Wastewater Treatment and Recycling
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Lecture - 59
Public Acceptance for Recycled Water Use

Hello everyone and welcome back. So, we are in the 59th lecture of this 12th week in the course. So, we are nearing the basically towards the end of this course. So, this week we have been talking about the various other aspects of Wastewater Reuse and Recycling. So, earlier we did talk about the decision making system in the previous week. And, week before we this in the previous lecture sorry and this lecture we are going to talk about another important aspects, when we go for the decision making or when we go for deciding over a wastewater reuse or recycling project.

So, is public perception ok? So, this particular class will be discussing the various aspects that influence the public perception or public acceptance of such schemes.

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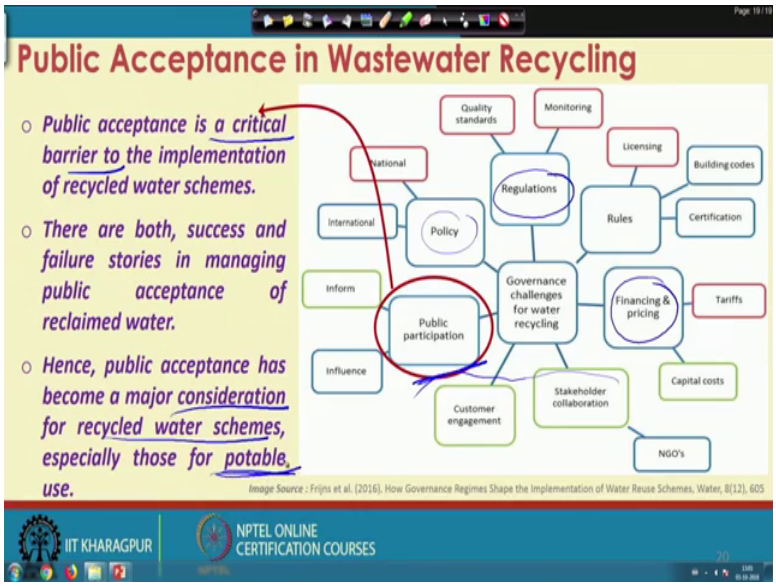

So, to begin with if you see the like overall major challenges in the recycling of the wastewater. So, there are we discussed this earlier there are kind of regulatory challenges, there are then financial and pricing, there are stakeholder customer this thing.

So, this can actually be linked with public perception there are policy regulation related challenges, then there are technological challenges all these things are there. The important ones are the public participation, which is very important. And, because it is not just participation the perception of the public towards that scheme is very important. So, the public acceptance is actually a very critical barrier for the implementation of the recycled water schemes ok.

There are both success stories, as well as failure stories in managing this public acceptance. So, there are like places where the wastewater recycling systems are running very well ok, public is happily using the recycled wastewater even for the potable water supplies. So, we have an example in the say Singapore new water system. Whereas, there has been cases where the public opposition has kind of prevented these kind of schemes being implemented at various stages.

So, this public acceptance that way becomes a major consideration for this recycled water schemes ok. And, especially for those who are for actually which the schemes that are for potable uses. So, that is very important in the kind of decision making systems for the wastewater recycling projects.

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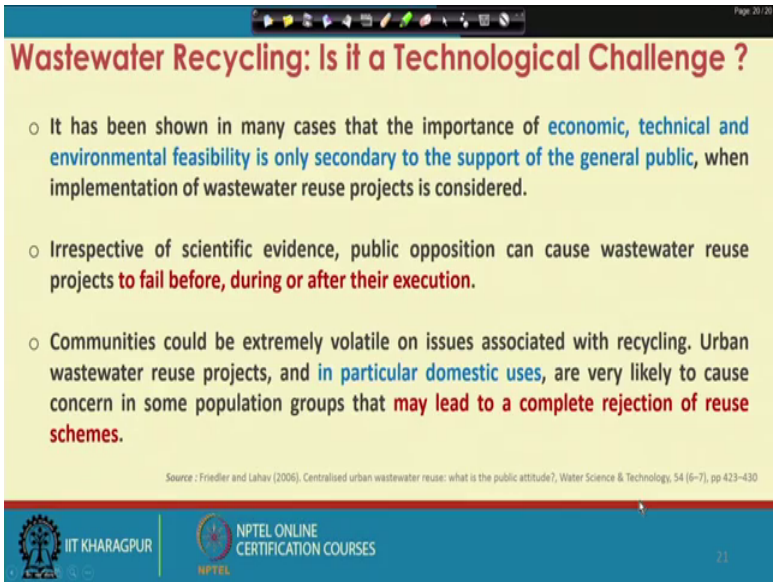

So, when we say the wastewater recycling often people think about that it is a big technological challenge, there has to be kind of adequate amount of techniques adequate amount of funds available to achieve this waste water recycling. So, that way there is like

particularly in the scientific community more so, ever it is general perception is that we need kind of economic support; we need technical support, to produce environmentally feasible recycling systems ok.

