Sustainable River Basin Management

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Module - 04

Lecture - 16

Part – 01

Welcome everybody to Sustainable River Basin Management, module three – one, part one.

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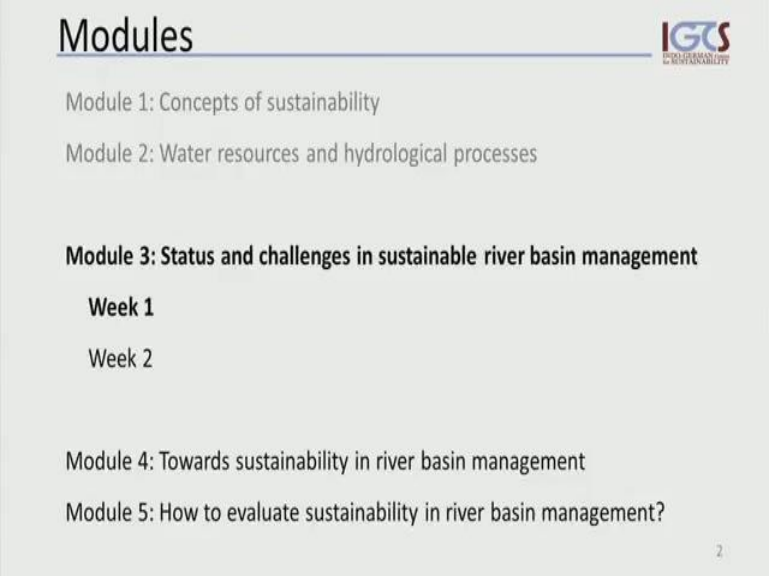

Let us first have a look at what we have been doing so far and where we are. We have completed module 1, 2 and we are now starting module 3 on statuses and challenges in sustainable river basin management and we will spend two weeks on this module.

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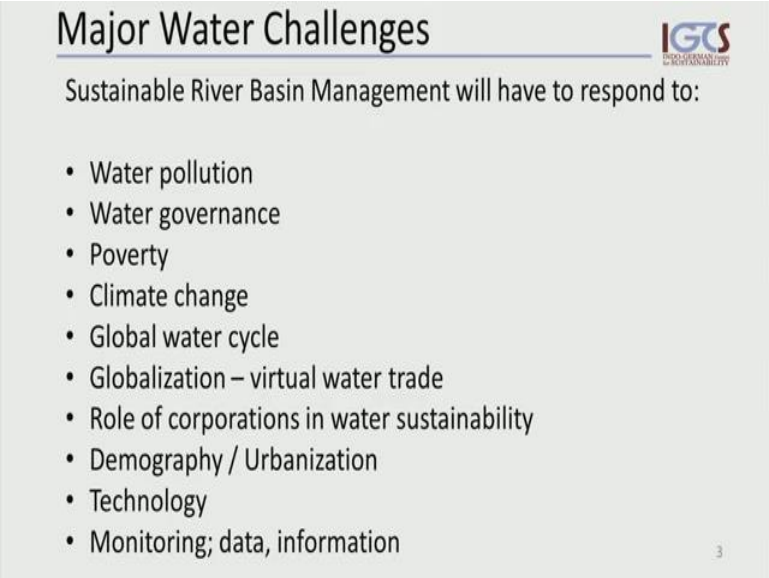

Now, let us look at the major water challenges and the sustainable river basin management has to be able to respond to those. First of all, water pollution, water governance, poverty, climate change, but also the global water cycle, the globalization including the virtual water trade, the role of corporations and water sustainability, demography and urbanization, technologies and the monitoring data and information in general.

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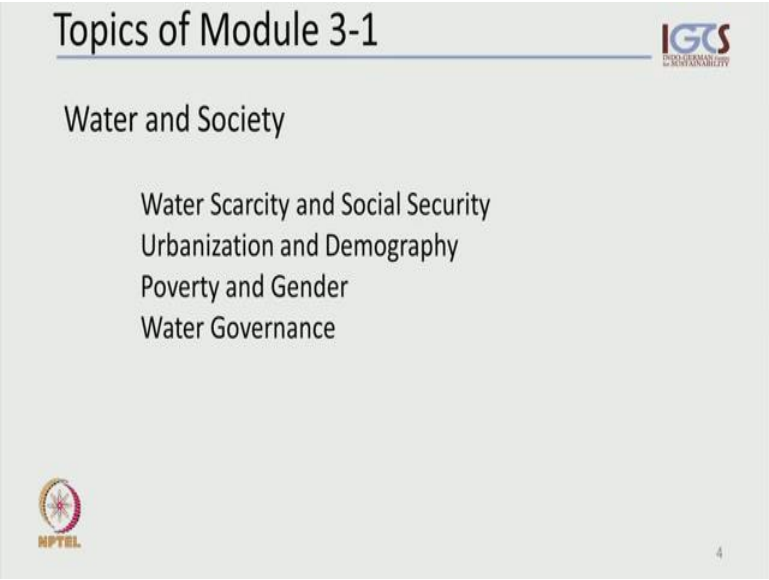

