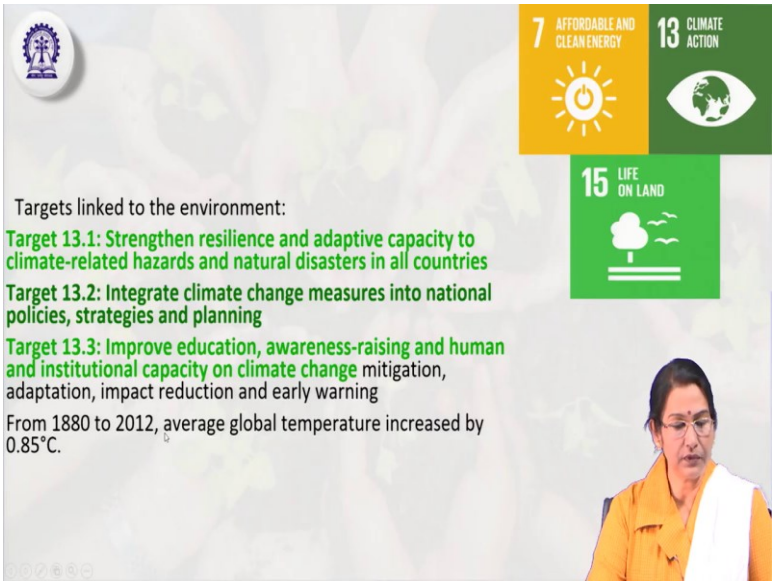
Education for Sustainable Development
Prof. Atasi Mohanty

Indian Institute of Technology, Kharagpur

Lecture - 30
Sustainable and Clean Energy (contd.)

Welcome back viewers. In the last class, we were discussing about Sustainable and Clean Energy, and we are discussing about you know policies and regarding the renewable energy sources and how to assist the needs of the future energy requirements, how to use it sustainably.

(Refer Slide Time: 00:35)



So, to continue with that only. So, we will discuss today about the how the energy is related to our climate. It is the it is very much evident that how it is related to our climatic change, climate and atmosphere etcetera, but at the same time life on the land also. So, the these three SDGs we can say this SDG 7 that is clean affordable energy and climate action and life on land that is SDG 15.

All these three are very much interlinked interrelated. So, the targets that focus primarily on the environment and on the climate, also relates it is very much related to energy sources; because the energy is directly affecting the atmosphere, the land, the life of the plants, the life of human beings, the pollution, the air quality everything it is. So, all these three SDG is very much interlinked.

So, now let us focus on. So, the in the target 13.1, it is mentioned that within this energy domain that is the strengthen the resilience and adaptive capacity to climate related hazards and the natural disasters in all countries. So, these targets related to environment also focuses on how to strengthen the resilience of the society of the people of the ecosystem and adaptive capacity to climate related hazards; hazards are natural disaster that very often we are facing.

So, how it can be managed it how this resilience can be built of to face this kind of climate related hazards and natural disaster in all the countries and across all the countries.

And target 13.2 that is integrate the climate change measures into the national policies strategies and the planning. So, at the government level it should be very much implemented in the policies in terms of you know eco friendly policies how to integrate this climate change measures to be adopted by the agencies both at the national international level in terms of policies planning, planning commission, strategies and legal implications also.

And next target at how to again regarding in education, how to improve education awareness, awareness raising through different workshops, information channels, media, communication and institutional capacity on climate change mitigation; all kinds of you know adaptations impact reduction, early warning.

So, all from the meteorological department to the policies, to the education department, to I mean information broadcasting. All the sections how they should act cooperatively and collaboratively to improve the education, awareness, human activity and capacity to deal with this climate change to mitigate it through warning regular warning then the advocacy and all kinds of information system.

So, that is from this is the average global temperature that increase by 0.85. So, gradually as we can see from this especially in the coastal areas with you know recurrence of the natural disasters like the you know floods and the cyclones and all kinds of this calamities that happens.

