Water Economics and Governance
Prof. Manoj Kumar Tiwari
School of Water Resources
Indian Institute of Technology, Kharagpur

Lecture - 18
Valuing Water: Valuation of Water

Hello everyone. So, this week in our earlier sessions, we were talking about the use and non use values of water. So, what we are going to discuss today is, how the water is valued. We have talked about different aspects of the values of water, but how do we value this water, what are the methods, or how the valuation of water is done, what are the various approaches of that.

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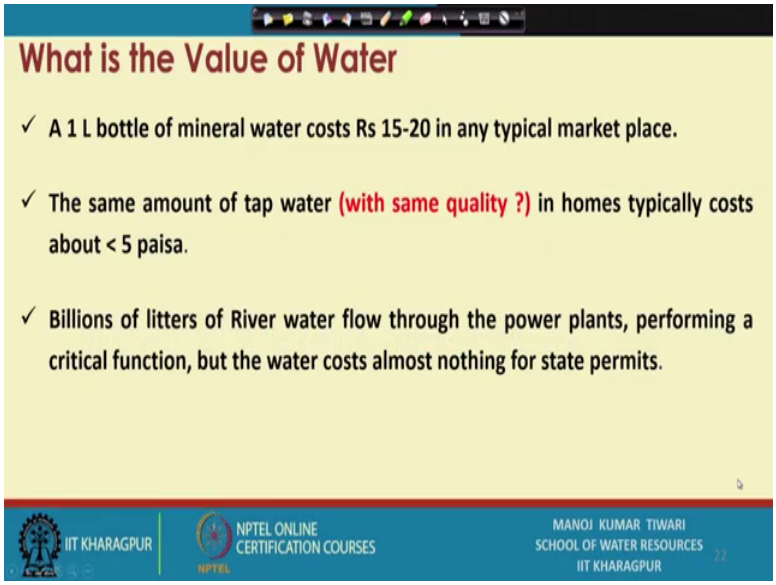

So, first thing is, when we say that; what is the value of water. We did talk about the different aspects of the values of water, but precisely when we see water. So, for example, you see the 1 litre of bottle of mineral water would costs 50 20 rupees. In a typical market, the same amount of tap water although the quality is questionable, but even if we consider the same amount of tap water or same quality of tap water in the same amount, if supplied in homes, it will typically cost about less than 5 paisa ok.

Ah same amount of water or same quality of water, when it fed to the industries. Like industries, many times use demineralized water or very pure or quality, safe quality of water, but they also do not pay that higher price. So, that price would be something

different; however, on the other hand, if you see the billions of litres of water flows through our rivers, several rivers, and they also perform like several critical functions, but the cost of water is almost nothing for state permits.

So, that way if you see the, when we go on to the value of water, what exactly we are valuing is, of very high importance.

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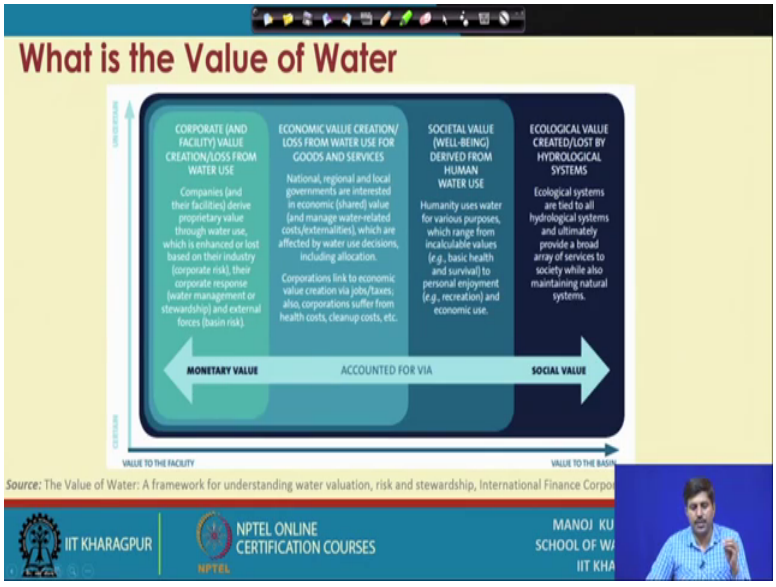

So, the water has a monetary value, social value, and this we have already said that basically when it is used in terms of corporate, corporate facilities. So, the value of water use in corporate would depend on the what water services facility is being created in a corporate, in that particular industry or in that particular company, or what particular water services has lost, or has basically damaged in that. So, if something gets damaged, you need to basically replenish it, you need to restrain these services.

