Wastewater Treatment and Recycling
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Lecture – 05
Wastewater Management: Issues and Challenges

Hello everyone. So, this week we have been discussing about the basics of Wastewaters Management Treatment and Recycling. And, in the last session last lecture for this week this first week we will be talking about what are the prime issues and challenges? And, where we stand in terms of national status and international status in wastewater management, so that is what we are going to discuss?

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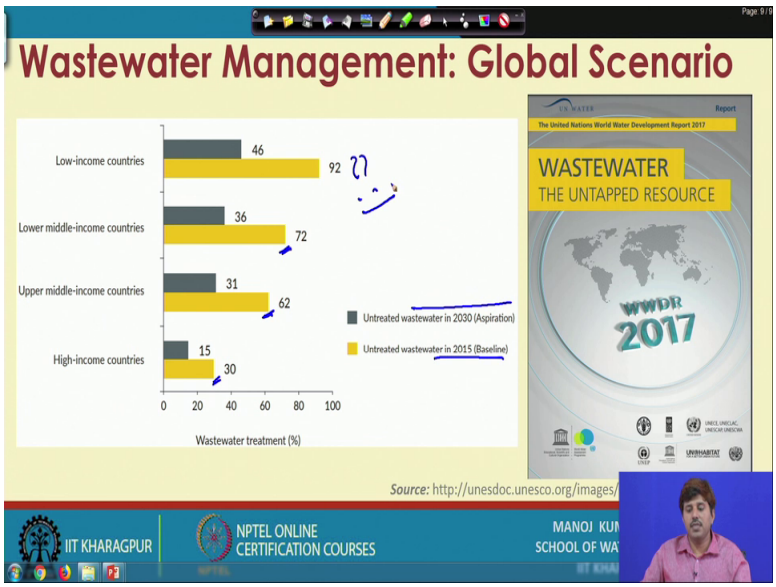

To begin with the global scenario, if we see of the wastewater management; so, the United Nations World Water Development Report of 2017 last year has a sort of summarized some of the data and if we refer that if we see that. So, it is interesting to see that the yellow blocks that you see here are for untreated wastewater in 2015, which is baseline which is a sort of measured or collected or gathered or estimated data. And, the grey one are actually the aspirations for 20 30.

So, by 2030 the targets are that to get from yellow to the grave point. Now, if we see the high income countries or developed countries the existing or 2015 status suggest that around 30 percent of water remains untreated and 70 percent is treated.

The targets are to increase that 70 to around 85 percent. So, that only 15 percent remains untreated and rest is properly treated and managed wastewater. If we see the upper middle income countries many of the European countries fall in this category.

So, we see that close to 60 percent. In fact, little over sixty percent of wastewater produced is still untreated ok.. The targets are to basically cut it down by 50 percent ok. So, bring it down to 31 percent. The lower middle income countries like, we have India falls probably in the lower middle income country in that way so, in such countries the average or the typical value of the untreated wastewater in 2015 is around 70 percent.

So, 30 percent is getting treated 28 percent if you see the 72 number. So, 28 percent is roughly getting treated and 72 percent is untreated and again by 2013 in the 15 years duration it was proposed or (Refer Time: 03:22) to cut it down by another 50 percent. So, that around your 60 64 or two-third of water at least is treated. In the low income countries the conditions are very pathetic only around 8 percent which is in fact, less than 10 percent of generated sewage get some sort of treatment and 92 percent goes untreated. So, the conditions are very very alarming here and the targets is again to cut down by at least 50 percent by 2030.

So, that is the sort of a summary of global status ok.. The detail various country wise details are available in various reports here and there.