Now, the topics of our first week of module 3 are the following, dealing with these water challenges and specifically, we will be looking at water and society ((Refer Time: 01:36)) under this topic, we will talk about, whater scarcity and social security, urbanization and demography, poverty and gender and water governance.

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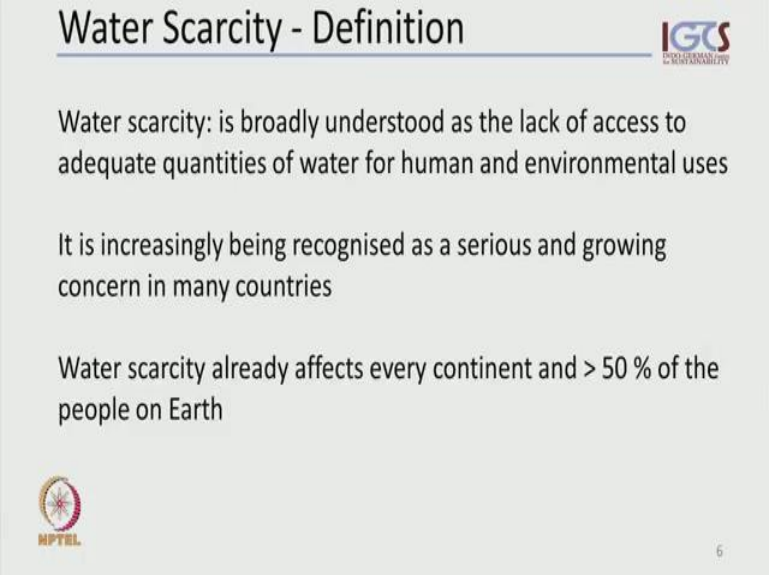

Today, we will start this water scarcity and social security. Let us first try to find the definition for water scarcity. Water scarcity is partly understood as the lack of access to adequate quantities of water for human and environmental uses. You see, that the water scarcity at this level of definition, we only look at quantities and do not include quality, although this becomes also an important component of water scarcity. It is increasingly being recognized as a serious and also growing concern in many countries. What we can say is, that all of the continents, all of our continents and more than 50 percent of our population on our planet are affected by water scarcity at this moment in time already.

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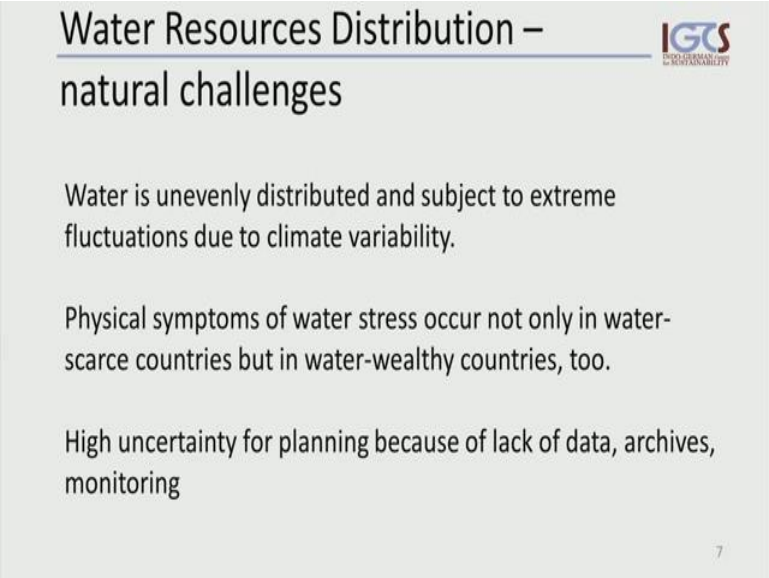

Now, let us look at the water resources distribution, which come along with the water scarcity. And from a natural perspective, the hydrological perspective we know, that water is unevenly distributed and it also subjects to extreme fluctuations and this is simply due to climate variability. We are not accounting for climate change in this, as you remember.