So, in order to ensure that, you will have to, you will have to incur investment in monetary terms. So, that gives you a monetary value. On the other hand, the ecological value, or sort of, which is either created or lost by the hydrological systems, could be by human interventions or anthropogenic activities, but those values either created or lost, primarily leads to the social value, and in between we have economic values for creation and loss of water used as goods and services, and societal value of well-being deprived for human water uses.

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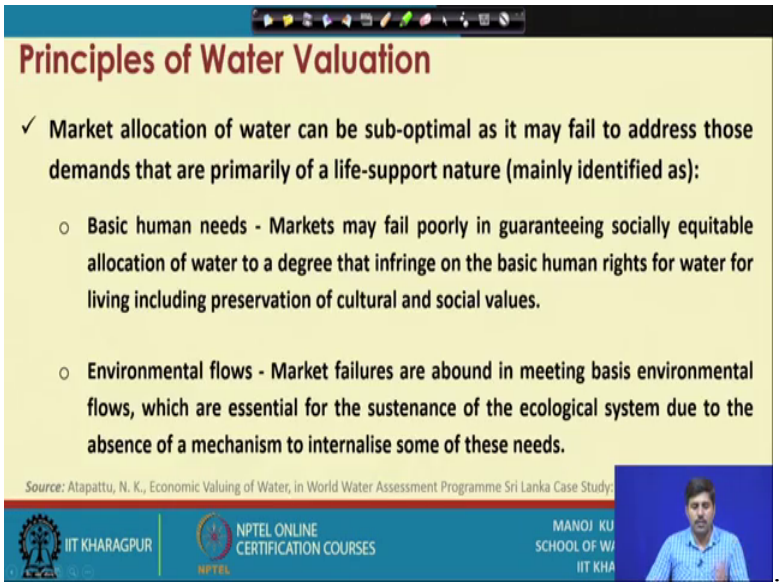

So, we have human consumption, we have environmental aspects, we have industries aspects. So, all these sort of different values are there.

Now, when we go on to the valuation of water. When we are saying water, we does not mean only water as a product or good or commodity, that as we have discussed earlier also, that when we say that the valuation of, what are, we are sort of assuming that valuation of water incorporates, water resources, water products, products based on of water and water services as well.

So, when we go on to the valuation of water resources, or water services the. There are some underlying principles on to that. Mainly two, the market allocation of water can be sub optimal, as it may fail to address those demands that are primarily of life support nature. So, there are basic human needs, and there are environmental flows. So, these are sort of primary demand of life support natures ok.

So, like drinking water requirements or basic environmental flows or basic environmental requirement. The minimum flow that should be there in the river or ecosystems. So, all those, the basic requirements many times if you sort of, do a market-based price allocation. So, these are definitely going to be the sub optimal in terms of infringe. You will not going to one is not expected to get the good return on to these services ok

So, the market allocation based, if we see. So, we will be basically, we will not be able to address the basic life support, nature demands particularly ok.

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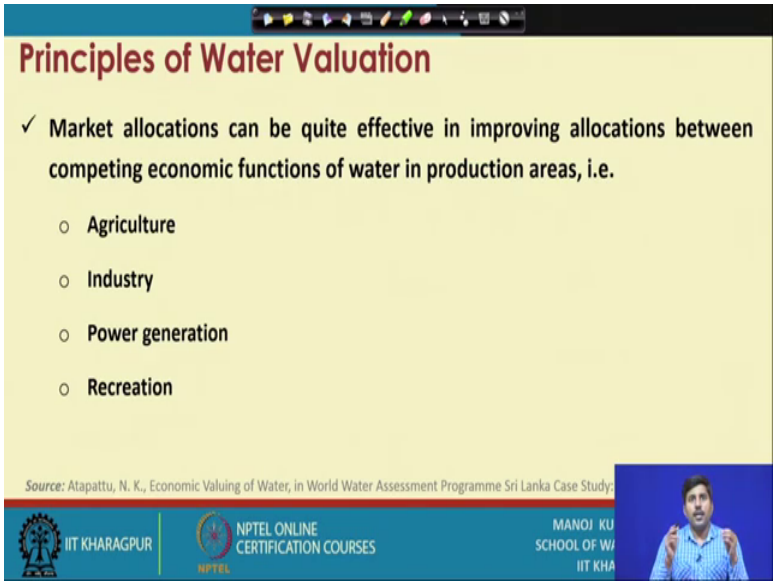

However, it can be quite effective in improving allocations between competitive economic functions. So, where there is a competition for water resources in terms of economic functions. So, basically in terms of product industrial use, and all that where there is water is returning, some sort of monetary water is returning, some sort of monetary values as well.

So, in the particularly in the production areas, in the agriculture, in the industry, in the power generation, in the recreational aspects. So, these are some of the functions or some of the applications of water, where there is a competitive economic return can be analysed, and the allocation can effectively be done, based on the market allocation principles.