So, gradually the temperature in the countries in the different states also gradually increasing. The overall temperature in the coastal areas especially in the coastal areas gradually increasing. So, how to and that is the result of this climate change that is the result of this disasters climatic change and it is a disaster happening, because of the climatic change or the pollution and all kinds of the and global warming. So, how to mitigate it?

(Refer Slide Time: 04:21)

So, 13 target; target 13 a also says that implement the commitment undertaken by the developed countries to the United Nations Framework. So, these are the some of the conventions are there, how to mobilize the funds, and how to monitor, how to mitigate the you know mitigate the actions and the things and how to bring transparency in implementation monitoring.

So, how to again whatever green climate fund is there in United Nations, it is a it is a responsibility of the developed countries how to distribute it, how to help it help the underdeveloped countries or developing countries in distributing the this distributing and facilitating and in installing and in the infrastructure in installing this renewable energy.

So, how to this green climate fund can be distributed and utilize properly by the developed countries for the and how the developed countries should reach out to the underdeveloped countries or developing countries to capitalize this benefit in terms of renewable energies creating the sources of renewable energy installing the infrastructure etcetera.

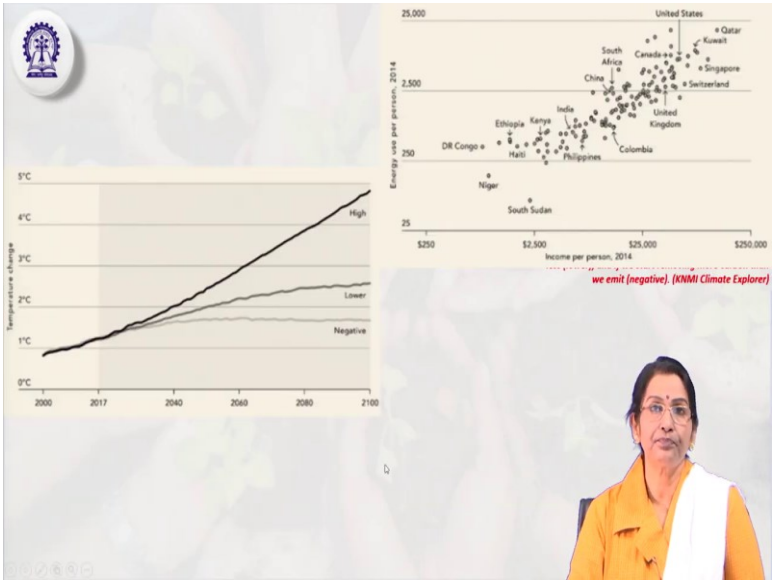
So, 13.b again said the promote the mechanism for raising the capacity for effective climate change related planning and management. So, at the same time it is not just enough to install the infrastructure, but also to build up the capacity, human capacity, financial capacity that for the effective management and planning also. So, that the least developed countries can also manage their they will be able to learn and manage their own business.

So, including the focusing on the youth, women, local people, marginalized communities how to empower enhance their capacity in not only installing, but maintaining and managing the renewable energy sources through you know through education, through information, through workshops, through hands on activities, through capacity building workshops all kinds of training, skill development all kinds of thing.

So, these are some of the videos are there which are related to this climate change and energy renewable energy that you can go through it later on. So, now, we can say that this climate change is the major factor that sustainable that goal it is the major goal then it is also very much related to our policies that is policies on the life on land.

Then our you know energy sector. So, all these SDGs are taken say primarily are very much interlinked because all these are related to either our life human life or life on land and our environment and our finance and economic prospects. So, all these 17 SDGs are related to this three; that means, the triple bottom line or three pillar basic three pillars of the sustainable development framework.

(Refer Slide Time: 07:13)



So, these are some of the graphical representation as you can see how the temperature is gradually rising increasing the temperatures and these are some of the thing you can say the in across the countries across the countries how this energy per person how the energy consumption is also gradually increasing and this is the temperature. So, these are some of the graphical representation.

(Refer Slide Time: 07:34)

So, and this how the temperature is also leading towards the knock down stages like knock on for example, hurricanes all these natural disasters or the manmade disasters are the outcomes of this unsustainable consumption use of resources.

