

Water Economics and Governance
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Lecture – 30
Water Pricing Case Studies

Hello everyone. We have been talking about the water pricing since last couple of weeks and in this particular session we will be taking some case studies, some data from the different states, different individuals from varying from individuals to the national level data and through these data, through these some specific cases we like to see how the pricing is varied across the globe and some of clues that how it can be used to regulate a few critical aspects of water management.

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Case Studies: India

Chennai

- ✓ A sampled apartment pays Rs 820 as water bill for six months for water consumption. There are fixed charges of Rs 320 and Rs 500 is tax = Rs 820. The billing is based on property valuation.
- ✓ In case the building (8 apartments) does not have adequate water, a tanker water supply is taken which costs close to Rs 700. Thus tanker water supply for one day / apartment can be 3/4th of the monthly water utility bill for the apartment.
- ✓ Seven years back a meter was installed in the apartment. No one has ever come to read the meter yet.

Source: Mr. Pawan Sachdeva's Lectures on Business Analysis of Water Utilities

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So, to start with let us consider a few cases from India. There has been a study done independently by one of the IT conductor aluminous Mister Pawan Sachdeva. So, through the various water bills from different independent households, apartments across the different cities in India. So, he kind of compiled and so in Chennai the sample department pays rupees 820 as a water bill for 6 month of water consumption.

So, there are fixed 320 charges for 6 month and 500 is of tax which makes it total to 820. The billing is based on the property valuations. So, what is the value of property, what is the land area coverage, based on that this billing is done. In case of the building does not

have adequate water, a tanker of water is taken and which cost for 1 tanker caused rupees 700.

So, you see if 1 tanker is taken for a day. So, the 1 day cost for the apartment, for the building that includes 8 apartment actually who be around three fourth of the monthly water bill for apartment. So, that kind of inappropriaty is there in the billing or in the charging for the water. 7 years back a meter was installed in the apartment, but as per the residents no one has ever come to take the reading from the meter in the past 7 years.

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Case Studies: India

Mumbai and Bangalore Apartment Complex

- ✓ The water billing is part of the housing society maintenance bills.
- ✓ Most of the residents are not aware of their water charges as it is part of composite payment to the society which manages the apartment / housing complex.
- ✓ The maintenance bill does give any details of the volume of water consumed either at the society level or at household level.

Source: Mr. Pawan Sachdeva's Lectures on Business Analytics

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From Mumbai and Bangalore apartment complexes, the water billing is a part of housing society maintenance bills. Most of the residents are not aware of their water charges as it is the part of composite composite payment given to the society which manages the apartment and housing complex. So, independent users are not at all aware that how much water they are consuming and how much they are actually paying for the water because they are paying a lump sum amount, whole sum amount to the society which includes the maintenance water and all this stuff.

The maintenance bill does not give any detail of the volume of water consumed either at the society level or at the household level.

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Case Studies: India

Noida Apartment Complex

- ✓ The apartment complex is few years old, and is billed only for its electricity consumption.
- ✓ Though water is supposed to be billed, at present there is no billing raised by the local water utility.
- ✓ It is expected that at some point of time in future, the local water utility will raise water bill from retrospective effect.

Source: Mr. Pawan Sachdeva's Lectures on Business An



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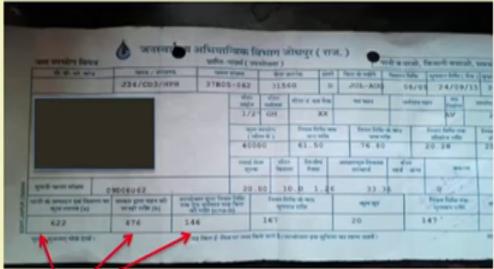


Apartment complex in Noida which is a few year old is billed only for the electricity consumption. Though water is supposed to be billed at, at present there is no billing raised by the local water utility; however, people are expecting that at some point of time in the future the local water utility is going to raise the water bill from this retrospective effect as well.

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Case Studies: India

Jodhpur and Nagpur



Check this out

Source: Mr. Pawan Sachdeva's Lectures on Business An



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These are a couple of water bills from Jodhpur and Nagpur which is in fact kind of a bill which should come.

These are, this how a water bill should come if you see. So, they have the picture of water meter like for Nagpur bill if you see there is a picture of water meter. So, one can practically verify that some person has come and taken the reading. So, that is the added advantage when water bill or for that matter electricity bill also contains the picture of the meter. One can have an asses of the older value, newer value and so for example, the bill from Jodhpur you see it has clearly mentioned that the what is the current reading, what is the previous reading, how much has been the consumption. So, that way the bill for the water does come consumption based for the meter consumers at few places in India also.

