Sustainable River Basin Management

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Module - 01

Lecture – 02

Part – 02

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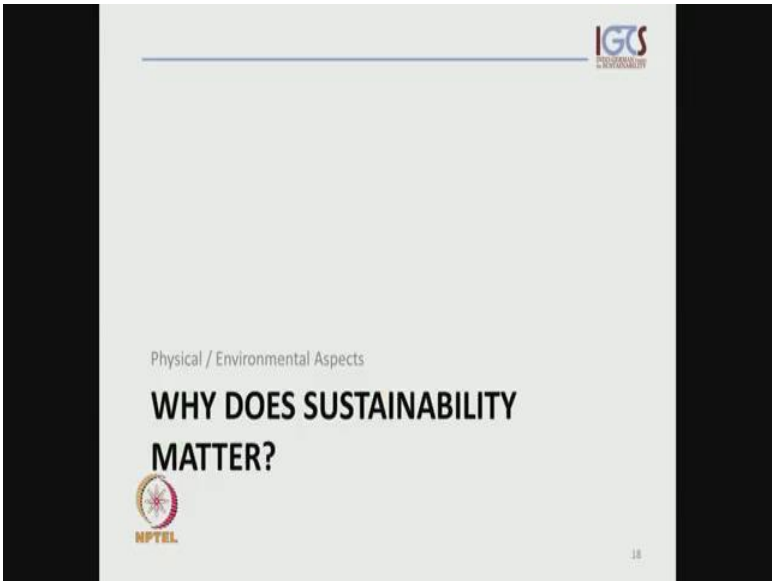

Hello everybody to Sustainable River Basin Management, module 1 part 2. We have been talking about sustainability and why it does matter, looking at social and economic aspects in our previous class. And now, we will be looking at physical and environmental aspects.

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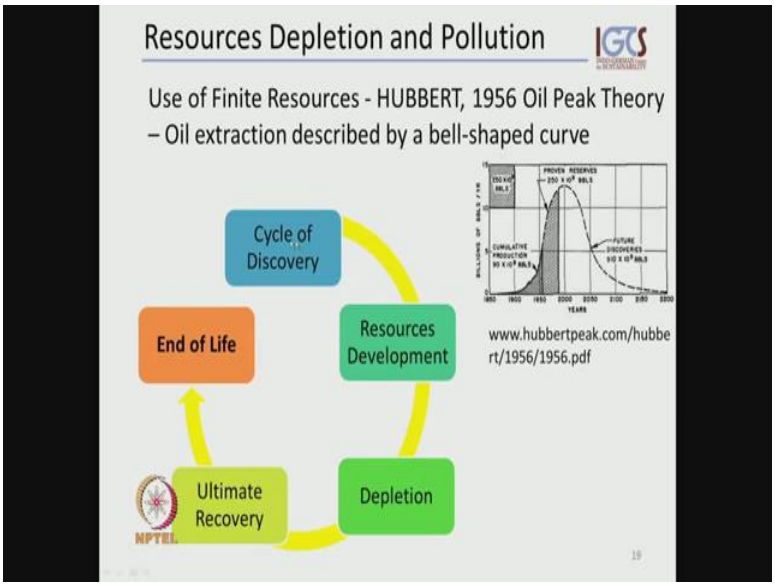

One of the most important reasons, why sustainability matters from a physical aspect is resource depletion and pollution. We have to keep in mind, the use of finite resources and most of our resources are finite on this planet. And we can describe the process of resource depletion by a referring back to report, who produced since 1956, the so called Oil Peak Theory, which he was hypothesizing that oil extraction could be described by a bell shaped curve, just like the curve that showing here.

I do not want to go into the debate of his projections and the hypothesis, which he came up at the time about oil peak and oil resource. However, the process as such of resource used and consequently resource depletion are valid not only for oil, the oil industry also for any other resource, a natural resource. And the general process is that this cycle of discovery taking place, resource are discovered, technologies are developed and those resources are developed, they go under production, they will be accepted. And there will be a market for it, at some point those resources will be depleted and there might be an ultimate recovery by finding additional resource or by developing better technologies, which allow additional resource section.

