

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

Lecture - 23
Pricing Water: Water Tariff Models

Hello everyone, this week we have been talking about the pricing water and the previous session we did discussed about the setting of water tariffs. So, what we are going to talk now is about the different water tariff models; what are the different structures, or what are the different schemes to set the water tariffs.

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Water Tariffs Schemes (Models)

- ✓ Fixed charge or Flat rate
- ✓ Uniform volumetric tariff
- ✓ Increasing block tariff
- ✓ Decreasing block tariff
- ✓ Two parts tariffs
- ✓ Seasonal tariffs

The central diagram shows a large blue water drop labeled 'BILL' in the center. Surrounding the drop are four circular icons: 'WATER TARIFF' (top left), 'WATER CONSERVATION TAX' (top right), 'SANITARY APPLIANCE FEE' (bottom left), and 'WATERBORNE FEE' (bottom right). The word 'BILL' is written in the center of the drop.

Image Source: <http://www.mombasawater.co.ke/>

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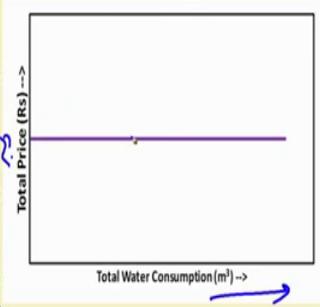
There are quite a few well accepted water tariff schemes which sort of includes the fixed charge or flat rate systems or uniform volumetric tariff increasing block or decreasing block tariffs or 2 part or seasonal tariffs or a combination of these can also be used at times.

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Water Tariffs Schemes (Models)

Fixed Charge or Flat Rate:

- ✓ Charge a constant fee regardless of the volume used
- ✓ The consumer pays a monthly water bill, which is the same independently of the volume consumed.
- ✓ However, the charge may vary according to specific factors (such as connection size or type, consumer type etc.).



The graph illustrates a fixed charge or flat rate tariff model. The vertical axis is labeled 'Total Price (Rs)' and the horizontal axis is labeled 'Total Water Consumption (m³)'. A horizontal purple line is drawn across the graph, indicating that the total price is constant regardless of the volume of water consumed. A blue arrow points to the right along the x-axis, and another blue arrow points to the horizontal line.

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So, we are going to talk about these one by one, to start with there is a system for pricing water which works based on the fixed or flat charge. So, it is a very simple system it straightaway charges a constant fee regardless of whatever volume is being consumed or whatever volume is being used. So, the consumer pays fixed monthly water bills which is the same independently of the amount or of the water consumed now if you see. So, whatever water is being consumed whatever scale of water is being consumed there is no increase in the price.

The price is more price is fixed, this is one of the very common systems or one of the very common setups particularly in India and many other places. In fact, it is priced that way the charges may vary according to specific factors such as connection size or connection type or consumer type. So, based on those aspects the charges could be vary, but it is not dependent on the consumption pattern.

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Water Tariffs Schemes (Models)

Fixed Charge or Flat Rate:

- ✓ In absence of a water metering system, a fixed water charge is the only possible tariff structure, and hence very common in many parts of the world, including India.
- ✓ Fixed water charges are commonly found in countries where water has historically been abundant and hence metering was not needed to give people an incentive to reduce water consumption.
- ✓ Fixed charges are still quite widely used in industrialised countries, such as Canada, Norway, and the United Kingdom.

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So, particularly when there is no metering system available this is the only option that one gets for pricing water because if you do not have a metering system in the previous session we were discussing that in the most of households across the country we do not have water meters installed.

So, when you do not have water meters installed how you are going to pay for a known consumption because the consumption itself is not known. So, when the consumption is not known at the first place you cannot go for any tariff structure which is consumption based and in the absence of the metering system or in the absence of the quantification of the consumption of water from households of fixed water charged or a flat rate is the only possible tariff structure and that is why it is very common in many parts of the world it is not only in India, but in many other parts of the world as well this fixed water charges are commonly found in countries where water has historically been abundant and hence metering was not needed to give people a sort of incentive for reducing their consumption.

