Sustainable River Basin Management

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Module – 01

Lecture – 05

Part - 05

Welcome everybody to Sustainable River Basin Management Module 1, Part 5 plus part.

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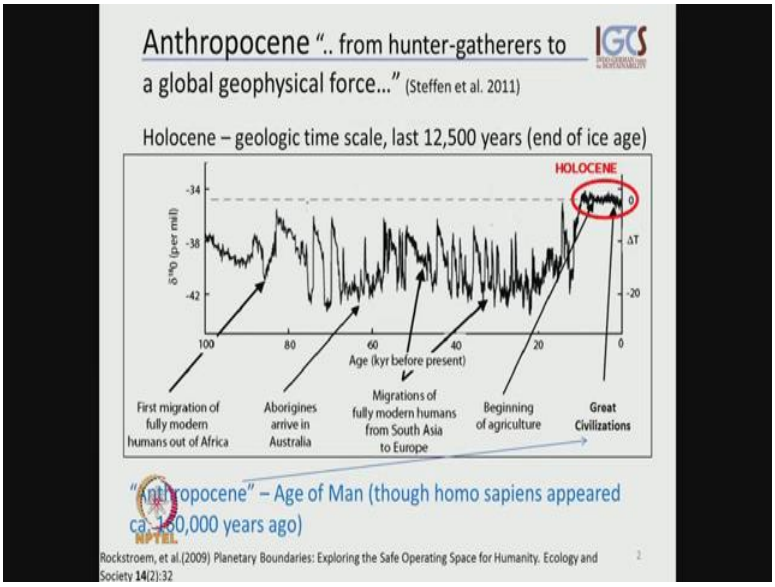

We will today speak about the Anthropocene which is (refer time: 00:29) from hunter, gatherers who are a global geophysical force; we look at what happen to human kind in this particular geological time. We essentially speaking about Holocene which is a geological time scale that covers the last 24 and half 1000 years, essentially the end of the ice age and there is a particular thing about the Holocene which you can see here, when we look at climate development. This is a graph that shows us on one axis our years and 1000's years before from today before present. And on the other axis we have stable isotope, in this case the stable isotope ratio of oxygen in the water.

This stable isotope or stable isotopes help us to detect and reconstruct polio climates and what we can see here, very nicely is that our earth has seen peeks extreme events from

very cold to very hot. Again changing to very cold years and hot years over the past about 100 and 1000 years and then doing Holocene create we see that our climate actually stabilized at a fairly high stable warm temperature.

How do we know those temperature changes here? We will be looking at ice course from our ice shields which allow us an archive of the climate. So, what we also see we can relate our climate changes through migration pattern of human population and we see that major migrations we always get it during the cool seasons, during the extreme events of cold appears. So, all of those were force migration and the disposal of the human population across the entire world.

But, we also see that this stabilisation of our current climate, the climate that we live in today, we see the development of what we call the great civilizations across the world. Now, this particular period when our great civilization started to develop and came into being is also called the Anthropocene which is translated into the age of men.

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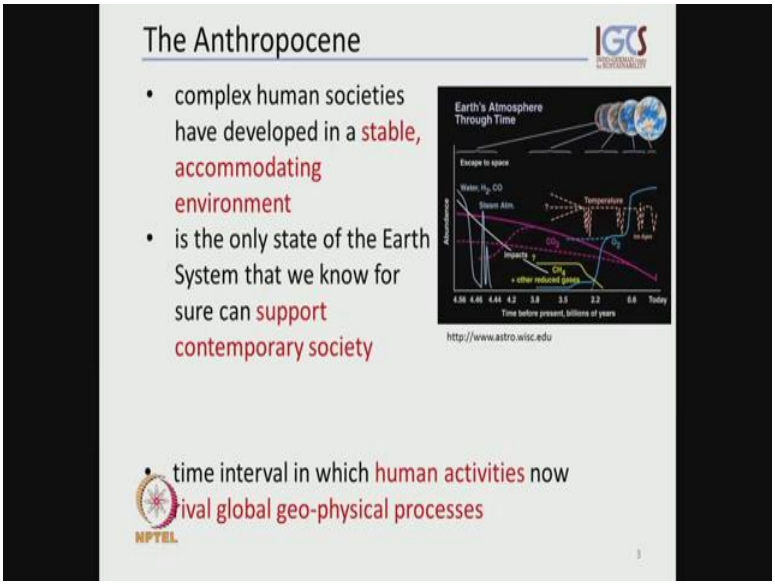

Let us look at what this Anthropocene actually means. Let us say if you look at the Perce atmosphere development as we know today. We know at all this is about four and a half billion years old know the set, this is the lock scale here. And obviously, we have more detailed information in the recent for the last two and half million years and information becomes more, scales more uncertain future way. We try to go back and our history, we see a set climate at the atmosphere changed and developed.