But, eventually you come to a point, which we would call end of life of such resource of such deposits where those natural resource will be completely used and not available any more out of this cycle here. So, this is what applies, not just to oil, but to any of the resource that we can pick, we can think of.

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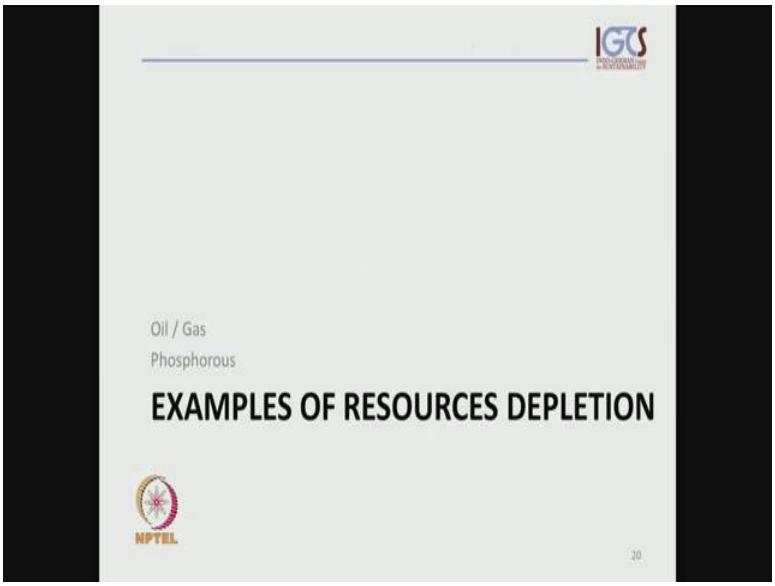

Now, let us look at some examples and if I chose an oil and gas and phosphorus, we could say a key in our economic and a key for our current survival as well.

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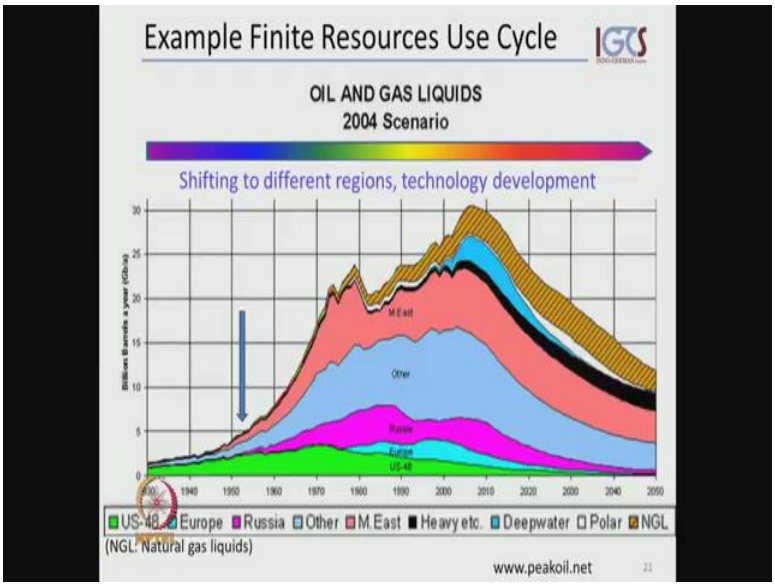

Let us look at the example of those finite resources use cycle, that I just explained in a generic way in the case of oil and gas liquids. This is a scenario, that was developed in 2004, in this three data, what we can see it covers a time spend from 1930 to 2050. Again we are at automatic year that we have mentioned in our previous lecture a very and we have here on this axis billions barrels per year, production, numbers, much, much.