Because you meters a quantity only when there is some sort of indication that you want to know how much you are consuming can it be reduced or all those aspect will only matter when there is something is in the like not abundant quantity since water at many places are in plenty people do not talk much about this saving water and when they do not talk about the saving water or when they do not interested in how much water they

are spending or how much water they are wasting they are not very inclined towards the metering water they are not very inclined towards the metering the consumption of water and when one is not metering the water consumption you have no other option, but either not to charge anything or to charge a fixed rate or a flat price.

So, these fixed charges are still quite widely used in several industrialized countries also including Canada, Norway and United Kingdom.

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Water Tariffs Schemes (Models)

Fixed Charge or Flat Rate: Criteria for Setting

- ✓ **Income and/or ability to pay:** Higher fixed charges set on valuable residential properties on the assumption that people with a higher income tend to use more water and/or have a greater ability to pay for the water they use.
- ✓ For the same reason it is common to assign commercial entities a different fixed charge than for households.
- ✓ **Diameter of the pipe connecting to the distribution system:** Households, which generally require a smaller bore than connections for larger concerns (e.g., businesses, hospitals), are commonly set a lower fixed charge.

Source: <https://www.sswm.info/category/implementation-tools/water-use/software/economic-tools/water-pricing-fixed-water-charge>

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In India it is very common many parts many most of the cities in India actually we either do not pay. In fact, not paying can also be considered in a way as a fixed charge where charge is 0, it is as good as that. So, we are not paying or paying a flat or fixed charge for water consumption now if you see what is the criteria for setting the fixed charge.

When we let us say we do not have water a metered system we have to go for fixed charge only. So, what how we should basically assign a fixed charge what is going to be the criteria, criteria could be income based or ability to pay based. So, higher fixed charges are set on valuable residential properties on assumption that people could have higher income and would be willing to pay more for water and with the sort of larger or well equipped houses their consumption is also likely to be more even after unmetered even after it is not metered, but one can get an idea of the consumption pattern as well, those people whose incomes are higher they typically have a greater ability to pay.

So, for these reasons income based fixed charges or income means that depends on the society or that depends on several other aspect it can be reflected in those. So, fixed charges could be fixed based on that for the same reason it is common to assign commercial entities at different fixed charge than a household. So, because household consumption are for the basic essential needs so that is charged at a lower fixed rate while the commercial is a basically profit making entity. So, they are charged at a higher fixed rate even of even if they are unmetered another criteria could be the diameter of pipe connecting to the distribution system. So, household we generally require less amount of water would be connected with a sort of smaller bore or smaller pipe dia the larger entities business hospitals or industries will commonly sort of have larger fair use or larger bores larger dia pipes for meeting their water demands.

So, they can be set a higher fixed charge because smaller dia pipe means or smaller bore means your consumption is also likely to be proportionally smaller whereas, a larger pipe size or larger dia setups are an indicative of the higher consumption as well. So, based on this size as well the charges can be adjusted. So, it is not that the charges are going to be uniform across all customers as we as we have been seeing it could be it could not be. So, charges could be vary based on the customer characteristics or based on the consumption characteristics, but it is not going to be based on the volume of the consumption because volume of consumption is not metered even if it is metered in a fixed system when you say that we are going to charge you let us say this much of money per month it is going to be that and that is what is happens in mode of most of the cities in India some people pay 50 rupees a month, 100 rupees a month, 200 rupees a month, 300 rupees a month, that sort of prices are paid for water it is not that it actually accounts quantitative estimation of that.

There are certain advantage of fixed charges or flat rates the advantages are that it does not need a metering system because since you are charging at a flat rate the you are not interested or one does not require the amount of consumption done at a at a individual specific connection beat a household or industry it is easy to administer because the charges are fixed for everyone, fairly easy.