So, rising sea level because of the global warming the sea level is also increasing, rising hurricanes then you know; that means, pandemics are also yes and these are also the outcomes and storms very frequent storms.

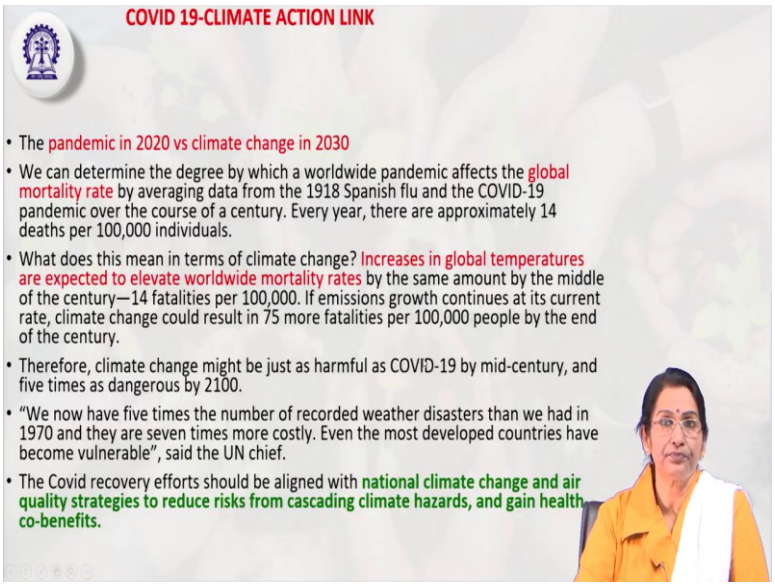
Even in the even now you might have observed in even in America, in Canada, and America being the cold country even then there this means you know there also this wildfire is also wildfire and the forest fire are also coming up. And, the sudden you know flood and sudden; that means, rising of the sea level, these things are they are also facing this kind of the disasters.

So, climatic displacement then wild fires even in the countries like America and Canada. So, and these are also the this is the you can say that how this climatic change that it also global climate change that is the state of the climate change. For example, warmest year then the ocean records that is sea level is also rising, sea ices are also being melt.

Sea ices like there in the Iceland areas the sea; that means, ices the ice sea ices are also being melt melting and causing the water level rises in the sea warmest years then the state of these are the some of the records that is; that means, affordable; that means, affordable; that means, meril life; that means, meril life how the meril life can be protected and conserved that is.

So, all these are the thing you know this is the kind of the climate, how global climate it affects all the things both the land about the forest about the and about the marine life with the life on land every aspect how it is affecting. So, these are some of the outcomes of this climatic change and unsustainable energy uses.

(Refer Slide Time: 09:37)



So, now more over this pandemic. Again this pandemic is also another thing pandemic; so, the when we compare pandemic in 2020 versus the climate change ok. So, these are some of the things the some of the findings like in the global mortality rate also increases because of this kind of thing. So, these are the data given by the different countries.

Similarly, there is we are also expecting the increase in the global temperature are also expected to elevate the worldwide mortality rates it is not just because only due to the pandemic etcetera, but also because of the global temperature high temperature rise also it can also cause the mortality rate increasing worldwide increasing mortality rate.

So, therefore, the climate change might just be as harmful as the COVID19. So, one or the other we are facing one or other disasters. So, therefore, this and the COVID19 or this pandemic has actually taught us how to be well prepared be resilient for the future such a = disaster.

So, national climate change and the air quality strategies to reduce the risk for cascading the climate hazards and gain the health co benefits; so, this is. So, these are the learning lessons takeaways that we have experienced during this pandemic and different surveys, different data

analysis and these are being done how to mitigate and how to be prepared better prepared for the future you know risks that we are facing we are going we may face in future.

(Refer Slide Time: 11:07)

So, here again how this process whole process has been evolved has how this process have been evolved, how these are being monitored, how these are being regulated by the international agreement. So, let us focus on these some of the things.