You can see is that an oil extraction as such started to develop around the 1930s. And it

started on, basically on one continent in one country and it developed in a very, a modest, very famous linear variant and peaked. And then, from this peak decreased at a very earliest stage in 1970s, at the same time we can see a shift to other continents, so the countries and the regions where oil resource were discovered. And at some point a boom started, where all this resource were taken into production, extraction started and this point is critical to our entire economy. This is where technologies became available to dwell deep holes and to access those deep oil and gas deposits. And our economy became adjusted to availability of these hydrocarbons. We can see that those developments took place at more or less the same point in time and peaked also by more or less than at the same time, a few slight shifts in it. But, we can see that around 2010 most of these sides or areas under production saw a resource, depletion and reduce production of oil and then, the response to this was that another shift to place to new technologies, they are so called natural gas liquids.

The top layer here on this graph, it is a very expansive technology, which became available and in some of the countries also accepted and provided in other way out of the resource depletion that was noticeable at this point already. Hence, we also see the shift to a more expensive for unexplored terrains such as the polar region and the deep waters, international waters which require new expensive technologies, but also new laws in speculations and agreements to become A S used for economic in dimension.

So, this is a typical image we can use any other similar again to demonstrate it. So, we see a shift in general form to different regions and we see also a technology development attached to a (refer time: 08:02) abstraction amounts over time and then, we see a dip in our exploration numbers. Let us keep this begin of the acceleration in mind, because be (refer time: 08:22) critical point yet that produce a change in our living quality and our over living conditions, population, numbers increased that are growing, technology became our new substances became available based on our hydrocarbon industrial, based on petro chemistry. So, it is a big remarkable point, which we will refer at a later stage, so keep this in mind.

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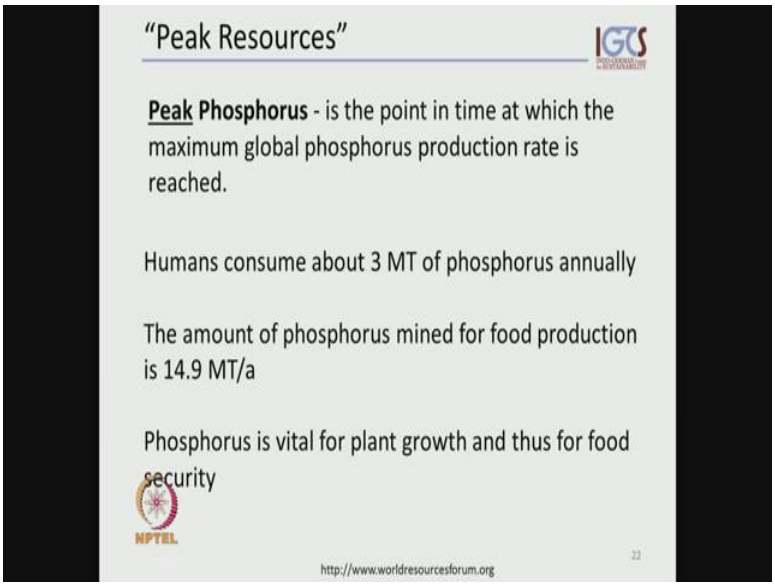

Now, let us look at the, so called peak resource if I use the term peak oil earlier, what is meant by peak oil or peak phosphorus, peak resources. It is actually the point in time at which the maximum global mineral production that is specific mineral production rate is reached. It does not mean that the resource being sourced at that point, it is simply that maximum production rate has been reached. And after that point less resource would be available and eventually it would be exhausted.

So, that is a point that can shift an information and more knowledge on resources is gained, it is mapping is going on geological and exploration is going on. But, eventually in this we will know all our resources on our planet and eventually we will get to a point where the resources will be entirely exhausted. So, let us look at peak phosphorus here. Phosphorous is quite important to biological cycles, the humans consume about three million times of phosphorus annually and for that about 3 times or 5 times the amount of phosphorus has to be produced or mined.

So, means the c over d e here there is a huge difference between what is being produced and, what is extracted from earth. So, for deposit and what amounts it has been consumed; that is typical and just want to highlight here. That it is typical for resource extraction at large amount in loss on the production phosphorus. So, phosphorus is vital for plant growths and for that we use is vital for food security.