The physical symptoms of water stress occur, however, not only in water scarce countries, but increasingly and more and more in water wealthy countries too. And this, these hydrological impacts and the climate variability come along with the high uncertainty for planning, planning of water infrastructures, planning of water supply. And this also is attributed to the lack of data, the lack of archives or the non-functioning of archives along ranging archives and monitoring systems for hydrological data collection.

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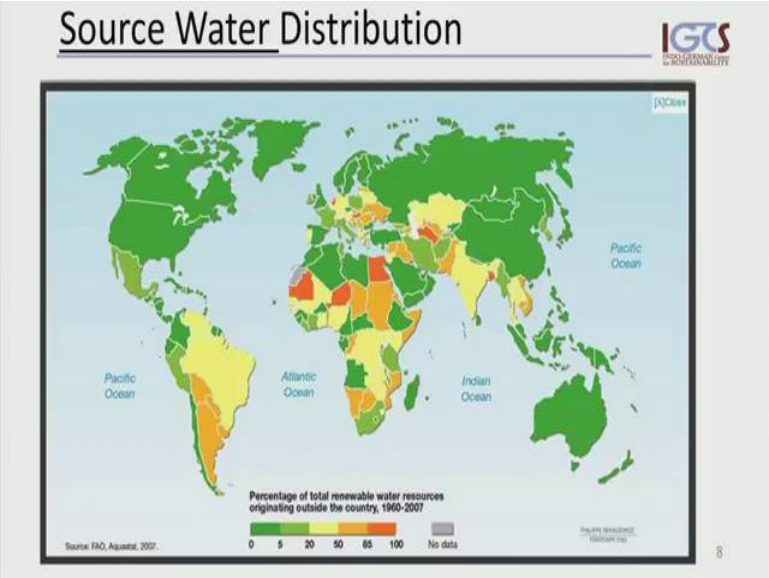

Now, let us look at this in little bit in more detail. What this also means, when we take source water distribution here and the term source water, we will come back in detail later. The source water applies to the head waters, the water, the areas where rainfall is being transformed into a runoff and feeds off ground water in our river systems.

When we look at this interesting map here, which was produced based on FAO hydrological and climate database in 2007, we can see which of the countries depend on waters, which are generated outside their county borders. And if we just take India for the sake of interest, may be from your side as an example here, then we see, that about between 20 and 50 percent of the source waters of India are generated outside in just country borders. And this shows us already component, that leads us to the aspects of water security, water conflicts and also corporation in water conflict resolution.

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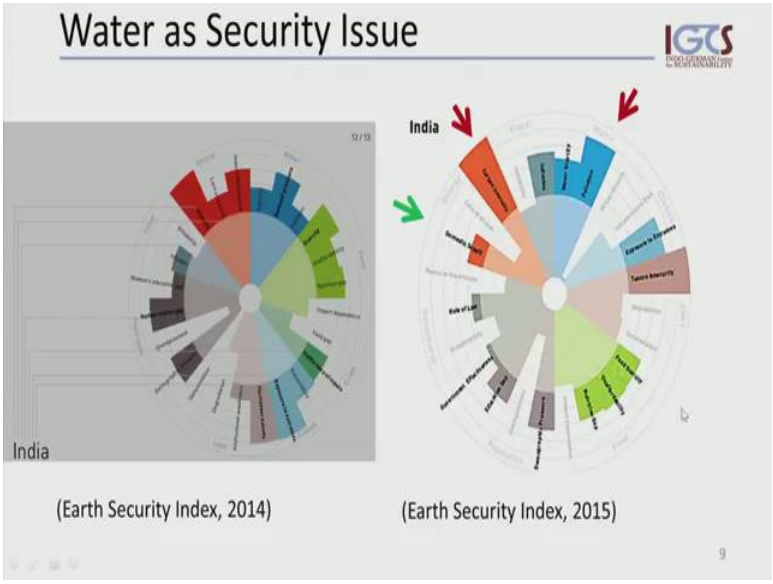

Let us follow up on this water as a security issue and good source as an entry point is this report here, is where security index, which has been produced on annual basis. I have just picked the last year and this year, this year's report you should try to get hold of these reports and use it as an entry reference and resource to get additional literature on water and security.