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Water Tariffs Schemes (Models)

Fixed Charge or Flat Rate: Advantages

- ✓ Does not need a metering system
- ✓ Easy to administer
- ✓ Ensures affordability of water services if differentiated by ability to pay
- ✓ Provides stable cash flow if set at appropriate level

Source: <https://www.sswm.info/category/implementation-tools/water-use/software/economic-tools/water-pricing-fixed-water-charge>

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It ensures evade affordability of services if sort of differentiated by the ability of pay because charges can be accordingly established and it can provide a stable cash flow if set at an appropriate level. Now, this is a misleading idea that a fixed charge or a flat tariff system cannot be sort of sustainable in short of course, it cannot be sustainable in long term it needs substantial revisions that way, but in short terms if you see particularly let us say I want to recover my onm cost I just see that this is my total onm cost per annum and I need to recover this money I see these are the number of connections or let us say n number of connection n_1 number of connections are with certain dia while n_2 number of connections are with certain other dia. So, I can actually fix a charge a flat charge that I need to collect this let us say a flat price of 200 rupees per month from these households, a flat price of 350 rupees from this household, a flat price of let us say 3000 rupees from these larger business entities or commercial establishment or in sort of companies factories.

So, that would give me the total recovery, in a smaller setup in a smaller time frame even the fixed water tariffs could eventually be sustainable at times could be justifiable also if you are going income based and if you see that if for metering purpose how much resource how much further financial resources would be needed if you want in order to avoid that if you can get it done by just putting a fixed charges and people have that willingness to pay in that way. So, even that can be wonderful it could be workable solution.

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Water Tariffs Schemes (Models)

Fixed Charge or Flat Rate: Disadvantages

- ✓ Do not give signal of the real cost of providing water and sanitation services
- ✓ Do not provide incentives (reductions in bill) to reduce water consumption
- ✓ Water might be sold at high prices to the households with no access to water
- ✓ It is not possible to know the exact level of water consumption because there is no metering
- ✓ In the long-run, fixed charges do not generate revenues for future service expansion, hence locking communities into poor level of service

Source: <https://www.sswm.info/category/implementation-tools/water-use/software/economic-tools/water-pricing-fixed-water-charge>

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However there are associated disadvantages that it does not give a signal of the real cost of providing water and sanitation services. So, in a fixed charge model in a fixed rate model in a flat rate model one will not know that what is the real cost of water and sanitation services and since it is not providing any incentive it will not lead or it will not encourage the people to reduce their water consumption because in order to reduce their water consumption if there is certain incentive like in the if I reduce my water consumption I will have to pay less for my water fees. So, those sort of incentives could help in reducing the water consumption which typically is missing in the fixed charge systems.

Water might be sold at high prices to the household with no access of water that is one more disadvantage that if let us say certain households are not connected with the water people or a some particular section of community or particular people may actually take undue advantage by feeling because they are not they need not to pay any extra for more water. So, they can feel more water and sell that water to the households where there is no water available or there is no those households which are not connected to the water services.

So, if they are not connected to the water services they can basically sort of sell that what are in unfair way of course, further it is not possible to know the exact level of water consumption because they are not metered. So, that is the consumption pattern or

consumption level would also be not known in such a system and in long run fixed charges do not guarantee revenue for future services hence the like communities could face the poor level of services because if the charges are fixed in a long run if you are not generating this subsequent revenues it can be done. In fact, if you revised your fixed charges from time to time and you in count you sort of corresponds to incorporate the different expenses or the likely addition in the infrastructure or infrastructure improvement or enhancing the services.

So, what are likely expended in expenditures likely to occur in such setups if those are considered one can actually get a get a revenue generated as well from fixed charge systems, but because if flat prices does not increase that way are not increased frequently or are not generally decided based on the overall recovery or overall sustainable financial sustainability of the system. So, that way in long run if you do not end up having a significant pool for further expansion or further improvement in the water services you are the society may end up facing the poor level of services as well. So, that is kind of a risk associated it is not certainly that it is going to happen, but this could happen that is a very common risk associated with the flat rate setups.

