Sustainable and Affordable Sanitation Solutions for Small Towns

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Lecture - 14
Liquid Waste Management - An Overview

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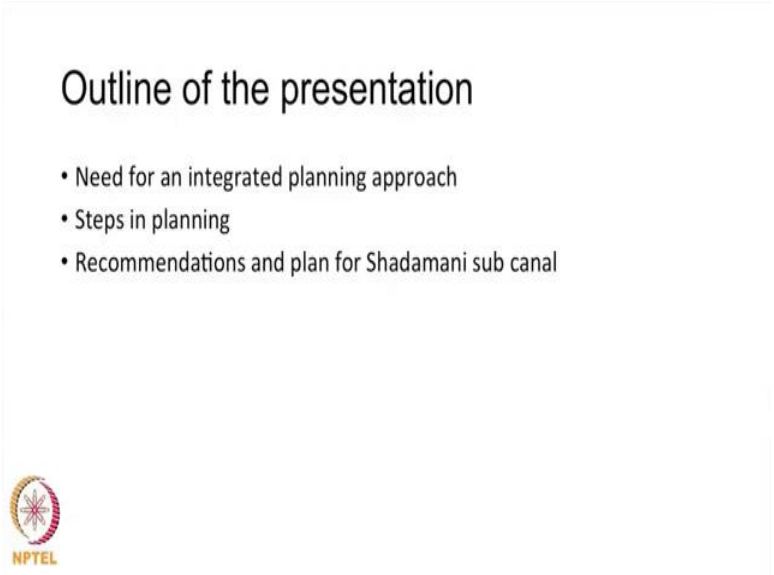

So in my presentation I will be talking a bit about what was the need for an integrated planning approach, what was the steps in planning and the recommendation and plan for the Shadamani sub canal, I will tell you a bit more about Shadamani sub canal.

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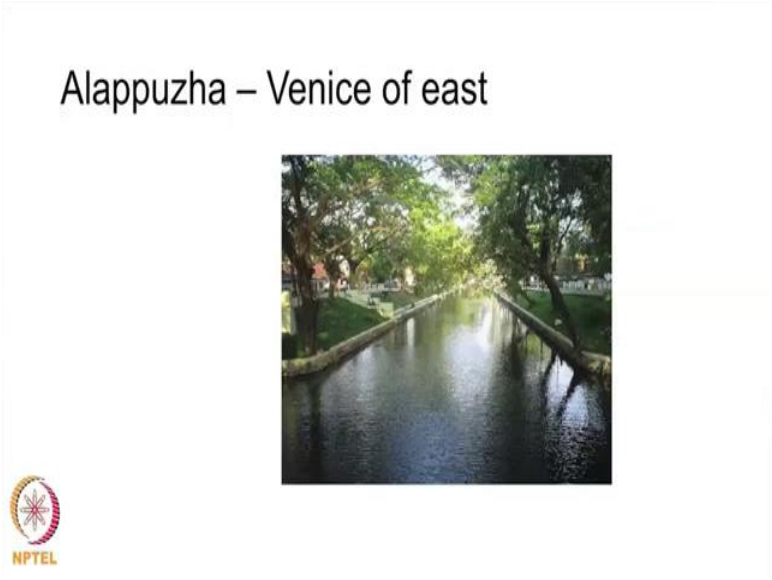

So, yes everybody is saying this Alappuzha is the Venice of the east, what ab64t the original Venice? So, everybody is like why does not Alappuzha become like the original Venice? What is the condition of Venice are we aware of it? Anybody has been to Venice anybody you have been Venice?

Student: Yeah.

Yeah. So, can you can you tell us a bit more because this is just secondary data which I have got; how are the canals there?

Student: Very dirty.

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Very dirty ok. So, the canals in Venice, they also are pretty dirty and the city relies or a 16 century sanitation system which are underground pipes called Gatolis and the waste water is transported to the canals through these pipes and it is the tidal fluctuations of the Venice lagoon, which keeps it relatively cleaner. But still when the Venice city gets flooded during monsoon and all, there are pictures of people actually playing in that water without even realising that it is actually waste water, like there are photos of people frolicking in the Venician waters. But unfortunately I do not know whether they do know it or do not know, but Venice is always touted as the aspirational city for canals.

However studies have shown that, there is an abundance of E. coli in the waters from untraceable to 10^4 colony forming units. And the different strains of E coli which are found are pretty pathogenic. They are not the benign kind and they can indicate presence of other pathogens which might be dangerous for human health. So, this is the condition of Venice canals and let us for now agree that Venice is not the aspiration which we have been to be is that ok.

Student: Yeah.

Let us have our own model of the perfect canals.

Student: Yes.

Right.

Student: No.

No.

Student: Yes.

So how critical is this liquid waste management. So, somebody yesterday mentioned about Bellandur Lake.

Student: (Refer Time: 02:41) yes.

Yes.

Student: Yes.

So, what is happening in Bellandur Lake?

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Student: (Refer Time: 02:45) frothing of the (Refer Time: 02:47).

Frothing of the lakes

Student: Catching fire.

catching fire yes.

Student: (Refer Time: 02:54).

So, in February it caught fire the lake the complete lake got fire.

Student: (Refer Time: 02:58).

So, why is this happening in Bellandur Lake?

Student: (Refer Time: 03:00).

Why is this happening?

Student: Lot of discharge of industrial effluents into the lake.

Sorry?

Student: Lot of discharge of Industrial effluents.

Lot of discharge of industrial effluents into the lake and so, BWSSB you guys aware of BWSSB. BWSSB is Bangalore Water and Sewerage Board; Water Supply and Sewerage board BWSSB. So, they are operating 19 STPs in Bangalore 9 more are in the pipeline. So, out of these 19 STPs remarkable portion of untreated sewage is reaching the Bellandur Lake and it is due to this untreated sewage coupled with a small portion of industrial effluents that the lake froths out.

So, it is actually sewage which is causing this frothing of the lake ok. So, that shows that it is very important to manage the septage or sewage which is being generated at households, they pose great risk otherwise if not managed properly.

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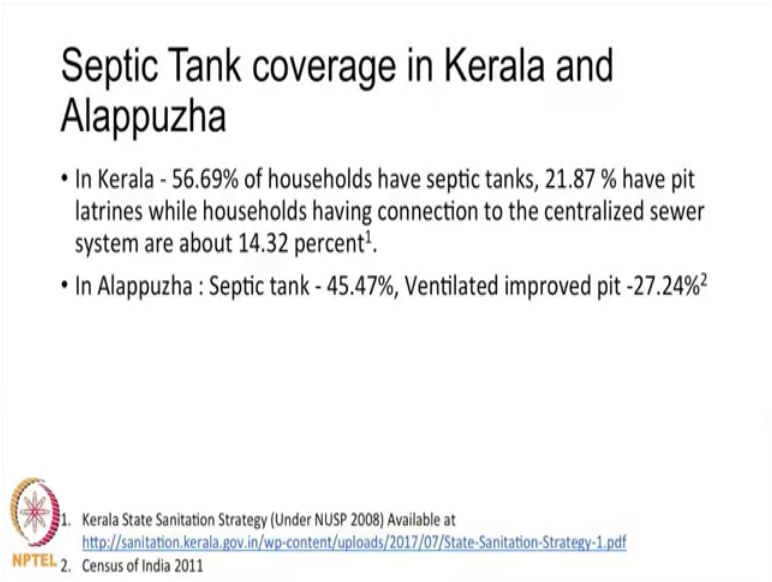

So, these are some data on septic tank coverage in Kerala, 56.69 percent of households have septic tanks and 21.87 percent of pit latrines, while households having connection to centralized sewer system is about 14.32 percent.