Now, what this brings together in this diagram are several aspects, water, food component, crops, which is food security, the climate aspects, land, population, fiscal aspects, governance issues and energy. And then, we see on a scale of 0 to 100 percent the different components, which should be indicative for these larger fields and in which range we are. So, larger that is, the more serious the security issue is. And what we can see in this diagram of this 2014 is, that there are two sticking out, one is the energy component, energy scarcity in this case and the second is water. Water, especially the demand pressure, very highly, high in this diagram.

Now, I just took the most recent report of 2015 in trying to compare this situation, what we can see however is, that the comparison is not straight forward. This is unfortunate. But often the case, and we should pay attention to this, they are different sub crops to our major subjects. We still find our major subjects like water here. We have fiscal here, food and population, but the arrangement is different and then, we have different sub categories to it. In the case of water, those have not changed, we still have water scarcity.

But, we also see that water pollution has become a major, increased substantially and become major concern of security. And what we also see on the energy part that the carbon intensity has increased a lot, whereas the domestic supply seems to have slightly improved probably at the cost of the carbon intensity. So, this can give us some guiding orientation, but as you see, this may not be comparable across the years and for that reason also difficult to compare across countries.

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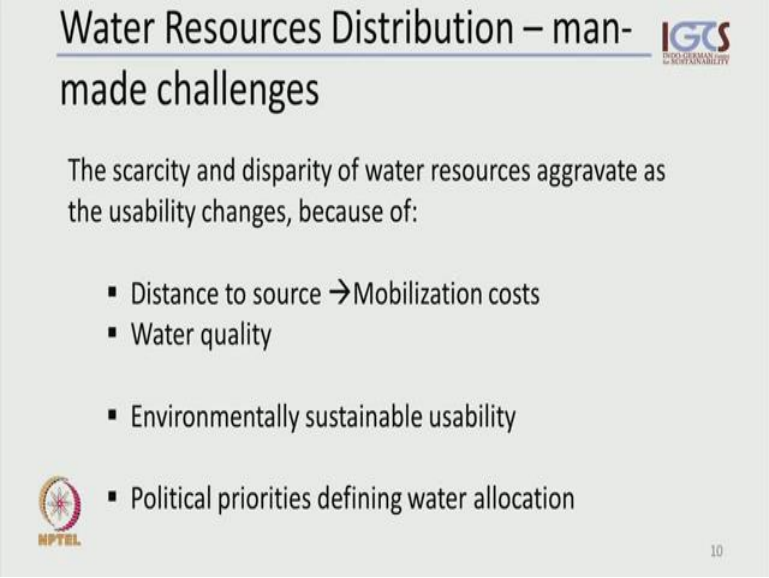

Now, let us look into the challenges in water scarcity, of water availability, water resource distribution, that actually are human made or man-made. The scarcity and the disparity of the water resources if increased as the usability have changed and this, because the distance resources have increased, those easily available water resource have been tapped. So, we have to fetch water from more distant sources. We have to go for deeper wells, for instance, and this attached to this, they are caused on operational, but also on capital cost, which limit the usability. And the other component is water quality. The water quality has decreased or deteriorated substantially, which limits the usability, that the water that we have available right now. And then, the additional components, which are environmentally sustainable, usability which limit what we should be using as a water source and the force of this the political priorities which define water allocation also define the usability or changed the level of usability.

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Now, we will investigate that manmade water scarcity a little bit more. We can differentiate it in various ways and I have chosen this one, which from my point of view, highlights the best way issues are. First is the competition for access and that competition increases as the scarcity of the resource increases and this takes place at all levels. It starts from the lowest community, household level and goes up to national and regional levels. Each of the states will try to achieve water security and this may drive drought and this may induce migration in the region and it may cause regional or large scale starving of population.

Then, there is a second category, which is I have called colonial heritage or colonial disputes. Those have to ((Refer Slide Time: 11:51)) their country borders, which were divided under colonial times, which divide traditional, traditionally commonly used resources like water, but also forest for instance, or grassland, pasture land. And for instance, the colonial laws, which emphasize the resource abstraction as example.

The fourth, the third of these man made scarcities ((Refer Time: 12:28)) the fact, that water security and access to fresh water have reached to top ranks of political agendas. It is not often said to be the case, but very often it is the hidden agenda that actually deals with the water as the major subject. And this is, that water security has been increasingly perceived as a part of struggle for empowerment, empowerment, form of democratic empowerment of regions or of counties. And very often, as a fourth manmade factor we

see a competitive exclusion or we also can say resource capture, which creates disadvantages, disadvantaged communities in favor of, for instance, wealthy economic sectors. This could be an export factor, important part of the economy, mining or ((Refer Time: 13:45)) or some specific crop production whatever is, which puts certain parts of the society, of the communities into very restricted condition in terms of access to water or other resources like land.

