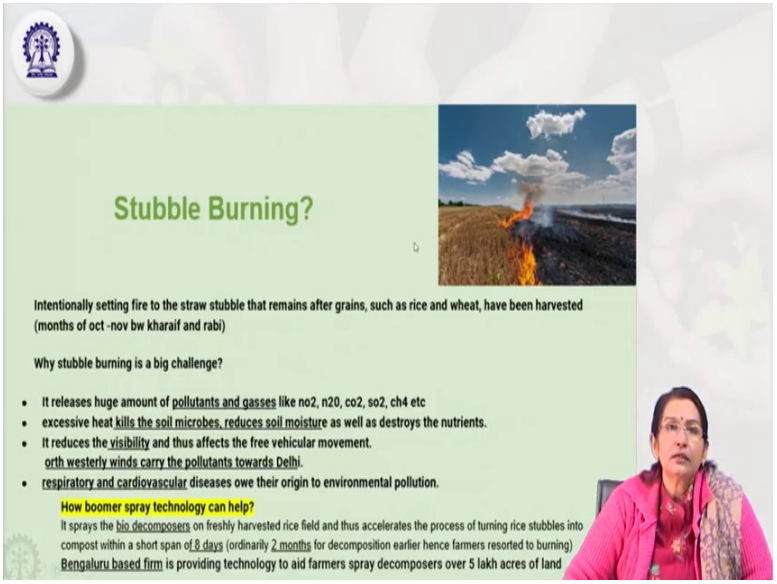

So, similarly stubble burning so, is that you know you might have come across the all this in the Punjab's in the Punjab's Haryana and Punjab's all these kind of especially Haryana this stubble burning, how it causes the you know carbon you know carbon dioxide in the atmosphere and how it affects the nearby states, nearby states especially in the Delhi territory.

So, how to reduce it how to; that means, resolve these issues stubble burning? Because, it creates a huge amount of carbon dioxide and it affects the it is affects the climate the nearby states climate and weather. So, how it is a big challenge really it is a big challenge how the; so, how the here we have to be innovative in the sense that how can we create some kind of machinery, some product etcetera to mean to; that means, to resolve dissolve these kind of thing.

So, how boomer spray teaching technology can also help it in this direction. So, bio decomposers and the freshly harvested rice fields and that accelerates the process of you know turning this into rice stubbles into the compost etcetera and with the sort span of that 8 days. So, how with the spray with this kind of this spray technology how can we dissolve it and how to educate our farmers and the rural people regarding this technology; so, that the stubble burning can be curbed.

And, it can be stopped and we can maintain our climate, maintain our weather and the climate and the air quality better.

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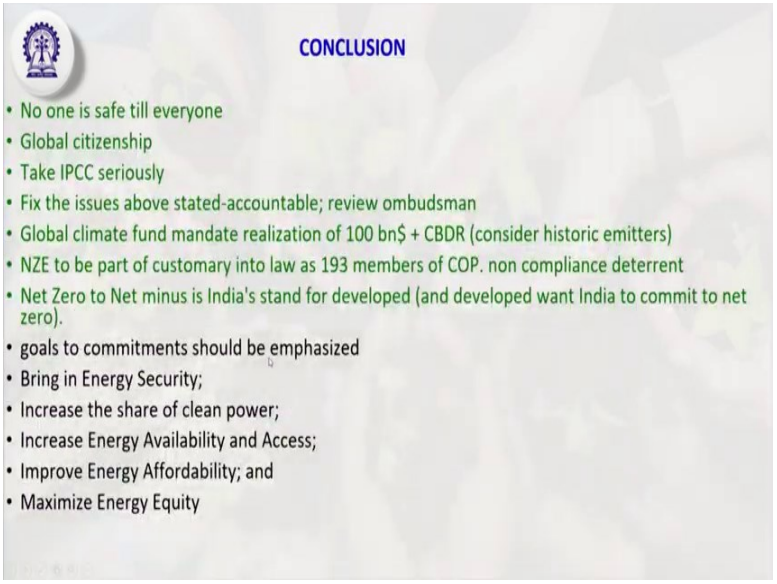

So, here now is the with the conclusion I like for example so, here we can say that yes here we can say that here without all our efforts putting together no one is safe. So, no one is safe till everyone does something, contribute something or at least lead a sustainable lifestyle and consumption style ok.