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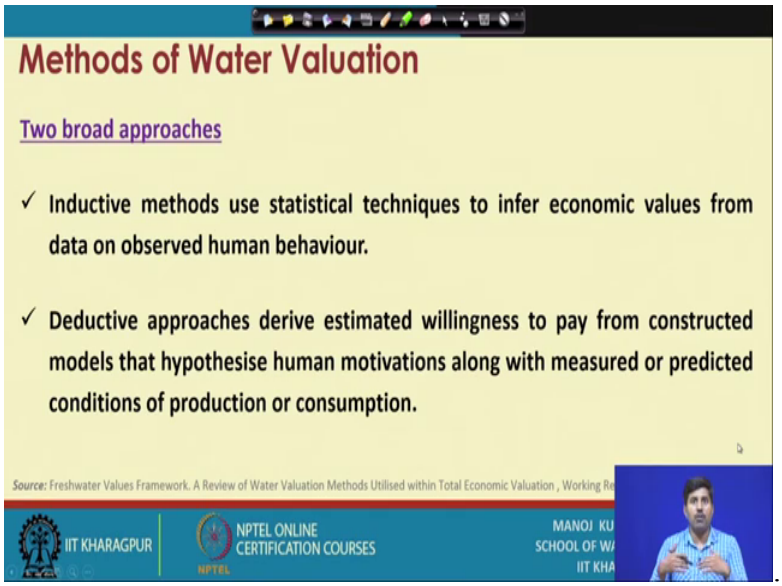

Based on the cost recovery or cost, like gain recovery principles, how much gain is being derived from which particular sector.

There are couple of broad approaches, when we go on to the methods of water valuation. Of course, there are several methods we will discuss one by one, at least some of them, but there are couple of broad approaches. There are inductive methods, which use statistical techniques to infer the economic value from the data, or observed human behaviour. And there are deductive approaches which derive estimated willingness to pay from sort of constructed model, that constructs a sort of hypotheses or hypothesize. The approach that human involves the motivation that human goes through for using that particular, for the consumption of that particular resource or services ok

So, that detective approach will primarily be based on the willingness to pay from, and that will be derived from a model which sort of, considers the human motivation for measured or predicted conditions for production or consumption of certain water services or water goods. Whereas, indicating methods will primarily based on the statistical techniques to infer economic values, based on the statistical data recorded from human behaviour or from like other aspects.

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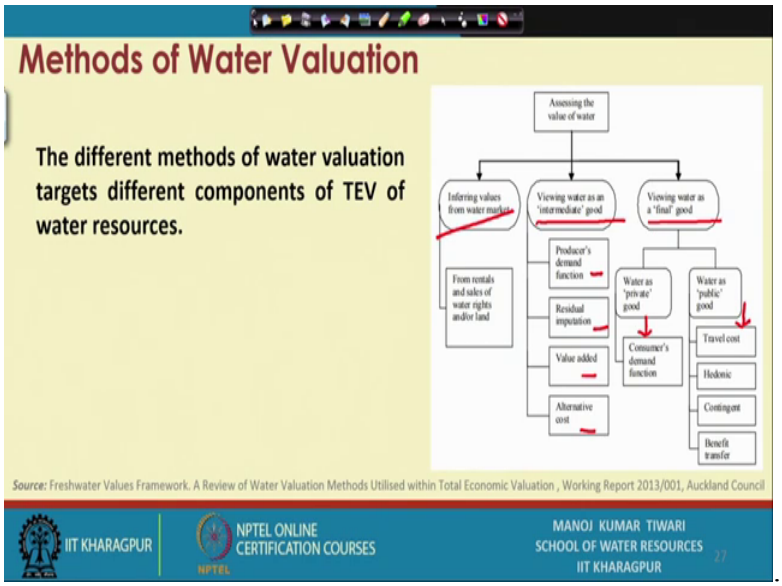

So, there are different methods of water valuation, and they particularly target different components of total economic value of water resources. So, we already discussed; what are the different aspects of total economic value. So, if you see the, if you go on to the approaches of methods of water valuation. So, there are methods that infer the value from water market, which particularly sort of from the rentals that they get the scale, the water rights, and basically the land uses. So, all these like the different aspects of, or the different associated values are gained or inferred from the water market.

Then there is another aspect, another approach, which considers viewing water as an intermediate good. What intermediate good means, that it is somewhere in between like in instead of product, instead of considering the water as a final good, as a final product. We considered that it is an intermediate good. It requires at several stage of a production of a particular final good ok.

So, there, it will consider the producers demand function, it will consider the residual imputations. What is the value is being added by the water in a particular service and what is the alternative cost. So, what we avoid. If we avoid, if you do not add that what alternative cost is being provided. So, it will be more clear, once we discuss the different approaches of the water valuation; however, another one is viewing water as a final good.