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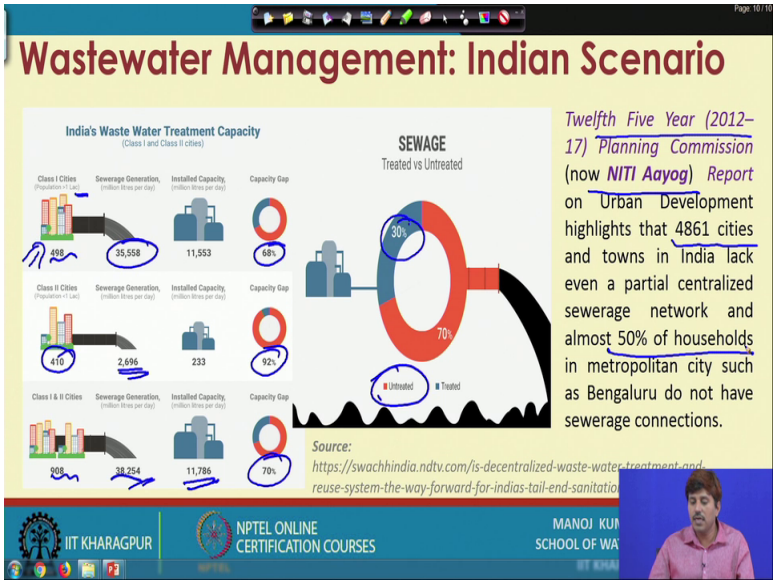

So, someone interested can actually Google it and explore it that way if we look at Indian scenario. So, we are very much on the average of lower upper ah lowers middle income group countries ok. And, that way totally on an average our 70 percent water goes 70 percent wastewater goes untreated and around 30 percent gets some degree of treatment if we see different class wise; so, in the class one cities where the population is greater than 1 lakh.

This survey of around 500 such cities with the population greater than one lakh says that 68 percent of water remains untreated and your 32 percent gets treated. In class 2 cities 410 class 2 cities which has a population of less than 1 lakhs 92 percent gets untreated. So, here we are as like close to the low income group countries overall if we see because most of the population or major population lives in here.

So, if we take the average that way of 908 cities. So, this is the total because this number is fairly low if you see as supposed to this number. So, this dominates the value and the total if we see the produced sewage, which is generated in million liters per day this the sewage, which is treated in million liters per day and around 70 percent of it sort of does not receive treatment only we have install capacity of 30 percent.

Now, 30 percent is the capacity install of these 30 percent also it is not that, they are running with the full capacity or entire treatment is being provided satisfactorily. There are issues in with that thirty percent as well. However, the large chunk the 70 percent of wastewater goes untreated particularly sewage we are talking about here. So, if we see our twelfth five year plan by the planning commission which, now under the new government resumes has been like NITI Aayog has been established in a in place of Planning Commission ok.

Planning Commission has been dissolved. So, this the their report on urban development highlights that around close to 5000 cities and towns in India lack even a partial centralized sewerage network. And almost 50 percent of the household in metropolitan cities such as Bengaluru do not have sewerage connection.

So, even in our major cities and towns like Bengaluru, Calcutta, Mumbai we say that they have their sewer network and all that, but a large chunk of population particularly living in the slums or suburban areas are not connected to the sewer systems sewerage systems ok. So, for say in Bombay almost 50 percent of the household 50 percent means

half of the city is not connected to the sewerage network, they do not have sewerage connections ok; so, that is the state.

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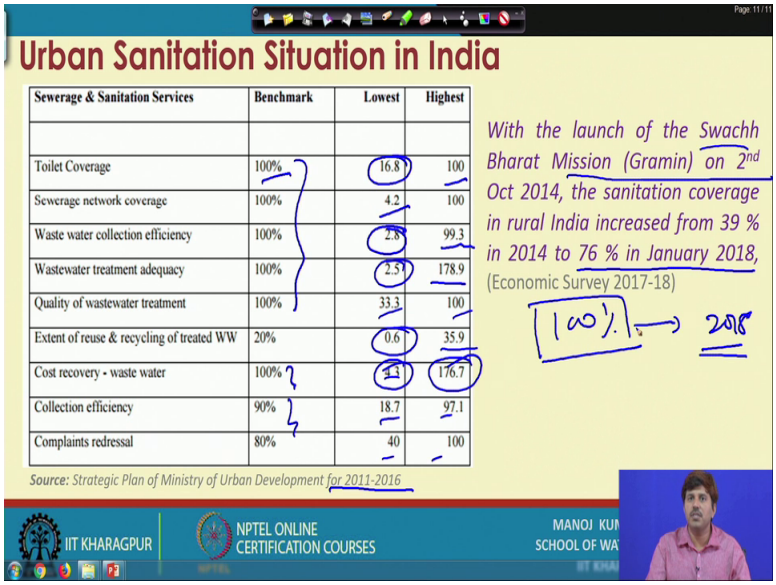