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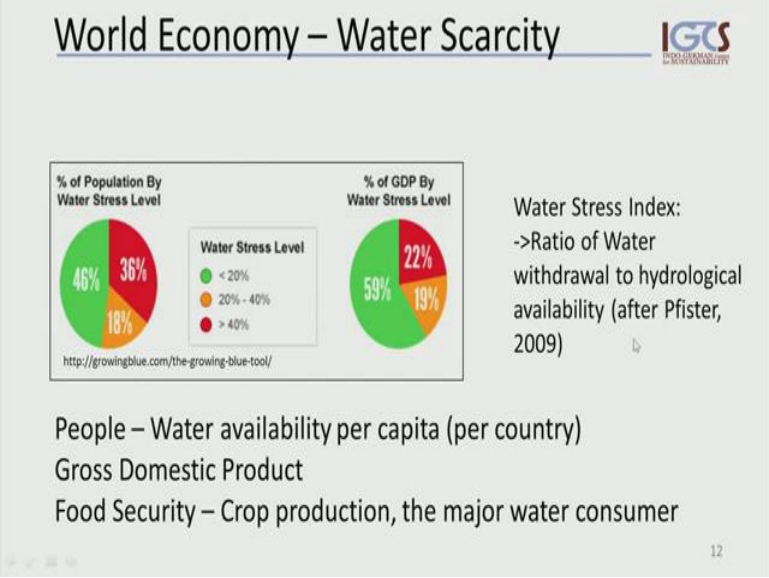

Now, let us zoom out of this and look at the world economy in the context of water scarcity. Now, we can do that by simplifying data need to compare one country with the other, to compare at a global scale and we could, we can look at people by making water availability per capita and per country. We can also take the economical, potential in the form of the GDP, Gross Domestic Product. And we can take food security in the form of, if you remember, that agriculture takes up above 70 percent of the water availability, that crop production is a major water consumer.

Now, as an interesting figure to that which shows us the percent of population by water stress level here and what we see here green, yellow to red scale. From green, below 20 percent water stress level to above 40 percent, red, water stress red level. And what we can see is such less than half of our population is in countries or in parts of the world, where the stress levels, water stress levels are below 50 percent and the majority of our human population is living in parts where water stress levels are medium to severe. And

now, when we take this information in terms of people to a measure of the GDP, the production, the monetary flows, then we see, that just below 60 percent would be, our GDP is being produced in regions where the water stress levels are below 20 percent and 20 percent is still quiet high as a water stress level. So, still that green is may be misleading here. And then we see, that about 40 percent of the GDP at global scale are produced in water stressed regions and this is quite alarming. This is our current situation and situation will not improve. Now, water stress index, the water stress index or water stress level means here is the ratio of the water restore to hydrological availability in this case.

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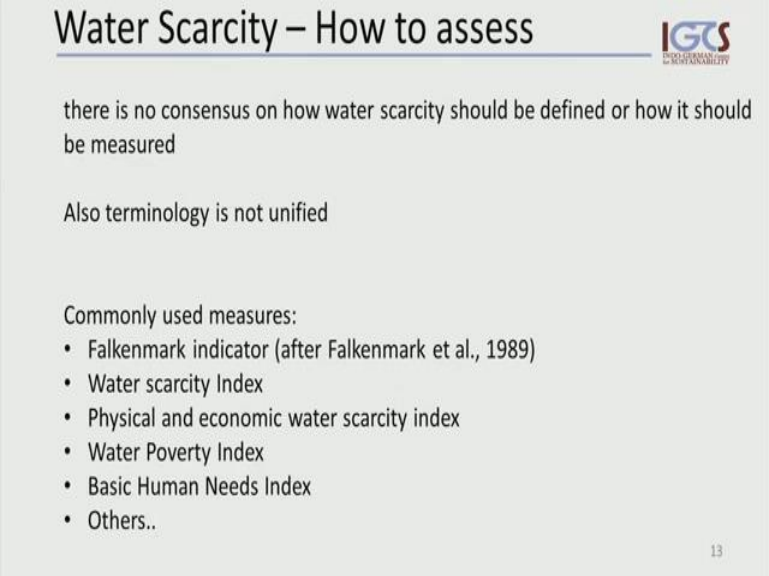

Now, let us try to think, to see, which ways we can use to assess water scarcity, what is, what are common methods to assess water scarcity. Unfortunately, I cannot send you unique instrument, not even unified terminology on water scarcity, but I will present you the most commonly used methods and measures, which are the Falkenmark indicator, the water scarcity index, the physical and economic water scarcity index, the water poverty index and the basic human needs index. You will find others and you may in your research, in your professional life come into a situation where you have to build your own index to be able to express transmit information that you want to highlight.