So, when we consider water as a final product as a final good. So, there water could be a private good or could be a public good. So, if it is a private good. So, it is going to be the consumer demand function, if it is my particular property, how I am using it, how I am selling it, what cost, how much return it is giving me for a particular service. I would have full authority to consider that, while if water as a public good.

So, then there are various approaches, whether it is a travel cost method, hedonic method or benefit transfer method contingent method. So, we will discuss these methods one by one. So, this is, these are the sort of basic approaches for we component ok.

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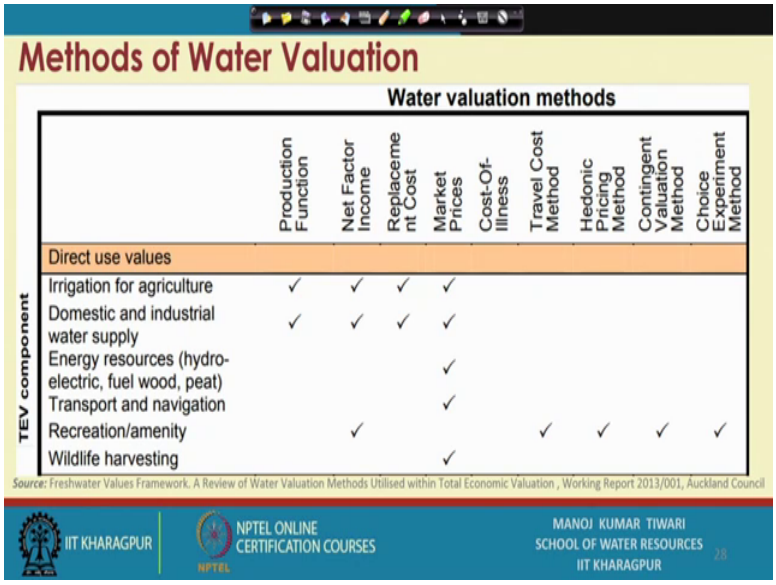

So, for example, it is a compilation, which is available at a freshwater value framework, which is a basically review on water valuation method utilization within total economic valuation from a report, from the working report, from Auckland council.

So, what it suggests that, it has basically summarized various methods. Now for our own interest, if we see. Let us say the direct use values. For example, irrigation for agriculture. So, we have several methods; like production function net income factor or replacement cost or market price. So, these methods would, could be used for the valuation of water resources or water services, domestic. And industrial water supply would also fall in this category, particularly in the direct use this thing.

If we consider as the energy resources market prices are better, because its a total competitive application. So, if water is being used to produce energy. So, that is a competitive use of water, and market prices should be governing this for transport and navigation. Similarly again market prices can be governed for recreation purpose. The net factor income or travel cost method hedonic method. So, all these methods can be used wildlife harvesting. Again the market price could be used.

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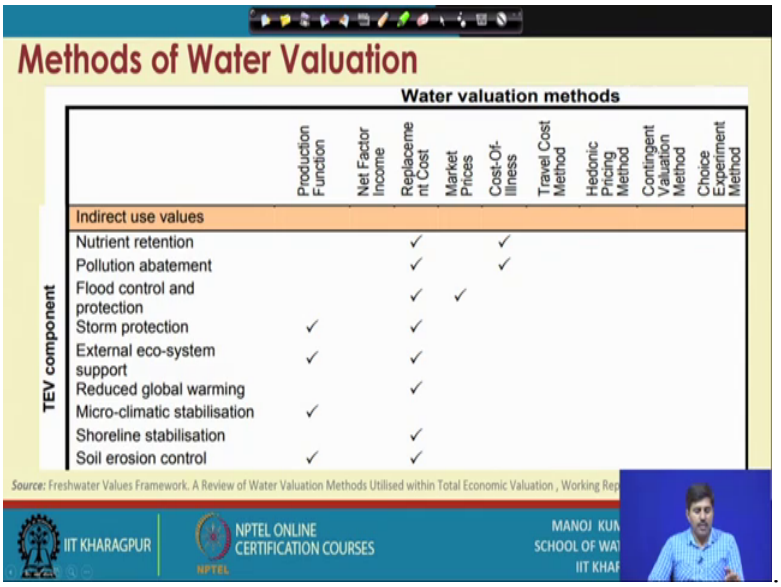

Similarly, for indirect use components including nutrient, retention, pollution, abatement, then flood control and protection storm, protection external ecosystem supports soil erosion, control microclimatic stabilization. So, all these various indirect use values could either be better, be estimated. Either replacement cost method or function method. Of course, at times cost of illness or market price can also be used.