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Case Studies: India

Delhi Water Bills

The image displays three sample Delhi water bills. Each bill includes the following information:

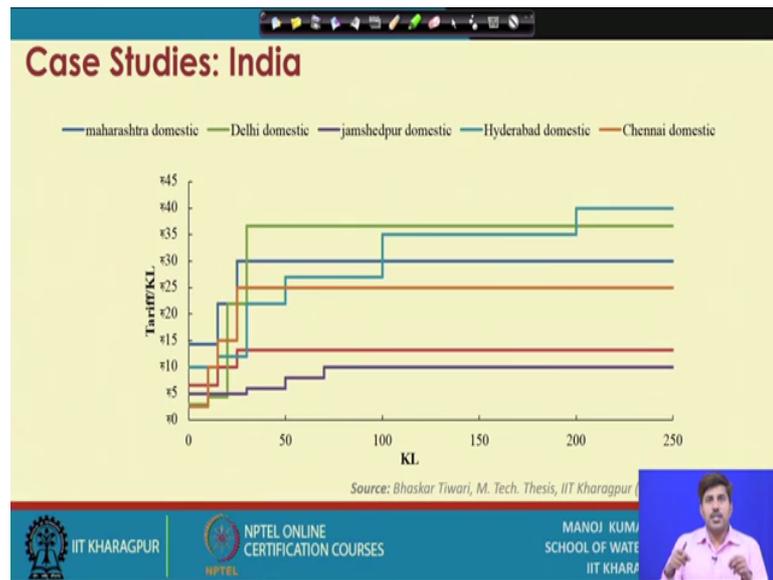
- Consumer Details:** Name (e.g., CHANDER PRAKASH SACHI, KALESHNA HANUJI, RAJESH KUMAR SINGH, RAJINDER KUMAR), Address (e.g., MANSAKAR GARDEN, MANSAKAR GARDEN, MANSAKAR GARDEN, DELHI).
- Bill Information:** Bill No. (e.g., 15770117201, 15770128535, 15770105043), Bill Date (e.g., 30-NOV-15, 30-NOV-15, 30-NOV-15), Category (CAT I).
- Period and Consumption:** Bill Period (e.g., 19-SEP-15 to 29-NOV-15), Consumption (CL) (e.g., 59).
- Charges:** Due date (e.g., 17-DEC-15), Consumption Charges (e.g., 464.37), Service Charges (e.g., 278.5), Water Rent (e.g., 539.77), Water Cess Charges (e.g., 1.18), and Water Total (e.g., 1284.02).

Source: Mr. Pawan Sachdeva's Lectures on Business

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These are few water bills from Delhi. So, this is how a Delhi water bill looks like of course, with the important informations in the bill.

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These are a compilation of the water tariff structured for various cities including Delhi, Jamshedpur, Hyderabad, Chennai and Maharashtra.

The domestic water bill. Again this study compiled for M practices at IIT, Kharagpur. You see the tariff structures are variable. Delhi the domestic tariffs are much higher. although for the first slab now it is lower for first 20 kilo liters, but usually for the higher tariffs it is pretty high and so is for the Hyderabad. The Chennai which works on the coastal water and they have recently installed couple of desalination plants as well is not charging that much for the water.

So, water bills in Chennai is relatively very low when you compare with the actual expenses being made in processing or procuring the water because.

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Case Studies: International

Water Tariffs set by:

Company	Tariff set by
American Water Company	Economic Regulator
DC Water	22 member board with representatives from district establishments and guides strategic planning. Board sets the tariff
Thames Water	Economic Regulator
Affinity Water	Economic Regulator
Melbourne Water	Economic Regulator
Yarra Valley	Economic Regulator
South East Water	Economic Regulator
PPWSA	Government
Manila Water	Long term concession. Tariff set for 5 years by MWSS- Agency which earlier owned the assets
PUB, Singapore	Company itself.

Source: Mr. Pawan Sachdeva's Lectures on Business An

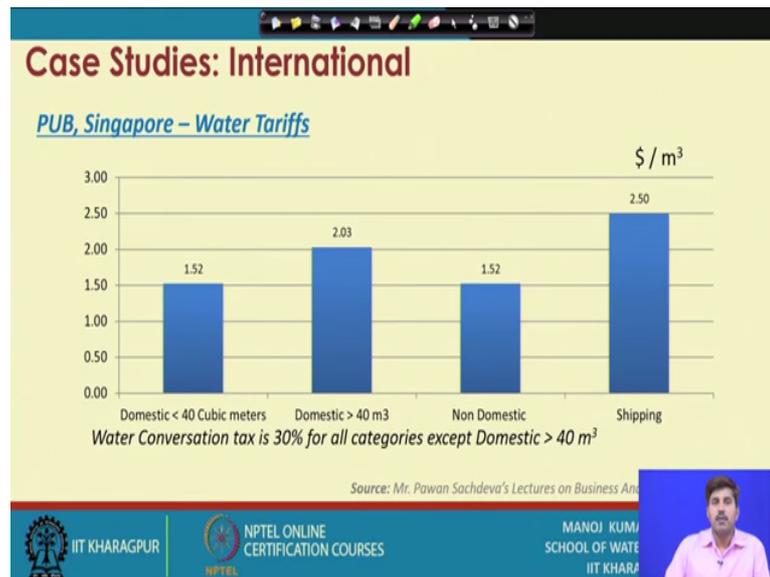
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It is usually typically coming from the sea. The in the beginning of the session this week we were discussing about the importance of economic regulator. How economic regulator or how a independent regulator is useful in regulating the prices and having an independent approach onto the needs of different stakeholders including the owner, including the operator and including the consumer side.