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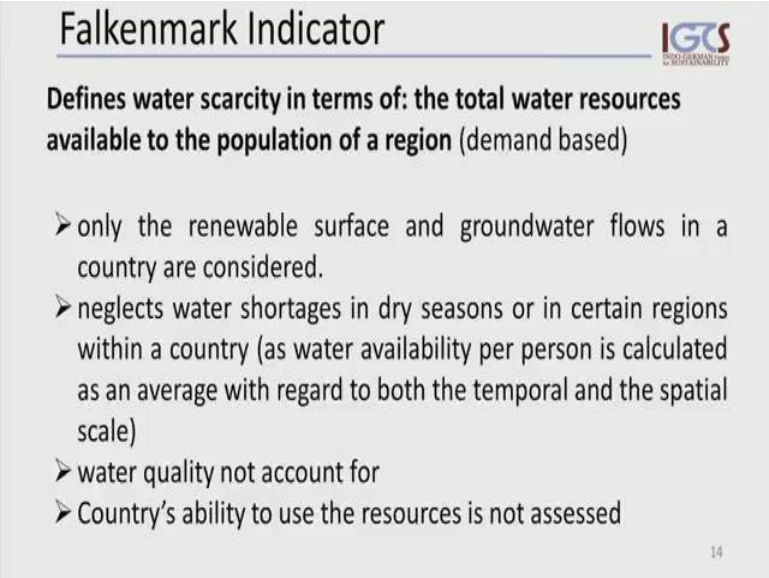

Now, let us look into the Falkenmark indicator. First, it defines water scarcity in terms of the total water resources available to the population of the region and this is, so to say, demand based. It has restrictions, as you can see, it only looks into the renewable surface and ground water flows of a country. It neglects water shortages in dry seasons or in certain regions within a county and that is because it only looks at availability per person on average and it does not account for water quality, and it does also not account for, express their country's ability to use the resources in a specific better way and an efficient way also.

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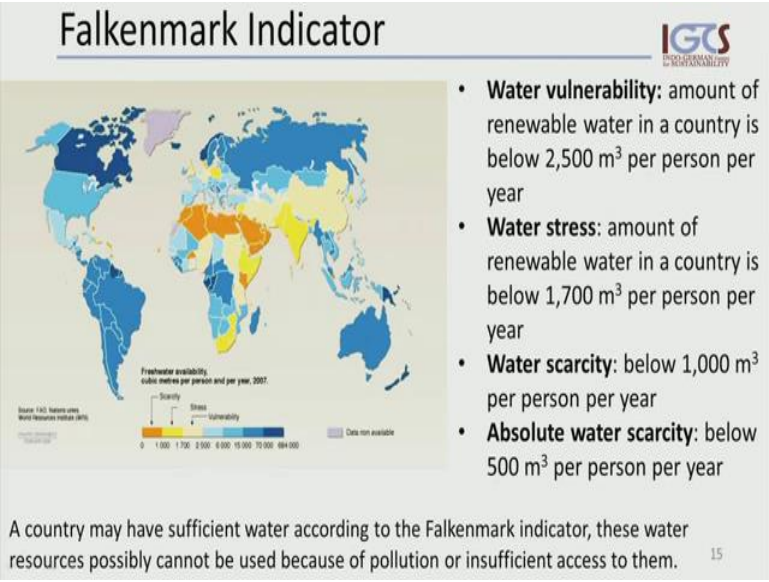

Now, the Falkenmark indicator shows us that country may have sufficient water, whereas we know, that county has actually severe water problems because of pollution or because the water is not being developed or is not accessible in this, in this stated where it is let us think of ground water, extended ground water aquifers, for instance. Now, the Falkenmark indicator splits the information into these categories. Water vulnerability, it shows us, that it does not express it as things are simply good. It still consider the situation as vulnerable, which is an amount of renewable water in a country below two and a half thousand cubic meter per person per year. It then, the next group is called water stress, the fourth group, third group is water scarcity and the extreme case is absolute water scarcity, which means, it has an amount below 500 cubic meter per person per year in that country available.