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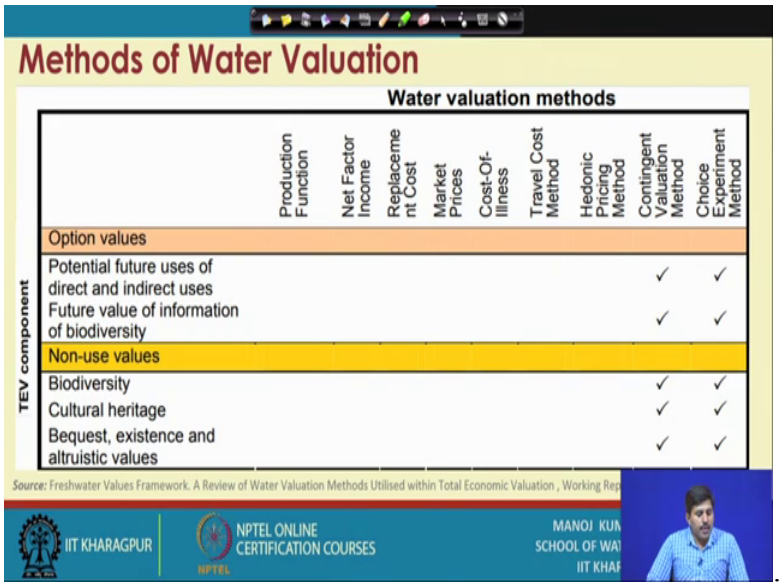

Then there are option values or non-use values. Option values as we discussed for future option, when we keep it, or particularly non-use values, where basically the biodiversity cultural heritage or existence value b quest value. So, all these are option values, which basically considers the future use, are best based on the experiment method or continued invalidation method.

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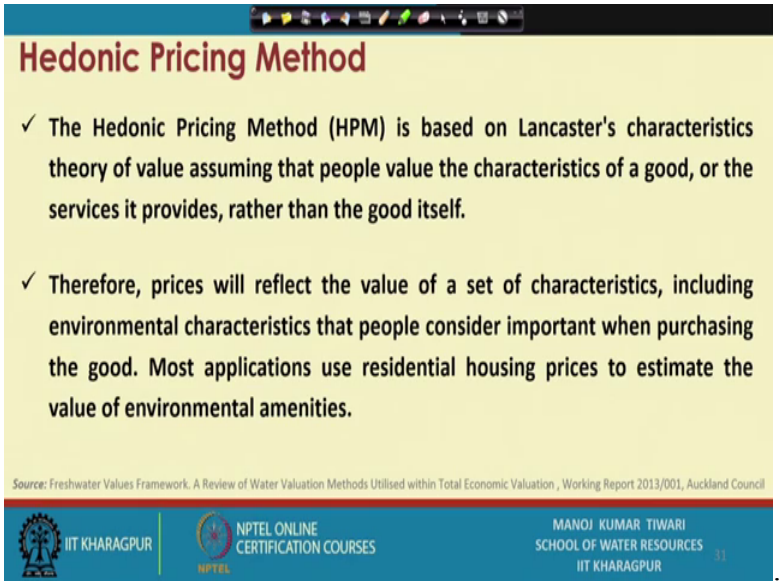

So, let us discuss some of the, or the major ones major methods for valuation of a resource or services suitable for what are purpose one by one.

So, the hedonic pricing method is sort of based on the basic Lancaster's characteristic theory, where it suggests that the people value the characteristic of a good or services. It provides rather than the good itself. So, the prices will reflect the value of a set of characteristics, including environmental characteristic, that people consider important, while purchasing some sort of good, or purchasing some sort of material. Generally the residential housing prices to estimate the value of environmental amenities are monitored or measured, using these hedonic pricing methods.

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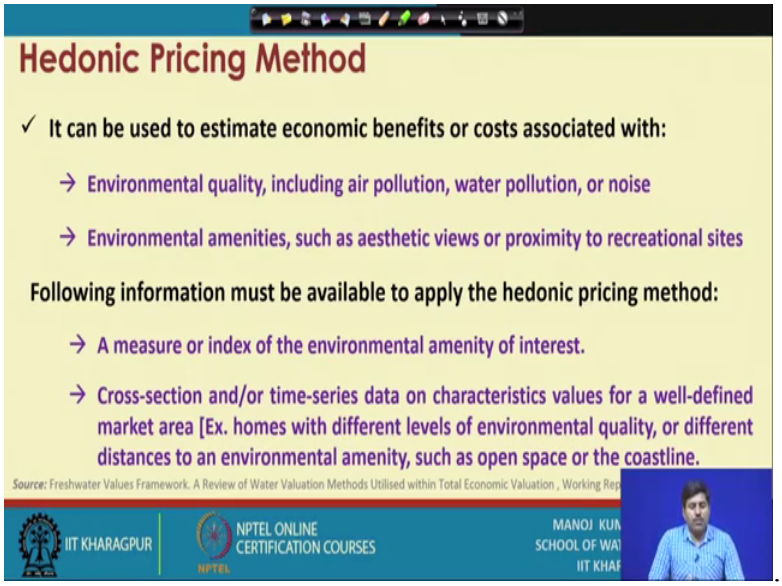

So, it can be used to estimate the economic benefit, or for that matter cost associated with the environmental quality, including air pollution, water pollution, noise or the quantity as well. And further environmental amenities; such as aesthetic view or proximity to recreational sites, and these aspects. One must have a measure of index of environmental amenities of interest in order to apply the hedonic pricing method.