So, the atmosphere composition changed, but it reached a fairly stable, high favorable condition for human development in the period that we call Holocene today. So, let us keep in mind that changes in the atmosphere are part of the real system and we have just looking right now, when we talk about Holocene into a very short time window of the earth. Now, what is special about this Anthropocene is that it allowed the development of the highly complex human societies.

So, this stable environment that in a way also is accommodating our needs in a perfect way and as far as we know today, which is also the only state of the system that can support our current societies. It also is the period where actually our human presence or our human activities actually have entered into competition arrival stage of global geo physical process and what this means, I will show right now.

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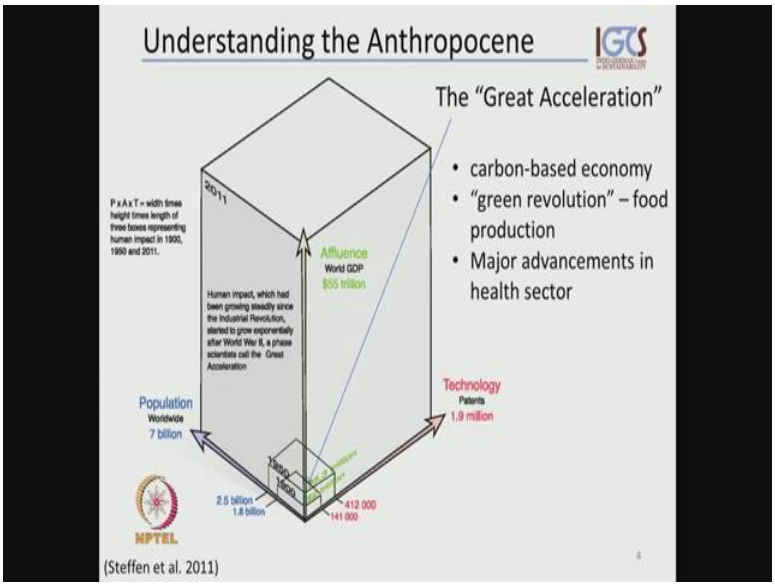

Let us try to understand this Anthropocene and here we have a graph that was produced by Steffen et all in 2011 showing on one access the population curves, population numbers on one axis technology, increase measured in the number of patterns. And on this side axis something called affluence which is well expressed in terms of the world cost domestic product. Now, spending this into a space and to the special frame like in this case, we can see that our wealth's, our human impact actually increased potentially from the 19's essentially onwards and that is particularly cool to exponential dimensions from the 1950's onwards.

Now, remember what we have been talking about in previous lectures on our carbo based economy. And this point, where this acceleration took place, it started to take place we also call the great acceleration and it actualluy goes hand in hand the switch to our carbon based, today's carbon based economy. It also goes along with major technological advancements which led us to the so called green revolution. Actually allowing food self-sufficiently, increasing at large scale food production, there is many problems associated to it and the nature advancements in the health sector which enabled a major population growth.

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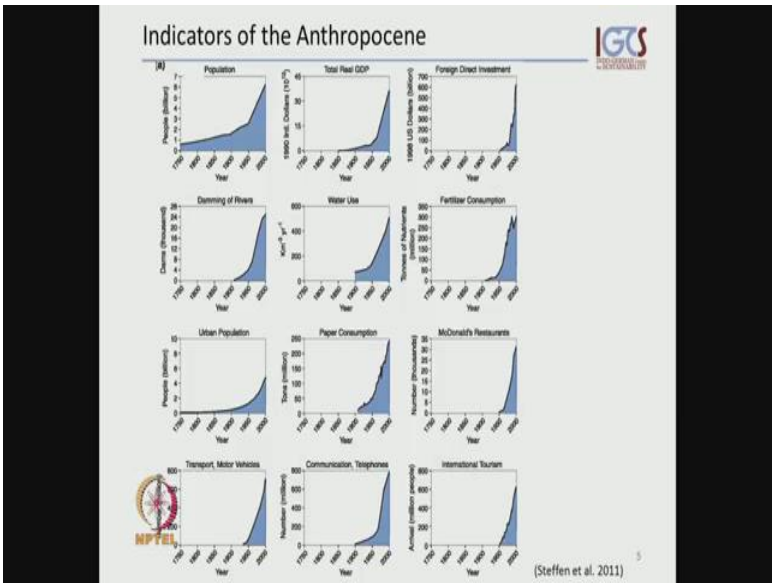