Although, this like data keeps on updating keeps on changing. So, if we see this urban sanitation situation in India which, was provided in the Strategic Plan for Ministry of Urban Development in of 2011 to 16. So, this survey was done somewhere around 2010 11 ok.. And through this pilot studies pilot surveys it was like sanitation status of the country was attempted to establish.

So, if you see the [tailet/toilet] toilet coverage the benchmark was 100 percent, the lowest percent is in the city was around 17 percent and the highest was 100 percent. Sewerage network coverage again some cities has as low as 4.2 percent sewerage network coverage although the highest was 100 percent. Wastewater collection efficiency again almost 100 percent to your 2.8 percent only.

So, in many cities wastewater is not at all being collected. The wastewater treatment adequacy some cities has like capacity overcapacity so, they have capacities larger than which is being generated or which is being collected. So, that is why we see around one eighty percent treatment adequacy is there.

But, it is as low as 2.5 percent also or almost negligible in a few cities. The quality of wastewater treatment, if you see almost one third at places to 100 percent, extent of reuse

and recycling of wastewater almost negligible 0.6 percent in some cities highest was close to 35 36 percent.

So, still large part of water has not being reused in any of the city, cost recovery aspect some cities are running very poor some are actually even recovering more than the cost collection efficiencies and complaint redressal. So, on these scales counting was done and there was a benchmark suggested, which was good 100 percent for most of the things and said that the by the end of 20 16 at least 20 percent of wastewater should be recycled ok..

However, that has not been achieved though and the billing and collection efficiency was supposed to ninety percent that way. This data is old and particularly since the ours new government has taken chairs a lot of efforts has been done towards improving the sanitation and sewerage systems the data keeps on updating.

The from for the urban setups much data is not available on a village front. So, when the Swachh Bharat Mission Gramin was launched on second October in 2014 the sanitation coverage was around 40 percent at that time 39 percent which has increased to 76 percent in January 2018.

So, by the end of December 2017 it was 74 percent 2 percent further increased in the month of January and the targets are around 100 percent by the end of 20 18. So, in the next in this year by the end of this year the target is that there should be 100 percent toilet facilities or 100 sanitation coverage in a sense basically toilet facilities particularly for village purpose. Village purpose sanitation does not mean the villages are connected with a sewer line ok.

So, there should not be any misconception the sanitation coverage means the toilet facilities here ok. It is not the sewer line connections. Villages sewer line connection almost negligible even today, but the toilet facilities had at least increased this to in this Swachh Bharat Mission and in order to make India open defecation free.

So, these are the kind of a status or situations about the sanitation in India.

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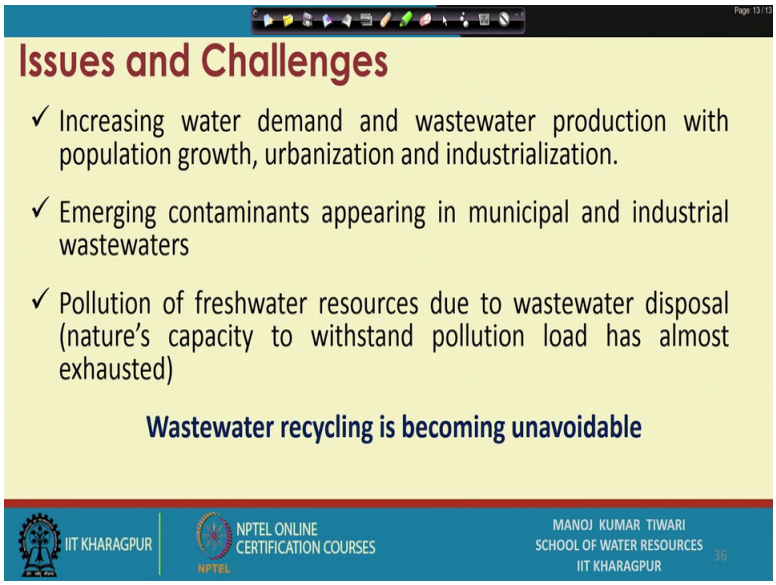