Ah further you like, if one is willing to use this method, he must have an assess to the huge amount of data, on to the time series, on to the cross sectional data, on the characteristic values of various well defined functions in the market area. The example can be taken as, like let us say we have a farm and try to assess its price with or without the access of surface water or groundwater. Now it is very much expected that once you go for purchasing or procuring a farmland, which has easy assess of irrigation water.

Whether it be in the form of surface water ,a canal running by or groundwater significant amount of groundwater available at the water tables are not very lower. So, all these aspects suggest that the prices of that farm are likely to be higher. When you compare it with the, with a form of more or less similar size or similar characteristic, or even similar climatic conditions, but you do not have easy access to water resources.

So, a farmland beside a canal would; obviously, fetch, one more fetch you more price as compared to a farmland in a barren area, where there is not adequate water resources or not adequate irrigation measures are available. So, if you apply the hedonic pricing method, you can get an idea of the value of that water resource for that particular case, that particular scenario by differencing by taking the difference in the prices ok.

And if you nullify all other factors, as you say that if your land is of similar attribute. Let us say the similar size, similar proximity, similar other aspect. So, then you can say that the difference is primarily attributed to the availability of particular water resource, either surface water or groundwater. So, the value the difference in the value of land a, where there is, where there is a. This not only for form, actually this is for any other purpose. You want to buy a, you want to build a residential block or you want to build a industry, or you want to build a sort of recreational facility.

So, for all these actually if you have a easy access of water resource, how much it is adding to that, that can be estimated by the market cost price of a similar size or similar features, or similar attribute with similar attributes of a land deprive of water resources. So, that will give you an idea of the added value or additional value, due to the availability of water resources; however, there are certain limitations of this method. It only considers the value for which people have willingness to pay.

If you are, let us say having a water resource or water services for which people are not interested in paying. For example, if you are going to make a industry factory unit, you will need water. Of course, you will need water, whether there is a pond or something or canal, but if it is adding some recreational aspects, and these kind of aspects. Also it may not be of much value for industry purpose ok.

Because people usually do not go to visit industry for recreational purpose, industries for manufacturing some product. If you are going to have, if you are going to install a factory, your objective is to manufacture certain sort of product. Your aim or your

intention is not to invite people for recreational purpose. So, that probably may not add any value, or for that matter the industry, or the person who are basically seeing that land may not have a willingness to pay for that added or extra advantage.

The quantity here is important that this much quantity would be available for industrial production purpose. If they have got permit and all that. So, that would have attract a price, that would give you a, that would generate a willingness to pay, but certain aspects may not necessarily translate into willingness to pay.

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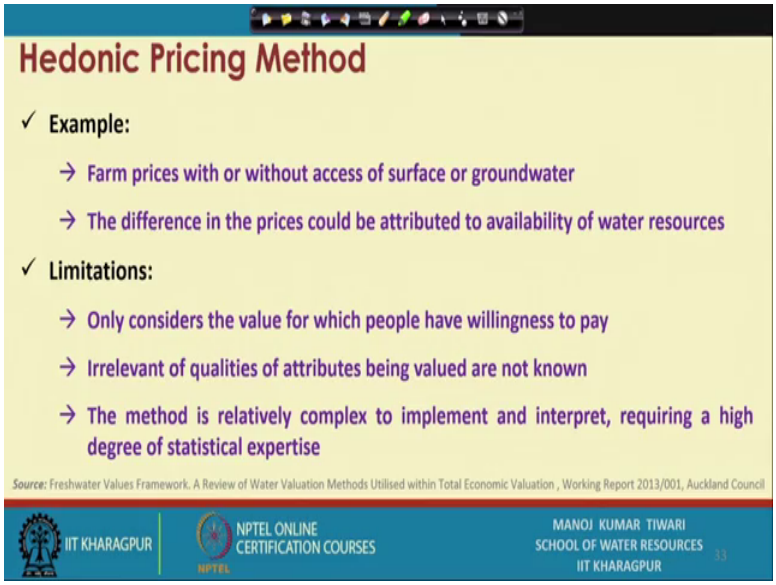

And your hedonic pricing method. If one apply hedonic pricing method, it may not actually consider those values for which the willingness to pay is not there, because that is not reflected in the market prices.