Sir mentioned yesterday about two cities in Kerala which have sewer network, but still the coverage is very low in those cities and it is only 14 percent of the population in Kerala which has a centralized sewerage network access. In Alappuzha specifically there is no sewerage system and the septic tank, the households connected to septic tank is 45 percent and ventilated and improved pit is 27.24 percent, these are nothing, but leach pits ventilated pits.

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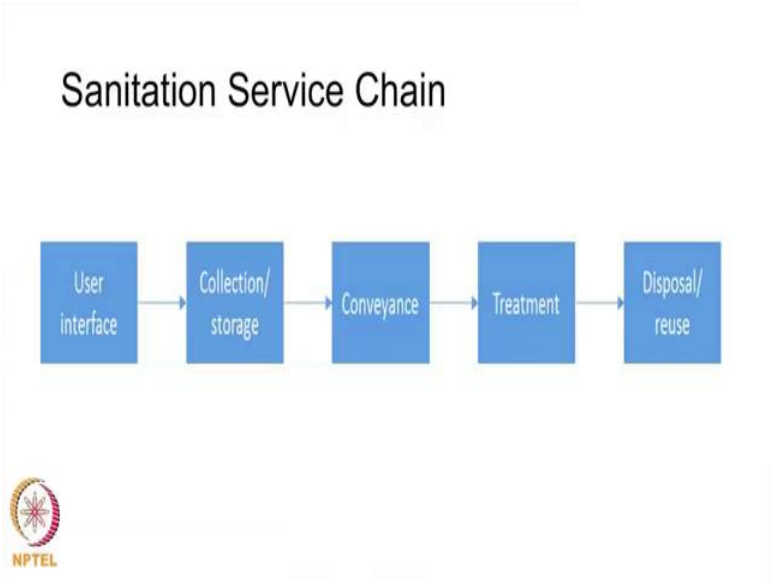

So, now, coming to the sanitation service chain; are you are you familiar with this picture? So, this is the sanitation service chain which is happening, this is the standard sanitation service chain where the first there is a user interface. There is the collection and storage system, conveyance, treatment and disposal and reuse, this is this applicable to Alleppey? You think so?

Student: No.

Yes no.

Student: (Refer Time: 05:37).

Since Alleppey does not, we have established that we do not have a centralized sewage network. So, does this work in case of Alleppey?

Student: No it does not work.

Student: No it does not.

No.

Student: No.

Why?

Student: Conveyance.

Student: Conveyance what is the (Refer Time: 05:54).

There is no conveyance, there is no treatment there is no disposal or reuse according to this particular diagram right. There is, in Alleppey since there is no centralised network, this particular sanitation service chain cannot be applied in the cities context and there is a reason why there is no centralised system in Alleppey any of you can guess the reason, why a centralised system is not possible in Alleppey.

Student: Space problem.

Space problem yes.

Student: Terrain (Refer Time: 06:26).

Terrain perfect flat topography right and?

Student: (Refer Time: 06:31).

How does terrain matter?

Student: (Refer Time: 06:33).

Student: We have to pump it (Refer Time: 06:36).

You have to pump it, that costs energy, O and M increases. What else? What else is that particular feature about Alleppey which makes it pretty difficult to have a sewerage network, yeah?

Student: High water table.

High water table exactly ok. Alleppey has very high water table there is no space for other sewage treatment plant. Even the Alleppey is a district where there are no forests there is reserved forests out of all the districts in Kerala there are no forests in Alleppey. So, imagine and the population density is also pretty high. So, imagine that there is no space even for vegetation how do you expect find out space for a vast sewage network as well as the treatment plant?

So, we are coming to the planning steps here and before going towards the planning steps I am I just want to refresh your memory from yesterdays slides. You guys are familiar with the Marthoma Church sub canal right.

Student: (Refer Time: 07:46) no.

No.

Student: (Refer Time: 07:50) that is pilot area.

Pilot area the pilot area we talked about the pilot area which was presented yesterday.

Student: Yes.

That is the Marthoma Church sub canal all right. So, we did talk about the delineation of water sheds or canal sheds and all yes the concept of canal shed was explained to you?

Student: Yes.

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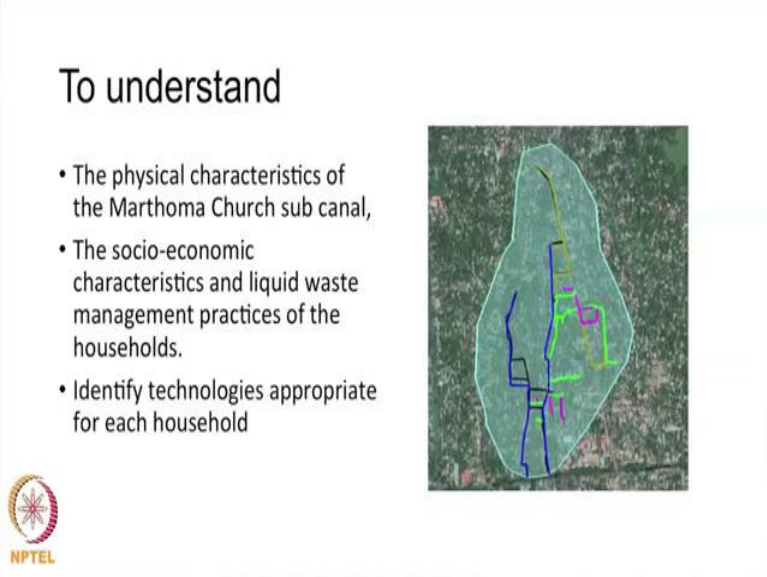

Yes so this is the Marthoma Church sub canal, the canal shed all right. So, this is a pilot area and the plan or our objective was to finally, have a treatment system or alternative treatment system for that canal right. We have established during winter school that it is during, it is from sub canals that the maximum pollution is generated and that drains in to the main canal. So, it is imperative that we address the pollution in sub canal first. So,

there is a need to understand what sort of factors are contributing to that pollution. You saw about solid waste yesterday that how solid waste is contributing the pollution in canals.

So, now we will be today looking at how liquid waste is contributing to the pollution in the same canals ok. Like yesterday the pilot area is the Chatthanad sorry the Marthoma Church sub canal. So, there are three wards through which this sub canal is going through it is Chatthanad, Mannath ward and Thondamkulangara ok. So, in order to identify the extent of pollution and to how to tackle it, how to come up with alternate strategies to tackle it, there is a need to first study the canal, there is a need to understand the physical characteristics of the sub canal. Secondly, to understand the socio economic characteristics and liquid waste management practices of the households which are there and identify technologies which are appropriate for each households right.

So, these are three steps which comes under it and these are our objectives for this particular study. So, how do we go about doing it?

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Initially, we did a secondary data collection and desk study, we identified some key stakeholders, we evolved a questionnaire there was an evolution of questionnaire over a period of the past 1 year almost and then we collected some primary data and there analysis point ok. So, secondary data collection involved collecting maps from the

municipality, cadestral maps from Trivandrum and data about canals about households about different wards.

Student: Are get.

And desk study about the different kinds of septic tanks and septics which are available in market today.

To identify and understand their working, to identify whether septic tank is actually a septic canal tank or not, the different standards associated with it and we identified some key stake holders. Since we have to if we have to work or the pilot area it is imperative that we get the support of the councillors there, yesterday you saw the councillors of Shadamani canal right.