Now, we can look or we can take so called indicators of this Anthropocene and any of these we can pick population GDP for direct investment, we can look at international tourism, McDonald's restaurants, paper consumption. It does not matter which one we pick, all of them will show similar (refer time: 08:50), which is extremely exponential. So, in this exponential development started goes hand in hand about what we have been talking about earlier. This switch to our carbon based economy, where some consumption, increased in consumption. Now, this is quiet (refer time: 09:11) and we will come back to this later, again I will talk about that.

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Now, let us look at the distribution of that bells, this is a graph that was produced publish by a economist. You show see here a change in world GDP on each previous year and we have subdivision here between so called rich countries the so called BRICS fixed countries and other emerging countries and total which follows as that line here. And what you can see is, this only starts in 1998, and goes to a about today the BRICS countries means it is an abbreviation for Brazil, Russia, India, China and South Africa. What you can see here that over we have an increasing trend of the GDP.

However, this lot of variation between years and what we can also see is that this over increase mostly takes place in the so called BRICS and the emerging countries where as in the so called rich countries, where GDP is actually decreasing and has seen a major break down in the year 2008 and 2009. So, what we can notice here is that our concept of rich and poor countries or developing and developed countries is not holding any more, the way we had established in the 1980's or 1970's.

Actually, there are 52 countries of the world representing about 90 percent of the world GDP. And the major portion is accumulated in those emerging and BRICS countries which have been less affected by the major financial of global economic crisis in the recent past.

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Now, let us just look at those BRICS nations, what we see here is where those countries are located and we see that many of these countries have major problems in literacy, education, education sector in those countries, not perfectly covered and some poorly covered, you also see that we have a major work force right now. In some of these countries more than 50 percent of the current population actually has an active work force. Some of the countries have a very low work force, but it accounts to a very young population.

So, in the very near future that work force will increase considerably and life expectancy is comparably low, compared to what we call the developed countries. However, those few countries actually bring together about three billion people and accumulate about 45 percent of the global GDP. That means that there is a considerable decision power accumulated in those countries in the way how resources as spend, how development causeways are chosen, where to engage, what priorities set in this also accounts to how energy sectors will develop, how resource choose will be defined by those countries which affects the global economic in large. So, let us something we should really keep in mind before putting the finger at a neighboring, neighbors in other continents.

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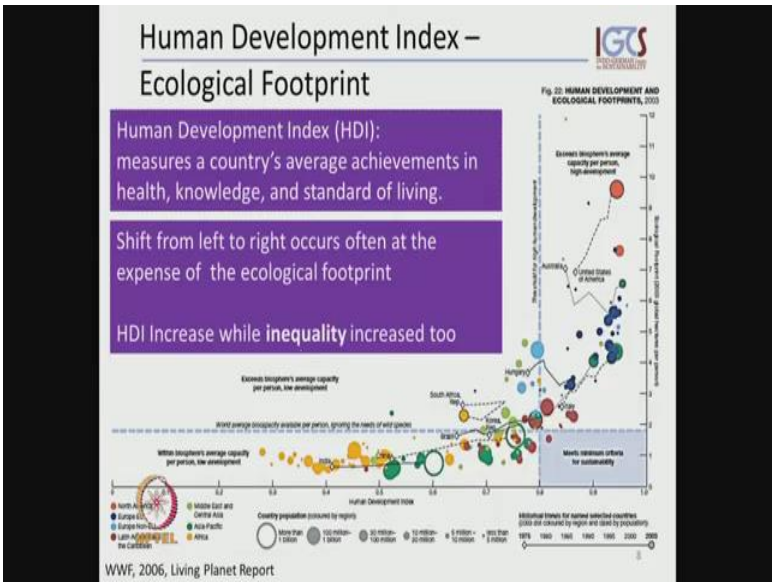

Now, there is a nice relationship between the human development index and the ecological footprint, we have been talking about the ecological footprint earlier. This comes from a report produced by the WWF in 2006. There is more recent report produced in 2013 by this WWF, but this figure actually is quite useful for demonstrating that particular relationship and I did not find it in more recent document.

So, what you can see here is a relationship between human development and ecological footprint. So, they are countries many countries with fairly high human development index which at the same time have indeed a way high ecological footprint. So, essential they are trying resources from the other areas, the other regions to compensate for their over usage, over consumption. But we can also see that some of these even in between fairly high (refer time: 14:47) development in (refer time: 14:49) we have a countries with considerably low ecological footprint.

