Municipal Solid Waste Management
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Lecture - 40
Municipal Solid Waste Management Rules

Hello students, so we are at module 13 ISWM and SWM rules. So, in the previous lecture, I talked about integrated solid waste management plan strategy and how to prepare. Please remember the hierarchy that was the critical slide. It started by reducing waste reduction, reuse, recycling, composting waste to energy, and the least preferable landfilling.

So, here today, I will talk about the municipal solid waste management rule. Now, see why I keep this lecture at the end; because it does not end, I think we will have one more module. But after discussion of all functional elements, now you people have clearly understood the primary collection, secondary collection followed by transport treatment in both ways like chemical treatment, biological treatment.

You completely understood and also you are well aware of what kind of waste will go for recycling, what kind of waste will go for waste to energy or for biological treatment and what type of product will get produced so quickly, and also you are correctly understood about what is the benefit of decentralised treatment processes especially with the weight waste and also the landfilling that issue you properly understood and how difficult to maintain the sanitary landfills facility.

And now, because of these rule especially I am going to discuss where the duties of all ministries are, what different kind of government ministries are involved in finalizing the rule, what kind of duty for the churches as well as for generator and for ULB or municipal corporations they will have particular responsibilities that has been notified in the specific rule which today we are going to discuss. So that you will utterly aware of what is a municipal solid waste management system; based on that, you can easily relate the duties of different stakeholders.

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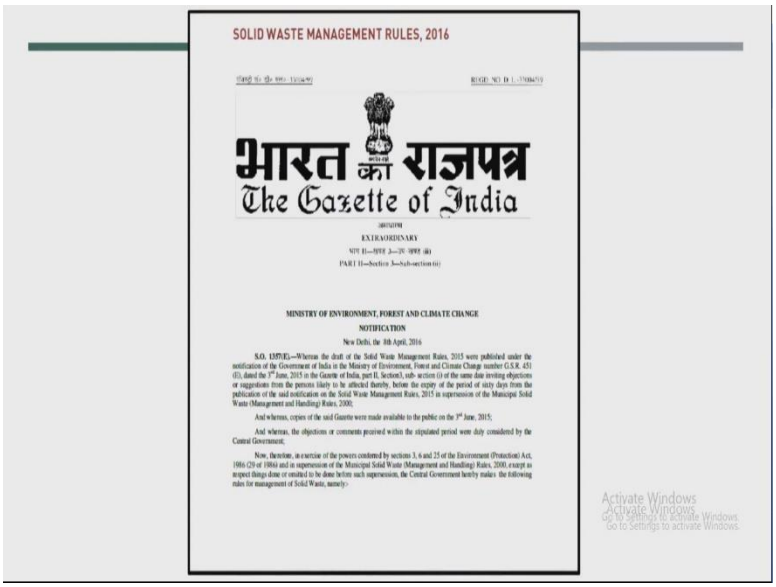

So, when I am showing the rule, you will find this gazette usually for any rule. And these standard rules are coming from the ministry of environment, forests and climate change because this ministry is specially finalizing the rules. But the implementation by the other ministries or other government bodies. And not only the solid waste management, because this course is for solid waste management, municipal solid waste management.

So I am only going to discuss solid waste management rule 2016. And there are several rules, especially is related to solid waste itself, which I had discussed in one particular module, like Biological waste, Biomedical waste, E-waste, CND waste. There are different rules are there.

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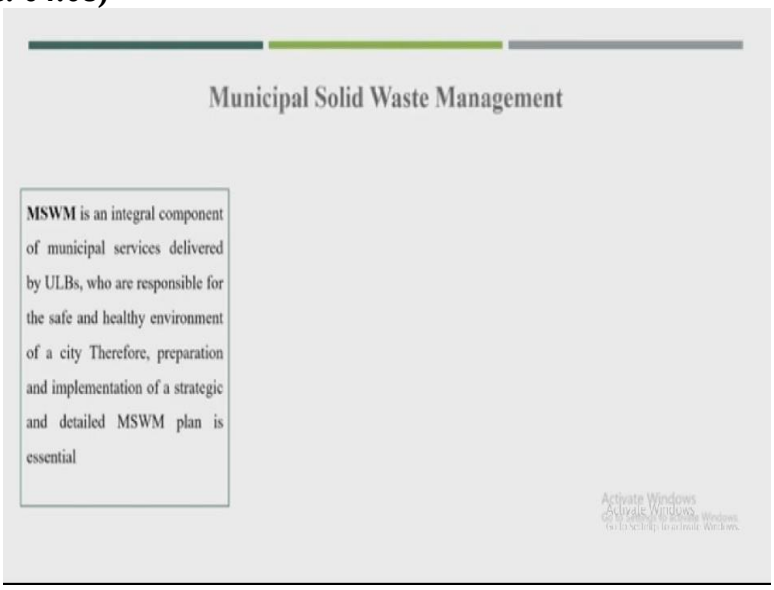

So, municipal solid waste management is a majorly when you talk about it is a municipal service. We usually talk about what kind of service is a municipal service and delivered by the ULBs or any Municipal Corporation. And they are responsible for a safe and healthy environment for the city. Therefore preparation and implementation of strategy and detail about solid waste management plan are essential.

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So, when I say the MSW usually is household waste, street vendor waste, residential waste, and the waste you already know about, the maximum concentration of the waste is coming from these sources.

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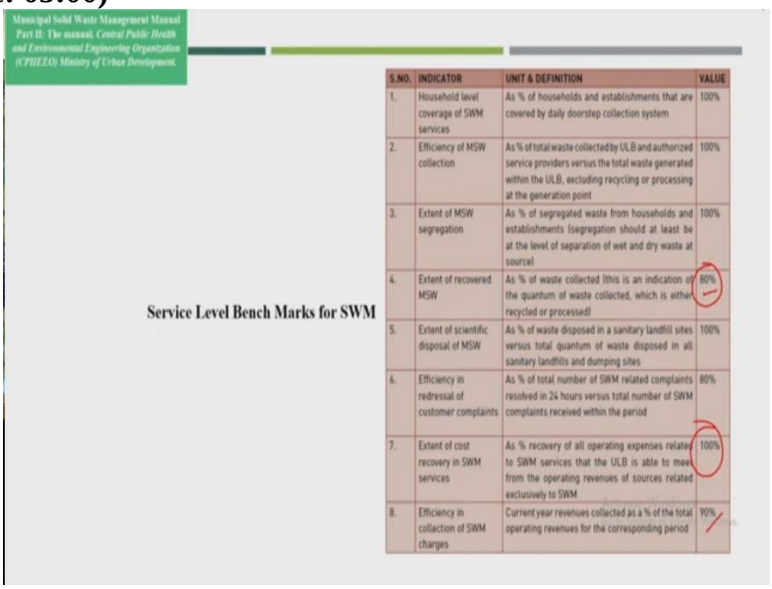

Before going through a rule, we need to know what is the benchmark for solid waste management. So based on the model, we will ask the implementing agency to follow such standards. So, the examples are given; I think that is shown in the manual. Like household level coverage of MSW services, I feel 100% should be covered as a percentage of the household.

The efficiency of collection should be 100%. The extent of MSW segregation should also be 100%. The time of recovery that is 80% itself is good. Because, why is it not 100%? Because 100% of waste is not able to recover. But at least the 80% means, see now, I think this 80% recovery should be there, maximum share can go means only the 20% should go to the landfill site or sanitary landfill.

That is the critical benchmark that has been given in the Solid Waste Management rule. Scientific disposal should be 100% is whatever the remainder 20% should be scientifically disposal. So you can not have the simple dumpsite, finding some location and just disposing of the waste without having the scientific collection of leachate or gas followed by their treatment. And the efficiency of a customer complaint by 80% extra cost recovery for MSW service.

This is also the critical point the extent of cost recovery should be 100%. Again, the same thought is that whatever the technology you are proposing for running that technology, you will be required 100% recovery should become out from that means a fund wise also. And the efficiency of the collection MSW charge is 90%. So, this is also is given that, because the fund is always required for operation maintenance. So, why not charge from the generators like household people, commercial facilities. You trust correctly and does efficiency should go up to, or maximum can go up to 90%.

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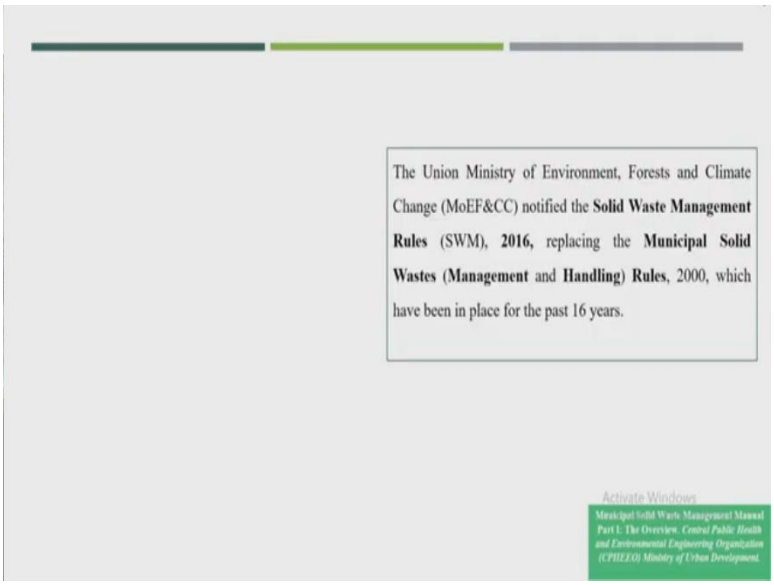

The union this Ministry of Environment, forests and climate change that notified the solid waste management rule 2016 replacing our rule was earlier was 2000 that is almost the 16 year is over.

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So, what are the authorised Ministry of Environment forests and climate change? These are the ministries different ministries are responsible for overall monitoring the country's implementation. So it is not only the solid waste management rule, but whatever rule comes from the Ministry of Environment, forests and climate change these all ministry are responsible. So like Ministry of urban development, Ministry of rural development, Ministry of chemical fertilizer likewise, even the central Pollution Control Board, even the State Pollution Control Boards, are responsible or urban local bodies are responsible.