Student: Yes.

That is the second sub canal we are taking up. So, initially we had a talk with the councillors from that sub canal, there Marthoma Church sub canal we they were they came on board and they also agreed to our you know survey and they helped us in data collection and all alied activities.

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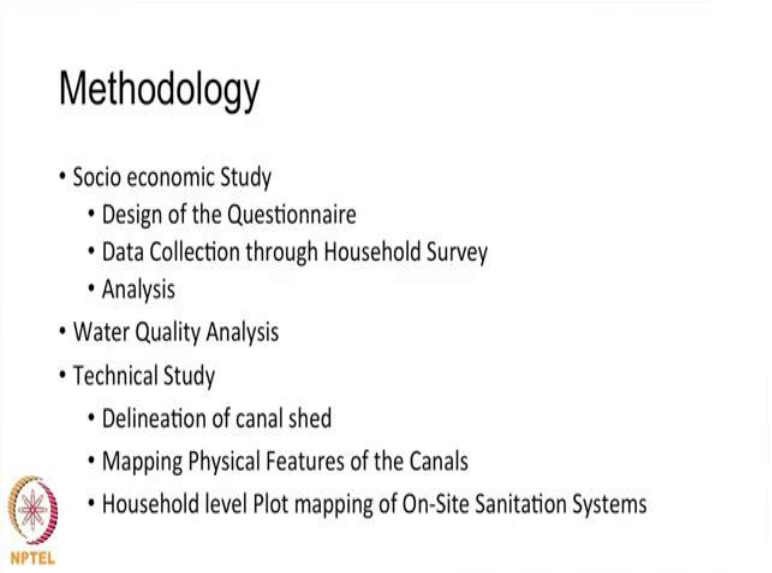

So, there are three things which basically happened. So, there is a socio economic study, water quality analysis and technical study which we conducted. So, this is how we

collected the primary data ok. So, socio economic study is again to understand the socio economic profile of the people who are living there. The class of people, the different practices which they follow, their plot size how much area they have for alternate systems with the systems they are found to be problematic. Water quality analysis, this was done to understand the water quality in case of wells and KWA water connection. And the third was technical study, delineation of canal shed, mapping physical features, household level plot mapping.

So, we have already talked about delineation of canal sheds how that was done during the last summer school. So, I have to tell you that these this methodologies are combined methodologies for data which were collected over the course of the last one year. So, there are different phases of data collection. There was the last winter school, there was summer school, there were activities which happened in between the last summer school that last summer school and winter school. There are of multiple surveys which happened, multiple studies and activities through which we havecollected data. So, first we need to understand the current existing situation like there has to be a situation analysis in place, before we go ahead with planning and proposing alternate solutions if needed.

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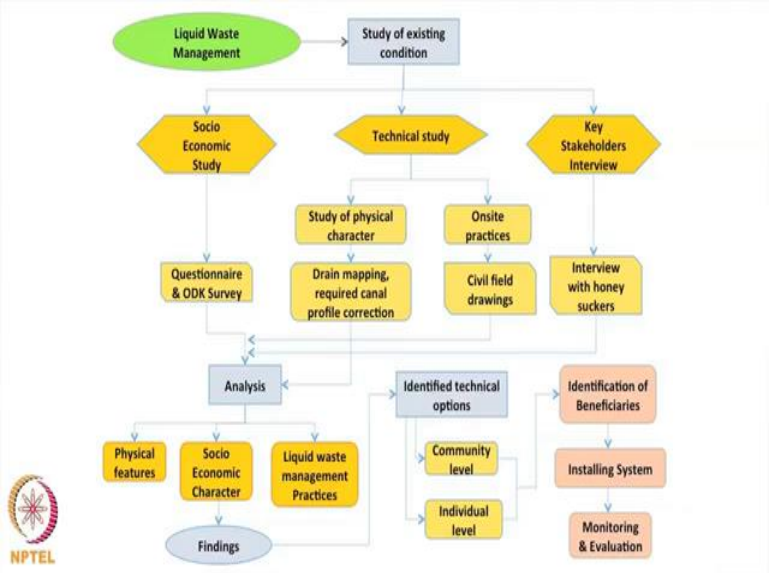

So, for that there were basically two components of the study which were as I mentioned. Earlier it is the socio economic study and the technical study. So, some of the socio

economic study it was basically a questionnaire based survey, I will be talking a bit more in detail about the questionnaire which we use the different elements of the questionnaire and all, but what we understand is that, this was done using ODK, you heard about ODK by now I am sure, we will be having a session about ODK after this and that that really made data collection as well as analysis very very easy and it was using mobile phones, which is pretty common place nowadays and it did not involve any paper work or transferring you know manual labour in putting the data to excel or anything.

So, that made it very convenient for us and also helped us in easier analysis of data. The second was technical study it involves studying the physical character of the canals and onsite practices. So, this I will be in the next slide I will be detailing it out and the third one was key stakeholder interviews. So, one of the aspects of liquid waste management is faecal sludge right. Yesterday you did here a lot about faecal sludge management, you heard a lot about you know honey suckers and how they there is.

Student: Desludging.

Sorry Desludging yes, but there is no current alternative or a any treatment or disposal option for faecal sludge in the whole of Kerala. Devanahalli in Bangalore has an FSTP plant, but Kerala people are still throwing away dumping the waste into either water bodies or fields. So, to understand what is happening there, we identify a few stakeholders and we had interviews with them.

So, this part will be detailed to you during a presentation on FSTPs by Paresh ok. So, I will be concentrating on socio economic study and the technical study and once you have analysis, you will understand the physical features, the socio economic character and the practices and from there you have certain findings and from those findings you can actually propose technical options which are appropriate for each context.

And when I say context I do not mean households, does not mean that every household needs an alternative solution there might be situations where you have to take a cluster of households together and propose a solution for them in case of land constraints or yeah space constraints. It can be community or individual level and in case of community level this is another exercise we have conducted, where in we have done an identification of beneficiaries which I will be telling you in the next section. Yes this is about the technical study which is there any doubt till now any questions or anything?

Is that is that clear? Because this is something which you will be doing from tomorrow. So, hopefully it is clear yeah. So, this is about the physical character and onsite sanitation practices.

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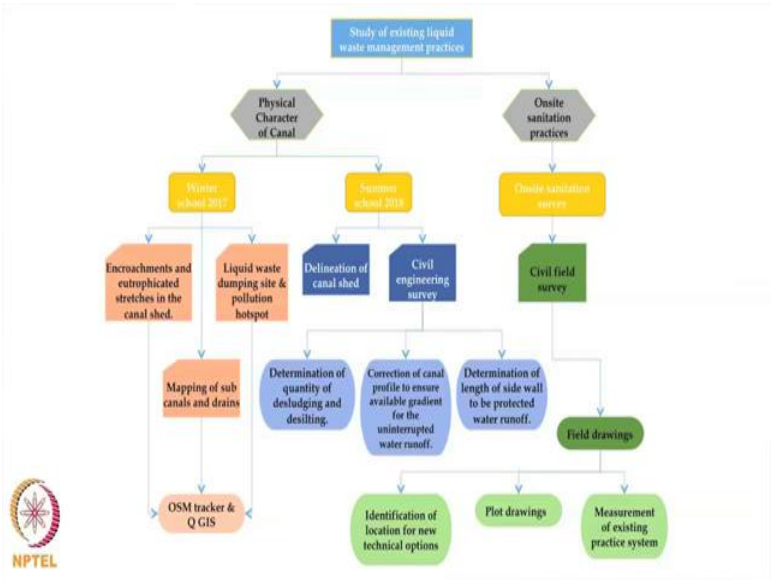

During winter school 2017 several encroachments are identified in the canals, there were liquid waste and solid waste hotspots which were identified in the canals and the mapping of sub canals and drains happen by using OSM is OSM familiar to you?