So, it is possible to achieve associate economic development and not compromising extra high level our equal systems carrying capacity. What you also can see is, how some important major countries, fixed countries for instance have increased the human development index and how they are ecological footprint changed from the year 1975 to the year 2003. And let us have a look at India, what you can see in the first place is a major population increase, exponential to what we know today and what you also see as

a major shift from, if any low human development index to a higher human development index, where by the ecological footprint did not increase that is quite remarkable.

So, it is possible to invest in key parts, key components which improve human and social prosperity, without actually having a large impact on the ecosystem. And then we have countries which actually follow strange pass ways which any way reflects the issues of health's of political and political stability. Health especially the inspect of HIV and other large epidemic means.

Now, let us keep in mind that the human development index is simply a global average, it is an measurement of the global, achievement that help in social economic development, it does not really show as the changes in poverty elevations in overcoming inequalities.

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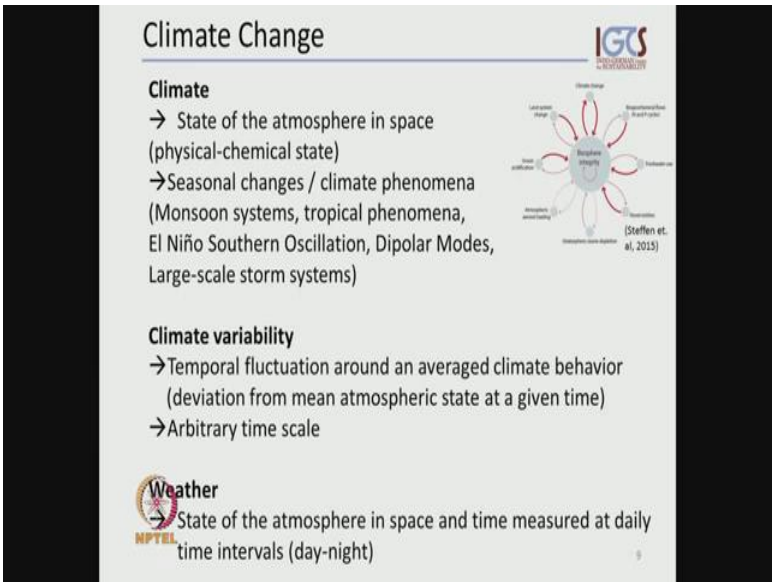

Now, let us look at climate change, because there is what we talked about earlier in the planetary systems boundaries and we where saying that climate change has a major impact on our survival on biosphere integrity. What do we mean by the term climate in general? It essentially states tells us the state, describes the state of the atmosphere in space which means the physical and chemical state. So, it includes temperature changes in the chemical composition of our atmosphere and it states the seasonal changes and those seasonal changes are also called climate phenomena. One way known in this region in India's are the monsoon system or El Nino events, and you also hear that we

very often, when we talk about climate change, we here the term climate variability and what we mean by climate variability is all those temporal fluctuations around an average climate behavior.

So, we may use a mean annual long term measurement and say what is our current temperature, rain fall pattern compared to this it may be above this, may be below, it may indicate a drought of flatter scenario. So, we have to keep in mind that this is an arbitrary time scale, it changed and applied in different ways for different purposes. Let us say for insurance purposes it is different compared to agricultural planning and in the third term to climate change which is the term better, which simply is an expression of the atmospheric state and space in times measure at it daily time interval. So, that is day night changed which essentially determines biological activity, this also quite important.

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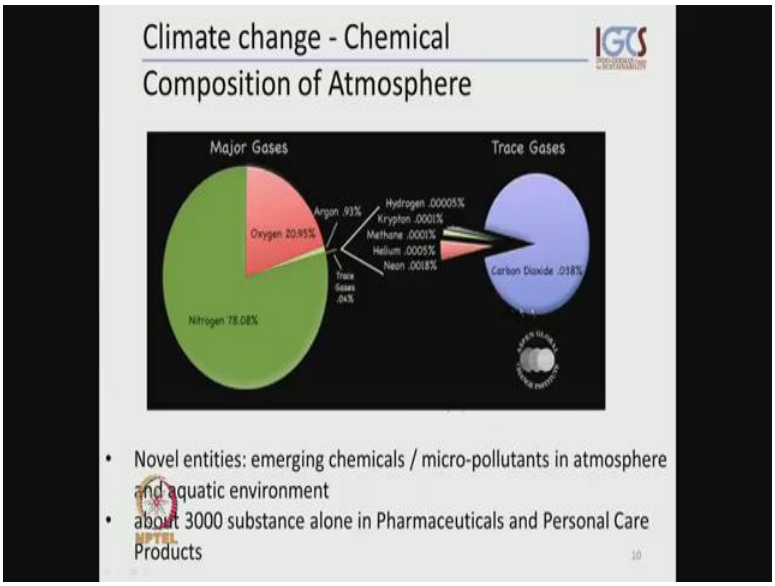