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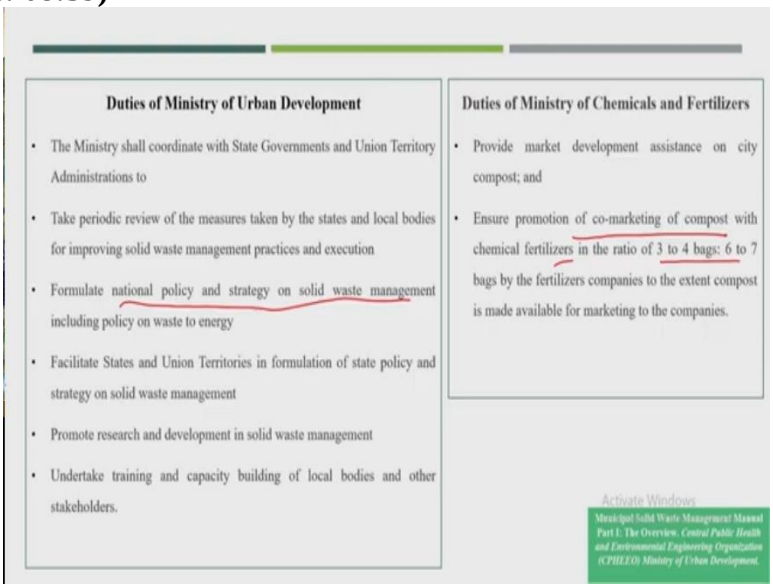

And now what are the duties, this is regarding the Solid Waste Management rule, what is the duty for the ministry of urban development? In the previous lecture, the Secretary of the state Urban Development Department is the major responsible person for preparing solid waste management strategies for the entire city, either city or state. So, these ministries coordinate with state government and union territory administrations and formulate the national policies or procedure.

So, national policies and strategy for Solid Waste Management including the policies on waste to energy. So, this is the primary duty of the urban development which will prepare the strategy. The following are the Ministry of chemical and Fertility duties; why this ministry is responsible here because this ministry is looking after the chemical fertilizer or whatever the biofertilizers are getting produced in the country.

So this ensures the promotions of co-marketing are compost with the chemical fertilizer in the ratio of 3 to 4 bags to 4 to 7 sacks by the fertilizer companies. So, see that this is one critical point here. So, already in India massive amount of chemical fertilizers are available. So, this ministry will promote mixing this compost, whatever is producing from the city area in the ratio of 3 to 4 bags to 6 to 7 bags of the chemical fertilizer.

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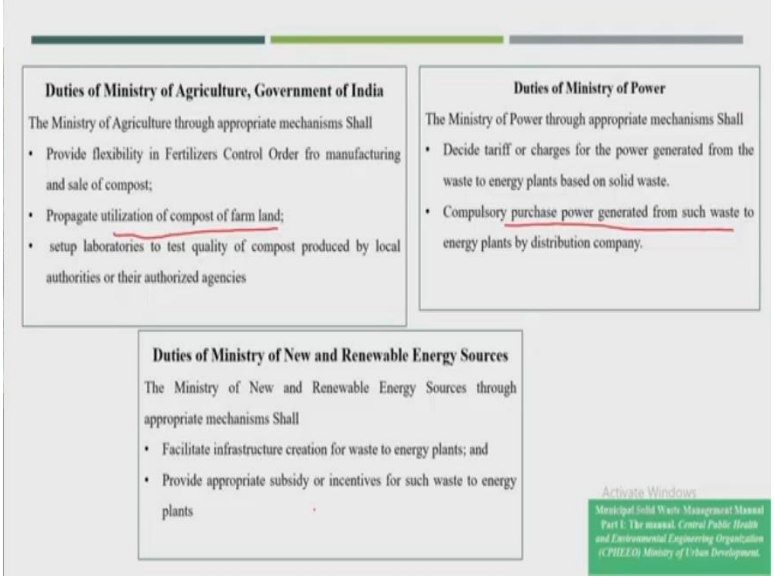

Now, the duties of the Ministry of Agriculture, Government of India, this is also this ministry will promote the all farmers to the utilization of compost in the farmland or set up the laboratory of test quality of compost produced from the local authority. This ministry is, and it is responsible for setting up the laboratories also. In India, there are some laboratories available where we can quickly check the compost.

And these are the duties of the Ministry of Power. So, why waste power because the waste to energy plants also has to be check from time to time. So, this ministry will see that the compulsory purchase power generated from the waste to energy plants by the distribution company. So, in India, many companies are working for distributions of energy or electricity or power to the residential, industrial areas or commercial areas.

So, they will make it compulsory wherever the waste to energy plant is available. So, whatever energy they are producing, they will promote the use of that particular energy. A Ministry of New and Renewable Energy Source. So, these ministers, the name understands, is new and renewable energy. So, they will facilitate the infrastructure of waste to energy plant, even bio methanation plant or anaerobic digestion plants.

They will facilitate even though they will provide the appropriate subsidy or incentives for such waste to energy plant. So, please remember that when anyone is sharing that waste to energy, do

not just understand it is an incineration plant. This waste to power could be bio methanation plants also.

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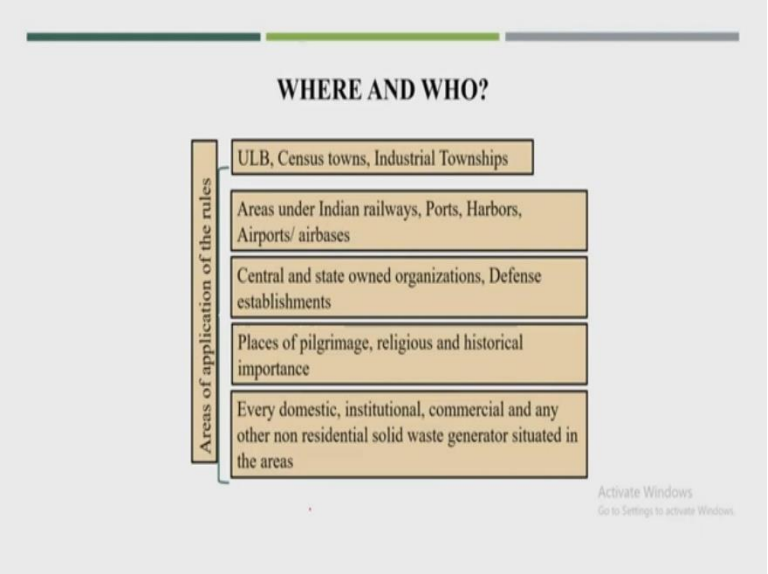

These were the duties of the different ministries, where and who I think will be the applicants or area of applications of the rule. So, where this rule will be applicable? Like in the ULB, census towns or industrial township. So, in this one, almost all cities like our class one, class 2, class 3, all districts, talukas everything will get cover even if all census towns will be covered here.

The areas under Indian railway, port, harbour, airports, remember that these rules are also applicable at the Indian railway, port and recently under Swachha Bharat mission has started in the Indian railway. Railway also started the Swachha Bharat mission, central and state-owned organisations, defence establishments. So, all kinds of government institutions, place of pilgrims, religious, historical importance. This rule also is applicable in this location and every domestic institutional commercial and any non-residential solid waste generation situated in the area of the city. So, in almost all places, this rule is applicable.

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Now, who are the waste generators are every household, street vendors, hotel restaurants, event organizers, market associations, resident's welfare associations or some gated community also will be there.

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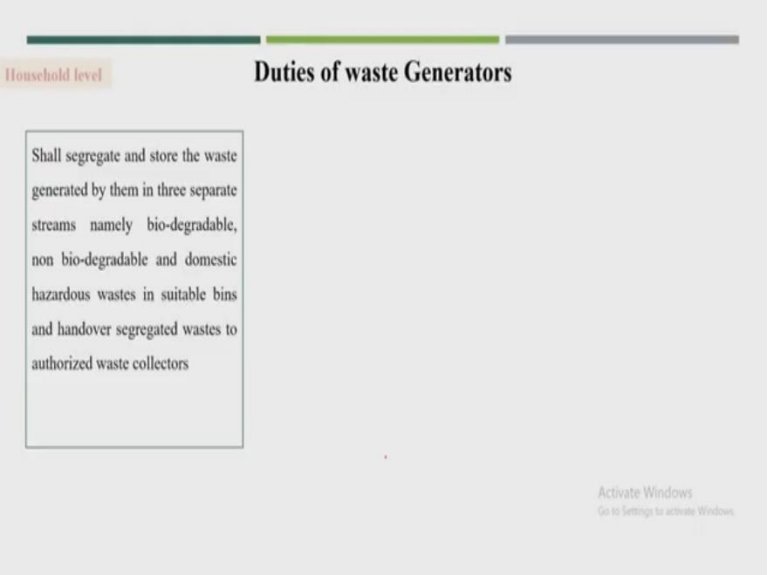

So, now for the household level, what is the duty of generators? So this is the significant slide you can see. So what is the responsibilities are given? Shall these households segregate and store the waste generated by them in 3 separate streams, namely bio degradable, non bio degradable and domestic hazardous waste, in suitable bins and hand over segregated waste to the authorised waste collectors.

So you nowhere you see that these biodegradable means wet waste and non-biodegradable means dry waste and domestic hazardous waste that is a particular waste, which should not be mixed into the other dust bins that have to be handovers. First, it has to be stored in suitable bins and handover segregate waste to that collection crew.

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And these are the two different biodegradable, non-biodegradable and sanitary pads; these are household hazardous waste suppose there is that commonly the yellow dust bins are getting used for household hazardous waste that facility is not available, what you can do? You can wrap this waste properly and put it into the dry waste dust bin itself. But inform the primary collection crew also. This is the particular hazardous waste.