Student: Yes.

OSM.

Student: Yeah (Refer Time: 16:42).

OSM is another application app which can be used for tracking purposes. So, this really helped us in tracking the drains and identifying and the major part of the technical study,it happened during the summer school 2018 where in, delineation of canal shed and civil engineering survey was done. So, civil engineering survey is to- Firstly, they can ask are in a bad shape at least the sub canals we do know that and one of the reasons is the sediments which have deposited there, the solid waste which has accumulated there has completely altered the canal profile right. So, there is a need to identify to measure the length width of the canal, what is the canal profile currently?

What should be the canal profile, the corrected canal profile and then see how much amount of desludging should be done, to reach that particular canal profile, is that clear yes? And the recent activity was this on-site sanitation survey, in which two in the in the pilot area. This survey was conducted only recently around October; last October, it was conducted and two rows have households near the canals, on the side of the canals they were identified around 200 households were there and we collected the liquid waste, solid waste sorry liquid waste yeah solid waste also management practices from them. And another thing which was done was we did a household level plot site plan and service plan for all of these households just these 200 households.

So, students went there they were given an appropriate training by the KILA (Kerala Institute of Local Administration) research associates who are with you. They were given training and they went there they measured the different aspects, setback, distance from boundary wall to the structure and they made a proper drawing which was later converted into auto cad and now we have a 3 drawings of all 200 households and this will eventually help us in deciding what is the appropriate technology for. So, that is one data set which we have at our disposal; which should aid us in decision method. So, coming to the socio economic study and the questionnaire which I earlier talked about.

So, this questionnaire has been defined has been piloted as well as revised many times over. I am now detailing the key parameters which are there in the questionnaire and the relevance of the same and how it will eventually help us in preparing a proposed action plan.

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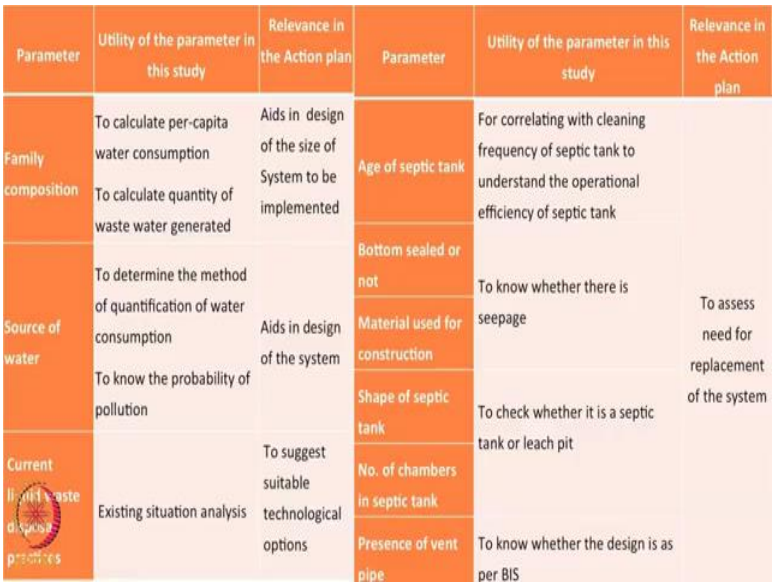

Parameter	Utility of the parameter in this study	Relevance in the Action plan	Parameter	Utility of the parameter in this study	Relevance in the Action plan
Family composition	To calculate per-capita water consumption To calculate quantity of waste water generated	Aids in design of the size of System to be implemented	Age of septic tank	For correlating with cleaning frequency of septic tank to understand the operational efficiency of septic tank	To assess need for replacement of the system
Source of water	To determine the method of quantification of water consumption To know the probability of pollution	Aids in design of the system	Bottom sealed or not	To know whether there is seepage	
			Material used for construction		
			Shape of septic tank	To check whether it is a septic tank or leach pit	
Current liquid waste disposal practices	Existing situation analysis	To suggest suitable technological options	No. of chambers in septic tank		
			Presence of vent pipe	To know whether the design is as per BIS	

So firstly, we need the family composition. We need to understand the per capita water consumption of the households in order to design a system yes. So, how do we calculate that ?

Student: Per population.

Sorry.

Student: Per population how many people are living?

How many people are living yes? But one you get the source of water quantity of water and family composition, how do you calculate the total amount of waste water which is there?

Student: 80 percent 80 percent.

80 percent right 80 percent of the water gets converted to.

Student: Waste water.

Waste water. So, that is something which is critical because while identifying, while designing a system we need to understand the waste water quantity generating. So, this is a critical data which needs to be collected. The current liquid waste disposal practices which are ther,e to identify whether that particular practice is happening properly or we

need to retrofit that system. So, for all these things then we were looking to. Now the next thing if we found was during our winter school I think this was covered yesterday. During our winter school we found that many of a septic tanks which people mentioned will have septic tanks were actually soak pits..

One of the questions is whether the bottom was sealed or not, the material which was used for construction, the shape of the septic tank, the number of chambers. And so, usually the septic tank there are three main kinds of septic tank which is there in which is found in our country one is the ring type.

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So, the one the middle one is the ring type one which is not actually a septic tank, it is a soak pit where in you just keep rings on top of each other there is no bottom and then you close it and this is one question which you will be asking them that was is the side wall made of is it ring type ok.

The second is the masonry structure which is shown here that is another kind of septic tank, it is a mason brick and not masonry structure and the last one is the prefab or plastic septic tanks all right. These are the different kinds of septic tanks which are found and only these two are proper scientific septic tanks ok. Since it is rings there is possibility of water leaking from the sides and hence and there is no insulation there is no cementing which has been done. So, another question which is of importance is the distance between well and septic tank? And according to Kerala municipality building

rules the minimum of 7.5 metre distance should be there between the well and septic tank.

This especially is critical because of the fact that most of the water the ground water wells dug wells as well as tube wells in Alappuzha are contaminated we will be looking at the data in sometime. And the so, the distance between the wells as well as the septic tank is also important and that was also another parameter which was identified. The width of the approach road to check accessibility in case of installation of the new system, the land occupied by the existing system and land which is available for new system and the willingness to install a new system.

So, their consent was asked for whether we want a new system to be installed coming to the analysis of this sorry..

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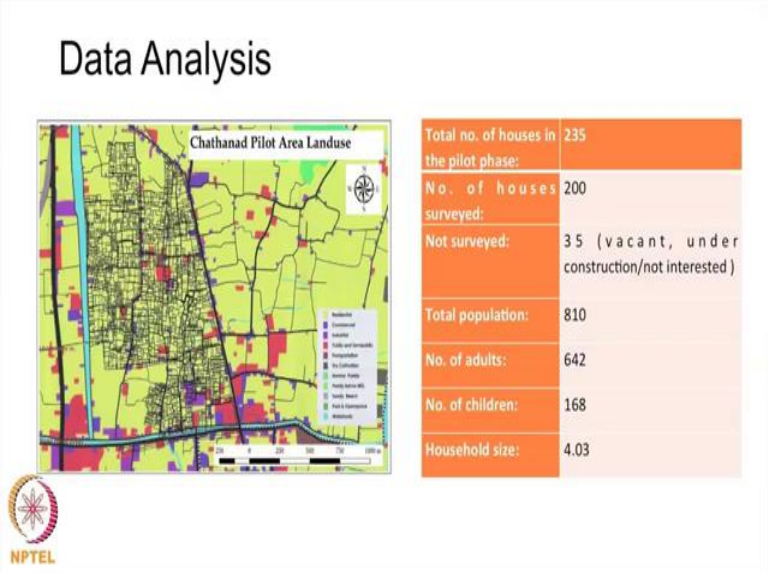

This is the pilot area and this as you can see these are the survey numbers which are there. So, this pretty densely populated, but these are pretty much densely populated the number of households which are surveyed they are 200, this happened in the most recent survey which happened in October eventually I told you that they made site plans and surveys plans for the households in each household. So, this is the what the analysis is of that particular survey data.