Now, let us have a look at the climate change and the chemical composition of the atmosphere. You know that the atmosphere essentially consists of three major gases nitrogen, oxygen and argon in an as a minor portion of a trace gases and this minor portion of trace gases is one that is important in we talk about climate change and green house gas emissions in general. Now, this trace gas competition here is changing, our carbon dioxide emission's are increasing methane in our atmosphere is increasing.

So, this is what triggers major changes in our atmosphere and major change that lead us to climate change. And then there is what we remember from planetary systems

boundaries the term called normal entities. Which also comes influences or inspects is trace gas a composition, which are emerging chemicals, micro pollutants in the atmosphere and aquatic environment, just to mention alone from a ((Refer Time: 20:49)) about personal care products about 3000 (refer time: 20:53) substances which all end up somewhere here in this.

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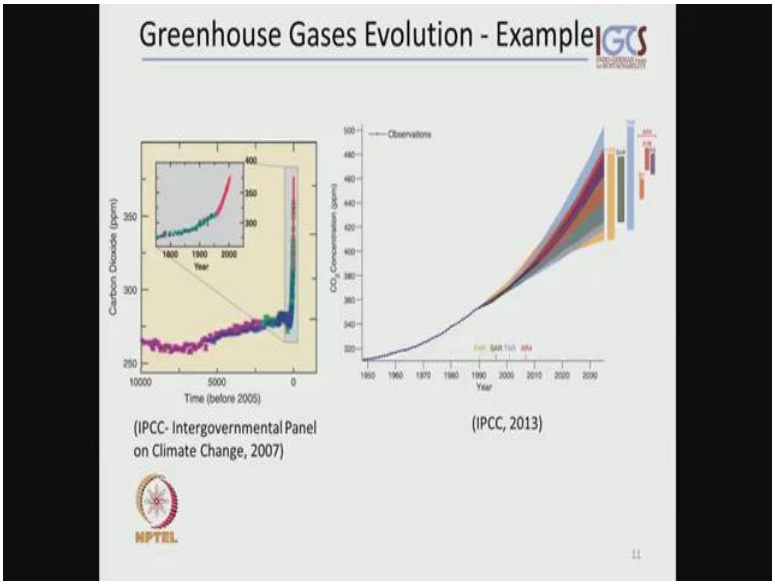

Now, let us look at examples of green gas evolutions we do not have time to look into each and everything but let us just look at two examples. And let us look at carbon dioxide here, what you see here is, this was produced in 2007 by the intergovernmental panel on climate change IPCC. This increases exponential spike that, we have seen in all the other indicators as well.

And this is quite a occupation, because it links the, vital links to mass extinctions before (refer time: 21:44) on our planet before we came into existence. And there are different scenarios of models being calculated try to project the path way under different scenarios. Let us say a no change, if nothing is been done no intervention be done, what the change will be, what the impact will be and if we apply certain measures how this will potentially impact or reflect on carbon dioxide emissions.

So, we get this wide range of possible concentration in the future and then we have this pointed or dotted curve here which shows, what is actually measured and we see that we are fairly in between the extremes of what has been protected. This is from the most

recent report of 2013 produced by IPCC. You should check those reports and get a more in-depth information from that.

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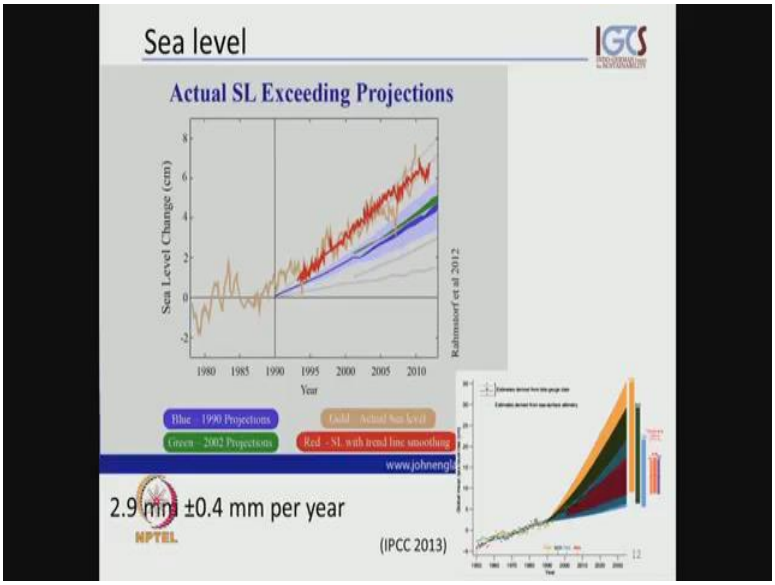