And even the tiny E-waste also has to be wrapped properly. And finally, this what this collection crew will do. So, he will have another facility to pick up this kind of waste. Typically this E-waste is also getting generated in the household area or suppose that particular city has some drop-off centres available nearby. So, household people can drop and drop the waste into those that specific facility. And any corporation can put up one law that any household cannot drop the debris into such a dust bin.

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Also, the duties of waste generator like shall store horticulture waste, garden waste generated from his premises separately, and dispose of as per local authority's direction. This should not be what we should not be following like this. You are disposing of the waste all horticulture waste, your garden waste we will take it and put it into some other location this should not be. And also shall pay user fee finalised by the local authority.

This user fee usually is starting from 30 rupees per month, it is not a day, per month, only 30 rupees means 1 rupee per day are you creating, and I think this is in the class 2 cities, but in class 1 towns like in the metro cities these fees are up to 200 or 250 also somewhere in per month. And this is important also because now these rules especially say that it is a service. Solid waste management collection is a service.

So, the households are paying for the other services like electricity we are paying, water service we are paying, whatever services are giving we are paying for that. So obviously the solid waste collection is one kind of service. So need to be paid for that. And shall store construction and demolition waste separately. When generated and disposed of as per the construction demolition waste, you know that is already discussed in one lecture.

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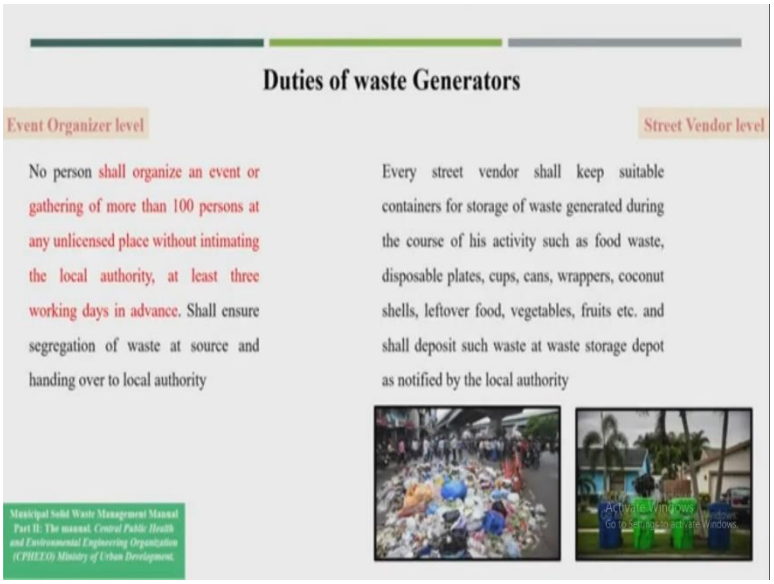

So now the duties of event organizers. So, this was the waste generator, mostly the household people; now, it is an event organizer level. Now here primarily is written like this. No person shall organize an event or gather more than 100 persons at any unlicensed place without intimating the local authority at least three working days in advance. And shall ensure segregation of waste at source and handing over to the local authority.

So remember that in any event, you are organizing even the birthday of your kid also if the 100 persons are there, the attendees, so you need to inform to the, or need to be in the proper licence location. If you are organising, I think you need not have a licence for that, but you have space, but informed the local authorities. Inform that whatever waste will be getting generated.

You will segregate, and whatever the authority will tell that for collection of waste you will give it to that waste and even the extra amount of fee will be required, you have to pay for that. Now, at the street vendor level, every street vendor shall keep a suitable container for storage of waste generated during his activity, such as food waste, disposable plates, cups, cans, wrappers, whatever leftover things shall deposit such waste at the waste storage depot notified by the local authority.

So, even the street vendors after Swachha Bharat mission, the number of street vendors also puts one particular dust bin with them. So, otherwise, I think a considerable amount of disposable

plates, cups are getting generated in such locations. So, you can see it here. So, this should not be like this. There should be a dust bin should be available.

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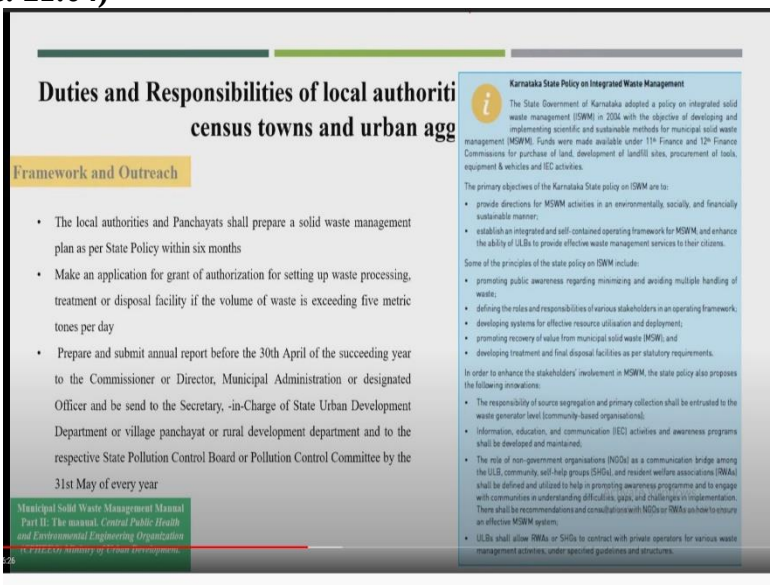

Now, the duties and responsibility of local authorities are village panchayat or any census towns. The responsibility of these bodies, like local authority panchayat, shall prepare a solid waste management plan as per the state policy within six months. So, suppose some approach has been proposed or modified based on designing a project within six months. Make an application for grant of authorization of setting up a waste processing treatment disposal facility.

If the volume of waste exceeding five metric tonnes per day. So, such kind of facilities is coming. So, make an application for grant authorization and prepare and submit an annual report before 30th April of the succeeding year to the commissioner or director municipal administration or designated officer and sent it to the secretary in charge of the state urban department. So, this has to be appropriately followed every 30th of April every year; you have to provide one report annual report to the commissioner.

And commissioner or commissioner will sign that and send it to the urban development department. And also the state pollution control board and pollution control committee by 31st May of every year. So, once this report is submitted again, one report should go to the state pollution control board or whatever the pollution control board is available for monitoring purposes.

This is the one particular slide you can see that the framework is prepared by one of the states. This is a state policy they made. These are Karnataka state policy on integrated waste management. So, the state government of Karnataka adopted policy and integrated solid waste management ISWM in 24 with an objective development implementation of the sustainable scientific method of MSWM. So that they come up with the primary objective and some of the principles of state policy they included, so, based on this policy, the local authority can prepare the MSWM plan.

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Now, the other duties of responsibility of local authorities like apart from a plan can come up with the frame by-laws to incorporate these rules within one law. So maybe the goals are coming with segregation at the household level or thin plastic utilization bag, you want to reject that, or you want to close the thin plastic bags or one time used bag, you want to complete that. So you come up with the bye-law.

In that way, you will ask every residence in the city to follow. Prescribe the user fee, which I had we explained from 30 rupees or 40 rupees whatever could be possible. And educate direct waste generator not to litter to segregate the waste at source and handle over the segregated waste to the authorized waste picker. So from time to time you make the awareness events or with the televisions or with the different posters. You can educate the waste generators.

And frame bye-law and prescribed criteria for levying the spot fines for the person who litters or failed to comply with the rules. This is also very important the spot fines if you find someone are disposing of the waste in some open areas or some other place not in the dustbin. So, you can ask them to pay the fine.

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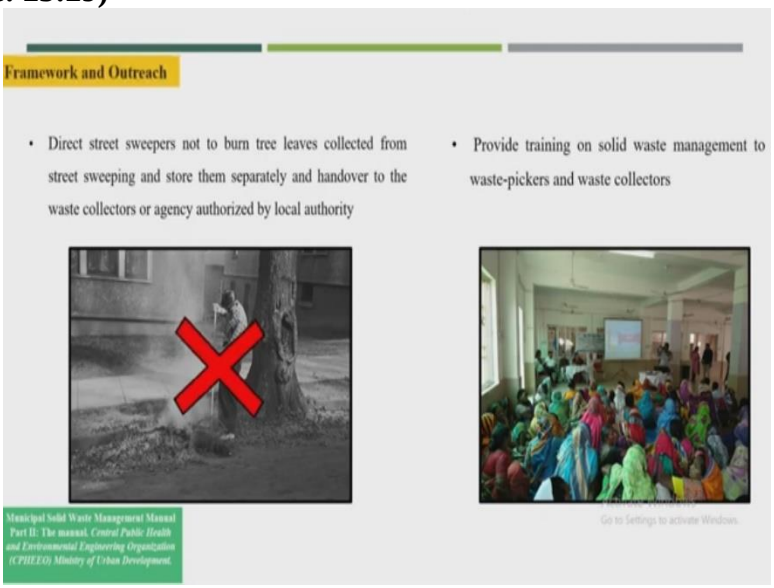

And also, the direct street sweeper not burn the leave collected from the street sweeping stored separately and hand over to the proper collectors. And also the providing training on solid waste management to waste picker and waste collectors. So likewise, some organize the events of these events, especially for the reliable waste pickers or waste collectors.

