Commodity Derivatives and Risk Management
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Lecture 35
Introduction to Carbon Credit Market

Hi all, welcome to this session on Commodity Derivatives and Risk Management and today we are going to discuss more on carbon derivatives and carbon derivatives do not trade in Indian exchange, however there is considerable amount of trading happens and other international exchanges, so I thought of discussing how what is the carbon credit and what are carbon derivatives and how pricing and valuation of these carbon derivatives are done.

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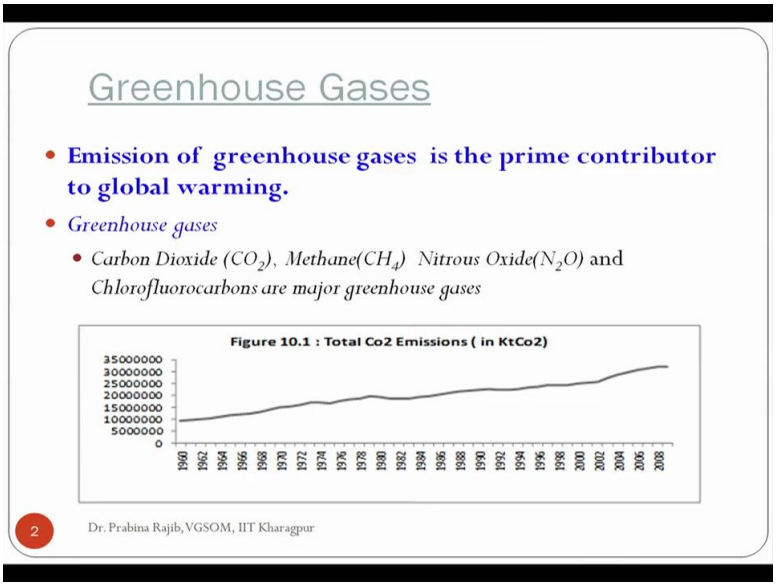

Now all of us know we know that emission of greenhouses greenhouse gases are the prime contributor to global warming and there are lot of discussion and debate is going on what needs to be done so that our greenhouse gas emission is reduced because this emission of greenhouse gases is leading to very extreme weather conditions what we are experience off late. Now before we go into our understanding of what exactly a greenhouse gases and the different aspect of carbon credit as per the United Nations framework on greenhouse gas emissions, the greenhouse gases are categorised as carbon dioxide, methane, nitrous oxide and chlorofluorocarbons are major greenhouse gases and the total emission of greenhouse gases all over the world is increasing at a very high rate.

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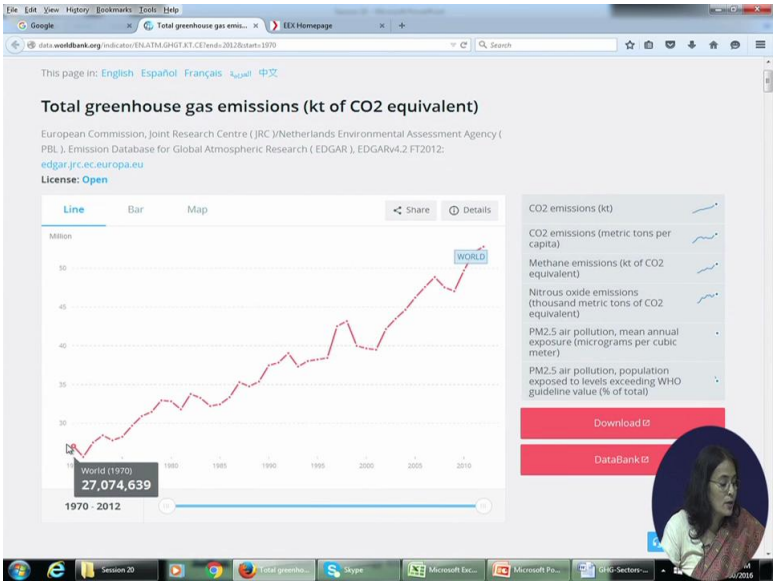

And this particular picture shows the total carbon dioxide emission kilo tons of carbon dioxide gas emission from the year 1960 to 2008 and I have downloaded this data from this if you can see this data has come from the world bank website, so this it is clearly visible to you if you see this one in 1970 total greenhouse emission in kilo ton of carbon dioxide equivalent was standing at 27.074 million and by 2010 it has gone 2012 it has gone up to 52.762 million. And if you can see it is absolutely you know growing at a very high rate, of course in the year 2008-09 it went down little lesser but subsequently it is going up at a you know at a relatively good rate.