And let us look at sea level change another of the parameters indicating that climate changes or temperature increases taking place. We actually see here the measured values and the protected values and we see here that actually measured values may for exceed the projections. And we also see that wild range of protected sea level changes and again the measured values here. So, overall we have about 2.9 milli meters plus minus point 4 in sea level increase per year measured already.

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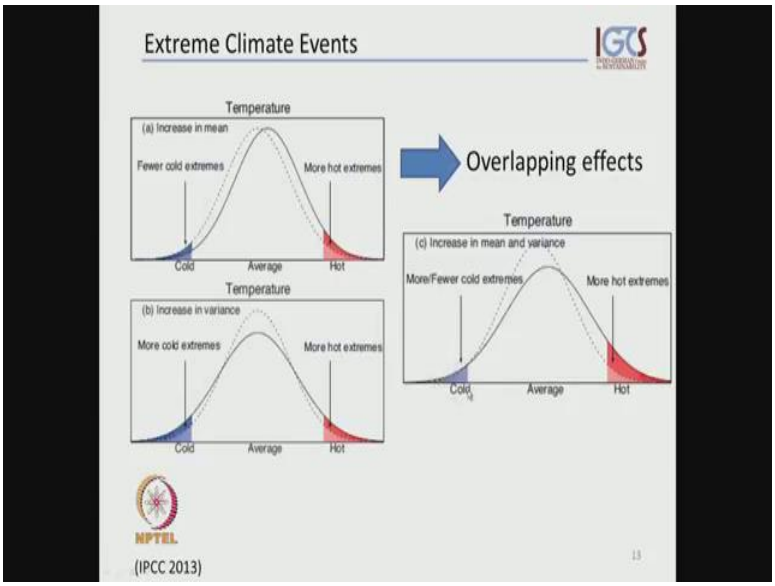

So, along was the change in our atmospheric composition. (refer time: 23:56) where composition. We also observe, measure the already extreme climate events and have been observing an increase in mean average, in our mean temperature, atmospheric temperature. And we said shift takes place over which leads us to an decrease in cold extremes and an increase in shift towards more extreme hot events. If we combine, if we look at the variants of these temperature events, when we see that curved ends to flat end shift pattern, which also means that we end up having more cold extremes and at the same time also more extremes in countries on regions where we are not used to these extremes.

So, and then we have we could just picked any other of these parameters precipitation also, but we always have an over lapping effect of those. So, if we combine in this example mean temperature and the increase in variance, then the result is over all more extreme hot events to be expected and if there is a cold event, it will be also very extreme. So, there will be few events, but extreme on the other end.

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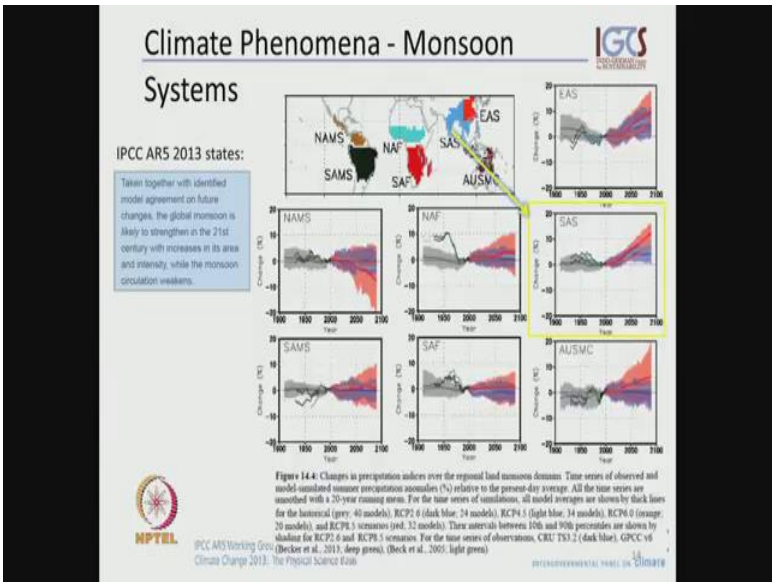

Now, let us look at climate phenomena and just the monsoon system, because its most relevant for this region here. There are several systems under different names and have picked India here. What you see in those is an increase in, there is a change in monsoon pattern and the most recent work group technical work group of the IPCC in 2013 actually is summarised in this way I wanted to keep this so, that you see the length which we carefully crafted and which shows how much uncertainty is there in how much ((Refer Time: 26:40)) also is in, we have not served and expected.