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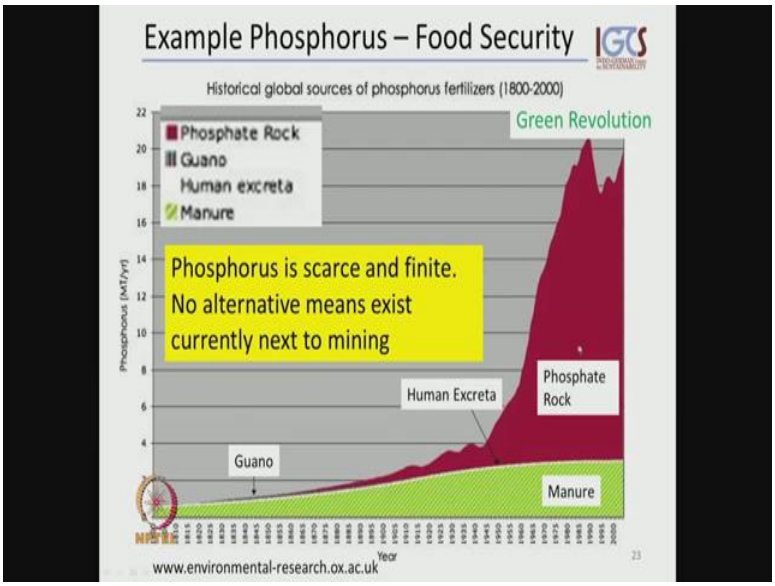

Let us look at this aspect of food security. We have here phosphorous production million tonnes per year. And here, we have time scale starting from the 18 18s and 1800 to about today and we see that at some point most of the phosphorus resource were either (refer time: 11:55) or manured and human, very small minor amount human excreta and then, it is a technology shift taking place in a way of phosphate rock. They started to be mined and converted into fertilizes, which with end use or used to improve soil, soil quality. In that way put you small food per hectare.

So, this huge amount of phosphorus, which we can available through mining phosphate allowed among other factors is huge which we will come back later. The so called green revolution and it actually allowed countries like India to become self-sufficient and to produce all the food required to feed the entire population.

So, this course handle as you can see again is the magic here of the around 1950s when also are while production became accessible through the technologies available. Now, what you have to mention and keep in mind here is that phosphate is scarce and finite. And right now we do not have any alternative means next to mining to replace or substitute our fertilizers. We can only for by come to manure are two around a resources, which you will be mentioning at some later stage we will be talk about Newton cycles.

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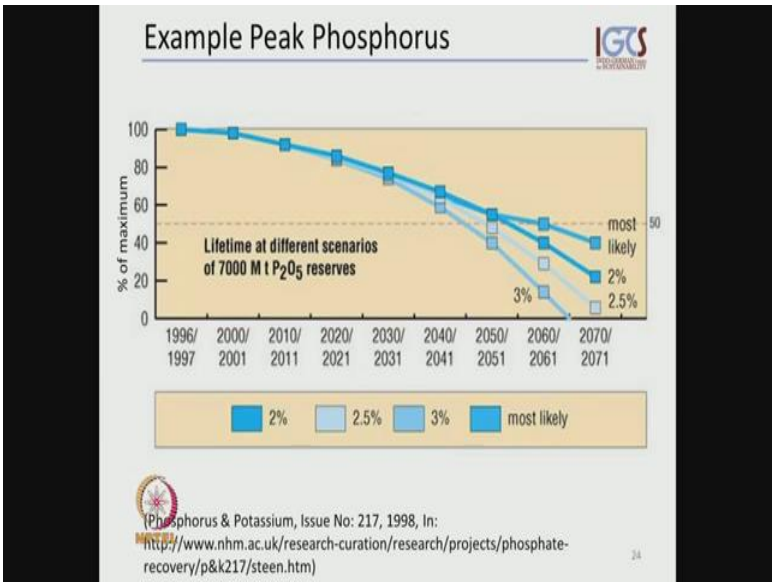

So, this is example of phosphorous, just summarizing the projection for phosphorous. We have here present of maximum production. So, around 2000 we had industries and scientists said that we have reached our peak phosphorus production and that from this point onwards, the amount first was that can be exited is decreasing and in about 50 years around the 2050 again we will huge about 50 percent of our initial maximum production.