There are irrelevant sort of irrelevant of qualities of attributes being valued are not known. So, many like the, what quality or what particular attribute is being valued. Many times, is again of very high importance, but at times the qualities of attributes that are being valued. If it is not known, it is of irrelevant. So, for applying hedonic pricing method one must know what qualities of attributes are being valued; that is a one basic information; that is needed for using such methods. Further it is relatively complex to implement, and interpret and requires high degree of statistical expertise.

Because, you will have to compare it, based on the different. Once we say like hedonic pricing that you have to have a similar area with similar external attributes, deprived of water resources or deprived of water services. So, you have to sort of, get an estimate in order to get an estimate of the additional values, due to the water. You will need, the all other things in a similar. All other aspects providing a similar set of characteristics, which is not that easy. So, this is one of the limitations of this hedonic pricing method.

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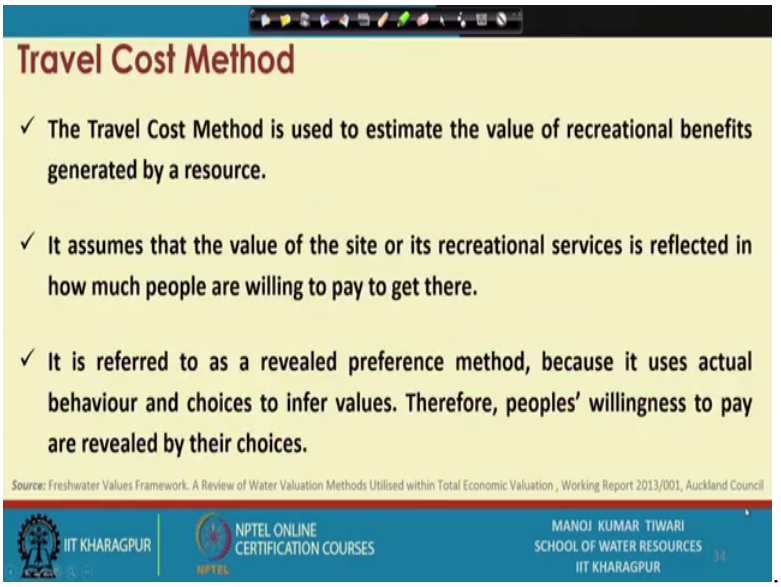

Then there is a travel cost method. The travel cost method is used to estimate the value of recreational benefits generated by a resource. So, it assumes that value of the site or its recreational services is reflected in how much people are willingness to pay to get there. So, this travel cost method primarily is limited, more or less for such aspect only. Even there is some recreational or these aspects involved, and people are willing to pay in order to get there. So, how much cost they are, how much cost they are spending, or how much it is costing to them in order to travel, and they have willingness to pay that much

. So, it refers as sort of revealed preference method, because it is actual behaviour and choices that infer the value. So, people's willingness to pay are sort of, are revealed by their own choices. So, what choice I am making if I need to travel to a lake, whether I am interested in going there or not, and if I am interest in going there, how much money I am spending in order to just go there, that spot, particular spot for my recreational purpose.

So, that amount that spent in this entire tour eventually is attributed, because my intention for that tour is to visit that lake. So, if it is to visit that lake. So, the value that the cost, that this I am incurring should be added to the value of the lake; that is it is basically value.

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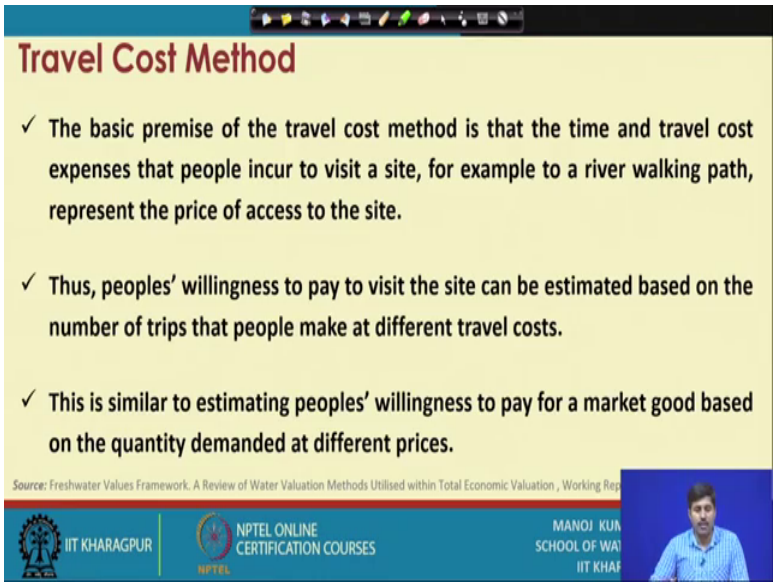

The basic premises of this travel cost method is that the time and travel cost expenses that people incur to visit a site, represents the price of the access of that site. It is not, it is again, it is not the value of that particular resource. It is just the price that I am paying in order to access that site.