So, it is actually saying that the taking together this identify modeled agreement on future changes the global monsoon as likely to stay so in the 21'st century, increases in this area and intensity by monsoon circulation weakens. So, this is what the prediction is for monsoon systems.

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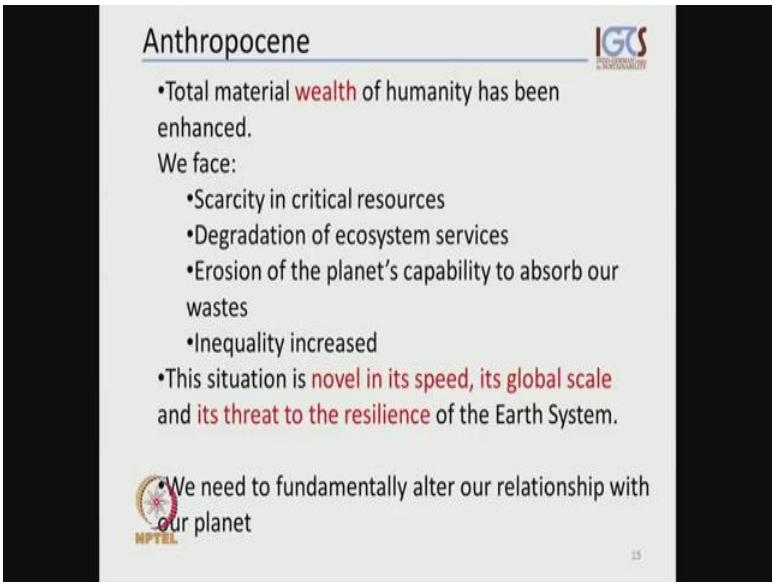

Now, let us summarize what Anthropocene means over; that means, that our total material wealth's of the humanity has been enhanced. So, as poverty increase as well, but total global wealth of humanity has substantially enhanced. And at the same time the phase sees issues like the scarcity in critical resources, the degradation of ecosystem services, the erosion of our planet's capacity and increasing inequality, poverty.

Now, what is special here that, this is normal in its speed, the global scale affects everybody and the actual threat not to local eco system, but to the resilience of our entire earth system. So, which takes us to the step that we ourselves have to fundamentally change our relationship to our planat and to our environment in particular.

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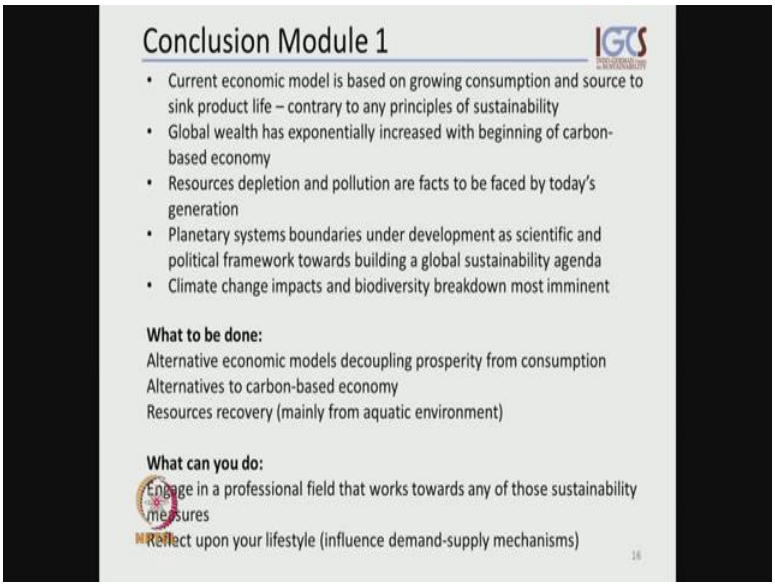

Now, I would like to conclude module 1 at a step, what we have been saying and investigating that our current economic module space on growing consumption and sources to sink product life cycles or life systems, which is completely contrary to principles of sustainability. Our global wealth here is exponentially increased versus the beginning of our carbon based economic resource, depletion and pollution affects which have to be phased by today's generation is not an issue of tomorrow or next generation.