Now, if we look at the major issues and challenges. So, what we see that there is increasing water demand and wastewater production. Because, water demand is increasing more water is being consumed and as a result the wastewater, which is being produced is also increasing. So, there is increase in the wastewater production with the population, growth with the urbanization, with the industrialization.

Now, apart from the increase in the quantity because the quantity of sewage is increasing there is deterioration in the quality as well in terms of emerging contaminants, which are appearing in municipal as well as industrial wastewater. Now, what are these emerging contaminants these are a sort of pollutant or contaminant or chemicals, which earlier was not like people were not much bothered about these ok. They were not considering these as a contaminants.

Primarily because they were not present in the water could be one of the reason and the second reason they were not people were not like concerned enough never detected them ok. There was not the detection facilities to that precise level were not available in earlier ages. Now, we have very much advance equipment's available, we can detect any chemical any contaminant to even the part per trillion level also we can detect; PPT level, PPB level, PPM level, we can easily detect these contaminants.

So, since we are able to detect these in the water and we know that they are the these chemicals impose some threat to the human health and to the ecosystem. So, we have

started referring them as a contaminant. And, these type of contaminants are generally referred as emerging contaminants, these are pesticides, these are the personal care products pharmaceuticals ok. So, these products which are earlier not that used they were not introduced in the nature they were not introduced in the world. And, as now they have their use is basically increasing they have started appearing in the natural waters as well through the wastewater. And, these are these group of contaminants are referred as emerging contaminants.

So, even our even we if we let us say plan a treatment and provide a treatment or conventional treatment systems of an rely, of an work for removal of the conventional pollutants. The organic load the element the bacteria microorganisms these things, but these toxic chemicals like no conventional treatment system targets removing pesticides, no conventional treatment system target removing of pharmaceuticals.

There are many personal health care products, which cosmetics and all that, which imposes lot many chemicals, which we use in our household and then like let us say you are using a face wash or you are using some face pack and then washing in the sink and it is letting flow with the water. So, it is eventually going to the sewer system. So, these kind of contaminants which are more and more getting introduced in the water through waste waters are typically referred as emerging contaminants.

So, these emerging contaminants appearing and municipal and industrial effluents industrial wastewaters are also one of the major challenges, how to handle that? When we are talking about recycling or reusing? So, we have to sure that even the treatment is provided to the fullest degree and the water which is being used for the reuse purpose particularly for the contract reuse purpose are totally safe.

The pollution of fresh water resources due to wastewater disposal is another major challenge as we discussed. And, the problem is that it is actually our nature usually had some capacity to with stand pollution load, but that has almost exhausted. And, that resulting in the pollution of our fresh water resources, which is we are already living in a sort of state of almost water stressed country and not only us large part of world that way.

So, the large part of what is already under water stress? And, further pollution of the what isoever available? What are the resources fresh? What are resources is basically further deteriorating the situation? So, on seeing this sort of become essential that

wastewater recycling is not only an option, but it is actually steadily becoming unavoidable ok. We cannot let these emerging contaminants pollute our water systems, we cannot let the our freshwater resources go pollute that way and with the water increasing water stress, how we are going to fulfill our water demands?

So, wastewater is a alternate resource for water as well and our water demand is increasing. So, why not use that this one as a resource for water?