So, Climate Action Evolution-I that is Evolution of International Agreements that from time to time this agreements International Agreements are being made, but how this how the countries are fulfilling, how the countries are meeting this, how the countries are following these agreements to evaluate it from time to time to monitor it.

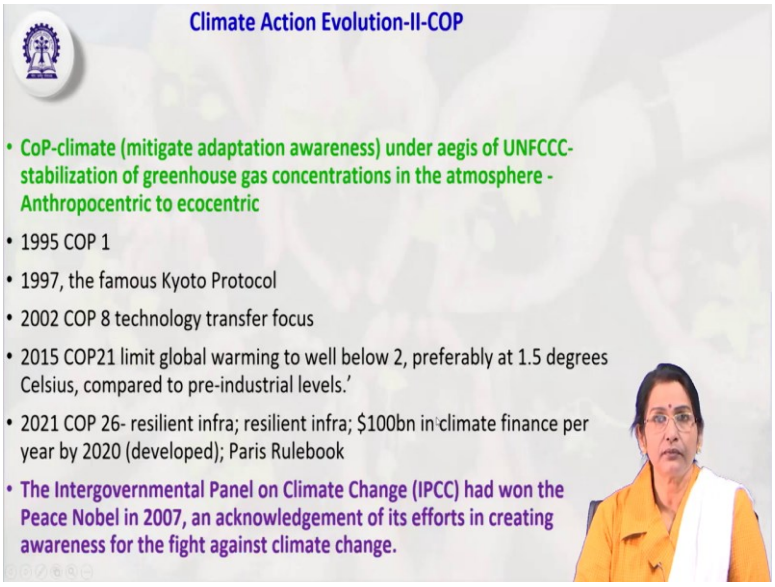
So, let us see. So, Climate Action Evolution-I that is sustainability. So, sustainable development here sustainable development definitely includes sustainable economic development, social development, sustainable natural and built different environment that is eco friendly.

So, Brundtland commission report in 1987 has already given the outlines had already that stated that the meeting the needs of the present without compromising the future generation is actually is called the sustainability framework or which is something which is intergenerational which also works on the intergenerational equity, conservation and sustainable use.

So, since 1987 we have been deeply contemplating on climate change and sustainability, environmental conservation all kinds of environmental education all these things we have been contemplating since 1987 from the Brundtland commission onwards.

But, how from time to time how these are being evolved, how these are being evolved through and we have to monitor it from. For example, 1972 Stockholm report to till date that is Meniscus 2015 SDGs and in between so many other agendas United Nations agenda then millennium development goal; so many things. How these whole process is being evolved?

(Refer Slide Time: 13:03)



So, again Climate Action Evolution-II that is COP climate mitigation adaptation awareness under the aegis of the UNFCCC and stabilizing of the greenhouse gas concentration in the atmosphere and anthropocentric and ecocentric.

The research is also being conducted research extensive research is also being conducted from 95 to 97, how the from the Kyoto protocol to technology transfer to 2015 global warming. So, these are the data given from given by the different, you know different survey reports and 2021 COP 26 says that how the resilient infra, resilient 100 billion climate finance per year.

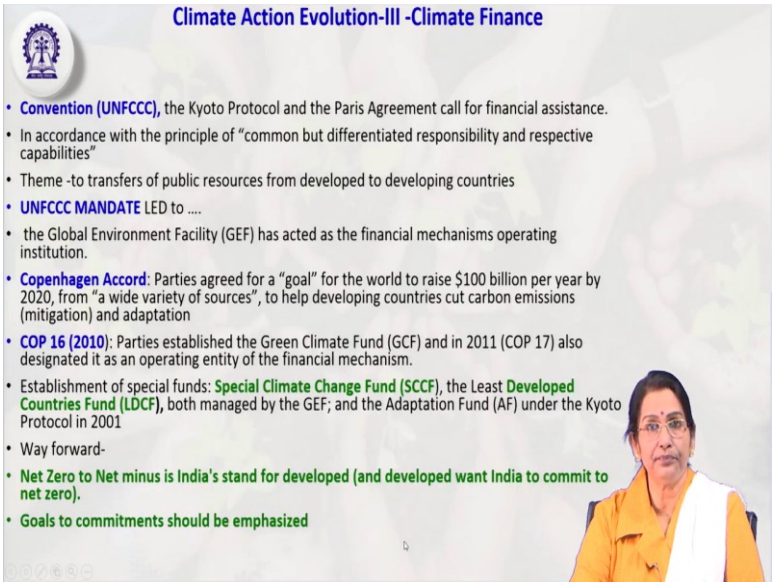
So, starting from the Paris Rulebook all these things are related to and related to the evaluation of the starters regarding to greenhouse gas concentration to air pollution, to the climatic change all kinds of thing. So, now, the Intergovernmental Panels on Climatic Change; Intergovernmental Panels for the Climatic Change had won the Peace Noble Price.