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Water Tariffs Schemes (Models)
Fixed Charge or Flat Rate: Example - Tariff structure in Raipur in 2009

Type of Consumer	Size of Connection	Per Day Charge
Domestic	0.5" = 1.3 cm	Rs 2.00
Commercial	0.5" = 1.3 cm	Rs 4.90
	0.75" = 1.9 cm	Rs 15.00
	1" = 2.5 cm	Rs 25.00
	1.5" = 3.8 cm	Rs 40.00
	1.75" = 4.4 cm	Rs 70.00
	2" = 5.1 cm	Rs 100.00
	2.5" = 6.4 cm	Rs 130.00

Source: TERI (2010): Review of Current Practices in Determining User Charges and Incorporation of Economic Principles of Pricing of Urban Water Supply
 Taken from - <https://www.sswm.info/category/implementation-tools/water-use/software/economic-tools/water-pricing>

Handwritten notes: 60/month 730, ₹150/month

Fixed charge or flat rate setups if you see an example here is from the city of Raipur of course, this data is a little older in 2009. So, that is in 2009 how it was priced in Raipur. So, based on this size of connection the domestic connections were of size of 0.5 inches

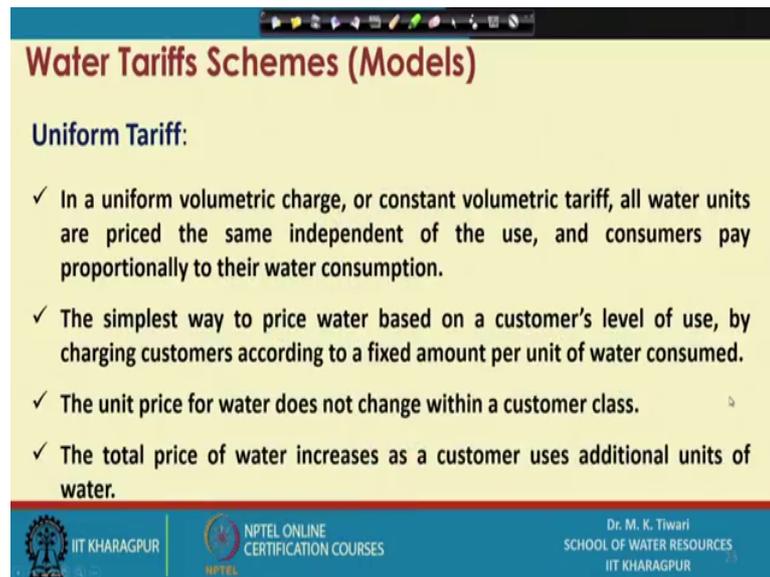
were priced 2 rupees per day, 2 rupees per day price means monthly almost 60 rupees per month or annually if we say that we have 365 days, almost around 730 rupees per annum. So, that was the annual price for water paid by the domestic consumers in the Raipur 60 rupees per month very low, for the same size of the connection 1.3 centimeters connection size 0.5 inches the commercial price for commercial establishment was close to 5 rupees. So, 4.9 rupees that way if you see this turn out to be some close to approximately around 150 rupees per month.

So almost more than 2 fold and further based on the increasing sizes increasing size of the connection because the larger the connection size the larger is expected to be the consumption of water you can see that the per day charges were also increased in proportion. So, that way the pricing structure was done at Raipur and it is a very clear example of how the fixed or flat charges are deployed.

There could be further arguments that the domestic connections all the domestic connections are priced at a fixed rate of 2 rupees in you know further revised setup or revised system it could be made based on the based on the type of domestic connection as well. So, for example, for poor people or for people with low income group people you could give similar dia connection at lesser price as compared to the people from well to do societies or well to do sections or higher income group sections or from those societies. So, those kind of amendments possibilities there, but as an example case is how the fixed charge or a flat rate system works.

So, moving towards the next model which is the uniform tariff system which charges the consumers based on their water consumption.