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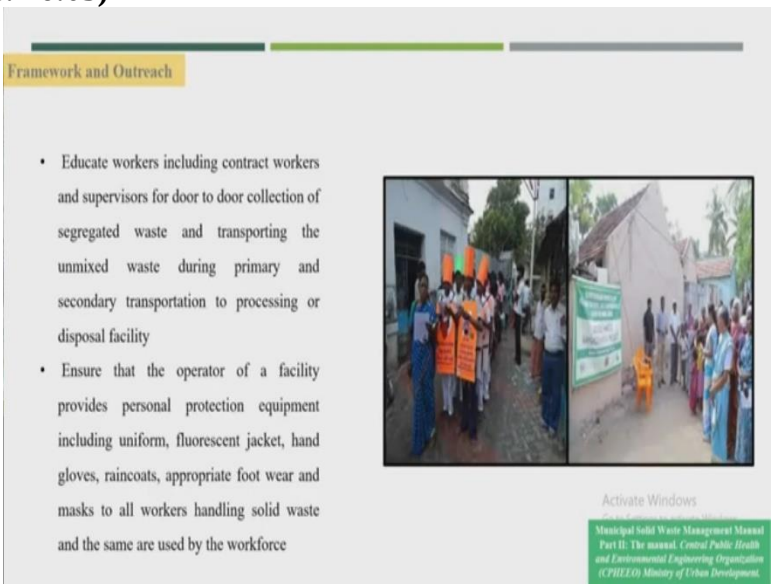

Also educate workers, including contract workers, supervisor for door to door collection of segregated waste, transporting the unmixing waste during the primary and secondary transportation. So, you educate those workers to ensure that the operators have a facility to provide personal protective equipment you need, including a uniform, the fluorescent jacket, hand gloves, raincoats, appropriate footwear, mask; these ensure by the local authority.

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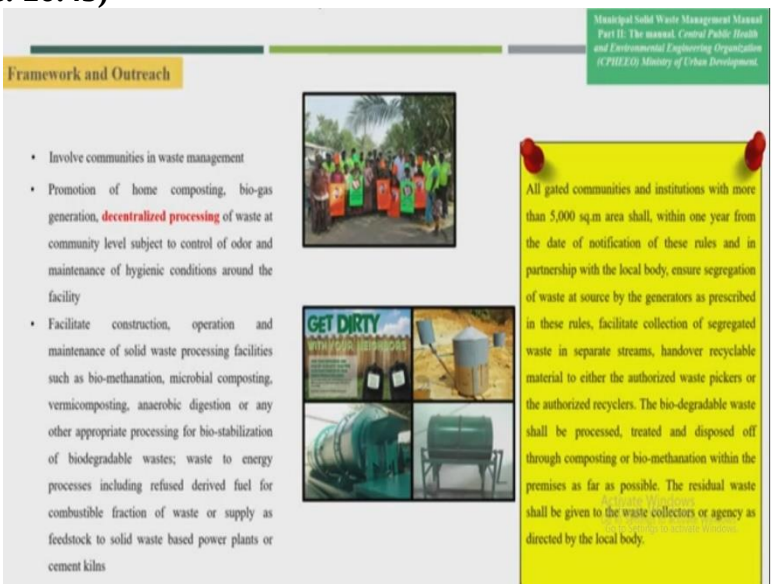

And also involve the communities in the waste management, a different community like NGOs, or other extraordinary communities in the particular city. And promotion of home composting, biogas generation, decentralized processing of waste, you promote that so that your collection and disposal of such waste should reduce and facilitate construction operation maintenance of solid waste processing facilities.

Such as bio methanation, microbial composting, vermicomposting, anaerobic digestion or any appropriate processing of bio stabilization of biodegradable waste, energy waste also. So, see, even the rule also says the same, which I was also sharing to you people that the first use try that promote the decentralized processing, whether it is a composting, vermicomposting or anaerobic digestion whatever the possibilities of decentralized treatment processes.

And the gated community here the gated community I had shown one photograph also I like some institute like your college, your college campus is a gated community means, I think several households are residing in the campus itself. For example, let us examine one institute where the

student hostels are there, faculty quartos are out there available, non-academic staff residents also inside the campus. So that is a gated community.

So, what is the rule says about gated community. So all gated community and institutions with a more than 5000 square meter area. So remember that any institutes, any academic institutes or any private or government institutes having an area of more than 5000 square meter area shall within one year from the date of notification of these rules and in partnership with the local body ensure segregation of wastage source by the generators as prescribed in the rule.

Facilitate collection of segregated waste in the separate stream, handover recyclable material to either the authorized waste picker or authorized recyclable. And biodegradable, which shall be treated disposed through composting or by bio methanation within the premises as far as possible. So, this is the special rule special writing you can find here for the gated community or institutes like the academic institutes.

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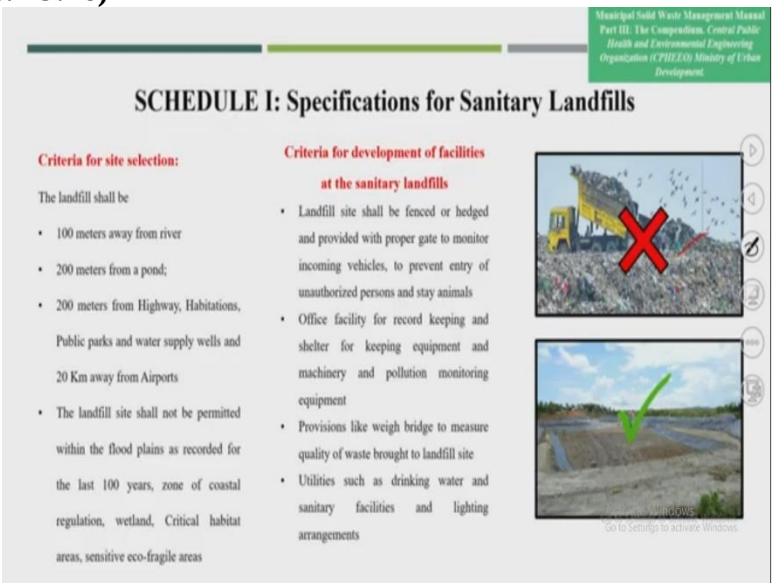

Now the schedule 1 is saying under the rule that it is for specification of sanitary landfill. So already in one of the landfill module, I talked about what the landfill shall be for site selection, like 100 metres away from the river, 200 metres from the pond. Likewise, the criteria have been formulated, and standards for developing facilities at the sanitary landfill, like landfill site, shall be fenced.

Fenced properly prevent unauthorised entry, office facility for record-keeping, and provisions like weighbridges to measure the quantity of waste brought to the landfill site and utilities such as drinking water or sanitary facility, lighting arrangement should be there into the, onto the landfill sites. So, we should not follow like this. The rule clearly says and we should have a proper sanitary landfill should be there.

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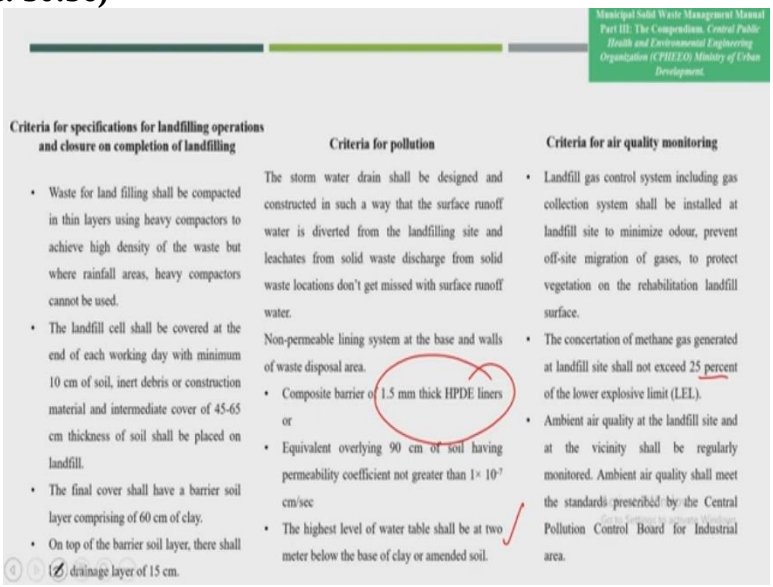

The criteria for specification of landfilling operations and the landfill's closure, criteria pollution, standards for air quality monitoring. So, one by one, we will see that the waste for landfilling shall be compacted in a thin layer. There are some operational criteria, and the landfill cell shall be covered at the end of each working day with a minimum of 10 centimetres of soil that daily cover.

An intermediate cover 45 to the 65-centimetre thickness of side shall be placed onto the land field, and the final body should have a barrier soil layer comprising 60 centimetres of clay. And where the drainage layer should be for 15 centimetres. So, this is what is proposed. And criteria for pollution like stormwater drain shall be designated and constructed in such a way so that surface runoff water should not be entered into the landfill area.

And also, a liner for the landfill should be a composite barrier of 1.5 mm thick HDPE liner. So, that is why in most cases, you will see that the HDPE liners are getting utilized where the broad 1.5 mm and the highest level of water table should be at 2 metres below the base of clay or amended soil. So, we need to check the correct water table in that particular city.

And the criteria for air quality monitoring for proper monitoring should be there. So, and concentration of methane gas generated in the landfill shall not exceed 25% of the lower explosive limit. And time to time, this ambient air quality at the landfill site in the vicinity shall be regularly monitored. And the ambient air quality shall meet the standard prescribed by the central pollution control board for industrial area.