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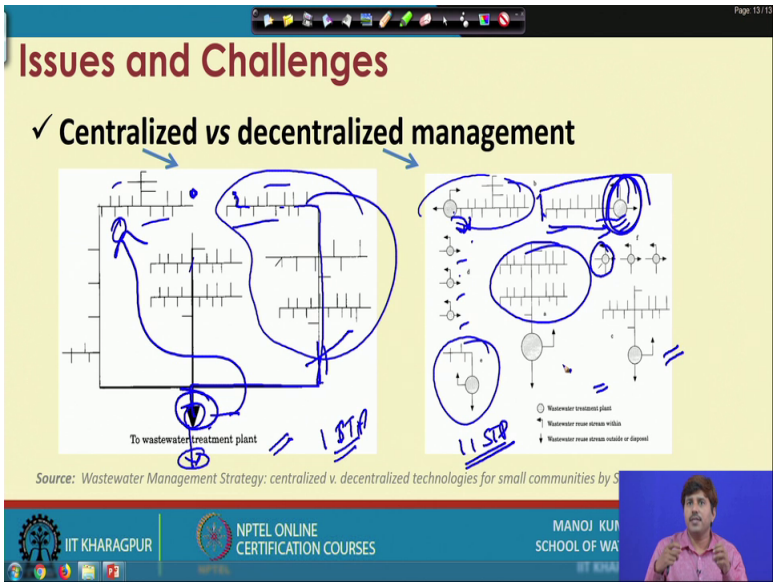

So, this way it is steadily becoming unavoidable.. One of the major challenges faced in the wastewater management is whether, we should go for centralized management or decentralized management ok.

So, if we see the concept of centralized management, let us take an example that there are many household colonies and all that are living. So, these all are connected through sewer lines and eventually everything is coming at just one point to the wastewater treatment plant. So, this kind of system is called centralized system. Where everything from the entire city the effluent is getting collected at one point and it is being processed either treated or re disposed of whatever is done at that particular point.

So, it is a centralized system. Decentralized system on the other hand has sort of managing at a smaller scale. So, we can go we can basically for this section we can install a water treatment plant right here. For this colony we can install water treatment

plant right here, these for small things we can have some smaller water treatment plants ok.

This we can have another water treatment plant over to here, central part we can have another water treatment plant. So, we instead of the one big water treatment plant managing everything, we can have a decentralized a various several small water treatment plants. Now, the decentralization is good could be good actually at a particular scale ok.. For this case for first case if you see. So, what is happening that you some household is generating sewer some sewage here?

So, this sewage has to be bought here and then it travels a hell lot of distance for reaching here. So, the sewage has to be transported to a great distance to a large distance. In the meantime there are issues related to there might be possibility of let say some infiltration thing happening, you have to have that size of sewer lines because this line if you see it is collecting waste from this zone.

So, for entire this zone so, what how big pipe size you need? How much pumping stations you need?. How like how you can basically transport a channelize this all entire sewer to here? And, then you have to make a big size treatment plant for that ok. That is your centralized option, in decentralized option what happens that? The since things are managed at relatively smaller scale, local scale, the transportation part reduces greatly.

So, the transportation part is reduced; however, here you are making just one treatment plant of big size, big capacity, instead here you will if you see 3 here 3 6 plus 4 10 plus 11. So, this has one treatment plant one say STP and this has 11 STPs. So, instead of one you have to build 11 although the capacity of this one is equal to the sum of all these 11 STPs ok.

Because, this is also the water which is being generated are the same. So, same amount is supposed to be channelized here. So, the capacity of this one STP is equal to that of 11 STP, but when you make just one instead of 11 your cost reduces a lot. So, there is a cost reduction here in the treatment, but there is a cost enhancement in the transportation here.

Plus there are more severe problems could arises you are transporting it if let us say there is a breakage in here, you cannot do anything this portion will like; there might be issue

in here there is no alternate arrangements available. Here, it is a smaller scale so, management is more effective ok. It is it can be more easily managed it can be like more easily observed seen handle improvised.. The quality of wastewater, which is let say the waste that you generated here, by the time it is travelling here, it quality may further get deteriorate ok.