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Water Tariffs Schemes (Models)

Uniform Tariff:

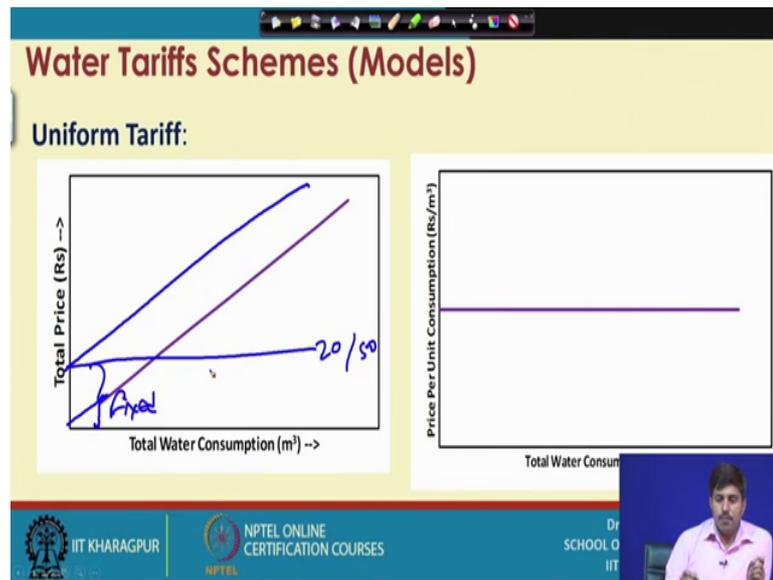
- ✓ In a uniform volumetric charge, or constant volumetric tariff, all water units are priced the same independent of the use, and consumers pay proportionally to their water consumption.
- ✓ The simplest way to price water based on a customer's level of use, by charging customers according to a fixed amount per unit of water consumed.
- ✓ The unit price for water does not change within a customer class.
- ✓ The total price of water increases as a customer uses additional units of water.

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So, post the fixed tariff model all other models that will be discussed will incorporate the concept of how much water is being consumed by a customer in absence of the water consumption data the flat rate is the only option. Now, the uniform tariff is basically sort of a uniform volumetric charge or a constant volumetric charge where all units are priced the same price, same tariffs independent of their uses and customer pay proportionally to their water consumption.

So, it is the simplest way of pricing based on a consumer customers level of use charging customers according to a fixed amount per unit of water consume the unit price for water does not change within a customer class of course, here also you can have a different customer classes like we have just means just saw an example the domestic customers are charged at a different rate and commercial customers are charged at a different rate. So, that concept would carry on for all the pricing models, but for within a customer class the price here unit price does not change within a customer class. The total price of water increases as a customer use additional units of water here in the uniform tariff system the rate is uniform the rate is fixed, but the total amount will change based on the quantity consumed.

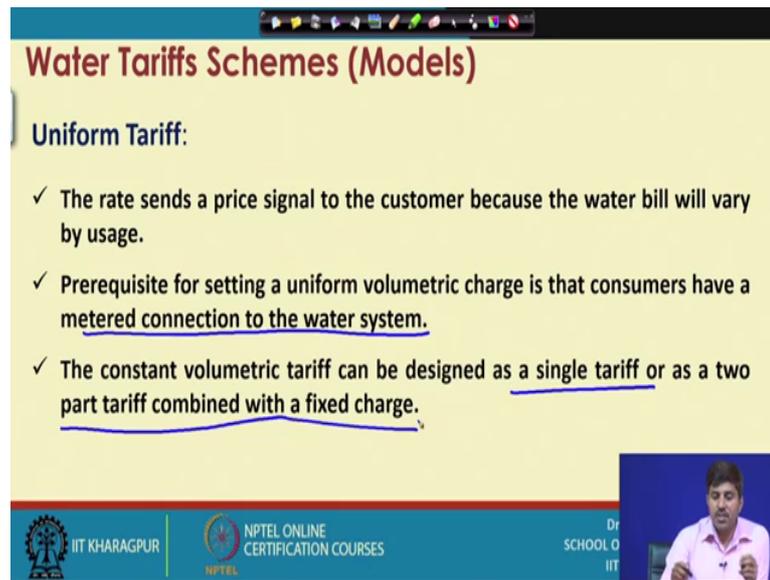
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That can be seen from these couple of graphs here, if you see the total water consumption with the what is so ever total water consumption increasing over here we do not see any change in the unit price of the water. So, this is price per unit consumption. So, price per unit consumption is stable it is not going to change and this translates in a total price like this, your water consumption is increasing and because your price per unit consumption is fixed. So, the total price you will pay will actually increase linearly with the consumption rate.