But, it has been shown in several cases that importance of this eco economic feasibility is technical robustness, the environmental feasibilities are actually the secondary to the support of general public. Until unless we get the support of general public all this exercise may not result in anything. We may have a very like economically viable system, we may have a very technically sound scheme for recycling wastewater; we can have an environmentally feasible project of wastewater recycling. But, if general public is not willing to accept that if the user community is not willing to accept those accept or buy that water or use that water this all sighs is of no use.

So, that way when actually the implementation of wastewater reuse project comes into the picture, because from planning phase from designing phrase your economic technical aspects, environmental feasibility aspects, are very important, but when it comes towards the implementation scale. In fact, the in several cases it has been seen that the public support or public acceptance takes the primary seat and all other things pushed back towards the secondary levels.

So, irrespective of various scientific evidences the public opposition can actually cause the wastewater reuse projects to fail. And, they can cause to fail before the implementation of the project, during the implementation of the project, or during their execution ok. Even after their execution at times ok. So, there has been like cases where a good amount of money has been invested and towards the later part like when the project is ready, people have refused to kind of use that water or buy that water or kind of utilized that water, and that way the entire project has been kind of decommissioned.

So, communities in that sense could actually be at times extremely volatile on these issues which like associated with the recycling. And, more server in the urban wastewater reuse project ok. Because, it depends on the type of uses also and so, in urban reuse projects and mostly the domestic uses if there are domestic uses involved. So, they are very likely cause of concerned that some population group may lead to a complete rejection of these reuse schemes. And, when they do that the entire project actually like goes into the low drums.

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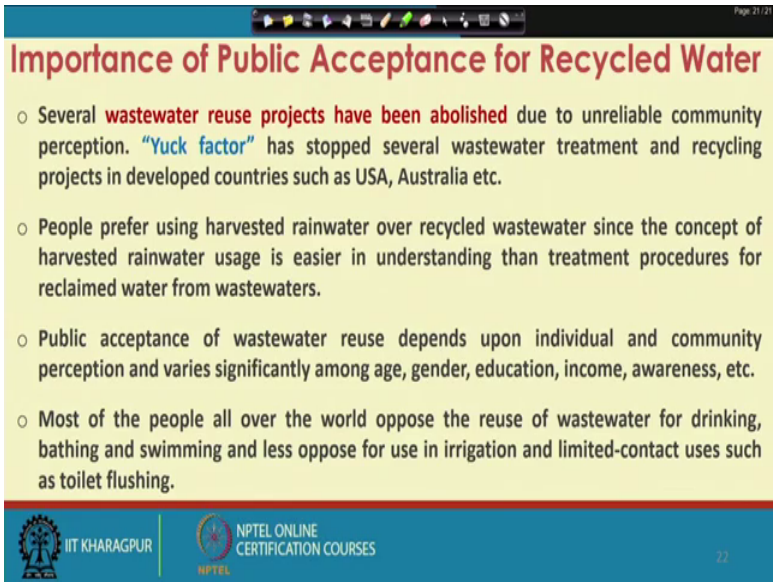

So, if we see the importance of public acceptance for the recycled water. So, there are several wastewater reuse project has actually been all list due to unreliable community perception. So, what they call is typically a "Yuck factor" which relates with the disgusted that how can we use a recycled water, how can we use a recycled sewage?

So that kind of things comes into the picture and this has stopped several wastewater treatment and recycling projects in developed countries. We are not just talking about the developing countries or underdeveloped countries, in many of the developed countries where peoples are thought to be more educated and those kind of things still like in the countries in USA, in Australia. All those places there has been basically some projects being planned and even at the implementation stages there has been opposition from the public, which has led to these projects being stopped.

So, people usually prefer to rather use harvested rainwater over this recycled wastewater, because they know that harvested the rainwater is kind of pure form of water may get little pollution pollutant during the harvesting, but it does not have that much of serious health concerns as comes from the wastewater ok. And, it is easier to understand the kind of flow cycle of the rainwater, then the complex treatment procedures of the reclaimed water which we receive after treating the wastewater.

So, this acceptance depends on various factors ok. This could be basically a individual perception, this could be a community perception ok. And, it varies significantly among

a gender, education, income groups, awareness, or those kind of thing the kind of information that is being dissipated ok. And, most of the people all over the world generally would actually oppose the reuse of waste water for drinking purpose directly ok. Drinking bathing or swimming purpose, which are kind of like the contact uses.