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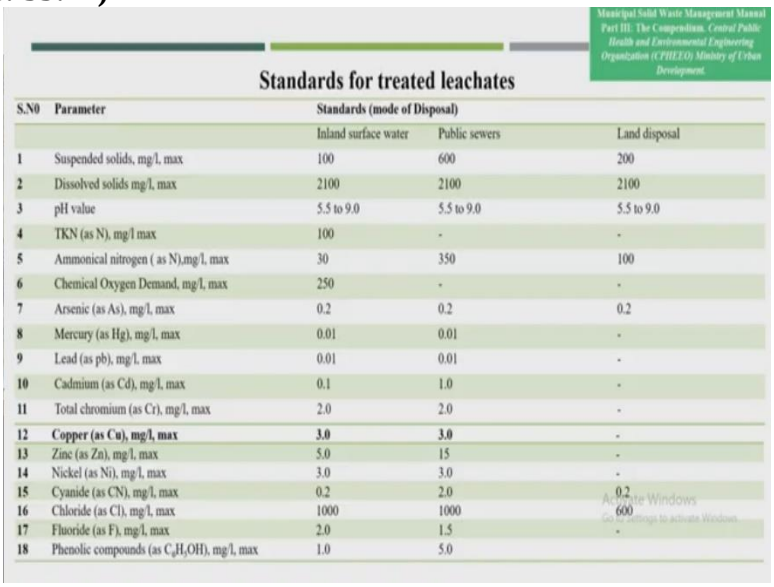

Municipal Solid Waste Management Manual Part III: The Compendium. *Central Public Health and Environmental Engineering Organization (CPHEEO) Ministry of Urban Development.*

Standards for treated leachates

S.N0	Parameter	Standards (mode of Disposal)		
		Inland surface water	Public sewers	Land disposal
1	Suspended solids, mg/l, max	100	600	200
2	Dissolved solids mg/l, max	2100	2100	2100
3	pH value	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
4	TKN (as N), mg/l max	100	-	-
5	Ammonical nitrogen (as N),mg/l, max	30	350	100
6	Chemical Oxygen Demand, mg/l, max	250	-	-
7	Arsenic (as As), mg/l, max	0.2	0.2	0.2
8	Mercury (as Hg), mg/l, max	0.01	0.01	-
9	Lead (as pb), mg/l, max	0.01	0.01	-
10	Cadmium (as Cd), mg/l, max	0.1	1.0	-
11	Total chromium (as Cr), mg/l, max	2.0	2.0	-
12	**Copper (as Cu), mg/l, max**	**3.0**	**3.0**	-
13	Zinc (as Zn), mg/l, max	5.0	15	-
14	Nickel (as Ni), mg/l, max	3.0	3.0	-
15	Cyanide (as CN), mg/l, max	0.2	2.0	0.2
16	Chloride (as Cl), mg/l, max	1000	1000	600
17	Fluoride (as F), mg/l, max	2.0	1.5	-
18	Phenolic compounds (as C_6H_5OH), mg/l, max	1.0	5.0	

Now, the standards for treated leachates. So whatever the leachate is getting generated in the landfill site should be treated and explained the disposal mode. The mode of disposal could be the inland water surface, public sewer or land disposal. So for that, the different standards are provided. See now you can see that for land disposal, a lot of parameters are missing here. Still, for inlet surface water, public sewers, I think we need to have the minimum criteria or maximum criteria that should be followed.

So, here you can see that apart from solids, like whether is a suspended or dissolved solids also a lot of metals had we added like arsenic, mercury, lead, cadmium, chromium, copper, zinc, nickel, cyanide, likewise, the metals should be low concentration and maximum concentration 0.01 milligram per litre is required. So, it is tough to have a proper sanitary landfill. And I already explained that is highly polluted leachate is producing, and you need to treat it before disposing of it anywhere, whether the inland surface water, public sewer or onto the land.

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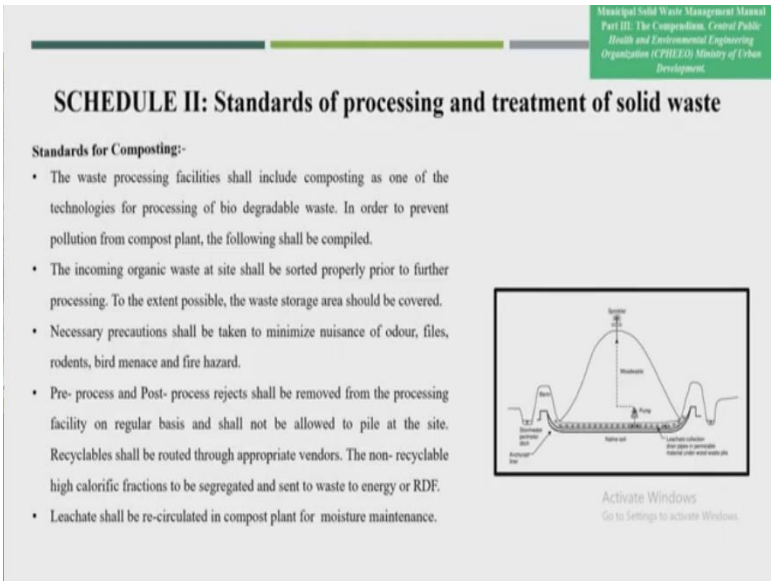

Now the scheduled two explained in the rule for standards of processing and treatment of solid waste. So standards for composting shall include composting, which is one of the technology for processing biodegradable waste. So, they have to follow the first thing, as the incoming organic waste inside shall be sorted properly before further processing.

And to the extent possible, the waste storage area should be covered. And necessary precaution shall be taken to minimise the nuisance of odour; flies should be there and pre-process, and post-process shall be removed from the processing facility regularly. And shall not be allowed to pile at the site recyclable shall be routed through the appropriate vendor's non recycled or high calorific fraction to segregate sent to waste to energy plant.

And leachate shall be recirculated in compost plant for moisture maintenance. So, this is for the centralized composting facility. Otherwise, I especially explained that there should not be leachate production in the composting facility. If there is a leachate production means I think that waste is not under the composting process.

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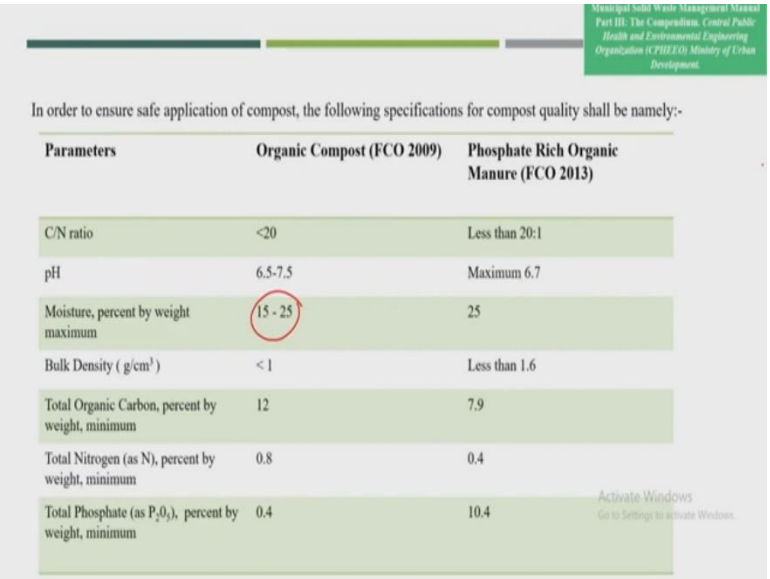

Municipal Solid Waste Management Manual Part III: The Compendium. *Central Public Health and Environmental Engineering Organization (CPHEEO) Ministry of Urban Development.*

In order to ensure safe application of compost, the following specifications for compost quality shall be namely:-

Parameters	Organic Compost (FCO 2009)	Phosphate Rich Organic Manure (FCO 2013)
C/N ratio	<20	Less than 20:1
pH	6.5-7.5	Maximum 6.7
Moisture, percent by weight maximum	15 - 25	25
Bulk Density (g/cm^3)	< 1	Less than 1.6
Total Organic Carbon, percent by weight, minimum	12	7.9
Total Nitrogen (as N), percent by weight, minimum	0.8	0.4
Total Phosphate (as P_2O_5), percent by weight, minimum	0.4	10.4

And to ensure the safe application of compost, the following specification of compost quality shall be named here. This rule is explained by explaining under the FCO 2009 and FCO 2013. So is an FCO is a Fertilizer Control Order. And this rule is these specifications came up from the Ministry of Agriculture because they are the duties to check about the testing of laboratories and the benefits of promoting the compost in the farming area.

So, the metal concentrations are given here organic compost, so like arsenic, cadmium, chromium is a measure in the metal concentrations. Because I think the vast concentration of metals, we usually are finding in the compost. Similarly, the other parameter like carbon to nitrogen ratio should be less than 20; pH should be neutral, moisture 15 to 25%.

But, you see, here I when I explained in the composting process, I already explained that in the composting, moisture should be 40% to have the live bacteria in the compost. These bacteria are highly beneficial not only for the soil but also for the plants also. But the rules suggested should be 15 to 20, 25%. So, it is in these cases challenging to allow those bacteria to be in the live condition.

But I think this rule has come up because several people are generating compose and putting more moisture in the form they can measure more weight there they are increasing the weight by adding more water into the compost. And after storage at a particular place, this moisture is getting

vaporised. So, the importance is getting wholly reduced. So, maybe that could be one of the thought.

And it should be handled because the 15, 25% this is like is a free-flowing material. So bulk density total nitrogen sees the 0.8% as poor concentration. So maybe because it is just for promotions for those industries are producing compose and can easily supply to the farmers by putting the low concentration of nitrogen. But I believe that this nitrogen concentration is too low 0.8%. So, in that case, sometimes composts would not say that is a fertilizer rather than it sounds good to say that such compost is a soil conditioner, not like fertilizer.

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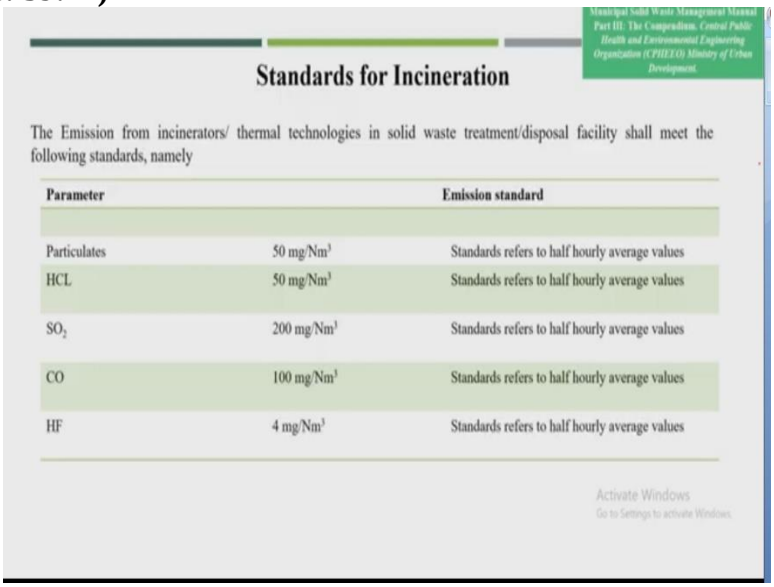

Next is the standards for incineration. So, the incinerations, the pollutant, the flue gas after treatment, and the emission standards are also given for the particulates HCL, SO 2 for HF.