35 of them are not surveyed the total population was found 810 and the household size was found the 4.03.

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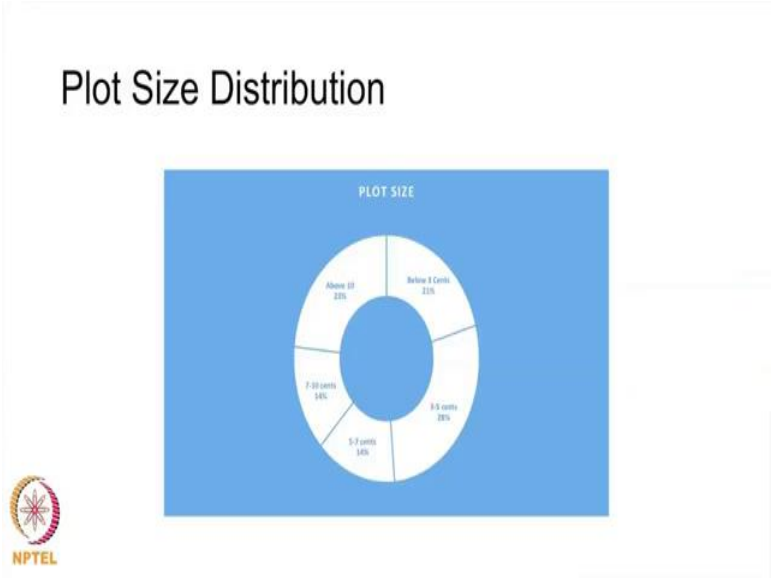

Ah The plot size distribution if we see below 3 cents, it is almost 21 percent this one. Below 3 cents is 21 percent, 3 to 5 cents is 28 percent, 5 to 7 cents 14 percent, 7 to 10 cents also 14 percent and above 10 cents 23 percent you know how much is a cent right.

Student: (Refer Time: 23:52) what is.

Anybody knows how much anybody who does not know can raise their hands up.

Student: 40.

40 meter square ok. Just 40 meter square approximately 40 meter square. So,. So, you can you have an idea of the area of the households now right and we can see that almost 50 percent of the of the above the below 5 cents and when you go back to the map there is a very thickly populated area somewhere here and that is a that is a colony called municipal colony and people are living there in small settlements and it is only it is only 3 to 5 cents max 5 cents there. There household area they using a community toilet though they have an individual systems in their place, but some of the there is a community toilet also be placed.

And this is an area where individual systems identifying or sorry designing and installation of individual systems would become very difficult because we already had a septic tank below the toilet and there is no place other than that for them. So, we need to going for community level system ok.

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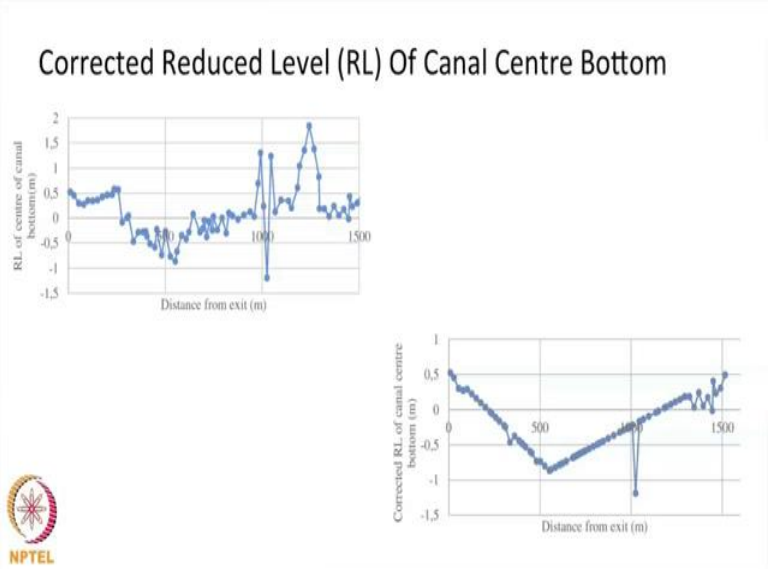

As I told you this is the canal profile of the Marthoma Church sub canal, you can see there are a lot of undulations here and this is the corrected level of the corrected reduced level of the sub canal.

So, this is how the canal level should be so, that proper flow happens where this is how it is currently ok. And for this canal level to be achieved almost 948 meter cubes of sludge has to be deselected and removed from these canals.

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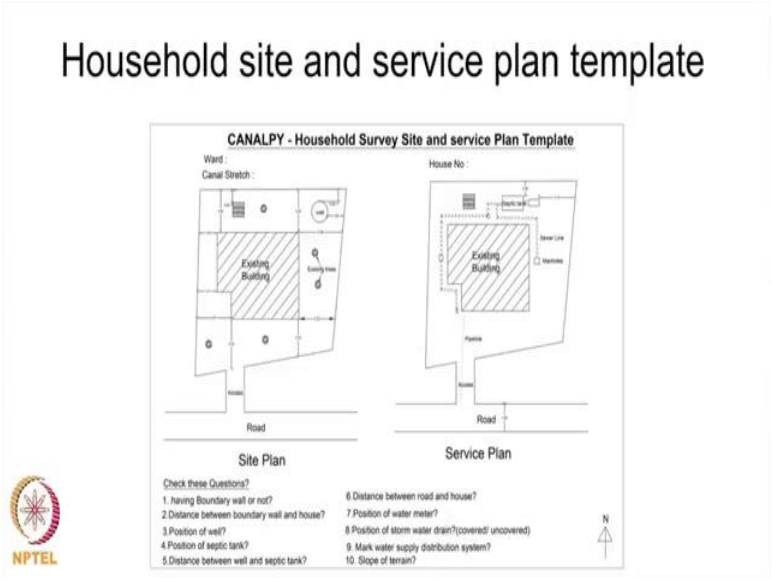

Now, this is the household site and the service plan which was made for these 200 households, this is the template which was followed. Now there are canalpy interns who are there amongst who are doing the survey along with you, they have they have painstakingly done this they have gone to each household in a paper they have collected these details.

You know what is the setback, what is how much is there a well or where is the septic tank, what is the distance between each structure and this service plan also where are the water pipes, where is the meter water meter all these details were collected they converted into a.

Student: Ma’am.

Yeah.

Student: What do we infer from the previous slide what do we?

This one.

Student: Yes.

So you know that canals for proper flow to happen. There should be a certain canal profile which must be maintained, the certain gradient which must be maintained right. Now the problem with the sub canals is that, during the course of all these years a lot of

solid waste has been deposited or of lot of sediments have been deposited lot of encroachments have been there that is obstructed the flow right.