And, they will be like more willing to accept the uses in the irrigation or limited contact uses such as toilet flushing or those systems. So, that way all these things actually govern the kind of acceptance level of the wastewater.

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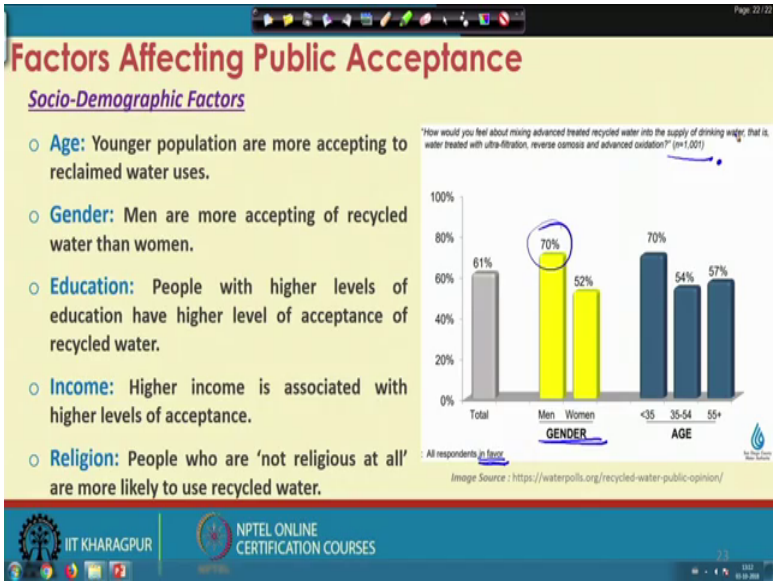

So, if we see the various factors that affect the public acceptance ok. We can categorize them into several sections. So, one of the factors like quite a few things under the socio demographic groups, will affect the acceptance level of the recycled water. So, say for age.

So, age again these findings are just based on some statistical observations, some surveys or some those kind of like opinion polls ok. And, there is no hardened like fast scientific proof for these claims. So, is the younger people are generally considered or generally believed to be more accepting to the reclaimed water uses, this has come across surveys also. So, the people who are of younger ages are more believed to be pro environmentalist and they are more willing to accept the use of recycled wastewater as well. Whereas, the people of the older age groups are relatively kind of it is more

difficult to convince them to get ready for using the reclaimed water uses ok. Similarly, if we see the gender aspects so, men are more accepting of the recycled water than women.

It is again a harder to convince women for accepting the wastewater, accepting the uses of treated wastewater as opposed to the accepting convincing the men education. So, people with higher education level have higher level of acceptance, because they can understand the things better they know from where water comes, how if post treatment the water is actually safe.

So, they are very much like the educated people can see the things and can kind of get themselves assured that yes this water may be sourced from a wastewater, but post treatment it is the quality is the safe reliable and fit for uses. So, that way they have a higher level of acceptance for recycle water as opposed to the people with lesser education group.

Income if we see so, higher income is kind of associated with higher level of acceptance ok. And, similarly with religion so, people who are not that religious are more likely to use recycled water, religious people have like more higher level of reservation or higher degrees of reservation for using waste water or recycled water for the domestic applications.

So, it is across all the religions there has been several studies conducted like with the Hindus, with the Islamic people, with the Buddhists, with the Christians. So, it is like there are there are reports in the bits and pieces that some studies has said that slamming peoples are having higher reservations for using waste water ok.

The Buddhists are more accepting like they are more ready to accept the recycled water for their even domestic uses, but again these studies are just bits and pieces there is no conclusive evidence, but this is for sure that the people who are not religious. They are more likely to use recycled wastewater; the religious people because of the religious practices and because of the kind of this perceptive hygiene and cleanliness in several religious activities, it like they are difficult literally difficult to convince for using the recycled wastewater.

For say this study is actually like with around thousand participants a survey has shown that if you see the gender level. So, around 70 percent of the men, were in favour of

using the like the kind of the question was how do you feel about mixing advanced treated water into the supply of drinking water. So, for drinking water purpose the advanced treated recycled water 70 percent of the men's were willing to accept it whereas, just around half of the women 50 per 52 percent of the women were willing to accept that.

In the age group if you see. So, the people with age less than 35 70 percent of those were in favour whereas, again the older people with age greater than 35, there is less number of peoples they were who are actually of the opinion, that yes they are in the favour of using the recycled water for the domestic purpose.