It may undergo certain reactions, it can actually further foul smell and this kind of thing started coming in here, you will relatively get fresher sewerage because it as soon as it is generated it is transported here and it managed on this scale. So, the transportation time and this thing has reduced drastically.

So, there are some good aspects about both this the centralized system is more cost effective in terms of treatment. Treatment management the manpower requirement would be less, because you will not be you need not to have run 11 sewerage treatment plants. Here there are some certain other type of advantages ok. First thing because you are managing at local scale so, maybe if you are planning for recycling and all that you can, because if you try to figure it out recyling if you want to intend to dispose it somewhere that is fine.

But, if you are trying to recycle this water so, after treatment if you want to recycling recycle here you will again have to channelize this water here. Here you are having a treatment plant if you want to recycle at this point you can quickly get it get this water here and recycle it reuse it for certain purpose. So, all these advantages are there the management is maybe little more costly here, may be little more costly in the decentralized system, but it is much more effective in decentralized system.

However, the extreme decentralized is that when you have a treatment plant at every household, which is not practically possible. So, you one has to get an idea of optimum degree of decentralization even if you want to decentralize. See in a city of where there are one lakh household you cannot go for one lakh treatment plants that is totally rubbish idea.

So, one has to actually come forward to see how effectively let say make a group of 5 one treatment plant for 500 households? How many will be needed one treatment plant for 1000 households? How many will be needed or one treatment plant for 5000 households? So, which is the optimum scale for decentralization, optimum scale which

gives you the desired opportunities desired management efficiencies, the cost efficiencies, or financial efficiencies.

So, all those things need to be taken care of and then one can opt for centralized versus decentralized management system. For smaller towns one centralized system could be good enough, but for much larger towns it is better to go for decentralized system on a optimum scale.

So, that is one question which often comes weather to go for centralized system or decentralized management of the wastewater.

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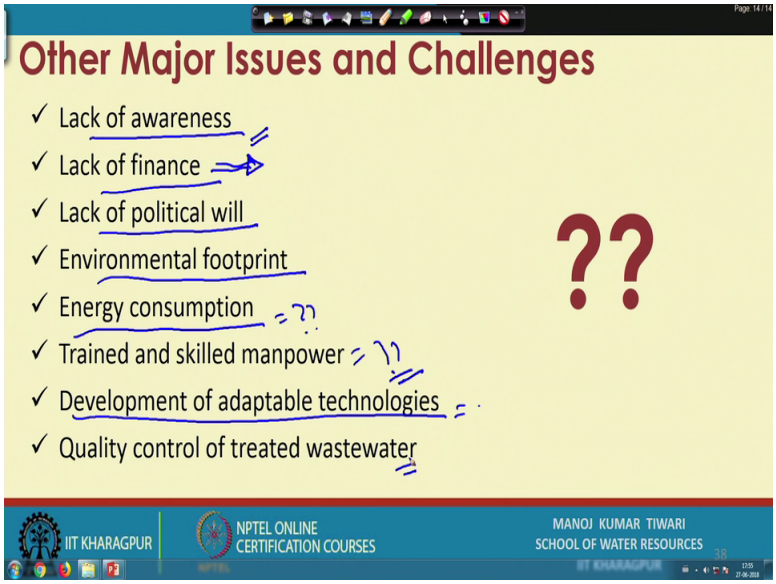

Other major issues and challenges if we see, well these are mostly common things many of us know, what are the major challenges? First thing is there is lack of awareness. So, people are not very much concerned about the wastewater management sewer management.

The municipality is often have the responsibility of providing water supply as well as making sanitation or sewerage arrangements. Now, people are much more bothered and much more concerned about water supply, which is obvious because that is the resource that they are getting and eventually planning to use it or consume it. So, if you cut down a water supply of say of a street for a day you will see that people coming on street and all that all those things can happen can take place. If, you cut down if you block a

sewerage line for a day people will not bother that much. Because, their water needs are being fulfilled they are getting water their daily work their routine work is taking place they do not bother much.