So, for proper flow to be maintained there is a need for desludging, but how do you understand how much desludging has to be done? That is a question right. So, for that there was a levelling survey which was done during the summer school by civil engineering students, who understood that this particular canal profile has to be corrected to this. So; that means, there is a lot of sediment which have to be taken out from it has to be deselected it has to be desludged.

So, that is why I said almost 914 meter cubes of sludge deposited at the end of the canal have to be taken out and that process is happening.

Student: will it be just treated after?

Yes it has to be treated after taking. In fact, it has to be dried.

Student: Dried.

And it has to be processed properly yes.

Student: (Refer Time: 27:37) So, we have the (Refer Time: 27:38) 14.

The question about what are we going to do with the sludge after we take it out?

The irrigation department has identified certain you know that you know like, 2 kilometres from here the Vembanad ecosystem starts. The Vembanad and then the Vembanad ecosystems is like 1 to 3 meters below sea level and it is a nice growing system. And rice is grow like you know by making bunds around the you know, shallow back waters and the water is pumped out and that is how this is done. So, this outer bunds need a lot of reinforcing. So, they going to l use it for that.

So, that then it is a, but now it is kind of you know making they are making concrete bunds and all, it is not eco friendly. So, that is that is one of the reasons why the floods happened also. So, we are planning to utilize that for that that one.

Student: I see you talking about participatory governance and (Refer Time: 28:38), but what is the participatory element in your campaign which involved local people?

It is cannot be you know these things cannot be planned with everybody there and we should be and I told you honestly yesterday that, I did not see any community I did not say any citizen when we go out and ask people they will not participate, I was very clear about that yesterday. So, that is why we need somebody to kind of trigger if that is students citizen, who will go and talk with them and you know kind of make them kind of participate in what way. Segregation they should do; you know they should be paying for the use of a you know, that is a kind of participation that we kind of you know and then of course, if there is a polluter the committee should kind of come together and you know you can tell that.

For the for all that you need kind of very what you called committed 2 or 3 people who should be kind of doing that otherwise everybody coming is a very romantic concept you know deliberative democracy.

Student: No.

Democracy and (Refer Time: 29:46).

Student: Coming from an organizational of background, we study how participatory processes through designing policy and theinvolvement of locals somehow in short it is a longer lasting. So, it is currently the canals are dirty, there is no function and people have no use of it and that's why its pollutedSo, people after the (Refer Time: 30:08) So, even after the regeneration, there is no functional aspect for the community, how do you ensure that the canal remains clean? (Refer Time: 30:12).

Yeah, small canals is very difficult to get the utility that way, in small canals now because these are you will see that you know, it is actually something like one to three meters wide and you know it is very difficult to kind of. So,thee first thing is to not make them drains that is the that is a first thing. The utility is being made of the for big canals, I do not whether everybody was there when I started the beginning. Last one 1.5 kilometres stretch we are going to have it as a more heritage areas where people are the youth in Alleppey are going to see the utility of the canal by the tourism future that they have.

So, one thing is you know hop in hop out, whole system where instead of the auto rickshaws and all that currently tourists use, can we have a hop in hop out when a boat

system which can actually run through half of the canal at least, or may be the full length of the canal also and that will actually we will bring in a aeration and you know it will actually kind of you know rejuvenate the system also in a way that that is a one way. Second for both sides the canal having you know shops and you know kind of parks and those kinds of areas, we should make a some kind of a utility of the major canals; but then to make the major canals clean, minor canals have to be clean.

Student: There is an association between the local community and if they feel like they there was some ownership involved of there, citizens being involved with the canal it would be ...

Yeah, you know I have been in this specialization of participation for the last 20 years and so, with no offenses men in urban contexts it is very difficult for people to kind of spontaneously participate a lot. And it is very difficult for utility to be kind of identified everywhere. If we if you have a plan you are most welcome we will try it out, but I am not from my experience and my personal experience in Alleppey, I have spent at least kind of maybe more than 100 days in Alleppey you know now and I belong to here also my mothers places in Alleppey.

So, looking at all that you know working here, I am not very optimistic that there will be a huge community participation. The community is fragmented into ethnicity like caste, caste gender politics you know all these kinds of things. So,. So, and why should they participate I told you know they will run for the livelihoods every morning.

Otherwise it should be it is a like a very elite community like it is a Bangalore case where you know there would be you know some people who can actually kind of a spend their time to I do not see in small towns to kind of have a Bangalore model also or the Sabarmati community I do not know about it. So, those kinds of things may not work in Alleppey is what I think, but you are most welcome if you have any ideas.

So, So, this is the question which we had asked during summer school as to how toilet waste is disposed in households.

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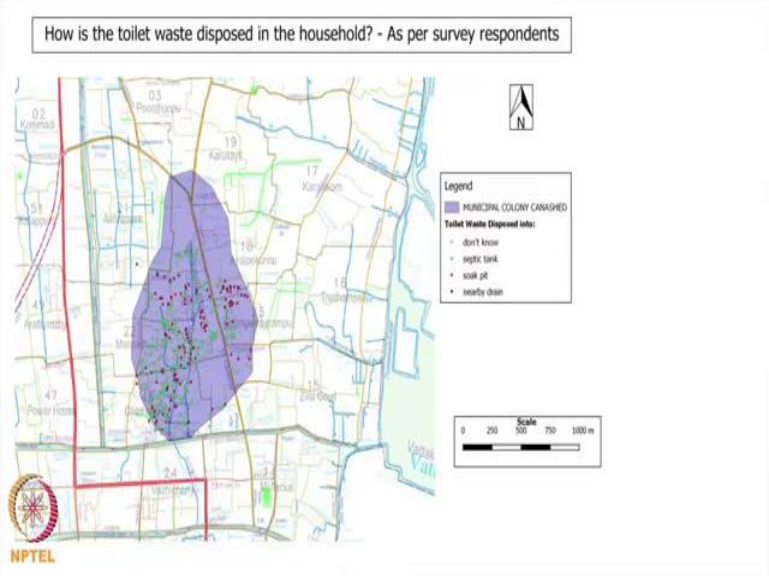

And all the green ones are septic tank according to the people ok. Now when you go the next slide you see that when we tested whether there this is actually a septic tank or soak pit we found that all the green ones which we they had listed were actually soak pits.

Student: Sruthi.

Yeah.

Student: The septic tanks.

This one.

Student: Yeah first one is plastic or metallic.

It is a FRP,fiber reinforced plastic ok.

So, coming to black water analysis.

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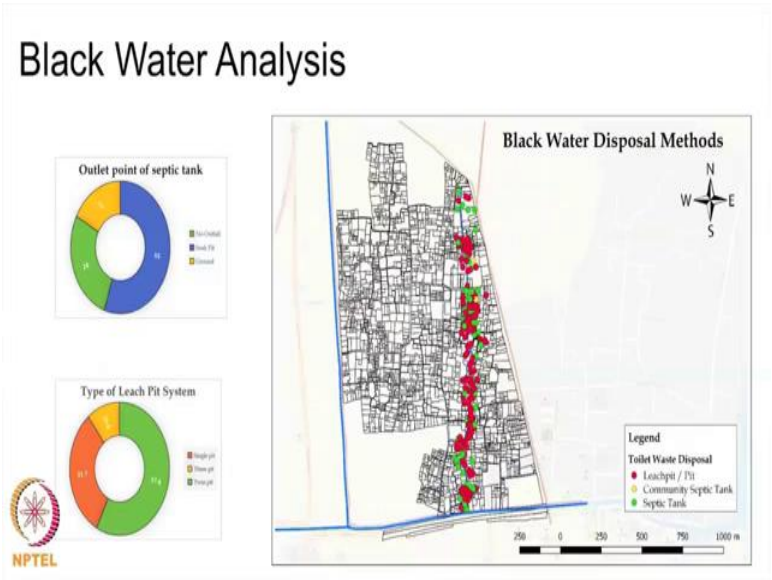

So almost 55 percent of the septic tank the outfall is to a soak pit, there is no outfall for almost 25 percent and for 17 percent outfall is to the ground that is the first graph this is as I said every septic tank it must have an outfall into the soak pit. So, that functions efficiently. Because the outfall it consists of a pretty high BOD effluent which if directly released into the ground can contaminate the ground water as well as when it reaches the sub canal, it can contaminate the surface water. So, this particular graph, this particular map is of the different black water disposal methods which are being used by the people in the Chathanad area in the pilot area, the Marthoma Church sub canal.