So, if you see internationally at various places across the world, the tariff is set by the separate economic regulator. The American water company has a economic regulator. The DC water has a 22 member board which represents from district establishment and guides strategic planning. Then Thames water, affinity water, Melbourne in the Australia, Yarra valley southeast. So, all these having a economic regulator.

In Cambodia Phnom Penh, the water tariffs are regulated by the government. Then, there are Manila water which is tariffs set by a 5 member agency which earlier on the set. The Singapore Company itself sets the tariff. So, there are different types of tariff setting model across the world.

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Mostly in the developed or in the nicely working utilities, they have a independent economic regulator for the purpose of setting tariffs.

Singapore, the public utility board of Singapore which manages the water also is one of the very bright examples of water management, particularly urban water management because there is not much of agricultural activity. So, for urban water management you see Singapore does not had a water source for itself and it used to import water from Malaysia. So, they had a treaty of importing water for the Malaysia and then the treaty was again revised; however, they slowly started conceptualizing it and they developed, they kind of came forward to, took the initiatives. They reduced their dependency on the their neighbor country Malaysia and they have made, now there are three four different sources of water which there are four taps they call it.

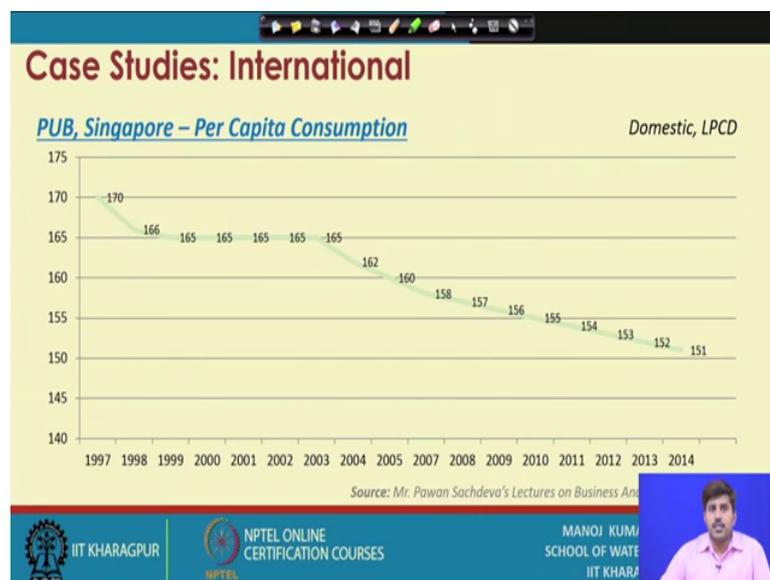
So, they still import some water from Malaysia, but they use the recycled water, they use the rainwater harvested in the taps and they have a desalination plant. So, some of the seawater they desalinate and use it that way. So, for a tariff purpose, the Singapore water which has nicely managed its infrastructure and the tariff for domestic consumption is less than 40 cubic meters is 1.52 dollars per meter cube.

So, in the current sense it translates to near 100 rupees if we convert dollar or 90 rupees at least, if we say 60 as a value of dollar to rupees, it is close to 90 rupees per cubic meter. The domestic consumption is greater than 40 meter cube are charged higher at

around 120 over 120 rupees per kilo liter, which becomes around 2 dollars per meter cube.

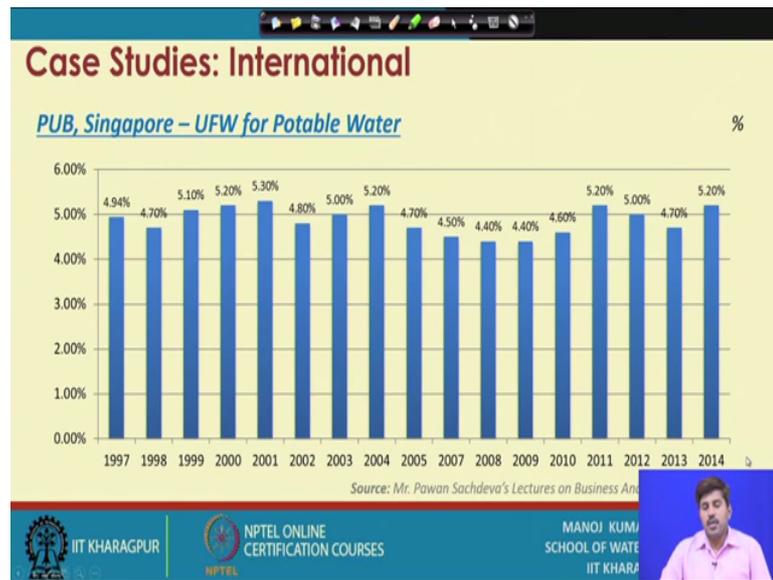
There are non domestic are also priced according to the domestic while shipping charges are much higher at the rate of 2.5 dollars per meter cube. They put a water conservation tax of 30 percent for all categories except domestic greater than 40 meter cube. The per capita consumption through their like pricing and demand management and nice operations they have reduced their per capita consumption.