So, global citizenship is a topic which can also enhance these things, we can also spread the owning the responsibility of you know taking care of our ecosystem and be conscious about the carbon emissions and the how to minimize our carbon foot carbon footprint. So, IPCC also taking the IPCC rules as a; that means, policy on the climate change how to take it seriously and to act upon it.

And, fix the issues above the state above the state accountable review the situation from time to time global climatic fund mandate realizations of this you know this billion dollar. So, it is how to it use it sustainable sustainably then the implementing the laws, customary laws; 200 and to all the member states and how in the within the country also how should we comply to the national laws with regard to the environment protection environmental regulations, environment and environment; that means, quality control.

Similarly so, goals to the commitments should also be emphasized bringing the energy security like the food security, energy security should also be there by increasing the share of the clean power, increasing the energy availability in access affordability, maximize the energy equity then monitoring then evaluation. So, all kinds of things are

to be taken seriously and all of the all the citizens should be educated as a mandatory component as a compulsory discipline from the very beginning.

And the rural people or the adult, illiterate adults they can be inform they can be informally, non formally educated to be energy conscious. And, how to and from time to time they would be educated; that means, which equipment which system which technology which machinery which product is energy efficient product how and energy efficient product how to replace the all the things, the old things with the new energy efficient system products etcetera.

And, this process would be a continuous process, a lifelong process, a continuous process. So, it is our all of us there is a responsibility to spread the awareness, educate people, organize the workshop; it is not just the responsibility of government or media and or so and so. But, is it is the responsibility of every stakeholder, every citizen of India because we are the global citizen and our primary responsibility is to take care of our not our plan our planet not only India, but our whole planet.

And India is interconnected, it is the part of this global scenario. So, first initially to begin with from our home to take our own state, own country and there from onwards to move towards the global targets.

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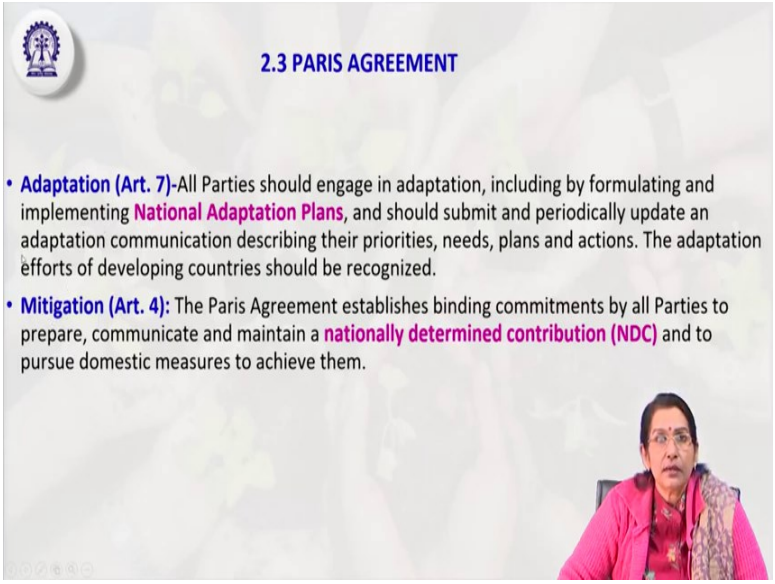