Whereas with the sewer because so, this is something which they have already discharge which they have let it go from household. So, until and unless it is completely choked and it is coming back into their houses they would not bother much about this. So, this one of the like lack of awareness or lack of intent of giving too importance to the sewage management has been one of the major problems so, far.

So, that is one of the major challenges that one has to overcome. Of course, there is a lack of finance. So, because a good sewerage network installed and the good treatment capacity needs lot of money. And, how this like? Economics can be made sustainable or can be managed is to be seen, but initial investments are huge ok.

And, that huge investment like it has to be; obviously, come from government or some alternative sources. So, and particularly in the low income countries people the governments are not willing to spend that much on to the sewer aspect. They are much more concerned about the water.

Lack of political will is one of the another reason ok.. As we have been discussing that water is given far more important than sewerage. So, in the in election campaigns and all that also you will see lot of promises are being made towards the water supply towards the water tariff. So, this somebody says we will make water free, somebody says that we will ensure that round the clock supply to the households, know all those things are included for water there is a very little or not much attention is given to the sewerage even in the political campaigns as well.

The environmental footprint of sewer management or wastewater management is needs to be properly worked out ok.. We can manage it sustainably, there are resources available if you withdraw that resources, if you are dumping it there is a sort of like, we are spoiling our environment lot of containment being added to environment, that hampers our environment alternatively we can treat it re use it in a possible way. So, how much? Like what are the environmental footprint of all the different option need to be evaluated, what is the energy consumption and from where it is going to come is another challenge? Ok.

Ah. However, particularly because the wastewater are usually reach in organic matter and there are anaerobic processes, which we will discuss later on can actually produce also some energy. So, at least some cases are effectively managed effectively handle some this processes can be made energy sustainable as well.

So, without any requirement of additional energy; however, the conventional treatment systems requires lot of energy, typical aerobic systems requires lot of energy, and from where that energy is going to come. What is the associated footprint of that energy? Or what is the cost for that energy? Also is one of the issues major issues.

From where we are going to get trained and skilled manpower, because the effective management of sewer effective management of wastewater, if you see the treatment, recycling, the quality control all those aspects need; well trained, well educated, and well skilled manpower and there is a lack of people trained educated in this sector.

So, particularly as if we are talking about the decentralization thing. So, these days use go to Delhi, Bangalore all the Metros. So, new households coming in they have to have a mandatory STP installed in there itself. Now, so, who will operate that STP are the person deployed to operate those treatment facilities those treatment plant or those systems are well qualified to do that or well skilled to do that that is a big question. Ok.

So, there is a need of human resources development in this area ok. That is one of the major issues and then development of adaptable technologies, there are many technologies available in the market, but we have to identify based on the cost, based on the adaptability, based on the location, based on the suitability, based on the ease of operations.

So, how many technologies sort of justify these categories?. Ok. And can be accepted adopted and implemented in Indian conditions need to be seen. So, that is one of the aspects. And, then there are quality control of treated wastewater. Particularly, when we are talking about recycling it is it is very essential to have a good quality control, you cannot you have a recycling plant or if you are treatment capacity failed and you have send that water to somebody's household and foul smell or bad smell has started coming in.

So, it is going to basically a it is going to be a disaster in that case. There will be lot of agitation will coming in so, a good quality control on the treated wastewater is must ok. And, that also should be ensured. So, these are the major challenges, which one should be basically looking at, we will explore some of these points in the due course of this subject ok.

So, we conclude the first weeks discussion here.. I thank you for joining this was the introductory sort of material about the course in general and about the wastewater treatment recycling aspects.. Next week onwards, we will progressively started discussing the first thing that we will be discussing is the estimation or how much sewage is generated? So, what the qualitative and quantitative estimation of the sewage is that we are going to discuss next.

Thank you.