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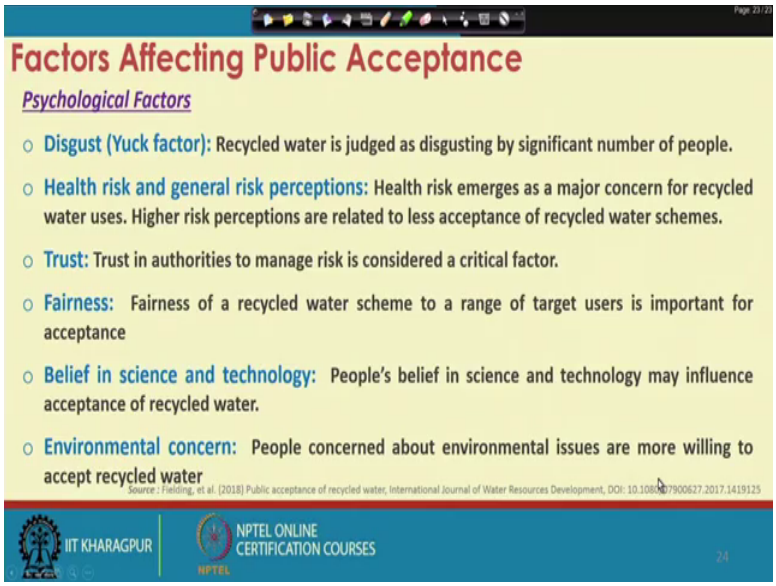

So, that was about the kind of demographic factors. Now, there are physiological factors again quite a few of physiological factors that affect. So, there are the first and foremost is the disgust ok, which we are just referring as yuck factor ok. So, people say yuck I am not going to use this ok.

So, that kind of feeling so, the recycled water is that way kind of just as disgusting by a significant number of people. And, this has been the major reason major force behind stopping several wastewater recycling projects in the USA san diago of the USA say for example, in several in basically some counties of Australia.

So, those kind of like factors have been have played a very important role in educating people for opposing the recycled water schemes, then there are health risk and general risk perceptions. So, health risk emerges as a major concerns, which is related to again yuck factor, that people are not sure of the risk involved with the recycled water uses, there are higher risk perception are related to the less acceptance of the recycled water scheme. So, if the risk is high they will be willing to the willingness to use is going to be go down, if the risk is low that way it could actually improve.

Then there is trust so, trust in authorities to manage risk is considered a critical factor. Again, if you trust your authorities, if you trust your water bodies, what a utility is that yes the kind of system they have the kind of system they develop, they will be able to treat it to the level of drinking water and then they are supplying it. So, the health why is that wise the water is safe. So, this trust actually helps in reducing the kind of risk and improving the perception also, but places like if you do not trust your utilities. So, for India, if somebody is saying that say this gel board will recycle the water and we will supply.

So, people will have a very first question that how efficient their treatment is going to be and what is the kind of risk of failures. So, because that trust is probably not of that level, which is there in few developed countries then there is a fairness of the recycled water schemes to a range of target uses users is important. So, if let us say you are having a recycled scheme and trying to supply to a area specific area, and some past colonies the utility is supplying the straw water. So, there will be agitating from that ok. Why it is if it is that safe, why you are not supplying there, why we are getting a larger share of this water.

So, those kind of kind of inequity in distribution or may become a major challenge. So, if the supply is fair and equity distributed equitably, it is it relatively will have at least those factors will go on so, will may have a little higher level of acceptance. Then there is a belief in science and technology. So, if people tend to believe that yes there are adequate amount of treatment technologies about there are like efficient treatment technologies available which are being used. So, they will be more willing to accept the recycled water.

If, they do not trust the technology or the science to produce the potable quality water out of wastewater of course, their willingness to use that water will go down then, there are environmental concerns so, people who are pro environmentalist who basically are like give due emphasis to the environment, who are concerned about environmental issues, they are more willing to accept the recycled water as opposed to the people who are who do not bother much about the environmental aspects.

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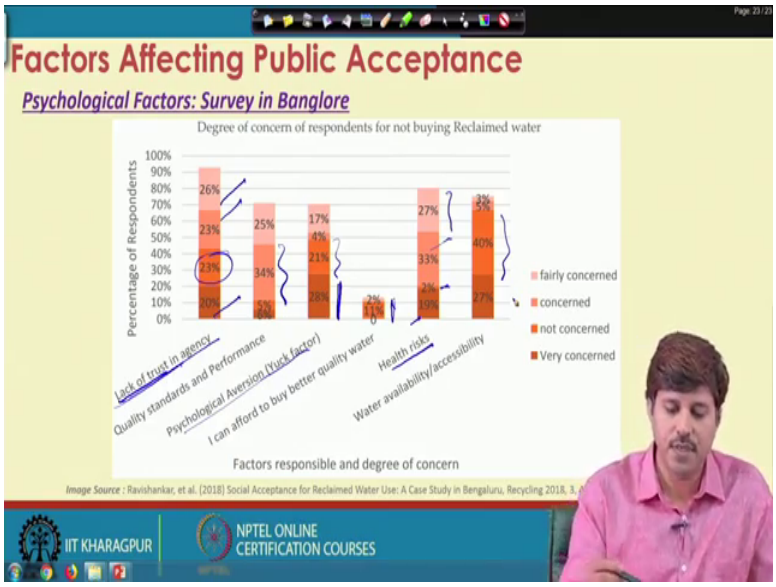