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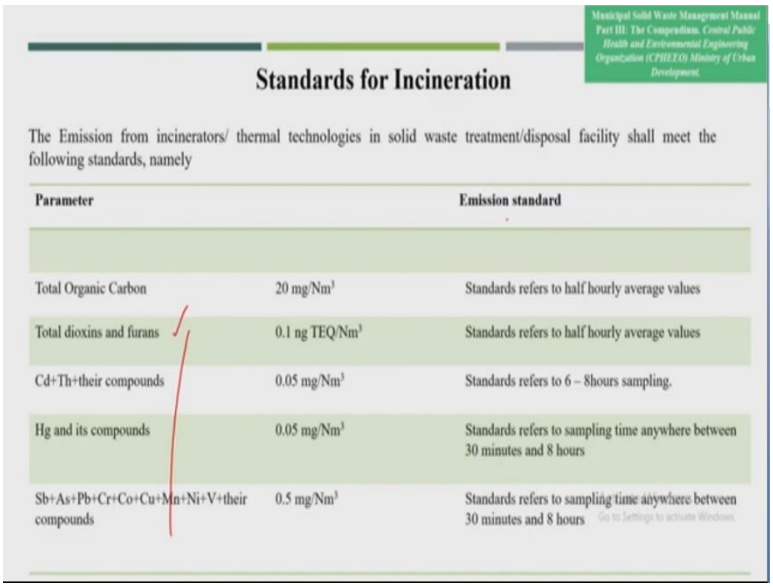

Some like total organic TOC, total dioxins and furans. There are new standards that come up in the rule now. I think it is good now. Whoever is running the waste to energy plants now follows this rule, and the pollution control board will monitor time regularly of emissions from the incinerators.

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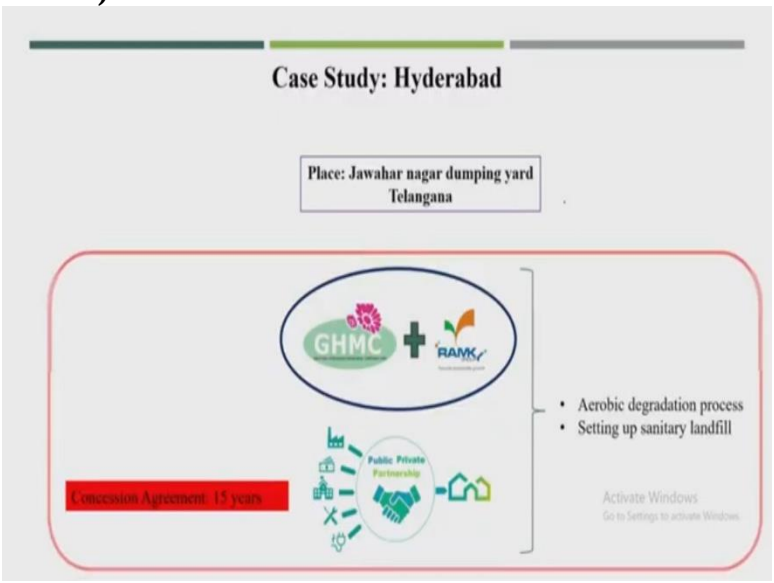

Now we will see that because we saw the rule. Now you understood the rules notably suggested the duties of different stakeholders like generators in another way and ULBs and the operator's special rules for the composting facilities, a special law for sanitary landfill, special practice for incineration are provided in the rule. Now, based on the rule, we will see that because this rule came in 2016.

And some cities, I tried to find which cities are implementing these rules and what benefits these cities are or helped these cities by this rule. So, the one study for Hyderabad like this was the Jawahar Nagar dumping yard, Telangana. So, this was a PPP project; the local guy with the Ramki group is a Hyderabad-based company. This is under PPP partnership. So, see that many times I was talking about this PPP.

So our next module, I will talk about financing and PPP to understand precisely when I am saying PPP. Every time I am grouping two people, one is a public and private company and shows a partnership. So, it was a concession agreement. The agreement also I will explain in the next module what is the mean of the concession agreement. And the idea was that to come up with an anaerobic degradation process and set up a sanitary landfill.

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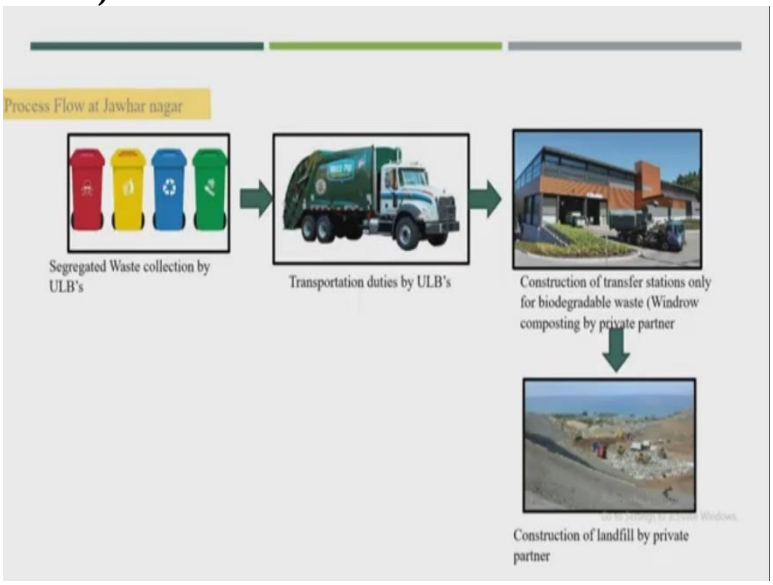

So, the process flow in that particular area was segregated waste collection, transportation properly and construction of transfer stations only for biodegradable waste windrow composting by the private partner. So, this kind of transfer stations has come up where the windrow composting has been placed and construction of landfill by private partners.

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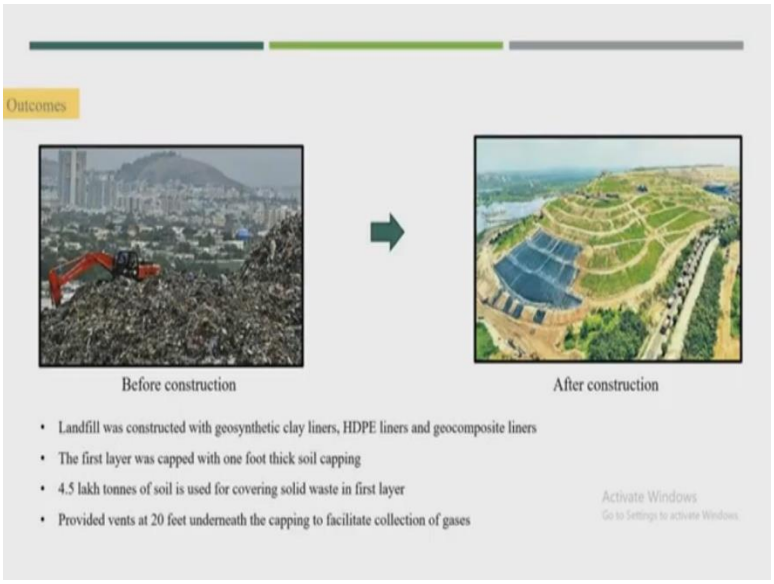

So, this was the before construction was landfill. You can see here in the city also and waste. Now see hereafter construction is become a beautiful location is a closed landfill entirely. They capped this disposal site ultimately. So, the landfill was constructed with a geosynthetic clay liner. Apart from that, the HDPE liner geo composite liner and first layer were capped with one foot thick soil capping, and 4.5 lakhs tonnes of soil are used to cover the solid waste in the first layer. And provided vents 20 feet underneath the capping to facilitate the collection of gases.

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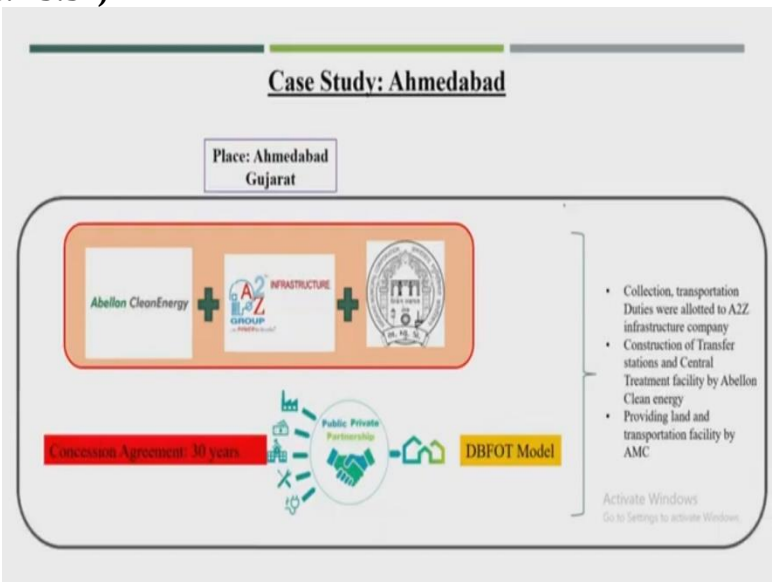

Now that this case study for Ahmedabad, Gujarat. This is also a public-private partnership that is with different companies. So, here the significant companies are A2Z infrastructure. And one more that Abellon Clean Energy concession agreement is for 30 years. And this model was DBFOT. So,

also I will explain in the next module that PPP what this model is. And taskforce collection, transportation duties were allotted to A2Z in the infrastructure company.

The collection and transportation, and construction of transport station and central facility for Abellon Clean Energy provide land and transportation facility for AMC, the Ahmedabad Municipal Corporation.