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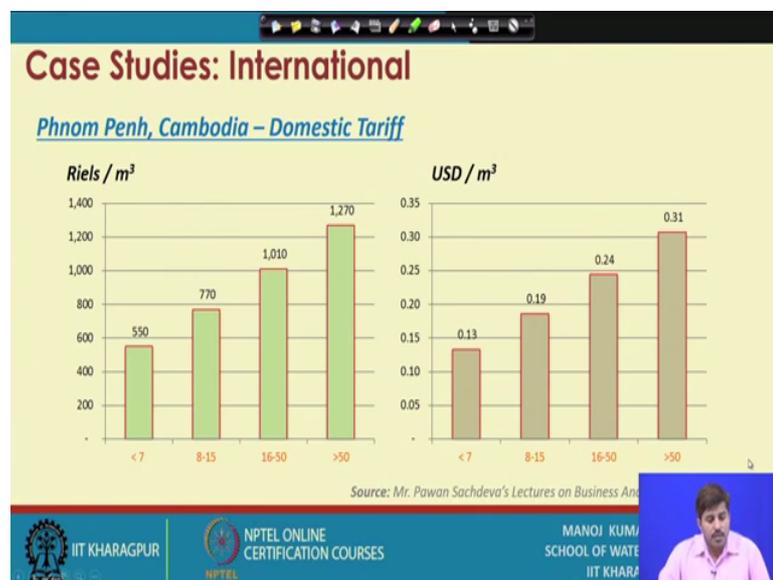
If you see that was like in the beginning of 1997 it was 170. And in 2014 they have brought it down close to 150 LPCD. So, that way in say around like 17 years they have brought it down from 170 to close to 150. So, 20 liters per capita per day reduction is what they have achieved. So, that is the importance of how pricing or how the appropriate pricing can guide the customers for the demand management as well.

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The unaccounted for water in their portable water sector has also reduced drastically and it is now ranging at around 5 percent, which is an indication of a very nicely managed system, very good system.

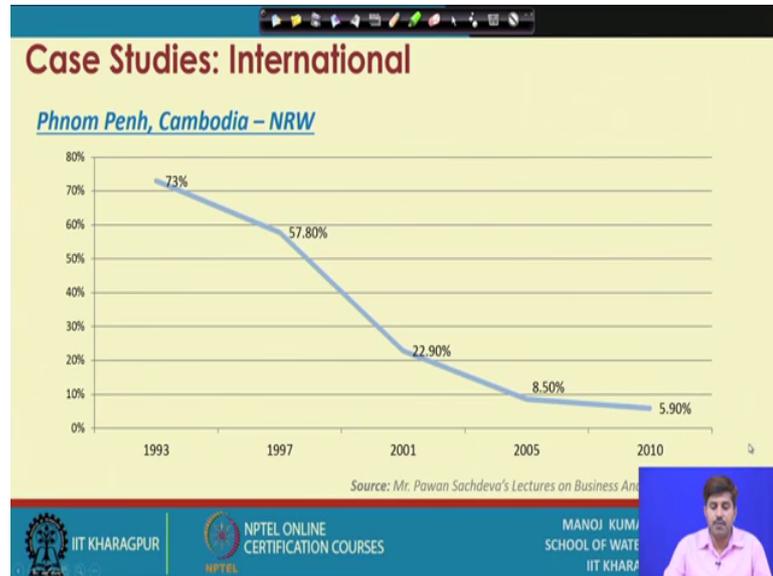
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Just 5 percent of the unaccounted for water is what they are achieving the Phnom Penh in the Cambodia again has a domestic tariff structure of the model of increasing block tariff. So, they charge around 0.13 USD per meter cube for consumption less than 7 kilo liters. For consumptions between 8 to 15. They charge at around 0.02 which is 0.19.

Then for higher consumption it is 0.24 up to 50 kilo liter and beyond that it is 0.31 USD per meter cube above 50. So, that is that kind of tariff structures are there in the Cambodia Phnom Penh which is another nicely managed system.

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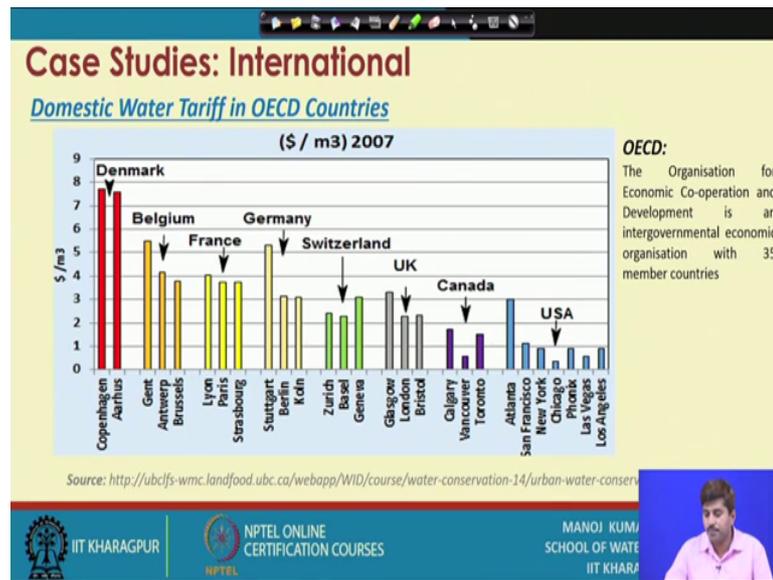


And the NRW in order to manage their utilities well and with the correct pricing and billing and collection strategies they have brought down their NRW from 73 percent to just under 6 percent.