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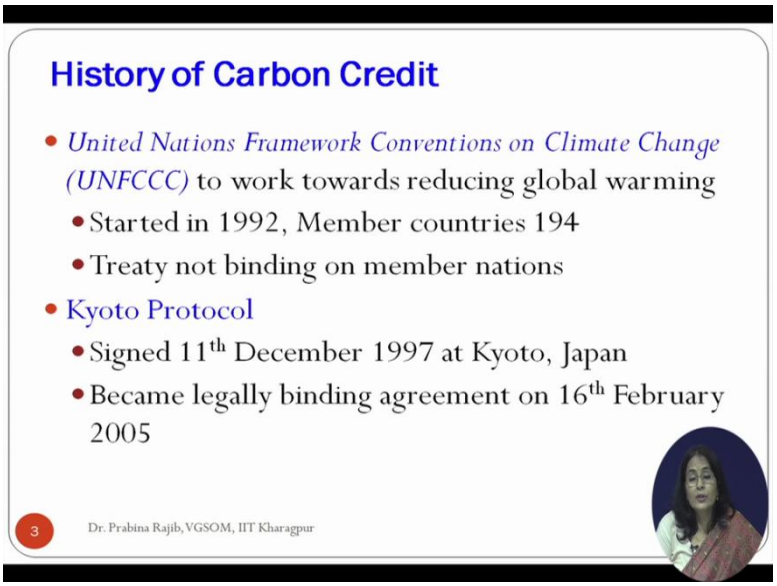

Now the need for controlling the this greenhouse gas emission was felt long back and the first convention that is United Nation framework convention on climate change UNFCCC came into existence in the year 1992 and it had a member nation of 194 countries and these countries understood the importance of reduction of greenhouse gas emission and the negative impact of greenhouse gas emission on the global climate and weather conditions. And they in 1992 treaty they made and made certain decisions to reduce the greenhouse gas emission, however this treaty was not made mandatory among the member nations because of certain conditions.

So this UNFCC required certain conditions to be made before this the treaty outcomes were or treaty policies were made mandatory. Kyoto protocol was Kyoto meeting United Nations framework convention on climate change meeting at Kyoto was held on 11th December 1997 and on this date this these member nation decided that this particular Kyoto protocol rules and regulations is going to be becoming a binding agreement and this agreement came into existence from 16th February 2005.

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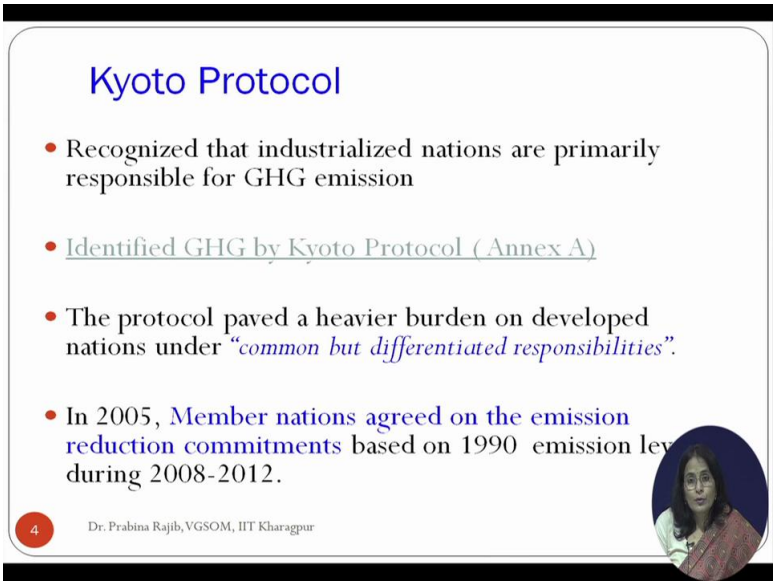

So what is the important or silent point with respect to this Kyoto protocol, the Kyoto protocol recognised that the majority of greenhouse gas emission is contributed by the industrialised nations and they are primarily responsible for the greenhouse gas emission and this protocol paved for a heavier burden on developed nations under the common but differentiated responsibilities? So what is this meaning of common but differentiated responsibilities? This Kyoto protocol indicated that it is the responsibility of all member nations to work towards reduction of greenhouse gas emission.