So, firstly, this is a kind of survey done in the Bangalore with the physiological factors for an example ok. So, if you see that lack of the trust in agency is one of the major points. So, just only 23 percent said that they are not concerned, but rest either they say they are fairly concerned or very highly concerned ok.

So, almost like two-third of the almost three-fourth of the population were having less trust or were lacking trust in the agency. The quality standard and performances again just 5 percent was not concerned and rest you see there are like quite a few percentage of population was concerned.

In yuck factor or physiological aversion, 21 percent says that they are not concerned, but that was one of the major factors as 28 percent of the population was very concerned about these physiological factors. So, that way I can afford to buy better quality water was something which was not a major factor ok. And, health risk was another one where just 2 percent says that they are not concerned, but around 20 percent says they are very

concerned and one third says that they are extremely concerned and then some others were fairly concerned about this thing.

It is basically the water availability and accessibility for which many says that we are actually not concerned the 40 percent large proportion of people, a large fraction of people said that they are not too concerned about this ok. And, relatively like 27 percent although opinion and that they are very concerned about the availability factor as well. So, these are some of the kind of responses, that way from residents of the city of Bengaluru.

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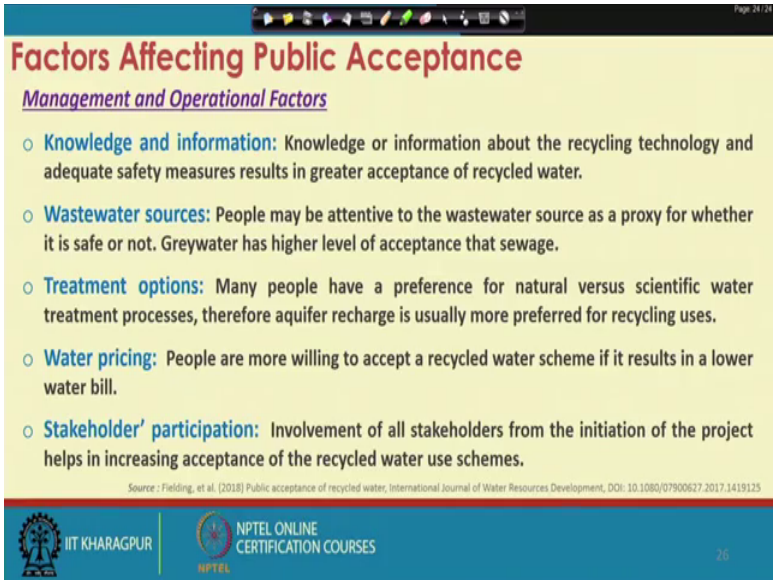

Then, there are management and operational factors which affect the public acceptance. So, among this the some of the important factors are the knowledge and information ok. So, whether people have adequate amount of knowledge or the complete information about the recycling technology, the source of water and kind of adequate safety measures that are being taken care of by the utility.

So, if they are more like informed the users which are more informed about whatever is happening, the users that have knowledge about all those things have actually greater acceptance of the recycled water. As opposed to those who actually do not know the system. So, there yuck factor that way becomes more prominent for the people having lesser knowledge ok. Then, the wastewater sources again people may be kind of attentive towards the sources of wastewater as a proxy of whether it is safe or not.

So, firstly, the grave water people know that if they know that this water which is being treated is just gray water coming from bathroom, kitchens, and it is not from the toilet us. So, that yuck factor level will also reduce, the disgust factor will also reduce, they know that there is lesser pollution so, health risk or the overall risk is also reduced. So, there; obviously, the acceptance is going to increase ok.

So, similarly like if they know that this is as some industrial wastewater. So, they know that industrial wastewater may have lot of pollutants may have some carcinogenic and all that. So, whether utility is able to remove that or not. So, they are like worried their concerns increases multi fold and it becomes more difficult for them to accept the say that kind of sources for their potable supplies ok.