So, we can see that most of the people there, it is in red they are using a leach pit for black water disposal. Very few of them are using a septic tank and only at one place there is a community septic tank..

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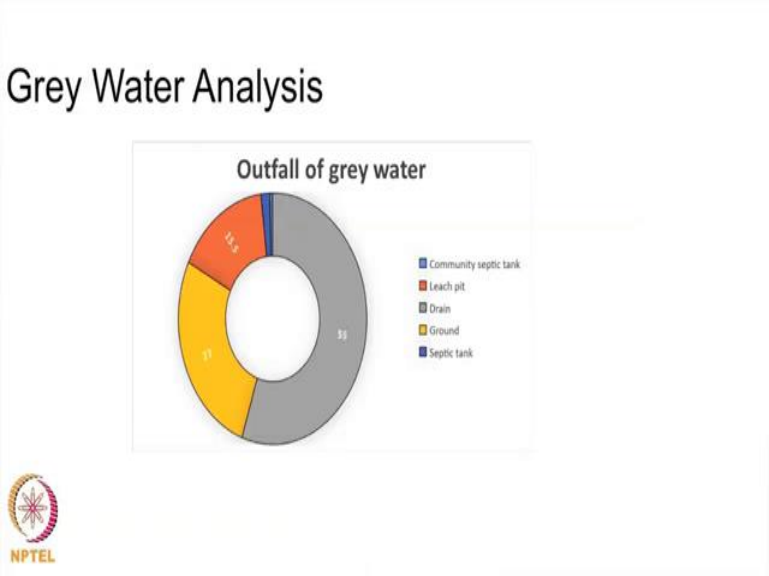

Coming to grey water analysis almost 55 percent of the people were letting of the grey water directly into the drain. And they admitted it admitted to a during a survey and that is because they have one thing they do not have any idea about how damaging it can be how much polluting it can be. When we look at the water in the drains more than black water, we find that there are elements of grey water there due to high TSS. It is due to suspended solids in the water is pretty high whereas, the BOD is not that much this was according to a water quality which was done earlier.

Now, there is high TSS and low BOD that indicates that they might be more black sorry grey water contamination than black water contamination. Only 15.5 percent people have a leach pit for grey water the rest of them almost 55 plus 27 percent they either release it into the drain or to the ground. So, grey water remains to be one of the important streams of waste water flow which have to be restricted and treated.

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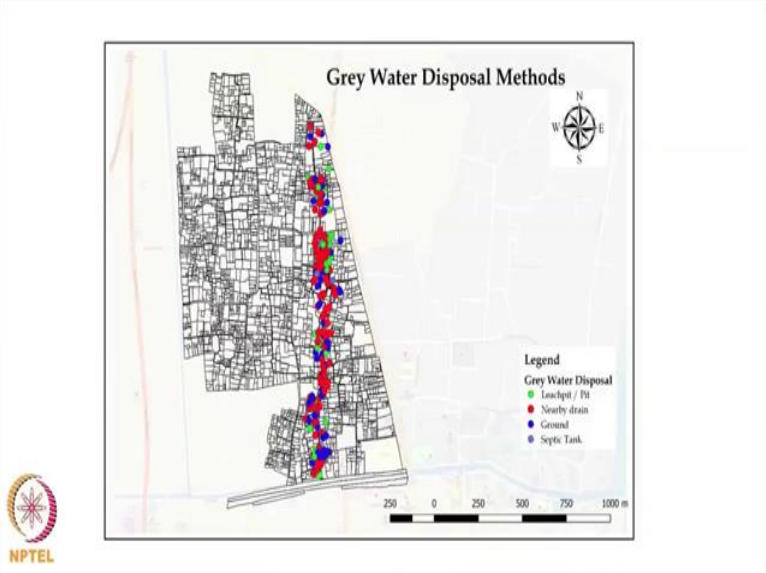

So, again here is the grey water disposal methods nearby grey you can see that there are lot of red dots.

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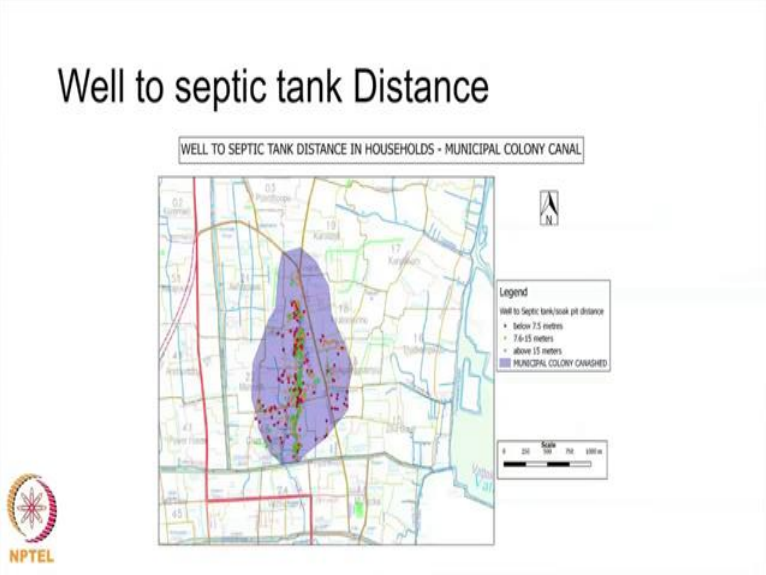

And this is the when to septic tank distance which we have measured earlier, now when we couple it with the water quality analysis. We can see that out of the dug wells out of the whole number of dug wells around 261 of them were tested for water quality and almost 93 percent of them had E coli contamination which is a same in most parts of Kerala. If you look at ground water, it is contaminated and it make sense there was no

septic or sewerage network here ok. Septic tank effluents in eventually finds a place to the ground water, but then why are not there any desease instances. Kerala should be a hotbed of epidemics throughout the year.

Student: Waters being boiled waters being boiled right. Most of the places where we found these high levels of contamination, the people there had one or two cases of dengue or in the past year I mean we would have expected every year for them to get some sort of deceases from water born disease at least. So, now this is an analysis of the survey, all right.