However a major share of this responsibility will be taken by the industrial nation and during this Kyoto meeting it come this UNFCCC also identified, which are the activities industrial activities which are contributing to the greenhouse gas emission and which are the greenhouse gases, which gases will be treated as a greenhouse gas. So this I hope it is visible to all of you so this is the please see this one the list of greenhouse gas and list of sectors generating this greenhouse gas as identified by the Kyoto protocol.

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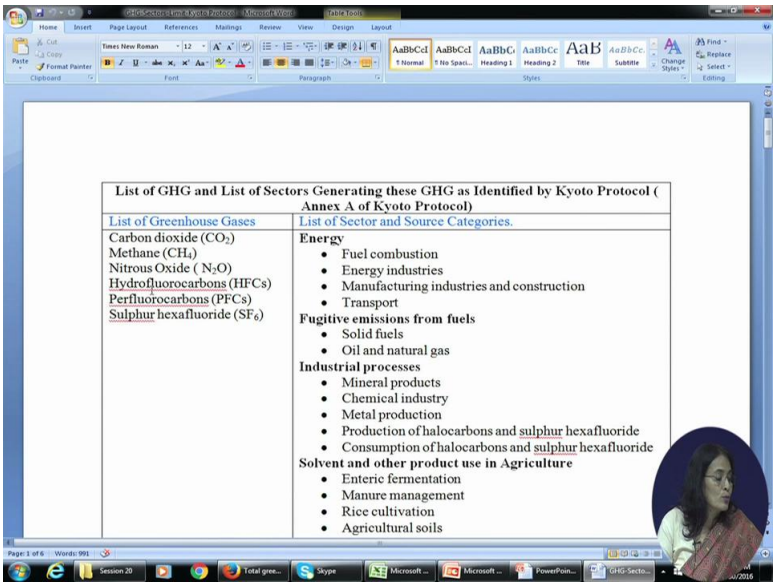

So this is your carbon dioxide, methane, nitrous oxide, hydro fluorocarbons and sulphur chloride all these are your GHG gases and which are the sectors which are responsible for generating these GHGs. So you have fuel combustion industry energy industry, transportation, your industrial process, mineral process, chemical industry, metal production and you have solid waste disposal, waste water handling waste incarnation and all this these industries were responsible are responsible for generating greenhouse gas.

So this gave this particular detail got formulate during the Kyoto protocol. And during 2005 when this Kyoto protocol became a binding agreement, this member nation agreed on the emission reduction commitment based on the 1990 emission labelled during 2008 to 2012. So let me rephrase, in 2005 this Kyoto protocol agreement became a binding requirement and as part of this binding requirement all member nations agreed to reduce their GHG emission but reduce GHG emission based on which year database, that is based on 1990 emission label and the reduction is going to happen during five year that is from 2008 to 20012.

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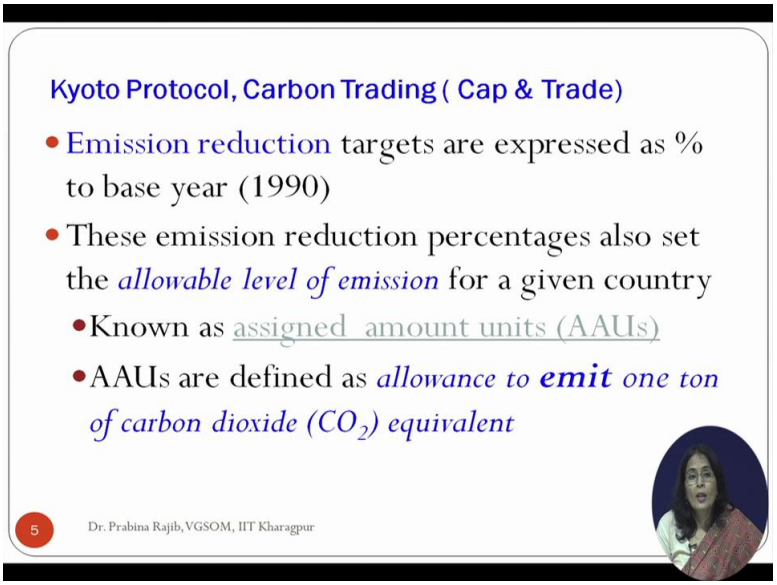

Let us take an example to understand this, so this emission reduction targets were expressed as a percentage of the base year GHG emission label. So let us say if a economy u or if a country was a countries GHG emission was X tons in the year 1990 and the country agreed to reduce this GHG emission by let us say a country agreed to reduce the GHG emission by 8%, so and this reduction is going to happen let us say within five years that is from 2008 to 2012.