So, that way our willingness to pay to visit the site can be estimated based on the number of trips that we are making at different travel cost. So, this is similar to sort of estimating the people's willingness to pay for a market good, based on the quantity demanded at different prices. So, in market also, let us say we have several set of goods or products available we decide, based on the price that how much we should consume, how much we should buy or which product or which company product we should buy.

So, similarly in terms of water resources also for recreational users, if I have, let us say 2 3 or 4 5 popular spots. There is a competitive that where to visit, how much I can, how much it is going to cost me, whether it is justifiable to expend that cost, whether I am willing to pay for that much. So, all these aspects would be considered, would be encountered in this travel cost method.

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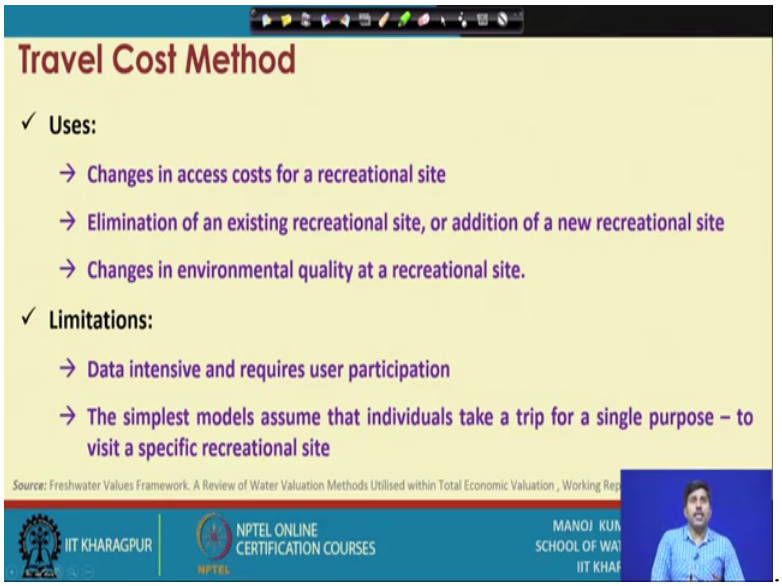

The uses is basically in the changes in the ss cost for a recreational site elimination of an existing recreational site, or addition of a new recreational site. One can use travel cost method. So, if you, let us say eliminate an existing rotational site, see how much revenue, how much changes in the revenue has been observed for people to go there, or people to visit there, and that difference you can set as a access price for that exactly creational side.

Similarly, you add a new creation, new recreational site. And again assess the difference or increase. This time it is going to be in the revenue. So, how much increase in the revenue is there, and that increase in the revenue can be added to the new recreational site, then change in the environmental quality at a recreational site can also be assessed. If I am having a very clean lake, a clean water body, how much value it is adding there

Or alternatively if I am, let us say that water body or that lake has turned polluted so; obviously, lesser number of people are going to visit. So, if there is a degradation in the environmental quality of that resource that can also be estimated, like the revenue generation. For example, you see you have a lake, the revenue generation. When the lake is clean to the revenue generation, when the lake is polluted, the difference can be attributed to the change in the environmental quality of that particular lake water or that particular lake.

So, those kind of applications can be there for travel cost method. The limitations are again it is a very data intensive, and requires user participation, because eventually the cost the travel cost is being borne by the consumers, borne by the users. So, the great degree of user participation is required, and it is a hugely data intensive method, because it is not easy to estimate the how much people are willing to pay, or how much people are spending in order to get an access of a recreational facility.

The simplest of the travel cost model will assume that individuals take a trip for a single purpose. So, we are like assuming, when we are in the general terms. When we are using this method, we are assuming that the purpose is for that trip for that one. We are accounting is to visit a specific recreational site, and there is no other side business involved in that, which can also be a motivation for going at some particular site ok.

I have to make a choice whether should I visit Nainital, or should I visit let us say Kerala. Now if my relatives and my friends, or my some other known people are residing near Naninital, that could be an additional reason for me to motivate to go towards that place, instead of going down to the south or Kerala or alternate way. If my hometown is in south or Kerala or those side, that could be additional reason that motivates me to go there instead of going on the hilltop Nainital. So, those kind of additional factors could also be there, which are generally not encountered in this.

So, we will end this session here, and in the next session we will discuss the rest of water valuation methods.

Thank you.