So, that is what uniform tariff is and this is another sort of popular model another very much used model for pricing water the rate uniform tariff rate sends a price signal to the customer.

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Water Tariffs Schemes (Models)

Uniform Tariff:

- ✓ The rate sends a price signal to the customer because the water bill will vary by usage.
- ✓ Prerequisite for setting a uniform volumetric charge is that consumers have a metered connection to the water system.
- ✓ The constant volumetric tariff can be designed as a single tariff or as a two part tariff combined with a fixed charge.

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Because the water bill will vary by the uses which is not there in the earlier fixed rate system the prerequisite involves for this that all the connection should actually be metered. So, for such a system one needs to meter the water system and when you have a consumption data available then only this kind of model can be employed.

The constant volumetric tariff can be designed as a single tariff or a combined 2 part tariff with a fixed charge, how this fixed charge and single tariff system will work will actually be like if you are having a 2 part tariff which eventually we will discuss later also, but like the one that is being seen here. So, this is you can if it is being passing through 0, no water consumption no price is your simple uniform tariff; however, one can have actually a uniform tariff system like this that this much is the basic would be fixed rate would be charged this is the fixed rate would be charged from every customer let us say be 20 rupees or 50 rupees or what so ever rupees and post that whatever uses will actually be charged according to the consumption. So, those kind of models those kind of setups can be used in the price in the pricing.

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Water Tariffs Schemes (Models)

Uniform Tariff: Signals

- ✓ Uniform volumetric rates can be structured so that the unit price for water is low (sending a weak conservation signal) or high (sending a strong conservation signal but potentially risking affordability concerns for some customers).
- ✓ The unit price for water can also change throughout the year. The annual variation in water costs by applying a higher price per unit for water could be used during certain times, usually the summer months.

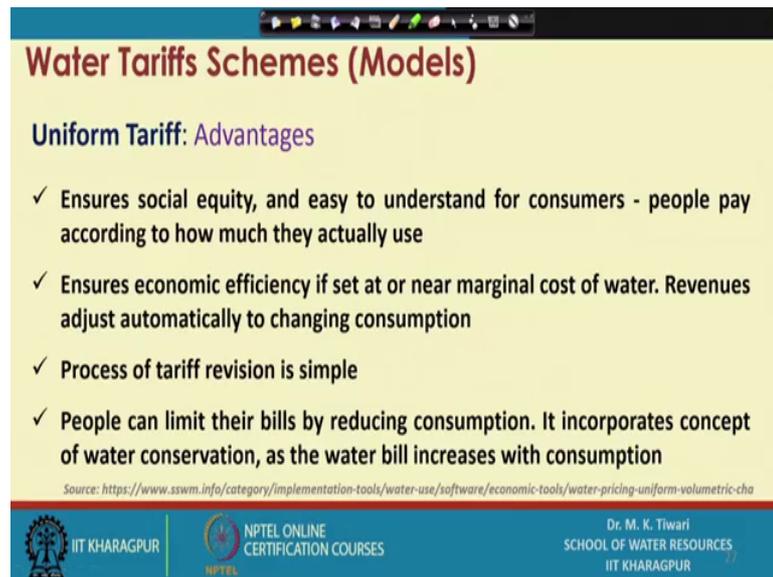
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This the signal that it sends this sort of uniform volumetric rate it sends a signal that the unit price for water if it is low it sense that there is not much need of water conservation of course, if you compare with a flat rate system there is a stronger signal of water conservation because you consume less you pay less, but if the prices are low; that means, you are not bothered that much about the conservation, but if prices are high this rather saying sends a stronger signal, but at the same time it potentially risks the affordability aspect as well.