So, again monitoring the which country is fast moving towards the sustainable society sustainable towards the achieving such SDGs and they are being also provided the acknowledgments. Acknowledgment of its efforts in increasing in creating awareness for the fight against climate change.

You know in Asian countries you know Japan is the Japan is leading ahead all of ahead all of us in creating a more sustainable and eco friendly country. And also it is a it is a worldwide it is a peaceful country, and it is a peaceful country not only and sustainable country; it make large effort in not only creating an ecosystem, but also in conserving in you know developing sustainable habits.

And in you can say in collocating this sustainable paradigm shift in their work culture, in their education, in their practices also. So, these are the committees monitoring the status of this climatic action and agreements from time to time.

(Refer Slide Time: 15:17)



So, similarly Climactic Action Evolution-III that is the climate finance; finance in terms of investment like convention of UNFCCC, Kyoto protocol you know Paris agreements then what that the what the theme was to transfer the public resources from the developed to developing countries.

And similarly the next is UNFCCC mandate to lead the global environment facility that has acted on the financial mechanism being operating the systems institutions. Copenhagen Accord

that is Paris parties agree to agreed for the goal for the world to raise 100 billion per year for by 2020.

And you know from diverse issues from the diversification of the energy resource from the wide variety of sources from the and to help developing countries to cut the carbon emissions and mitigation through technology transfer, etcetera.

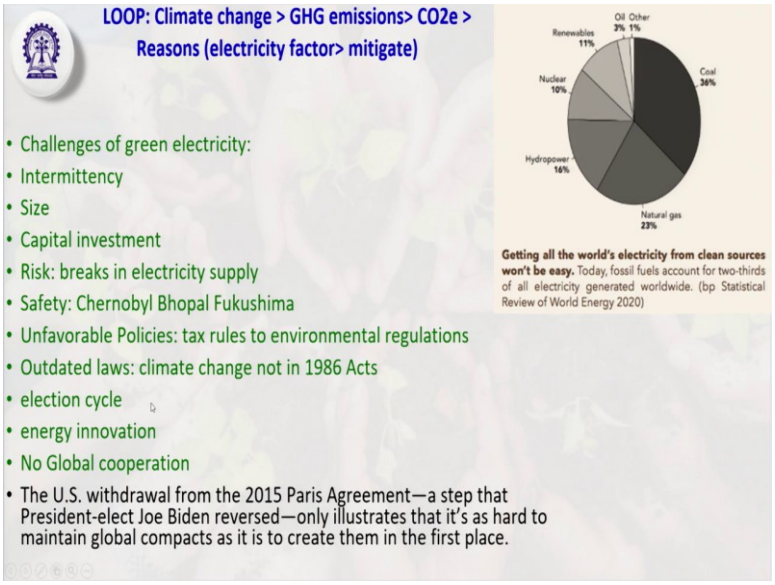
Then COP 16 also parties establish the Green Climate Fund, how to establish the Green Climate Fund and how to use the resources and financial resources for helping out the developing the mechanism in the mechanism in the developing countries.

So, Special Climate Change Fund also Special Climate Change Fund has also been created and the developed countries at least for should be managed by the developed countries and adoption of the fund under the Kyoto protocol.