So, depending on the source to source label wastewater sources the acceptance level will also changed then there are treatment option. So, many people have a preference for natural versus scientific water treatment processes and that way the aquifer recharge is usually more preferred for recycling uses. So, if it has to be basically augmented to drinking water supplies instead of direct potable to use they prefer that you put it in the aquifer.

So, that when it goes through that file filter column there will be natural purification and by the time water is extracted it will be safer to use ok. So, those kind of then there are advanced treatment options also. So, if it is for reusable water they say what kind of treatment option is being adopted whether it is treated to adequate level or not. So, for say R O has a kind of image that it can treat everything. So, they say that there is a R O unit at the end of the treatment chain. So, they will kind of have that belief that this water is free from the contaminants majority of the contaminants ok.

Then, there are pricing issues. So, people will be willing to accept a recycle water scheme, if it reduces their water bill. So, if it is priced lower as opposed to the kind of the raw water sources. So, the acceptance level will also increase people will not more be willing to use the recycled water for the lower prices for it is lower prices then stakeholders participation.

So, many times what happens that the government agencies or the state agencies are forming a recycle like water recycling scheme or they come up with a water recycling project, they do all the kind of study by themselves, they design it, they start kind of

constructing, the facility and, when they come to like at a later stage when they come to user that we have now this scheme installed and will give you the recycled water.

So, there the acceptance level will be lower people may get agitated that ok, we are not going to use it we do not know what has been what has happened here and those kind of thing, but if the involvement of stakeholders particularly the public side stay holders is from the initiation stage itself is from the beginning stage itself. So, that public is aware that ok, this kind of projects are being planned.

So, what are the concerns of the public they can basically opinionate it at the beginning stage, some of these may be taken care of and like the state agencies could actually try to convince the public from the beginning itself that ok. This is going to be the safe and this is what we are adopting taking their suggestion in writing their suggestion. So, involving the stakeholders from the each state in from the very beginning itself will increase the acceptance level of these schemes.

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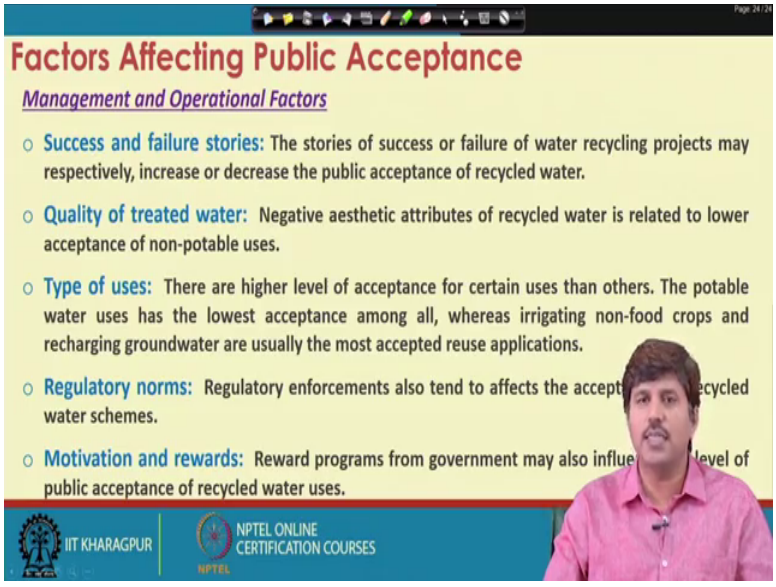

Then, there are various management and operational factors ok. So, success and failure stories, the stories of success or failure of the waste were of the wastewater recycling projects may respectively increase or decrease the public acceptance.

So, if people know that there are like 10 places where this recycling is being done and people are people are using it. So, say they like society that way looking after the other

success stories they said when they are using we can also use, but if there are failure stories ok, it was implemented there and there was risk concerned it failed system people opposed it. So, they will cite that example and opposed the system in the like in their own city in their own domain as well.

So, that kind of reduces the public acceptance that way, then quality of treated water. So, if it is having say negatively as to take attribute. So, it obviously, it is acceptance quality is going to be acceptance level is going to be decrease, then type of uses is another important aspect.

So, there are higher level of acceptance for certain uses than others. The potable water uses has the lowest acceptance among all whereas, irrigating non-food crops, or recharging groundwater, relatively has much larger range of acceptance as a reuse applications. Then, there could be regulatory norms or regulatory enforcements are there so, people may be kind of if they are forced to use this ok.

So, then that may like because of these regulatory norms also you may see the higher level of acceptance and then motivation and rewards are something which can be kind of increased the level of acceptance. So, if there are reward program that ok, those who are using this kind of recycled water are involved in using this. So, they will say get certain type of reward or rebate in the taxes, or say reduced in their water bill or free water supplies. So, then they actually can kind of get motivated for using the recycled water and that eventually increases the level of acceptance as well.