It will affect us, already planetary system boundaries or currently under development from a scientific point of view to clear centrifugal and political frame work, which will have countries to develop to get on hopefully the global sustainability, again. And well climate change impacts and the breakdown of the biological integrity or imminent. So, I do not want to leave you stop you at this stage with such a blank out view. I want to also high light what to be done under these conditions.

Identity economic models which decouple our human prosperity from consumption have to be developed in are in some positive world under development. There must be alternative to our carbon based economic energy systems must change, our natural resource space based on carbon has to change.

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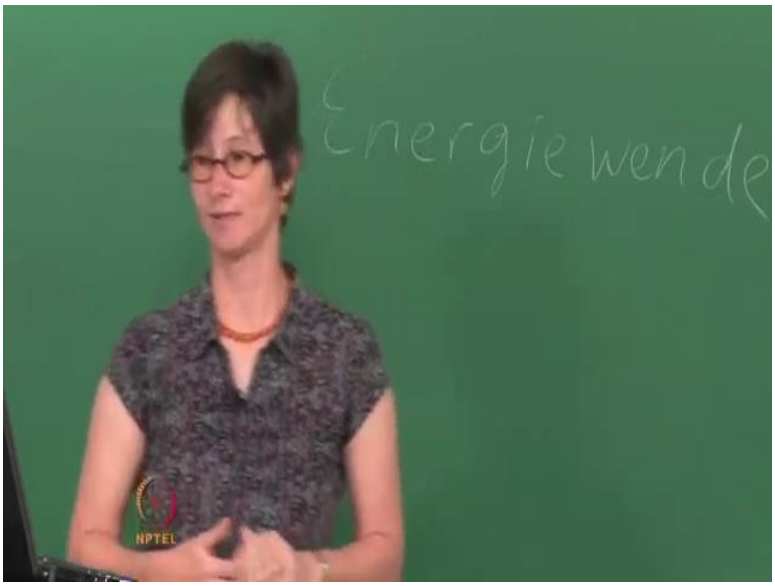

And also some countries which actually work on this may have read about it or may read about it, the German term, energie wende which actually expresses a major profound change of economic and social systems towards those initiatives. And that our economic has to overcome resource recovery mainly from aquatic environment systems, lakes, oceans and so on.

What can you do new is you should engage in profession phase that work towards any of these sustainability measures. And you could also reflect upon your own life style, because you know that our system called in economic system is based on consumption means demands, supply mechanisms. And there is where you person, can make a change yourself. At this point we stop and we will see as again for module 2.

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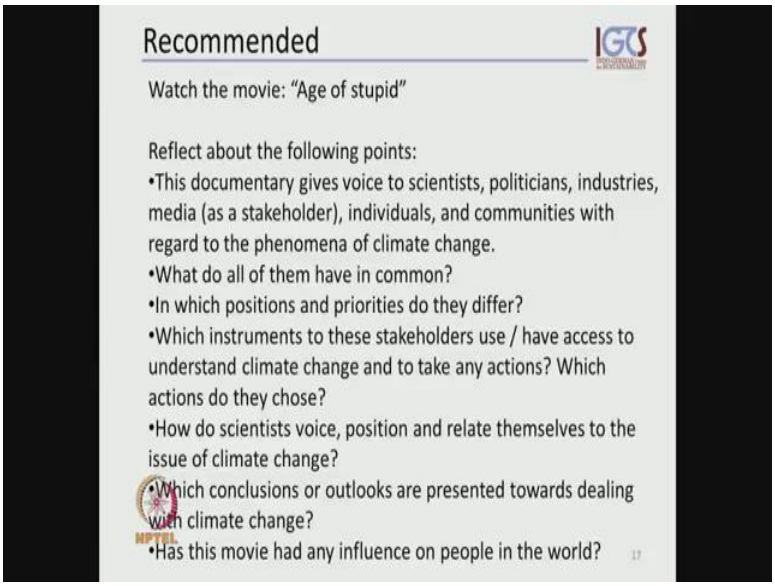

I would recommend you to watch this move called Age of stupid and I should also recommend you when you watch that you can find it on line you can watch it at home to reflect on these questions for yourself. This movie has been watched by more than 681 million people on earth and it has its major impacts and shows that societies can be a driving force in lifting major changes, even economic changes.

Thank you.