So, here the thing is ultimate the goal is that net zero or the net minus creation net minus; that means, net zero carbon, is India's stand for the developed countries and the developed ones India to commit to the net zero; net zero emission or the net minus emission carbon emission for the as the target of India.

So, goals to commitments would also be emphasized. So, goals to commit first is the commitment and the target that are not only setting the target will be enough, but commitment towards the goal achievement. So, from the net zero to net minus that is the that should be the India's stand for mitigating the climate change impacts.

(Refer Slide Time: 17:26)



So, here again the LOOP that the climate change to global the greenhouse gas emissions to carbon footprints all kinds of things how to mitigate it. So, these are the challenges then again. So, now, nowadays we are focusing more on green society, green energy, green marketing, green product, green all kinds of things.

So, how what are the challenges that are involved that as in that are there inherent in this green electricity. So, as we can see 36 percent energy is being is created from the coal sector, 23 percent natural gas sector and hydropower 16 percent, nuclear 10 percent, renewable 11 percent and oil and other 3 and 1 that is 4 percent.

So, this how to increase this renewable percent energy sources and how to decrease how to decrease our dependence on these coal sources from the coal energy or the natural gas energy. So, the challenges of challenges of the green electricity is that yes intermittency, size, capital investments, risk break breaks in the electricity supply because you know even if we are depending or increasing our nuclear power energy that maybe be the disasters that maybe be disaster that takes place like in Fukushima in Japan.

So, that can be a lesson that can be lesson even in our Bhopal Gas Tragedy is also that is also these kind of the lessons that we have to be we have to learn from this. So, sometimes some unfavorable policies tax rules of tax rules to for the environmental regulations, some of the outdated laws like for the climatic change we need to update our acts.

So, old and outdated laws then again election cycles in every country election political environment, financial condition, election cycle, energy innovation yes how much we are spending on R and D renovation, energy creation, energy research.

So, again, but at the same time so these are the challenges independent challenges of every country, but however, there are also we need to have the global cooperation. So, no global cooperation like every countries they are you know they are very much keen in to fulfill or achieve their own goals and fulfill their own criteria.

But yes, we need to have the global cooperation. So, without global cooperation it cannot be resolved because we are it is again it is not just about one country or two country. So, it is about the all the communities all the countries across the globe. So, the US withdrawal from the 2015 Paris Agreement ok.

So, that is also that has been. So, that has also impacted that has also that has also impacted this global you know climate change policies. So, how to maintain this global climate as to create them to collaborative in work they work in the collaborative way.

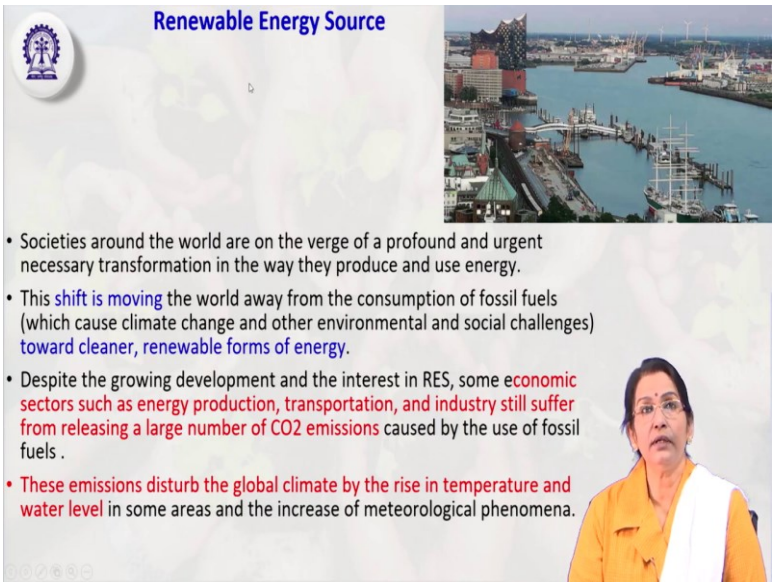
So, how to involve and engage all the countries equally and how to commit towards these kind. So, all these kinds of things these are the challenges that we are facing on day to day basis and it is across the globe the challenges that we are facing to create the green electricity. So, it is not at the hand of one country or in the hand of the UNESCO or on the developed countries but it requires the global cooperation, global collaboration.