So this emission reduction targets were expressed as a percentage to the base year 1990's GHG emission label and this emission reduction percentage also set the allowable level of emission for a given country that means how much GHG a country is allowed to emit because a GHG cannot be emission of GHG cannot be fully stopped, the as long as the industrial activities is going to go on and our needs for air conditioner conditioners, our quality of life is increasing and we are acquiring more goods and services so as long as human beings are going to live in this earth, greenhouse gas emission is going to be there.

So it cannot be completely done away with it, however greenhouse gas emission can be reduced and so this a protocol allowed for the maximum amount of GHG which a country can emit and this limit is or this limit was expressed in terms of assigned amount units or called AAUs. So what is an AAU? AAU is defined as an allowance to emit 1 ton of carbon dioxide equivalent, so AAUs is allowance to emit 1 ton of carbon dioxide equivalent. Now let me read out what is the article 3 of the Kyoto protocol which spells out the procedure for emission reduction please if you see this.

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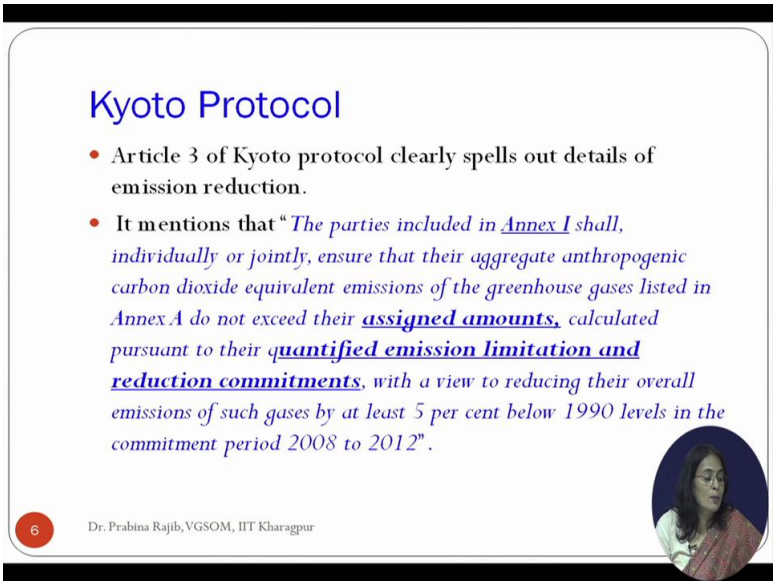

This it mentions that the parties which are include or the countries which are included in Annex One shall individually and jointly ensure that they are aggregate anthropogenic carbon dioxide equivalent emission of greenhouse gases listed in Annex A do not exceed their assigned amounts, calculate pursuant to the qualified emission limitation and pursuant to their quantified emission limitation and reduction commitment with a view to reducing their overall emission of such gases by at least five% below 1990 level in the commitment period 2008 to 2012, so all member nations agreed to reduce their GHG gas emission with respect to the 1990 level.

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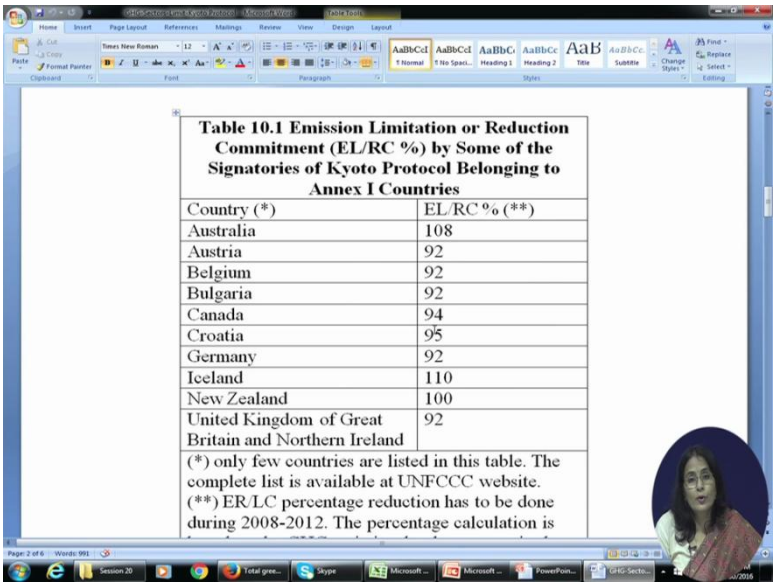