So, in 1993 there are NRW was estimated to be around 73 percent which has drastically reduced to just 6 percent close to 6 percent. So, you can see that scale of water on which they were not getting any revenue. So, since they manage their system nicely they started, they improved their collection system, their billing and collection system, their correct pricing strategies, the consumer coverage. So, with all these they have been able to reduce their non revenue water from 73, which is almost three fourth of the water was not generating any revenue that they have brought to a level where around 94 percent of the total water supplied is giving some sort of return to them.

And that is why they are able to achieve their targets their goals while keeping the prices also reasonably low because if you see the prices, there the prices was in of about like, up to 15 they you just pay 0.2 dollars per meter cube. So, which translates around 12 rupees which is not very high value. So, apart from this if you see their domestic water tariff in various OECD countries is compiled here.

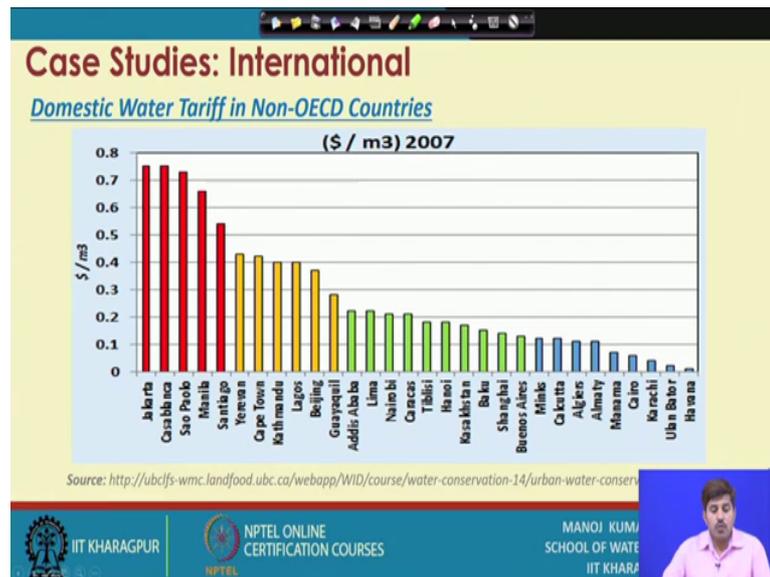
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So, the OECD is in fact the organization for economic cooperation and development and is an organization, intergovernmental organized economic organization of 35 member countries US, Canada, UK, Switzerland all these major economies are part of OECD. So, you see in the water prices in OECD the various cities in USA the water prices are fairly low. In Canada again there is relatively higher, then you go to the UK, Switzerland. So, in the European countries the prices are much more higher and Denmark probably having the that way quite high a price where the water price per meter cube go as high as around somewhere 7.5 to 8 dollars per meter cube. That is a huge price for water.

But because of the situations, because of the water management strategies they are charging that higher price for the domestic sector.

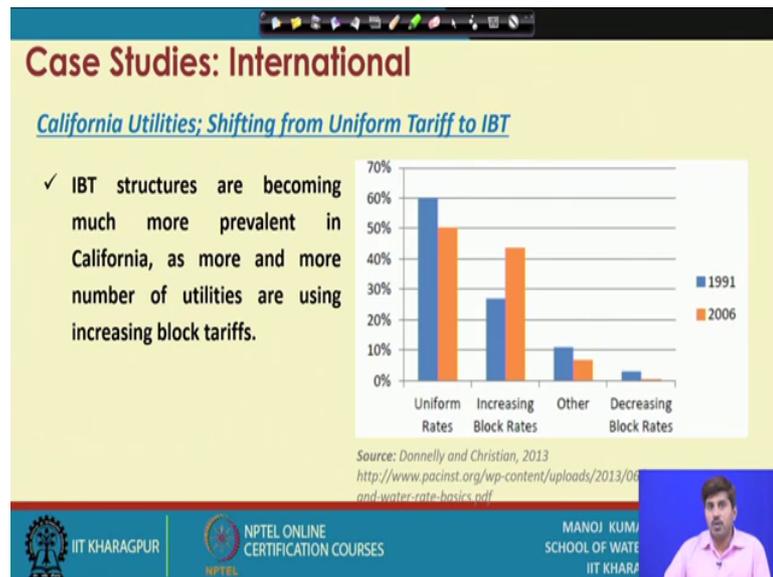
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The domestic water tariff in various non OECD countries also varies reasonably. So, it is like if you see in the dollars per meter cube in various because most of these non OECD countries are relatively occupied by low income group people.