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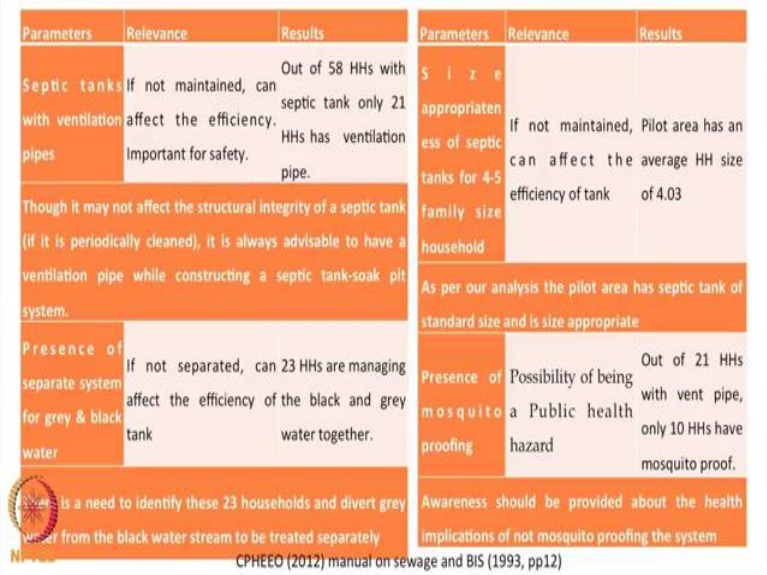

So, we are asking a question on whether the septic tanks with ventilation pipe or not. So, if not maintained if a set a ventilation pipe is not maintained, it can affect the efficiency of the septic tank and also it can provide the to be a problem to the structural integrity of the septic tank ok. Ventilation pipes they release all the byproducts anaerobic reaction, H2S and methane into the air and not having it might affect the integrity.

Ah And presence of separate system for grey and black water if not separated it can again affect the efficiency of the system. Now septic tank one it is always optimal to have low water content in any anaerobic treatment system. Once you dilute it then the process takes quite some days, the settling process we will take days there will be large water flows to be handled. So, it is always better to separate the base streams and then treat them..

Size appropriateness again for designing a system as well as maintaining an optimal level because there must be an optimal level of sludge in the system for the anaerobic dilution process to actually happen. So, it is important that the septic tank is size appropriate for that particular household.

Yeah the presence of mosquito proofing, it can the ventilation the pipes they usually have a mosquito proofing net on top of them. This was just to as a as public health hazard this is according to CPHEEO, but then many of the places we see that these things are not taking care of and ideally they should be in place.

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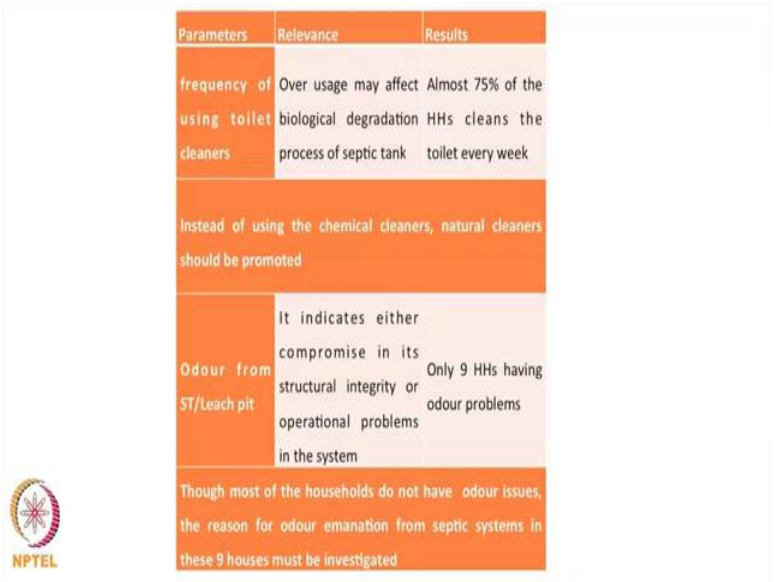

Frequency of using toilet cleaners over usage of toilet cleaners like Harpic, it may affect the biological degradation process or there are chemicals which can a affect the health of the bacteria and other micro organisms. So, these are even the detergents in the grey water for that matter.

They contain surfactants and these can affect the cell walls right. They can kill this organisms and it eventually affects again affects the efficiency of the septic tank, but that is again one more reason to separate both the black water as well as grey water streams.

Odour from the septic tank or leach pit- now it either indicates the failure in the structural integrity or operational problems in the system. Especially when there is no vent pipe in place and you have an odour from the septic tank then it indicates to a

leakage and the there were households. So, below each of them I have I have state of the result also. So, there are at least 9 houses which have been out of this in the municipal sorry the Marthoma Church canal shed and those houses has to be investigated.

. So, these houses have been marked we have the data about which house has which problem associated with the septic tanks. Also frequency of using toilet cleaners there are natural toilet cleaners available, there are toilet cleaners which can be made from home you use citrus fruits for that and.

Student: Salt.

Salt.

Student: Salt.

Salt is useful salt and sorry.

Student: Yeast kind of source.

Yeast I have heard of baking soda also baking soda also. The only problem is that the for toilet there is this Harpic has made that white sanitary you know look of it very aspirational. So, if it even dims a little if becomes a shade darker we associate that with dirty toilets right. So, these cleaners can actually be used in our households, but then they will not give you that particular bleached effect yeah. So, that is the problem with these natural cleaners and so; that means, that they has to be chage in the way it is perceived in which cleanliness is perceived in the first place for people do accept these natural cleaners.

And which I am very sure is going to take a lot of time when we talk of perception change or behaviour change, that is not a one day or a one campaign you know process it takes education to actually change it. So, that is that is a dream which may or may not be possible in our life time, but let us at least try to promote natural cleaners and they might be households which adopt, there might be households which don’t , but it remains that frequency of using toilet cleaners must be reduced at least; so, from these all these data which we have.

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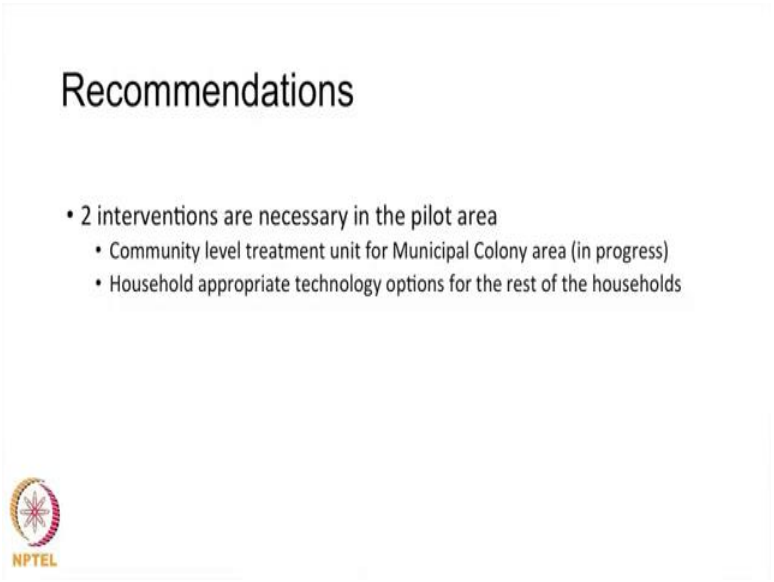

ah There are two recommendations that we propose, I did not tell you about the municipal colony area right of dense settlement of a you know marginal communities, who have very less space and the other households which we have detailed about having pro[per]- no proper septic tanks in place.

So, there are two particular approaches which can be taken. So, community level treatment unit for the municipal colony area, which is in progress right now. And the second is household appropriate technology options for the rest of the households. For all the rest of the households we do have the side plan service plan, then current system in place what is the problem with that current systems the amount of waste water which is being generated all the details about all that as well as whether they are willing to in to install a new system or not.

So, all these data can help us in arriving at a contextual at having a contextual understanding of the system in place and also arriving at a technology specific for that particular household.