That different scenario's again which have to be seen in the context of the projection for population growth. You remember that population growth in one of the scenarios decrease, is expected to decrease in the year of 2050 and this is also when the fertilizer production will see a reduction. This is to mention also that 2050 is not a year which is far way from our selves. It is something that we will face. So, many of us will face this decrease of this major tipping point in resources availability, in living quality and in population, decrease of population numbers. So, there is something we have to face and it is not something for the not even something for the next generations to look at.

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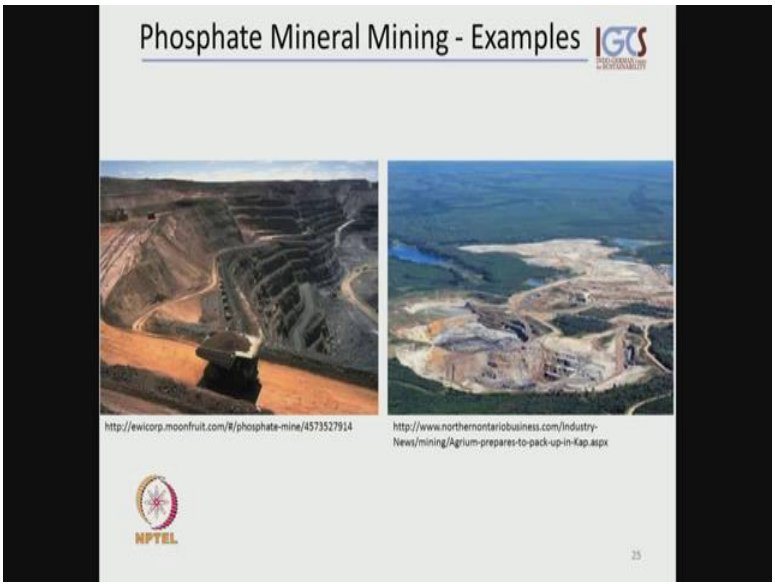

Now, what does mining mean? Just as example phosphate mining means essentially a digging a hole and extracting the mineral resource from an open pit or from unaccount mines. It usually would look like this in affects water bodies and affects soil and the soil fertility and lent use in general. So, this is going hand and hand with depletion of the resource. So, there is a degradation of our lent and water quality, air quality attached to this.

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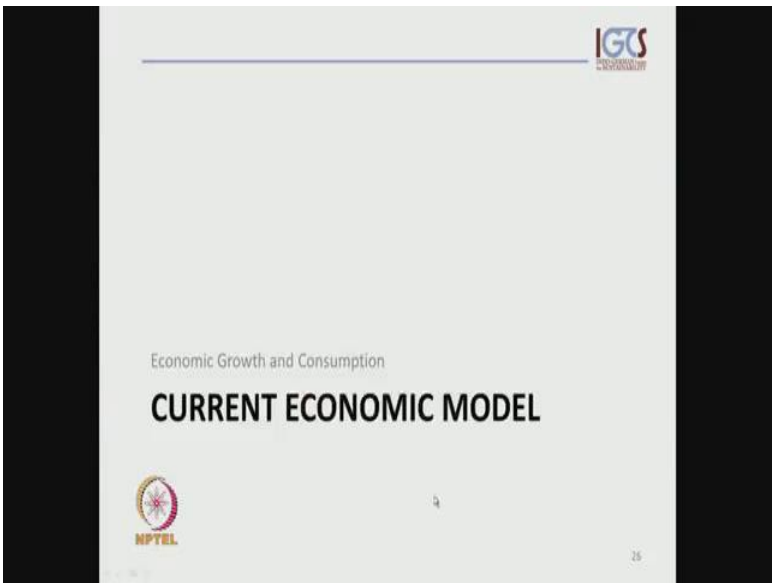

Now, let us look at a current economic model, because there must be a reason for why those processor those and you look it economic course and consumption.