So, with higher tariffs your higher uniform tariffs the system or the services may not be affordable to sort of low income groups. The unit price for water can also be changed throughout the year, this will this annual variation in water cost by applying a higher price per unit of water could be used in certain times when there is a water availability reduces like in summer months. So, one can see that summer months the water will be charged at a higher uniform rate. So, then it is sort of you will see 2 different curves or 2 different price slabs although both uniform, but let us say one can have that from for example, from July to let us say February or July to March the prices will be prices will be say let us say 20 rupees per kilo liter.

While from March or from April to the June or April to this for the summer months the prices are going to be 30 rupees per kilo litre, that kind of system can be adopted which sends the although uniform rate but different price signals.

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Water Tariffs Schemes (Models)

Uniform Tariff: Advantages

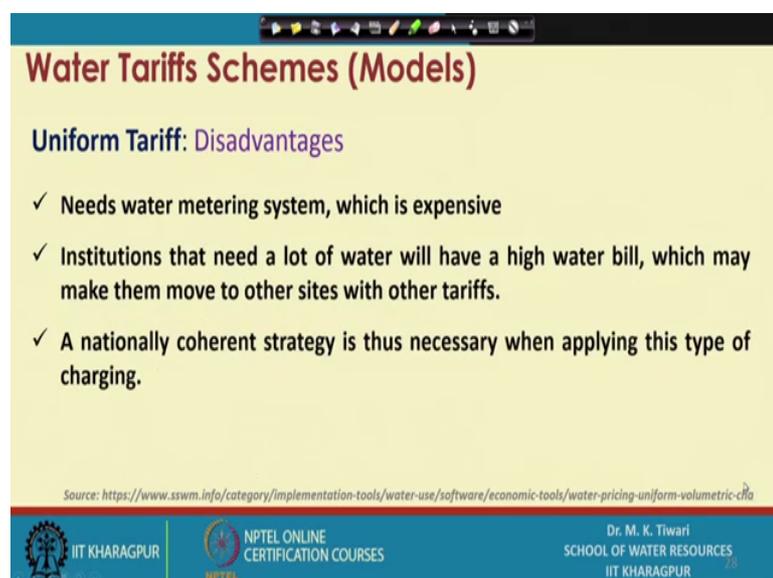
- ✓ Ensures social equity, and easy to understand for consumers - people pay according to how much they actually use
- ✓ Ensures economic efficiency if set at or near marginal cost of water. Revenues adjust automatically to changing consumption
- ✓ Process of tariff revision is simple
- ✓ People can limit their bills by reducing consumption. It incorporates concept of water conservation, as the water bill increases with consumption

Source: <https://www.sswm.info/category/implementation-tools/water-use/software/economic-tools/water-pricing-uniform-volumetric-cha>

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The advantages are obvious it in basically ensures social equity, it is easy to understand for customers, people pay according to how much they have used it is like simple market strategy, how much you consume, you pay for that at a fixed unit rate. It ensures economic efficiency if set at a near marginal cost of water, revenue adjusts automatically to changing consumption. So, more consumption, more revenue process of tariff revision is again simple because you need to see how much you need to increase a simple and the increment in the price and people can limit their bill by reducing consumption so that sort of water conservation signal is also inferred.

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Water Tariffs Schemes (Models)

Uniform Tariff: Disadvantages

- ✓ Needs water metering system, which is expensive
- ✓ Institutions that need a lot of water will have a high water bill, which may make them move to other sites with other tariffs.
- ✓ A nationally coherent strategy is thus necessary when applying this type of charging.

Source: <https://www.sswm.info/category/implementation-tools/water-use/software/economic-tools/water-pricing-uniform-volumetric-cha>

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While disadvantaged actually it needs metering system, which is expensive and institutions sort of that needs a lot of water will have a high water bill because the prices are fixed and a more consumption will incur more water charges nationally coherent strategy is necessary when applying this type of charging in order to say that whether it is fulfilling the affordability aspect or not. So, that affordability criteria needs to be ensured while putting a uniform tariff rate and more, ever needs to be seen that the services are services can be borne by the lower income group as well. So, that is all about the uniform tariff model and we will discuss the few more models as the block tariffs particularly in the next session.

Thank you.