Now, let us look into a map that, a global map, that shows us this Falkenmark indicator. This was produced in 2008 and it shows us here the scale of the Falkenmark indicator in cubic meter per person. The red or orange is scarce or absolute water scarcity and then, in most up to the vulnerable part about here. And what we see is at country level. We are the region that the countries was severe, water scarcity and we are the vulnerability countries, which need to pay attention to the water usage, but are not driven to the edge of the situation.

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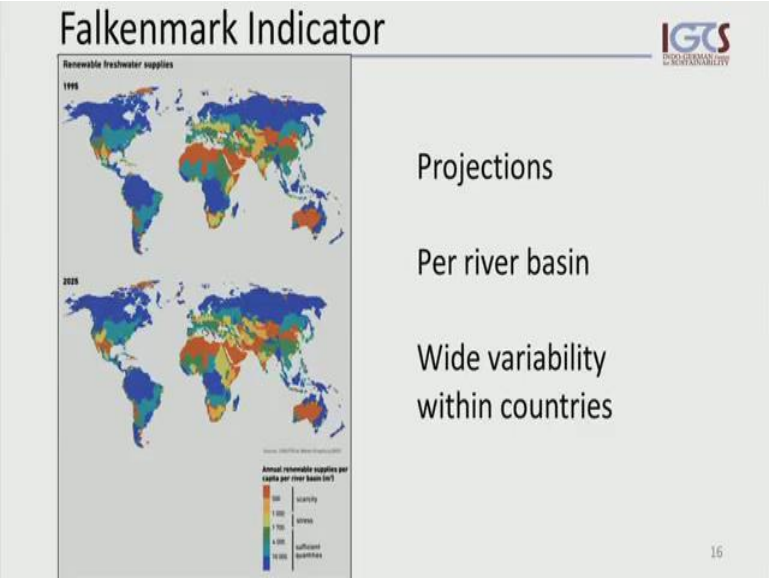

Now, let us take this Falkenmark indicator in a different way and to project situation. This is the situation in 1995 and this is the projection for the year 2025, which is not so far ahead, means in 10 years time. And we can see the changes, that are projected for this, for water scarcity in not only countries, but in this case the river basins, which help us to differentiate what was in countries and to relate it to certain river basins like the Indus river basin or the Nile river basin and so on.

What we can see from this only is, that there is a wide variability within countries occurring and this we should not forget when we talk about these water scarcities scaling at up to regional or country level very much loses the sharpness of information and make a country look better or worse than what you see or you know from your own catchment where you come from.

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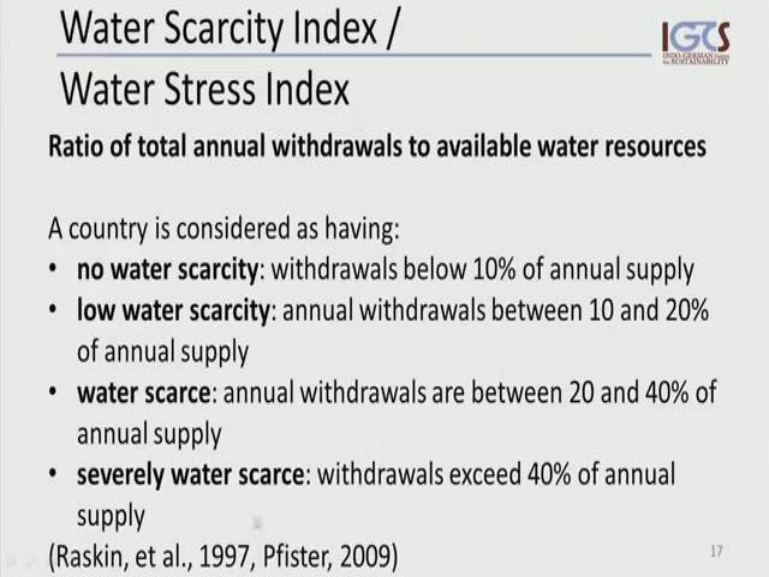

Now, the other, the second index that I want to present to you is the water scarcity index; very often it is also expressed as water stress index. Although, as I say, terminology is not uniform, so do not get confused. You always have to check what was the method used to know what index you are using. This is the ratio of total annual withdrawals to available water resources and the classifications are at country level that there is no water scarcity. If the stores are below 10 percent of annual supply, then a country is has no water scarcity. When as an annual withdrawal between 10 and 20 percent of the annual supply and that country is water scarce or severely water scarce with withdrawals

between 20 and 40 percent of the annual supply or exceeding the 40 percent of the annual supply.