Table 10.1 Emission Limitation or Reduction Commitment (EL/RC %) by Some of the Signatories of Kyoto Protocol Belonging to Annex I Countries

Country (*)	EL/RC % (**)
Australia	108
Austria	92
Belgium	92
Bulgaria	92
Canada	94
Croatia	95
Germany	92
Iceland	110
New Zealand	100
United Kingdom of Great Britain and Northern Ireland	92

(*) only few countries are listed in this table. The complete list is available at UNFCCC website.
(**) ER/LC percentage reduction has to be done during 2008-2012. The percentage calculation is

Now let us take so this particular table if you see this particular table indicates what the allowable limit for different countries is. Let us say Australia is allowed to emit 108% of the 1990 level, 108% of the 1990 level, so if Australia was emitting 100 units of carbon dioxide equivalent in the year 1990 by 2002 it is allowed to only emit 108 units, it is not allowed to emit more than 108 units. Similarly you have Austria which is allowed to emit only 92% of the of the 1990 level. Now some of you may ask this question why a country would be allowed to emit more than the other country.

Maybe the nature of business, nature of industry is such that by the this industry are in general emit more greenhouses gases so if the protocol becomes too stringent maybe economy will not be or countries will not be interested to be part this agreement. So depending upon the past history of the economy and the business venture which is there in particular country different countries were allowed to emit different amounts of greenhouse gases. Similarly you have UK was allowed to emit 92% of the 1990 level.

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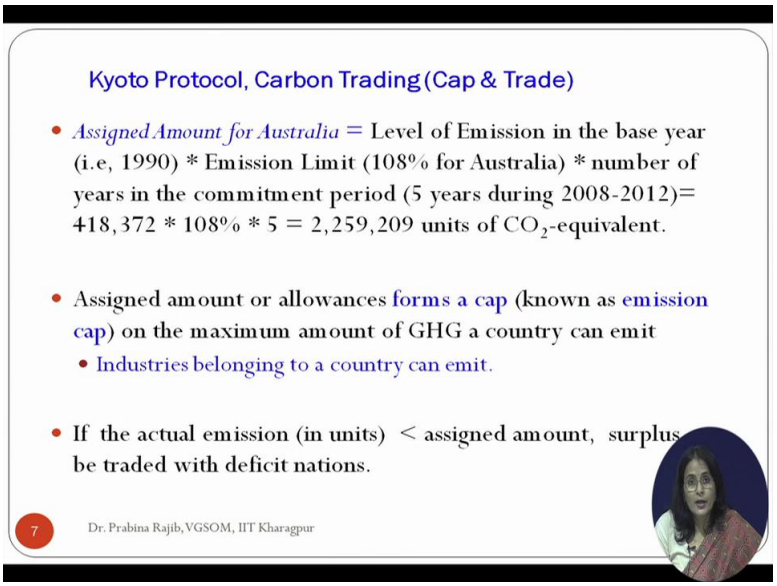

Now let us take this example, now let us calculate what is going to the assigned amount for Australia, so level of emission in the base year in the 1990 for Australia is around 418372 as you can see, so in 1990 the number of or units of A used which were emitted by the Australian all industries together in Australia was standing at 418372 this will be multiplied by 108% and into 5 years. So that is coming to your 2.259 million units of CO2 equivalent. So the Australia as a whole or all industry in the Australia as a whole are permitted to emit only this much of carbon dioxide equivalent within these 5 years from that is 2012 to 2008 to

2012 and this assigned amount or allowances formed a cap that is known as your emission cap.