So, water prices are much lower when you compare it with the OECD countries and you see that the water prices in the Jakarta or Casablanca kind of places, where water is not what, water management is very difficult. It is not that in the plenty of resources are available. In such scenarios also the water prices are not very high. It is under dollar per meter cube. If or IBT models.

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In order to enforce customers for more water conservation so that the wasteful uses of water could be reduced.

So, this is an example from a study done by Donnelly and Christian. So, they what they reported that in the various water utilities in the state of California in the United States are slowly and steadily shifting from uniform block to the increasing block tariff. So, they in 1991 over 60 percent of their utilities was onto the uniform tariff model while that has reduced to around 50 percent.

So, there is around 10 percent reduction from the uniform tariffs and that has gone to the increasing block which increased from almost 25 percent to close to 45 percent. The other tariff structures or decreasing block tariff structures has almost on the verge of elimination while the flat tariffs structure has also been reduced.

So, if you see the interesting point here is that all other tariff structures are, all other models for tariff fixations are on to decrease and only increasing block tariffs is being adopted more and more. So, that is what is actually gaining more popularity in the various places including the United States.

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Case Studies: International

New York Utility Information Sharing

Typical New York City Charges FY2016 (with Proposed 3.24% Rate Increase)

	FY2015	FY2016	Change
Metered Customers, Rates per 100 Cubic Feet			
Water	\$3.70	\$3.82	\$0.12
Wastewater	\$5.88	\$6.07	\$0.19
Combined	\$9.58	\$9.89	\$0.31
Typical Metered Charges, Average Annual Charges			
Single Family (80,000 gallons per year)	\$1,024.92	\$1,058.16	\$33.24
Multi-family Dwelling Unit on Metered Charges (32,000 gallons per year)	\$666.20	\$687.80	\$21.60
Annual Multi-family Conservation Program (MCP) Charges per Unit			
Residential	\$975.85	\$1,007.46	\$31.61
Low-use Commercial	\$803.39	\$829.42	\$26.03
Lodger/ Single-room Occupancy (SRO)	\$276.73	\$285.68	\$8.95

Source: New York City Department of Finance

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Another example that is here is basically the how the how it is important to involve the different stakeholders or involved the consumers also, make the consumers aware with the business of the water utility, how the water. What are the various sources of fund, how much is being charged from the customers, how much subsidies are being in, what is being; what is the profit margin of the utility operations.

So, all those information should be available to the customer in a fairly transparent manner. So, that the consumers or all these stakeholders are having full update and are in line with the business of the operator or owner or regulator that sort of sense. So, it is a typical example from the New York City charges for the financial year 2016. So, they have all the information available on their web pages and it is for the various stakeholders to look and see.

So, what are the meter consumers, what are the rates per cubic feet, what is the water charges, waste water charges, combined charges as compared to the financial year of 2015 and 2016, they have given comparison and how much is the change. So, all this information is that way available and anyone can who is interested can go and see and analyze for their self that how the business of the utility is running ok.

The meter charges, annual charges, how much is being recovered from single families with 80000 gallons per year or multi family dwelling units with on metered charges. Then there are annual multifamily conservation program charges per unit.

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Case Studies: International

New York Utility Information Sharing

Anticipated System Revenues and Expenses (in millions)

	FY2015	FY2016	Change
Revenues			
Operating Revenues			
Water/Sewer User Payments	\$3,581.8	\$3,605.4	\$23.6
Upstate Revenues	73.5	73.0	(0.5)
Miscellaneous Revenue	45.5	56.2	10.7
Total Operating Revenues	\$3,700.8	\$3,734.6	\$33.8
Non-operating Revenues			
Water Finance Authority (Authority) Investment Income	\$29.0	\$26.0	(\$3.0)
Federal Credit Payment on Outstanding Build America Bonds	70.1	70.1	-
Total Non-operating Revenues	\$99.1	\$96.1	(\$3.0)
Total Revenues	\$3,799.9	\$3,830.7	\$30.8

Source: New York




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So, that way there is all the charges or rates, tariffs they have mentioned and then their anticipated system revenue and expenses they have also provided. So, in terms of revenue, what is the total revenue expected or how what is the total revenue they are expecting to generate in the financial years 2016 is there, financial at 2015 information is also there.

So, those sort of information are there for revenue which is available.