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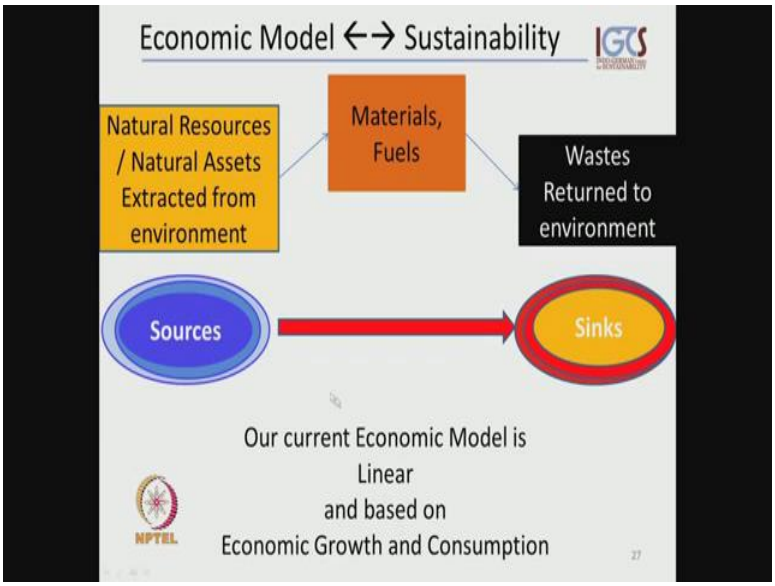

In a equation was a economic our calendar economic models, let say in line this sustainability concept. So, what we are doing right now, is set we are using natural resources our also we can call it natural assets we are extracting from the environment. We use some straight or we have to convert them into some other materials fuels and then, we will use them we will put use base and return those into the environment.

So, it is essentially a straight line from source somewhere to a sink somewhere, somewhere else. In our economies our trading on economic model is building on course we need lot of resources to source, to increase and at the same time of this lead a amount of waste will increase, we need more space. So, volume to deposit our waste somewhere sink has to be available.

So, summing this up we have an economic model; that it is linear right now, and it is based on economic growth and consumption if one or the two fails we will have economic crisis.

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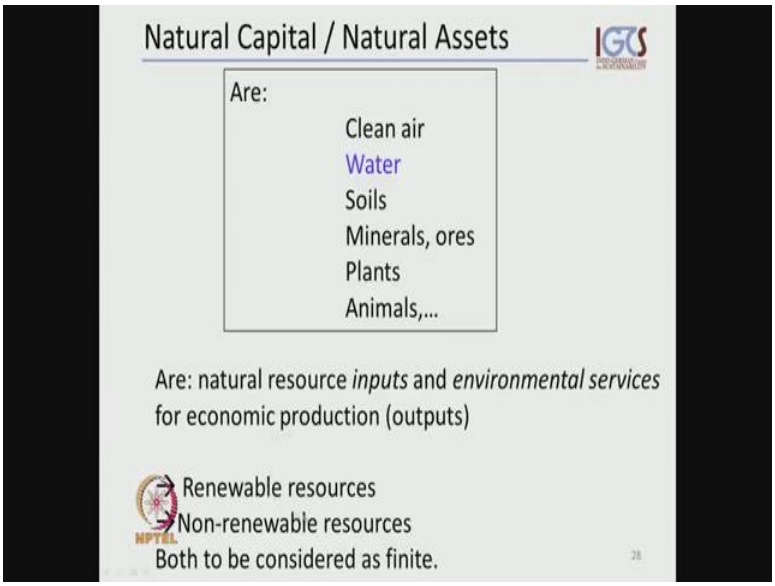

Now, looking at the term natural capital and natural assets, what is it? What you mean by natural capital natural assert, essentially clean air, water. We will focus on water later soils, minerals, ores, plants, animals and you may find better items just you can categories natural assets resource. So, if you look at it from an economic perspective the natural resources are essentially inputs to get this in biomentale services for an economic production and output.

So, our natural capital is compose can be distinguished into neutral resources non-renewable resources but in other way both can be considered as finite. By renewable resources to be considered finite this is because quality decreases as we use those resources. And they may not be put fast as we need them, they may plurals such a way that they became non-useable. We will stop at this point and continue part three next time.