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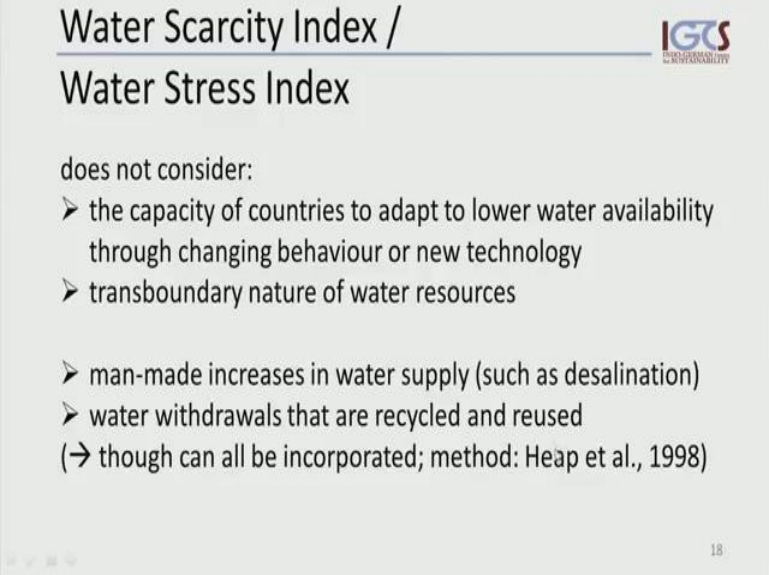

Now, this can be, this has been developed by various teams and you can get literature on that. However, this method excludes and cannot consider is the capacity of a country to adapt to lower water availabilities and there are techniques in each of region, which is by it is way climate a part, which has a lower water availability by using certain technologies could be latest or new technologies or by changing the water use behavior and it does not consider the transboundary nature of water resources.

It also does not as such consider man made increases in water supply which once could come from nonconventional water sources. And it does not include water withdrawals out of the recycled or reused water. Although, this can incorporated and the method has been demonstrated, for instance, by this team of researchers.

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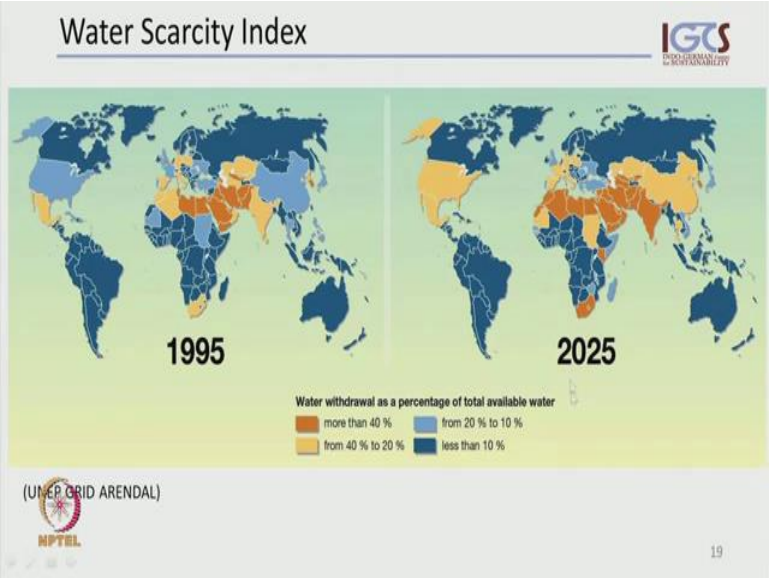

Now, let us look at the water scarcity index in a, in a map and again, we have a possibility to compare this between the change we can look back to the year 1995 and can see at the projections for that. You can see that the change is between the Falkenmark index and the water scarcity index here. You see, that there are several countries, which according to this have low water scarcity or are not water scarce, ((Refer Time: 26:52)) is not water scarce or have a low water scarcity. Although we know, that the situation has changed dramatically in those counties and we see, that some of these countries which use a lot of non-conventional water sources today are here classified as highly water scarce are severely water scarce countries.

The projections follow a little bit what we, what we would expect also from the economic course pattern of these regions, where the situation in all of the cases are deteriorating substantially driving those countries for instance India into severely, water scarce countries, but you also see this for some of the African countries here where you would not expect it in the first place.

Now, we will continue on this subject in our next class and I see you, in again.