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Factors that led to the project's failure were the proper lid system implemented, as mentioned in the MSW rule 2016. And no adequate awareness was created among the people. So there was no adequate segregation. So it is a mixed waste used to get collected, and no proper dumping system and the illegal unloading was there. And people were not ready to pay the fee for collection. And sometimes you would not believe that many city residents do not want to pay 30 rupees in a month.

But Ahmedabad may not know the monthly fee for 100 rupees or maybe 200 rupees maximum, and the people are not ready to pay. The problem is that people want to accept this is a service that is the problem. And the informal sector was not given the proper safety measure. That was also another factor which was I think this project was failed because of that.

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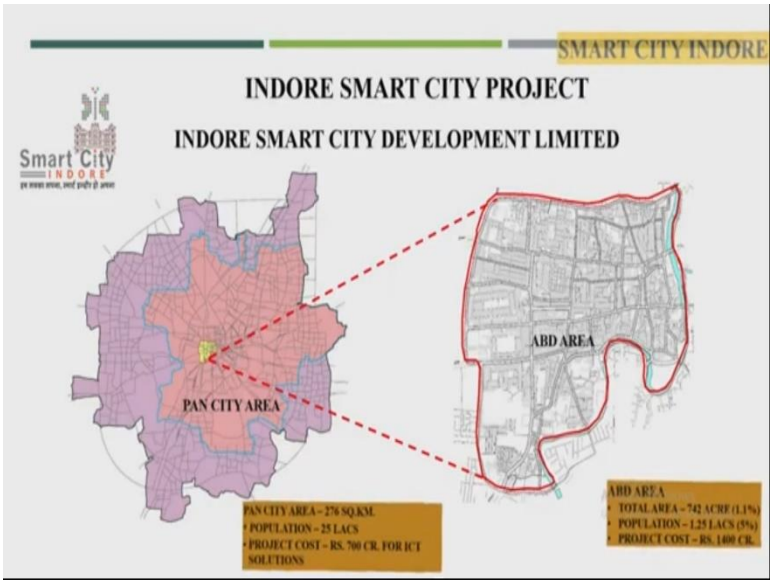

Now, also I thought of it because everyone knows that Indore is the cleanest city in India. So, I come up with few slides on that. And also the called the intelligent town now, so here the example of one particular area is a pan-city area. That was around they called the ABD AREA that was 276 square kilometre. The population is 25 lakhs, and the project cost was 700 crores per ICT solution.

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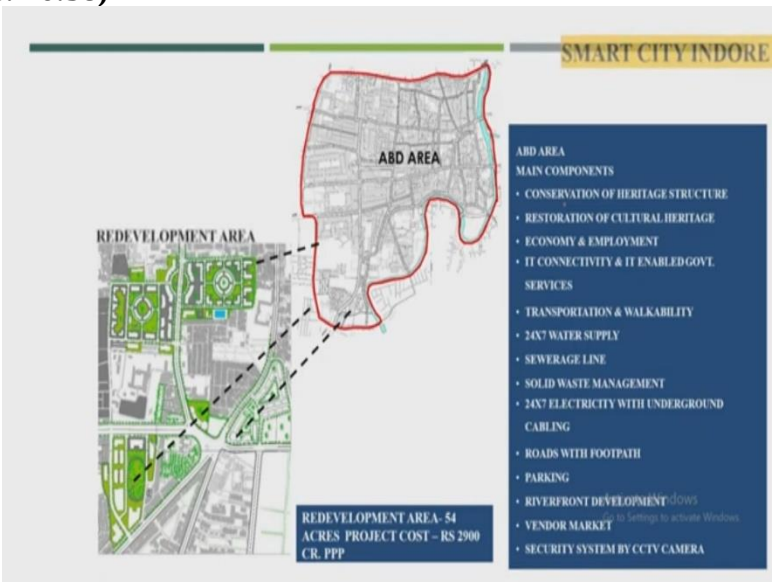

So, redevelopment area, this the area was 54-acre project costs rupees 2900 crore under the PPP. So, this was the ABD Area. So, the main component was the conservation of heritage structure, restoration of cultural heritage. Likewise, 24 / 7 water supply, sewerage line, solid waste management were the major components in this task.

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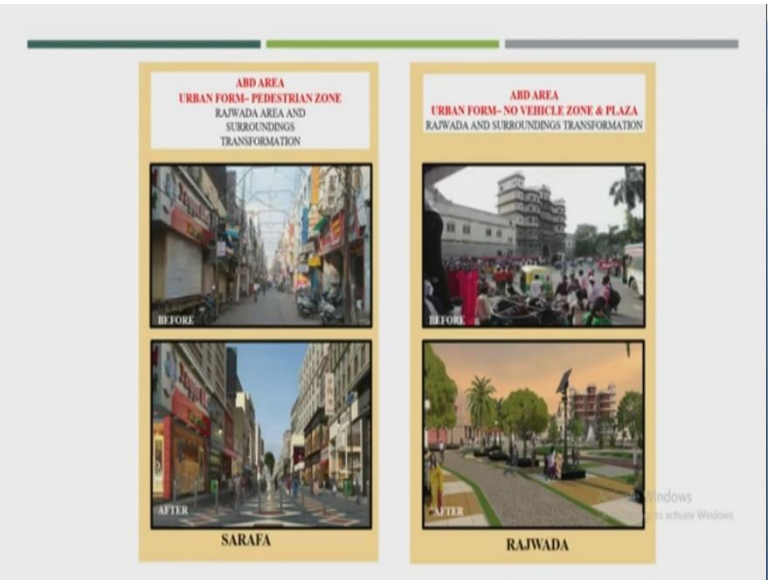

So, earlier you see here, this is the very well known location in the Indore city Sarafa. It is a central commercial location, or most tourists, if they are visiting Surat, will go to the Sarafa. So, earlier the photograph you see and after the Swachh Bharath Mission will see the Sarafa area. So earlier, this is another one of the most critical areas; it is the Rajwada. So earlier the Rajwada, now the Rajwada you can see another photograph.

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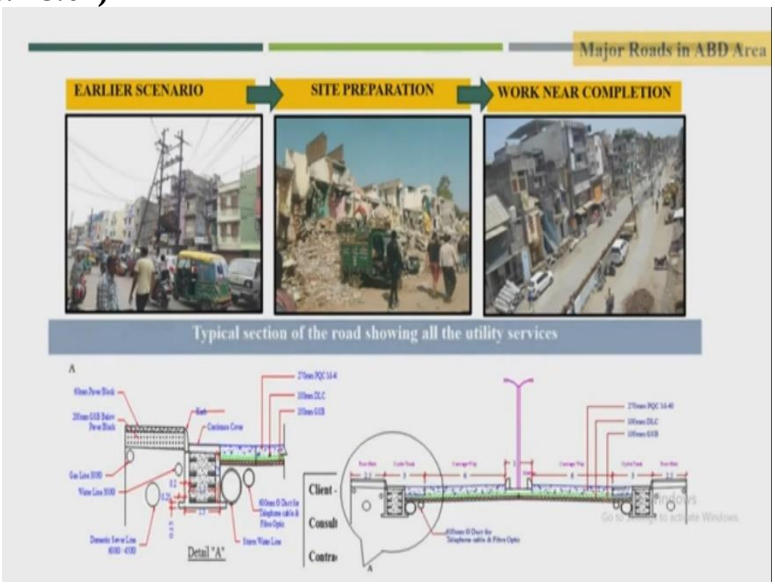

So, what are the major roads in the earlier scenario? This was a site preparation during the work task. So, the works near the completion, you will see the same area now. And this is the typical section of the road showing all the utility services. I think this map is also available online. You can see that.

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Now for Integrated Solid Waste Management. The objective of the ISWM project is to introduce an analytical tool for automated decision making to help in the effective monitoring of solid waste management operation. So, four modules like modules 1, 2, and 3 and 4 have been proposed for officials and residents. The project will be implemented in 6 months, and the contractor will provide optimum maintenance services for three years.

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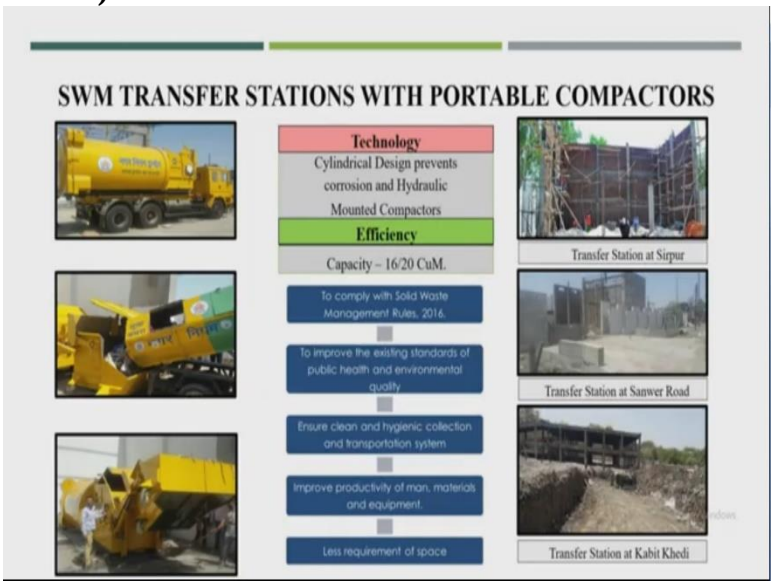

So, SWM transfer station with portable compactors. So likewise, they come up. So, technology was straightforward cylindrical design prevents corrosion and hydraulic mounted compactor. See cylindrical design efficiency was very good of that capacity was 16 to 20 cubic metres. So,

likewise, the technology has been adopted. The transfer stations have been constructed like it Sirpur, Sanwer road and it is a Kabit Khedi this transfer station has been built.