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Case Studies: International

New York Utility Information Sharing

Expenses

First Resolution Authority Debt Service			
Outstanding Bonds	\$175.4	\$166.5	(\$8.9)
Anticipated Future Bonds	-	7.2	7.2
Total First Resolution Debt Service	\$175.4	\$173.7	(\$1.8)
Subordinate Debt Service			
Authority Bonds			
Outstanding Second Resolution Authority Bonds	\$863.6	\$1,082.1	\$218.5
Anticipated Future Second Resolution Authority Bonds	-	18.7	18.7
Interest on Commercial Paper	1.5	18.0	16.5
Authority Bonds Issued to New York State Environmental Facilities Corporation (EFC)			
Outstanding Second Resolution EFC Bonds	479.0	475.8	(3.2)
Anticipated Future Second Resolution EFC Bonds	-	26.6	26.6
Less: EFC Subsidy	(93.1)	(95.5)	(2.4)
Total Subordinate Debt Service	\$1,251.0	\$1,525.6	\$274.6
Less: Prior Year-end Cash Balance	(884.9)	(850.8)	34.1
Subordinate Debt Service Payable from Current Revenues	\$366.1	\$674.8	\$308.7
Total Debt Service Payable from Current Revenues	\$441.6	\$748.5	\$306.9
DEP Operations and Maintenance (O&M) Expenses			
Water System	\$604.0	\$613.0	\$9.0
Wastewater System	701.6	801.1	99.5
Indirect Expenses	16.4	19.4	3.0
Judgment and Claims	15.9	8.0	(7.9)
Plus: Debt for Prior Year O&M Underpayment	3.6	-	(3.6)
Total DEP O&M Expenses	\$1,347.7	\$1,441.5	\$93.8
Other Expenses			
Authority Operations	\$48.2	\$52.6	\$4.4
Board Operations	36.1	\$1.8	(34.3)
Board Deposit to O&M Reserve Fund	17.9	7.8	(10.1)
Rebate Payment	200.0	244.4	44.4
Recovery of Debt/Cash-Financed Construction	\$65.0	\$50.0	(15.0)
Less: Cash Released from Bond Escrow	(1.8)	(25.1)	(23.3)
Total Other Expenses	\$1,167.9	\$671.4	(496.5)
Total Expenses	\$2,894.1	\$2,910.0	\$15.9
Year-end Cash Balance	\$906.8	\$930.6	\$23.8

Source: New York




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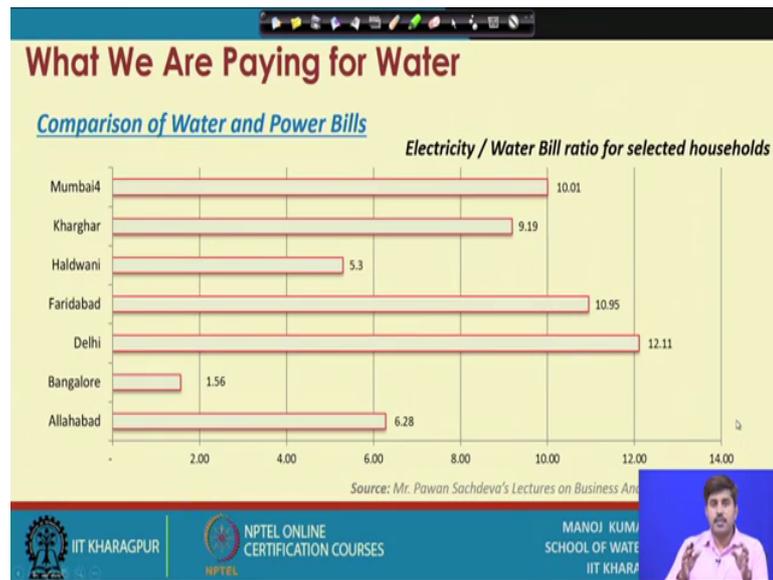
And then they provide the information of cost as well and what is likely the yearend balance. So, that way the entire information is present is made available to the consumers, to the customers. So, that they can see and analyze and look at the aspects of the various aspect, financial aspects particularly of the business of that utility. So, this sort of information displaying helps very much in order to raise awareness among stakeholders.

Because if stakeholders are not aware at all particularly the consumer end stakeholders. So, if consumers are not aware at all that what is happening, like in India we were discussing that in cities like Bombay and Bangalore, the people are not aware how much water they are consuming, what is there what they are paying for the water at all. They just pay lump sum amount of the charges to the society, apartment society as a maintain charge and they manage everything.

If one tries to figure out how the water supply system is working out in any of the major Indian cities except a few, it becomes very difficult to get any data, any relevant data. You go to a site of water utility; you will see the last updated in 2010. So, those kind of or may not be existing at all for many places it is. So, those kind of if user are not aware, if user are not informed, if consumers are not made aware with all these existing information or they have even if they are interested they have no way to basically get this information because it is very difficult to manage such data for the Indian utilities ok.

It is way, if it is not on any public platform or website and even if somebody is very interested and takes an effort and go to the water utility office. From there also it is very difficult that to get any information. There will be n number of questions. Why you need that, what is your purpose we do not have that data, all these kind of excuses will be given and eventually it becomes almost extremely difficult to get any information about the business of the utilities.