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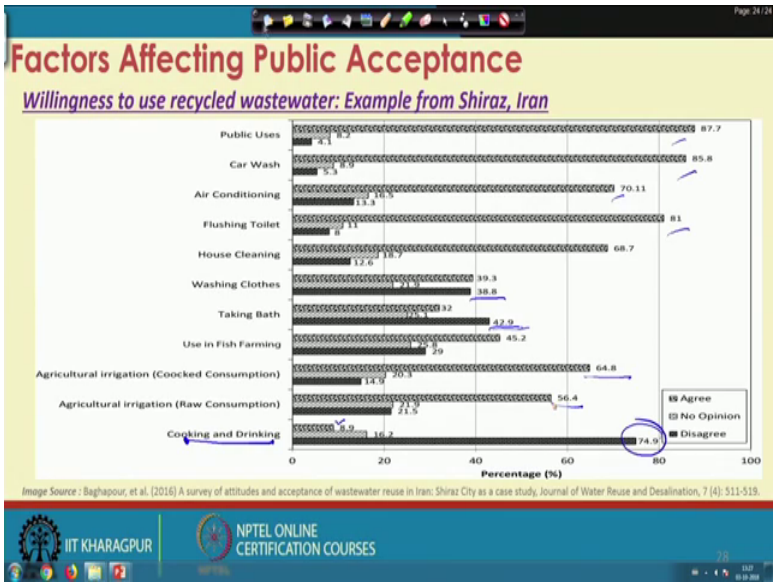

So, for example, if you see the willingness to use recycled wastewater so, this is an example from the Iran Shiraz Iran for different uses. So, it can be seen that for purpose of the cooking and drinking the majority of almost 75 percent of the people got disagree.

And, only less than 10 percent got agree to it whereas, 16 percent had no opinion on that ok similarly, if you see that like other uses. So, taking baths almost 43 percent people got disagree with that ok. These are the kind of prominent uses for which people got disagree washing clothes again close to 40 percent people got disagree with that whereas, if you see 4 public uses or car washes or air conditioning purpose, toilet flushing the kind of more people around 80 more than 80 percent people agreed for these things they are conditioning again 70 percent people agreed that way.

Agricultural irrigation for (Refer Time: 28:53) consumption almost 765 percent and for raw consumption it was all of the order of 50 percent people got agreed ok. So, that way there are like different level of agreement for the different uses.

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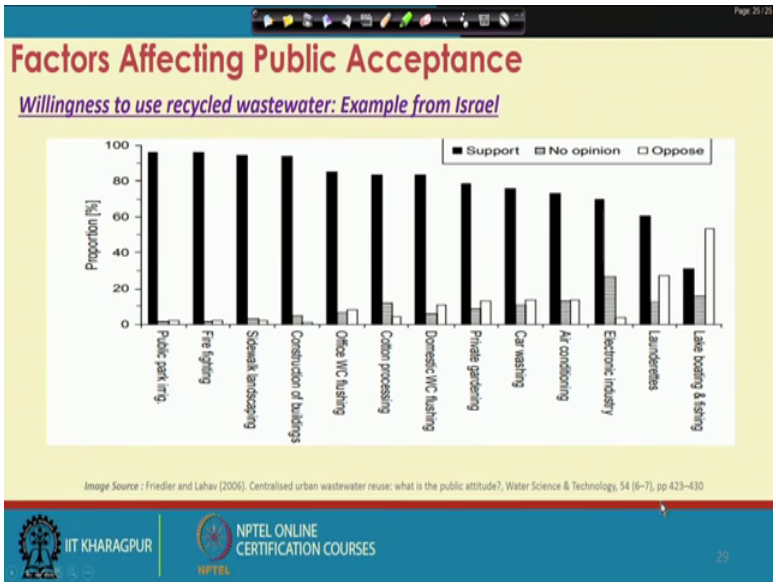

These, another example from the Israel ok. So, again you see that people who are in general in general in support for say public parking areas for fire fighting for sidewalk landscaping ok.

For construction of buildings for water closet first flushings office toilet flushings those kind of thing for gardening, car washing, air conditioning, but as we move towards say like lake pathing and those uses when it was asked so, they had a lesser degree of acceptance.