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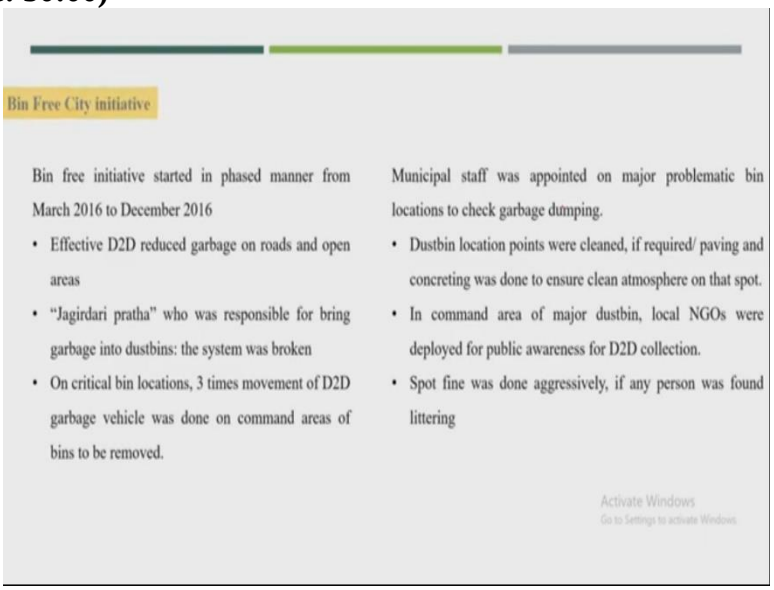

And bin free city initiated in a phase-wise manner; they started March 2016 to December 2016. Effective door to door reduce garbage on the road and open area. Jagirdari pratha, who was responsible for bringing waste into dustbins, the system was broken. So, this was also one thing that only the particular kind of people they used to work for the solid waste management. So, that is the Jagirdari path.

But now, I think they mixed population they had asked to become manpower for the solid waste collection facilities. For critical bin locations, three times movement of the door to door garbage vehicle was done on the command area of the bin to be removed. So, three times movement of the door to door garbage wherever is required is not only once in a day, but three times in a day. Also, the municipal staff were appointed on major problematic bin allocation to check the garbage dumping like dustbin location point where clean if required.

The concreting was done to ensure a clean atmosphere on the spot. In the command area of major dustbin like NGOs, we are deployed for public awareness. Spot fines were done aggressively if any person found littering.

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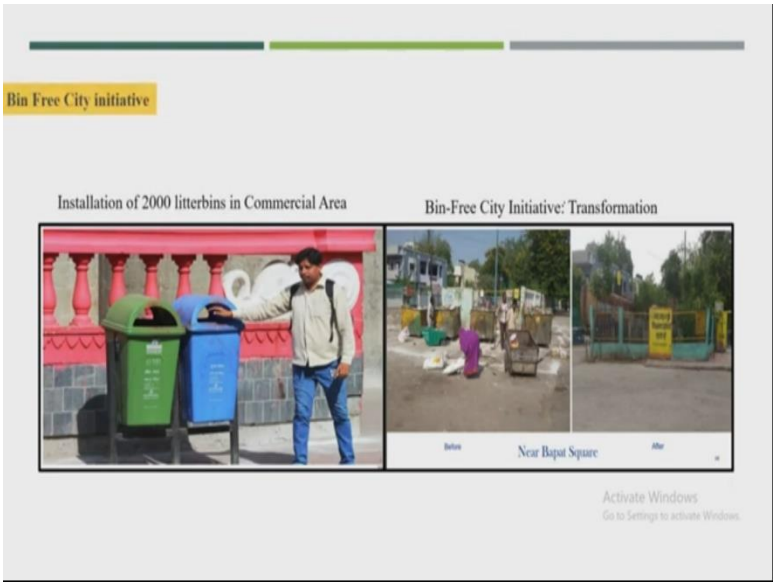

The installation of 2000 litter bins in the commercial areas and I think one photograph you can see is the Bapat square. The earlier was the location the number of dustbins was located in that particular square. Now you visit, and it is also written like (FL). So you see that exact location, how it has been changed.

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And also, door to door collection started in a phased manner from February to November 2016 with the procurement of 425 garbage tippers. So may I decide to have the door to door garbage collection system for all wards 5 to 6000 households in each neighbourhood? 4 to 5 garbage tippers were deployed per ward.

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So this was the distribution, procurement and distribution of door to door collection vehicles you can see.

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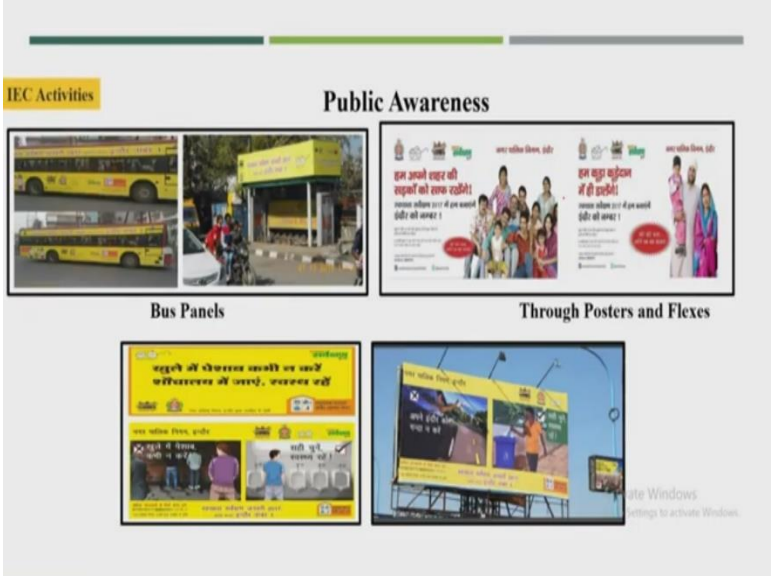

Like you will see, the IEC activity is the bus stop, so they rotate like Swatchh Bharat Mission or number of locations they put up posters or flexes with big flexes. Now also you if you visit Indore, you will see the big flexes. This is for the awareness of the local people. And also this kind of flexes they will know, you see it is a significant flex, you can see, (FL), do likewise.

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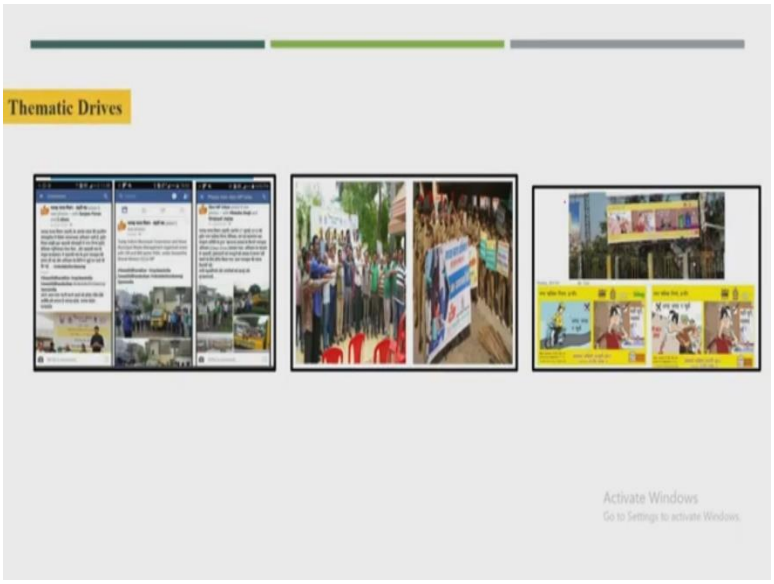

Now, few thematic drives also have been organised; you can see here people or local people they organise different events in the school also organise other events. And several thematic campaigns have been run in the entire city.

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So, this is the worth I think few photographs you can see like spot fines and so this is the one of the news in the newspaper (FL). So, likewise also spot fines also have been started.

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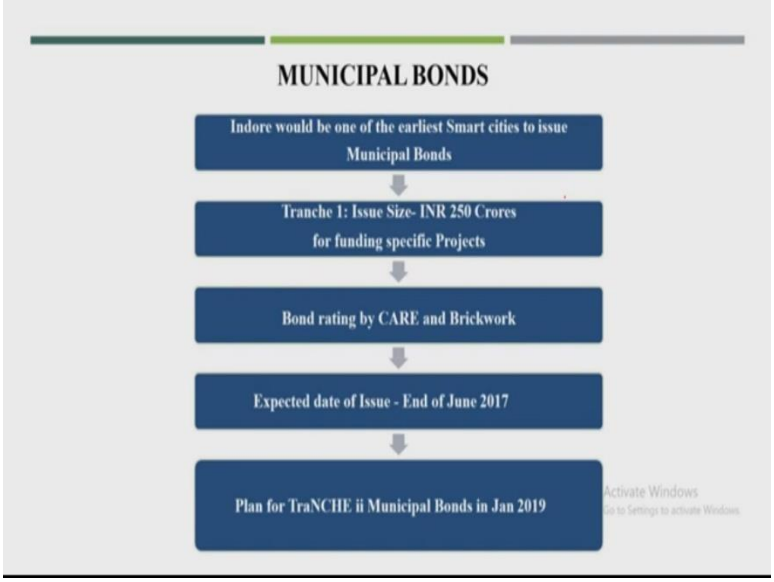

And also that municipal bonds also they started like Indore would be one of the earliest intelligent cities to ensure municipal bonds, like the issue size of 250 crores for funding specific projects, bond rating by CARE and Brickworks. The date of the issue was June 2017, the end of the issue. So, you were well aware now, this rule. What are the benefits of the rule? So, like the cities, I took only a few examples.

And like two examples were highly successful. One was Hyderabad and Indore, but you see that what is happened in Ahmedabad. So, know why this kind of issues has been come up in Ahmedabad kind of city. Because you are not working, the pre-process need to be there or need to be adequately understood for solid waste management; only you go for different processes.

Otherwise very difficult to think that you will start the Swachh Bharat Mission one day is not possible. In the remote location, you begin segregation slowly, aware of the people, and continuously work. Maybe it will take to start the entire city, maybe two years, three years will be required is not that by within a month or a few days, you will begin to the whole city to get clean. So thank you.