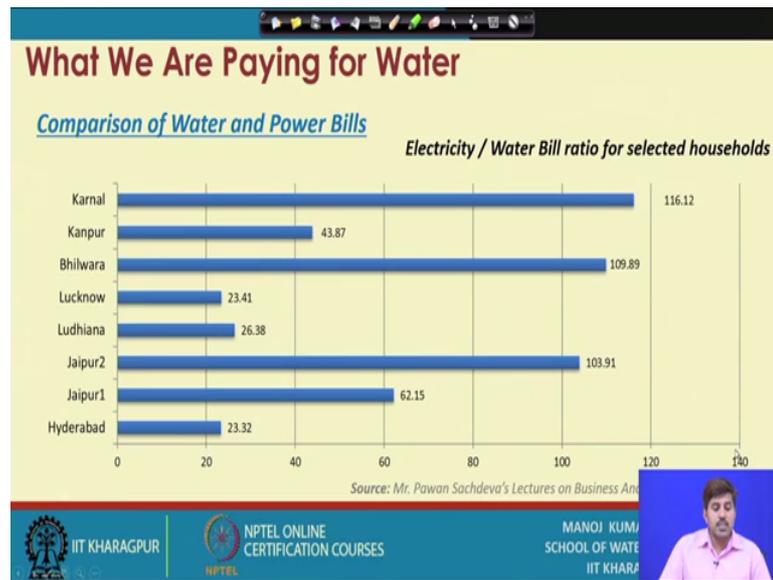
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So, these are the like nicer examples from where we can take some clues and accordingly improve on to our business analysis of our water utilities. Of course, there are of there are improvements which are taking place particularly for some places. We saw the examples of the water bills from let us say Jodhpur utility or Nagpur utility. Nagpur in fact is a very nicely coming up as a good water management, good nicely water managed city. The orange city water is actually managing the Nagpur water supply is onto like towards taking progress of towards recording the data, then atomizing the network, getting all the relevant information for the network is being stored, they are putting some information in public domain as well.

Similarly, there are systems in Jamshedpur, there are systems in Surat. So, we are on to, we are on the way actually to achieve this, but still such cases are very limited and on a gross scale the water management, particularly the financial management, the pricing, the recovery aspect is extremely poor in the in general Indian towns. In a study where the random, for the random households the comparison of their water and power bills was made. So, it was observed that in few cities the ratio is like the ratio the share of the ratio of electricity bill to the water bill is in the range of 10 or under 10, like for the many places it is mentioned here.

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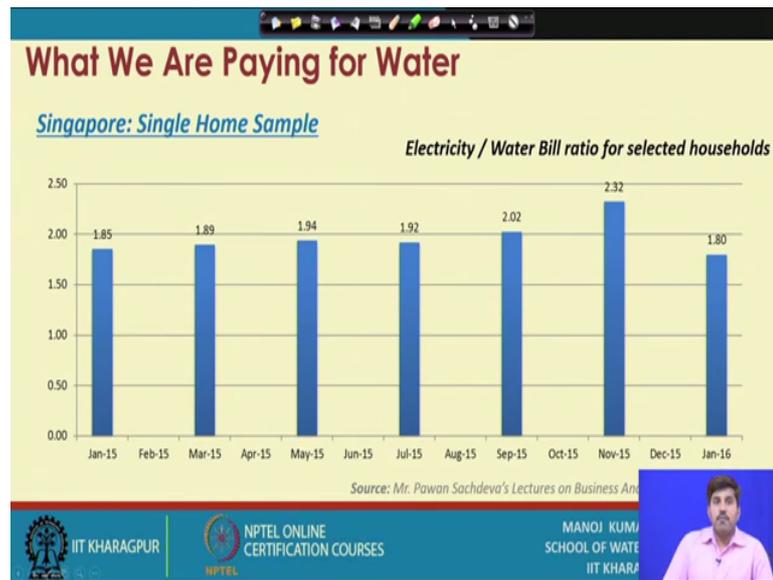


However for many other cities like you see the Bhilwara, Jaipur or Hyderabad, Lucknow. So, these ratios are fairly high. So, that way if you see, the water payment for water what we are making is relatively very low as opposed to the payment for power that we are making. So, power is we discussed the earlier that power sector has regular I digital and now their tariffs are on a sustainable basis.

So, if you compare with the sustainable system in the power of course, power and these water prices are not comparable and should not be comparable also; however, we can draw some conclusion from the ratio. So, how for different cities across different cities, water and power because power prices more or less are in a constant.

Of course, there are variation in the power also, but it is not that high. Across different city, you will see the power rate are more or less in a similar range. It could be some places it could be like maybe for 5 rupees per unit as high as can go around 10 rupees per unit also particularly for domestic sector, so the power variations are not very high and if you take that as a constant. So, you see how much the prices variations are there in the water sector taking the clue from the independent studies of this kind for comparison purpose this is the ratio of electricity to water bill for a Singapore, although for a single home across different months.

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So, there the electricity to water charge is fairly at around 2. So, they are paying twice for the electricity as compared to water or they are paying almost half of the price that is being paid for the electricity as a water bill.

However in India, it is for some places it is of the one hundredth. So, you can say one half and one hundred, what is the comparison. So, that kind of inequalities exist in the particularly in India and this gives us a clue for thinking that how important it is to rationalize our pricing in the water sector. So, that in order to the water utilities or water sector as a whole could run in a sustainable fashion.

So, with these thoughts, I will end the session here and will end the discussions for the week and then next week we will talk about the economic evaluation of water projects. What are the different aspects related to that. So, that will be discussing in the next week.

Thank you.