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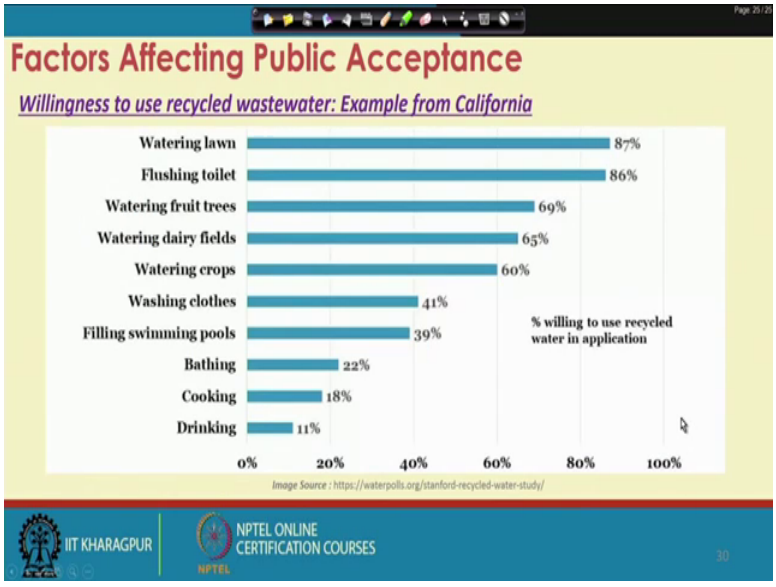

So, larger people start opposing for these kind of uses, this example from California ok. So, for drinking purpose very little only 11 percent of the population showed the willingness to uses, for cooking purpose 18, for birthing purpose 20.

So, these in swimming pool less than 40, washing clothes around 40, these were the uses which were not preferred, then if you see that were like watering lawns or flushing toilet us, majority of the people were willing to use the recycled water for these purpose ok. Or watering fruit trees watering dairy fields those uses were like 60 to 70 percent acceptance for these uses, while for flushing toilet watering lawns the uses like more than 85 percent people were agreed to that ok.

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So, how we can enhance the public acceptance, for enhancing the public acceptance there are like variety of things that can be tried. So, the regulatory requirements so, if there are regulatory enforcement, then people as we were just discussing can increase the acceptance of the people, rewards and subsidies are another things that the woman can basically take as a step for enhancing the public acceptance, then public awareness campaigns.

So, make the as we are discussing that knowledge and information is another important aspects which governs the public acceptance. So, like putting those knowledge in the public domain, making public aware with the systems, those things knowledge on water cycle the complete water cycle. So, as in the beginning of the last weeks class we

discussed that actually water recycling is not a new concept. We are already doing indirect water recycling. So, the when we dispose that water in a safe water body and some downstream city picks that for it is domestic water supplies so, that sea which is going into the river becomes the source of water for the downstream city. So, that way recycling is already there. So, we have to make people aware that ok, you are using this thing it is not a new concept, it is just we are doing it in a better improved system.

So, those kind of information or knowledge can actually increase the public acceptance as well. Then, inclusion of media and women is very important aspect, because women tend to be more kind of like repulsive towards using the recycled water. So, increasing including these women's into these kind of programs ok, including media which can kind of propagate the information the knowledge or the positive attributes of the recycling schemes. So, that is going to be far more helpful. Then control on the ground water abstractions because when you have a easy source of water. So, surface water it is not say feasible or possible for everyone to abstract surface waters, a river is going somewhere and your house is safe 10 kilometres away so, you are not going to get that water.

If it is not being supplied, but what people do that they kind of can board dig well and or put a hand pump or put a boring and use the ground water. So, if that groundwater abstraction is controlled people will kind of be forced to look for the alternate sources and recycled water could be one of them. Then, technological advancement with demonstrative project so, if you demostrate those kind of thing infield with the adequate amount of technology in involvement. So, that way it could actually be helpful.

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So, there are as we said that there are various success and failure stories. So, success stories are Singapore's in the new water where it is being used for the augmenting domestic supplies, there are orange county in California United States in the Florida in the window of the Namibia. So, they are kind of using the recycled water successfully, there are various failure stories also where these plants or the projects have been stopped by the public ok.

So, public were not willing to accept the uses of the recycled water like in the Australia like san diago of the United States, Los Angeles in the United States ok. So, the toilet to tap kind of campaign in Omaha Australia and Los Angeles United States have actually been stopped, even after the significant amount of contributions or financial investments has already been made.

So, that way we have both the sides of coin and there are ways to kind of concede there are ways to convince the people for using the treated wastewater, which is actually the need of the hour, but this is going to take some effort from our state agencies and regulatory bodies as well. So, with this we conclude this lecture here. And, in the next class will be talking about the global practices what is happening across the globe in terms of say wastewater recycling and reuse aspects and will see some of the case studies from that. So, see you in the next class and.

Thank you for joining.