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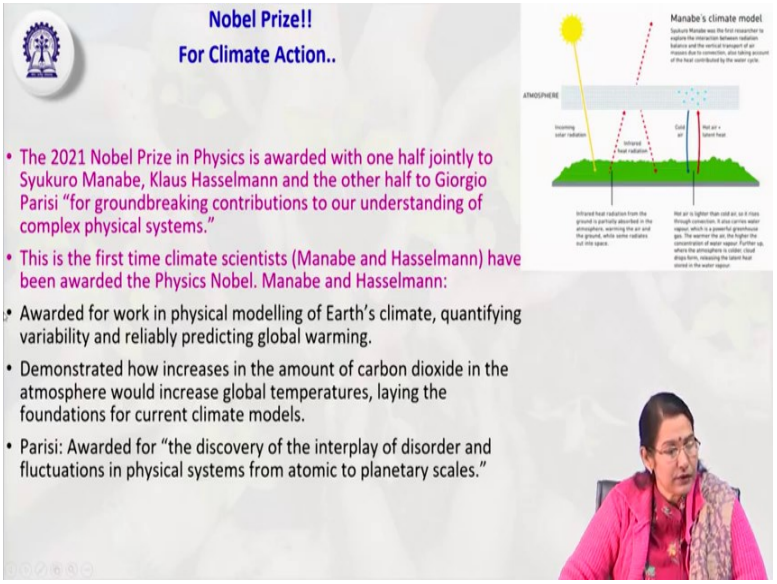

So, the Paris Agreement also the same thing adaptation of the article 7 adaptation, mitigation of the same. So, the nationally determined contributions and national adaptation plans we have to stick to the these rules and regulations, we have to follow these articles.

So, and also some this Nobel Prize are also being given to Nobel Prize for climate action are also being given; these are the data like the for this is the first time the climate scientist. So, Manabe and Hasselmann have been awarded the physics Nobel Prize. So, those who worked on this climate change is awarded the work for the physical modelling of earth's climate and quantifying the variability and reliability predicting the global warming.

So, the physics scientist working on the climate change they have been awarded. So, 2021 Nobel Prize in physics is being jointly awarded to Syukuro Manabe and the Hasselmann Klaus Hasselmann and the other half to the Giorgio Parisi from the for the ground breaking contribution to our understanding of the complex physical system.

So, the these are the things that has to be this kind of things should be you know spread it disseminated properly. So, that more and more students more and more professionals will be involved engaged in the energy research and development.

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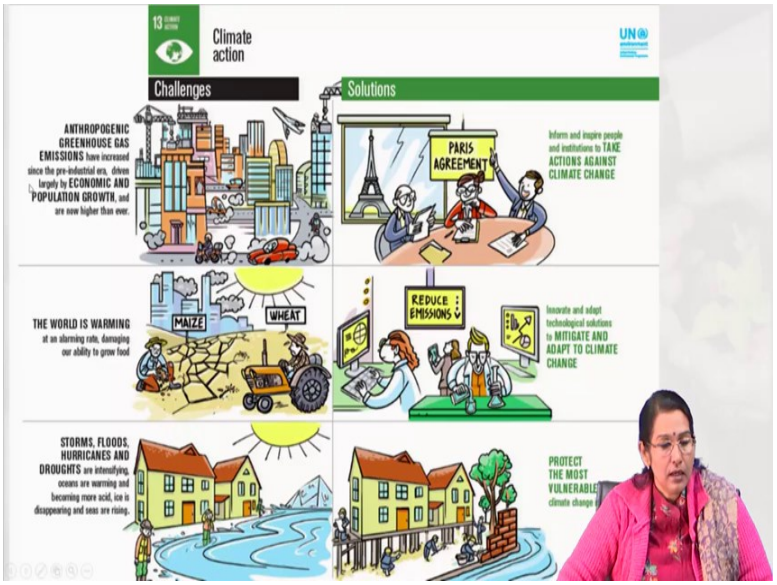

So, these are the some of the things as we have already seen that these are the climatic challenges we are facing greenhouse gas emission, global warming, storms, floods hurricanes, disasters; all kinds of thing how can it be mitigated, how it can be resolved. So, solutions like Paris Agreement, we have to follow the Paris Agreement, take the action against the climate change, then again mitigate the adopt the climate change thing by reduce the emissions ok by use the.

And, by engaging ourselves in more advanced research, scientific research and climate change and energy and protest protect the most vulnerable against the climate change that is, our greenery and our planet earth. I think this we are going to conclude, this topic that is sustainable affordable and sustainable and clean energy. So, I think so, I am concluding here only.

Thank you very much.