(Refer Slide Time: 20:51)

So, as we can see this is the renewable energy and sustainable development how renewable energy from the different sources here bio-energy, solar energy, wind energy you know how to use sustainable vehicles like the reduce our use of the petroleum gases and electricity supply solar energy.

So, how this is the circle this is the learning cycle of the renewable energy and sustainable development and here there is also there are also so many videos YouTube videos are there which from which we can also get more and more ideas to at least even in our life span in our environment, in our household, in our life sphere to use it sustainably.

(Refer Slide Time: 21:35)



So, again renewable energy sources – yes, renewable energy sources that is how gradually we are shifting towards more clean cleaner more renewable in a forms of energy and also at the same time you also need to invest on the economic sector such as energy production, transportation industry because all these sectors are to be updated.

So, how to reduce the carbon emission you know even in India also like we can see from time to time how this CNG gas auto rikshaws then the vehicles pollution control and rules and regulations are being implemented from time to time. But again, but the thing is that we can control this carbon emission to some to a very limited percentage.

Because unless and until we replace it with renewable energy we cannot control, how to reduce the; that means, even if; that means, we have to shift from we have to move away from this kind of energy to unsustainable energy sources from the coal from the you know from the petroleum products too.

We have to how to completely drastically 360 changes shift towards the completely renewable and clean energy and how to use our resources like solar resources, hydro resources, bio resources and you know wind resources for the renewable energy creation that is the biggest challenge that has that we are facing nowadays that has been put before us.

(Refer Slide Time: 23:14)

So, similarly renewable energy is market ready and price competitive. Once we have create we have created once the energy is being created. So, then its distribution, its prices, its it also

creates a kind of you know its creates renewable energy is market ready and price competitive with the conventional sources in many jurisdictions.

So, how to the how to prepare it, how to sell it, how to make it market ready and its price all these are also the conventional and the you know and how to compete with the conventional sources of energy what would be its market price.

So, these things are also the challenges. Similarly, communities and different communities and cities they have also found that the transition to 100 percent renewable energy is largely the matter of political will also because you know it depends on a lot of things like you know political environment, election the and again consensus.

Because first of all in order to implement a policy we need to have the consensus which that we see from the all the political parties should agree together. So, from sogetting a transition from; that means, conventional source of energy to the completely 100 percent renewable energy; that is also that is also a matter of political will cooperation then required technology, resources all kinds of thing.

Like that is why you know you can see that the oil rich countries which are primarily you know primarily monarchy based countries monarchy governed countries. So, they are competitive enough they are not only in terms of resources, but they are in terms of implementation policy implementation also. So, they have the control they have the you know they have the power to implement it. So, that is why all these oil rich countries that in monarchy based countries like Saudi, Middle East countries.

So, they are well ahead of us in implementing these things; because not only they are having the sources also, but they are also shifting they are also shifting in terms of technology transfer they have enough of financial resources and implementation of policy.

So, implementing this 100 percent renewable energy policy transition to the renewable energy policy is also a matter of political will, consensus, commitment you know transparency all kinds of thing and moreover technology transfer is also very important.

So, all the continents are you know setting the ambitious target for getting the renewable energy by 2030, but at the same time we have to resolve all these issues all these internal issues, all the political issues, all the financial issues. So, and that is why the rapid development of

renewable energy has been driven mainly by the wide range of wide range of objectives like objective drivers.

So, it has for the renewable energy also there are three major drivers like as we have already discussed that is one is the economic development drivers, improving the energy security; and energy success and climate mitigation change and others social and environmental implication environmental drivers are also there. So, in the next slides, next class we will discuss about the drivers that govern this renewable energy and sustainable and clean energy.

Thank you very much.