That means Australia is not allowed to emit any more a greenhouse gas than this particular limit. Now if industries belonging to Australia or companies belonging to Australia emit greenhouse gases which is higher than this level than they have to buy this amount this excess greenhouse whatever they are emitting that many units they have to buy from some other nation. So that as it as you can see if the actual emission in unit is less than the assigned amount the surplus can be traded with the deficit nation. So each for each nation total amount of emission which can which nation or country can emit that was given so the upper cap is given and if a country emits more GHG it has to buy from other countries which have a surplus GHG that means they have emitted less amount of GHG as compared to the maximum amount permissible for that that country.

So this particular program was known as cap and trade, so there is a cap for the total amount of greenhouse gas which can be emitted by a country, if the country crosses that cap it has to buy that one from other countries. Besides this cap and trade cap and trade initiative or mechanism Kyoto protocol also initiated to other mechanism those are known as your clean development mechanism and joint implementation. Let me repeat, besides the cap and trade program, Kyoto protocol also identified 2 other initiatives that is clean development mechanism and joint implementation so that the member nations reduce their greenhouse gas emission.

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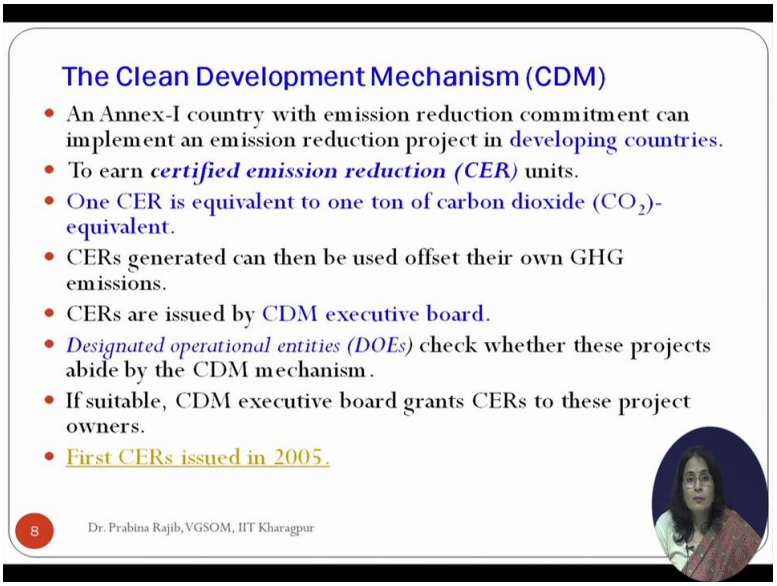

So what is exactly a clean development mechanism, a clean development mechanism in a clean development mechanism a member nation can start a project in a developing country and can earn certified emission reduction units that is CERs. It can earn CERs by starting a project in a in a developing nation. So what kind of a project it will be starting, let us say a a Annex 1 country will be let us say it starts a rural electrification program in a some country rural electrification program in some country based on the solar panel.

So that Annex 1 country by undertaking this particular project will be able to earn some certified emission reduction units or CER units and this CER units can be can be traded in the exchanges commodity exchanges for generating some generating some cash flow for that for the companies which are which are owning this CER. So what is this CER? 1 CER is equivalent to 1 ton of carbon dioxide emitted carbon dioxide equivalent.

And this CERs generated can be used to upset their own GHG emission, so in the in the actual activity if they have let us say, if a particular country all industries from the particular country have emitted more greenhouse than whatever has been permitted by the cap and trade program, so these companies can initiate these CER these companies can initiate clean development mechanism related projects in other developing other developing nations and can earn certified emission reduction units. And who is going to check whether the projects are as per the clean development mechanism rules and regulation, so the even if CC has appointed certain designated operational entities which check whether this projects abide by the CDM mechanism or not and if the projects are fine and they are as per the CDM guideline, the UNFCC issues certified emission units to the project owners.

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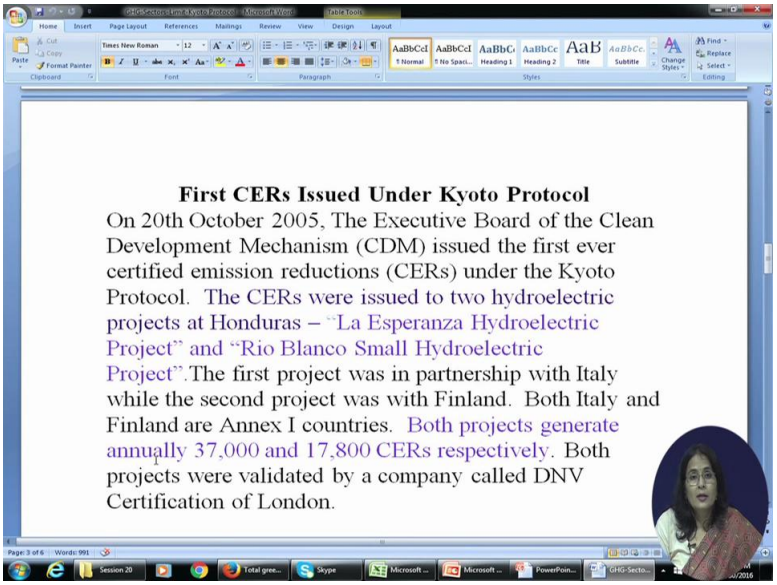

Now the first CERs were issued in the year 2005, so please quickly I want you please go through this particular paragraph which is in front of you, please see that the first year issued under Kyoto protocol in on 20th October 2005, the executive body board of the CDM issue CERs to 2 hydroelectricity projects, which were undertaken at Honduras and it was taken undertaken at 2 electric projects which was taken at undertaken at Honduras and the first project was in in partnership with Italy and the second part project was with Finland and both projects generated about 37000 and 17800 CERs for the project owners.

And who was the designated operational entity? That is the DNV certification of London, there is company called DNV certification of the London. Now subsequently many projects which have been undertaken as a part of the clean development mechanism and some of the recent recent CERs which have been issue by UNFCC if you can see it is as late as 29th July, so Salkhit Wind Farm, it was how many units of CERs are issued, it is 72940 CERs been issued and which in which country it was undertaken it is it is Mongolia and which is the other party, this is a Sweden, so this information again I have downloaded from United Nations UNFCCC website. So other different projects are there if you are interested you can download this information and which indicates how many CERs is being issued on a daily basis.

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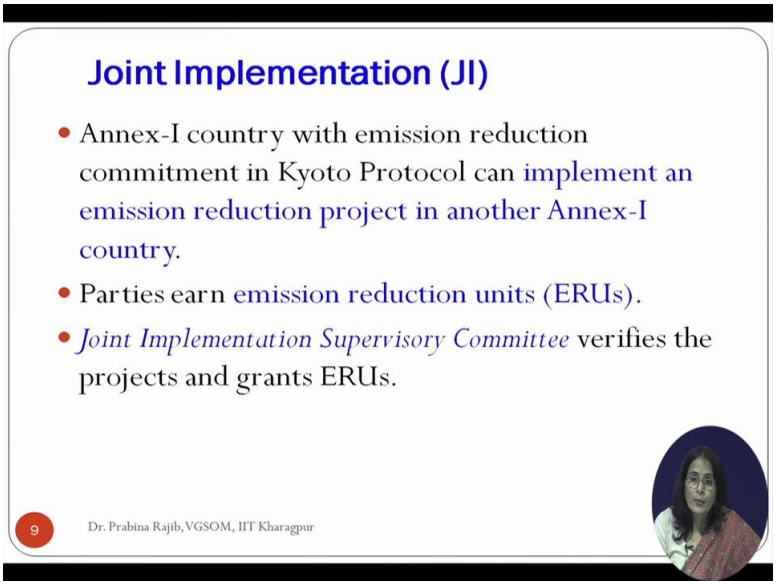

Even if in fact if you see on 29th January 2016 you have four projects which have been verified which have CER's are issued for these 4 projects. Now let us go to the third mechanism that is your joint implementation program. As part of the joint implementation program the member nations which are annex 1 countries up countries they can start some project with another annex 1 country and through this kind of a project they will be earning ERU's that is Emission Reduction Units. And this joint implementation supervisory committee will verify whether these projects abide by the joint implementation guideline or not and if the projects are abiding by joint implementation guideline this they will be issued emission reduction units.

So just to summarise you have a based on the GHG emission based on the cap and trade program, counties will be allowed to have a AAUs that is Assigned Amount Units AAUs a use as part of your clean development mechanism they will be issued a CER Certified Emission Reduction Units and as part of the joint implementation they will be issued emission reduction units. So these are basically in fact, all these three are same but the way these are generated this carbon credits are generated is different so to differentiate the process of generation this has been named different. And they also when this are traded in the exchange also they are traded by these names and the price of these carbon credits at times vary from each other depending upon the supply and demand.

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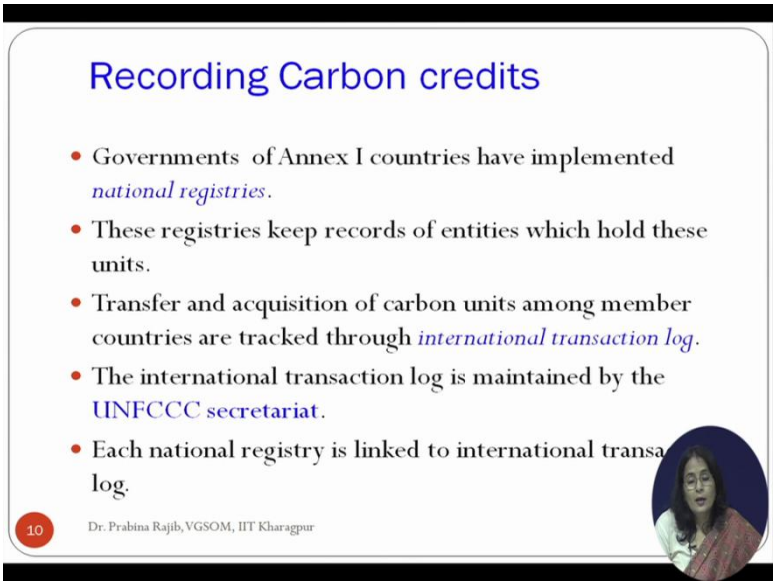

We will come to this aspect little later. Now how this carbon credits are recorded, so there is a each country has to maintain a national registry, let us say a company in India undertakes certain initiative by which it is reducing the greenhouse gas emission and or which it should it would be earning certain carbon credits so that in that registry, national registry that will be that information will be recorded. That information will be recorded, and you have all these national registries are connected to the international transaction log, and this international transaction log is maintained by UNFCCC secretariat.

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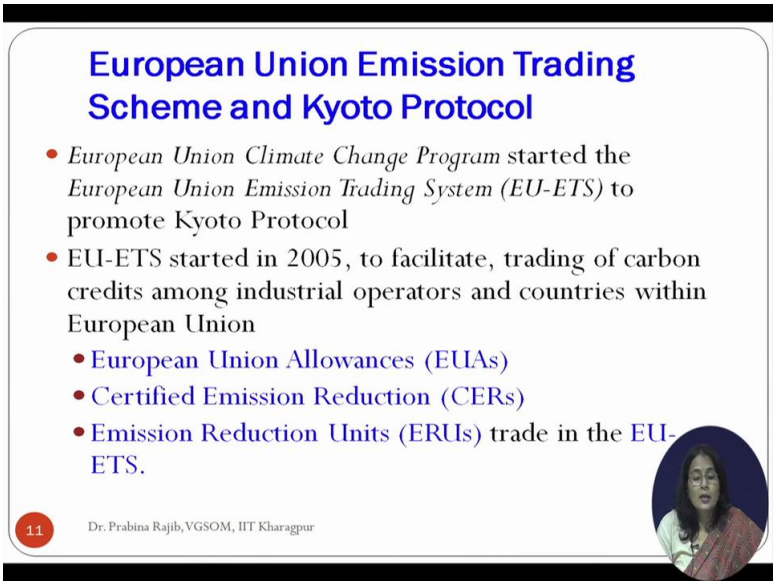

Similarly like your UNFCCC to in fact to bolster the activity of UNCCC you have European Union of emission trading which started a trading system called European Union Emission

Trading System. Let me repeat European Union climate change program started a trading system called EUETS that is European Union Emission Trading System to promote the Kyoto protocol, if is not a parallel initiative, it is just to promote the Kyoto protocol initiative a new trading system was formulated which was named as EUETS and what was the objective of EUETS, EUETS was started in 2005 to facilitate trading of carbon credits among individual operators and countries within the European Union.

So even if a country has a surplus or deficit carbon credit, so there should be a easy way of buying or selling these carbon credits, so this particular trading system aimed at facilitating the trading of carbon credits among the European nations. So exactly when this in the trading system the AAUs are known as EUAs and CERs the same CERs which were generated as part of the clean development mechanism and emission reduction units as part of the joint implementation. So with this we will be winding up this session and we will be continuing with the remaining part of the carbon credit derivative trading in the subsequent session, thank you all of you.