Municipal Solid Waste Management
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Lecture - 38
Management of Bio-Medical, E-Waste and Inert Waste

Hello students, so we are in the 2nd lecture of module 12, particular waste. And in this lecture, I will talk about the management of biomedical e-waste and inert waste. This is just an introduction about these kinds of waste because you need to well aware of these kinds of waste. After all, even biomedical waste e-waste are getting generated in the residential area, even the biomedical waste generated from the household area, even e-waste is also getting generated from the residential area.

So, it needs to be also discussed and but their management collection is different treatment is also different rules also are different for that. Still, I think it needs to aware how these wastes are getting separated from the MSW waste because these waste should not be reached to the sanitary landfill of MSW or whatever treatment facility we talked about in the previous lectures like biological treatment or chemical treatment process, these kinds of wastes should not be reach into those facilities.

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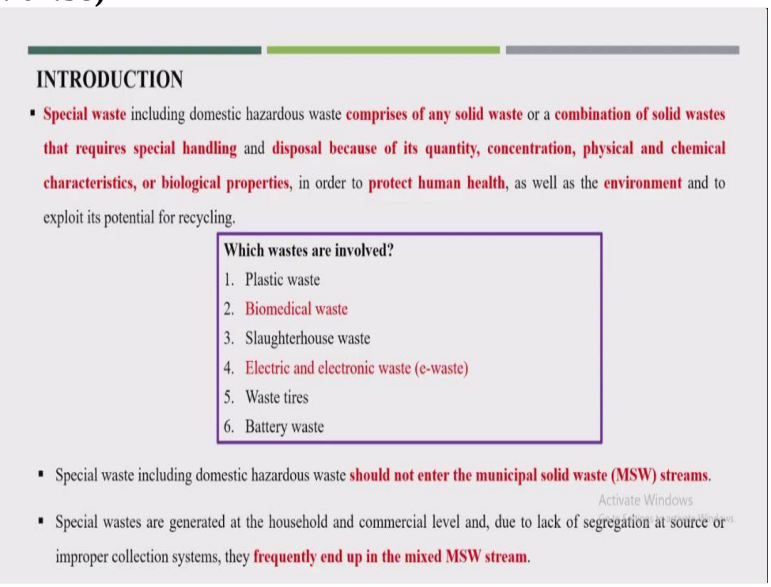

So, first, we will talk about the particular waste, which in the last lecture, I spoke about construction demolition waste. Usually, when you talk about specific waste, though sees the C and D waste not consider is not specific waste. So, the definition of particular waste is given, including

domestic hazardous waste comprises of solid waste or a combination of solid waste requiring special handling particular disposal because of its quantity, concentration, and different characteristics, different biological property.

To protect human health and the environment, this is the proper definitions of particular waste. So, these C and D waste do not come under a specific waste, but I thought of doing one specific module. So, in the same module, a particular base module, I thought of including the C and D waste, which I had discussed in the previous lecture. So, when you talk about specific waste, it is typically characterized as plastic waste, biomedical waste, slaughterhouse waste, e-waste that is electrical, electronic waste, waste tires, and battery waste.

The significant classifications are the special waste today because I will talk only about biomedical waste and e-waste because of their large quantity, plastic waste, we already spoke onto the MSW. Also, we spoke, but the slaughter out waste base style is separate, although they are also produced in the municipal area. But I think the more enormous challenges are biomedical and e-waste.

So, special waste, including domestic hazardous waste, should not be entered into municipal solid waste streams. So, whatever that dust bin was provided whatever the treatment facility or sanitary landfill who designed for MSW, these waste should not be entering such facilities and special waste are generated at the household, and commercial level due to the lack of segregation at source improper collection system and they frequently end up into the mix MSW waste.

You will see a lot of household biomedical waste like a tablet or even a lot of liquids are getting mixed into the MSW, and other hazardous waste also is getting integrated into the MSW because of lack of facilities. Also, e-waste like battery usually disposed into the MSW only, but that battery has to be collected. The special rule is available for battery waste disposal, but I think we do not have that kind of facility right now in our country or most developing nations.

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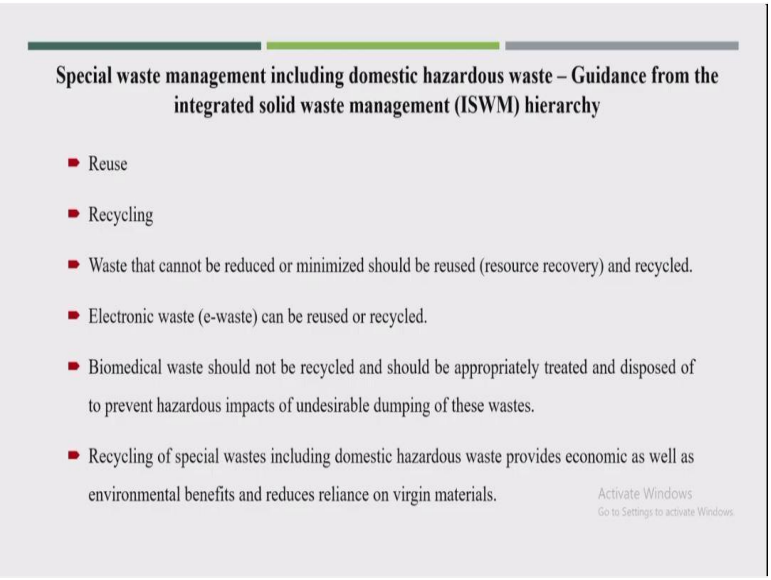

So, this special waste management, including domestic hazardous waste, the guidelines from integrated solid waste management hierarchy wise, if you see that should be reuse, recycle and waste that cannot be reduced or minimize should be reused or resource recovery. The e-waste can be reuse or recycle biomedical waste should not be recycled and should be appropriately treated and disposed of to prevent the hazardous impact of dumping of such waste.

So, mostly the biomedical waste goes to the incineration facilities, and very few concentrations are only getting recycled, but that is only the plastic is coming from the biomedical facilities. Also, recycling special waste, including domestic hazardous waste, provides economic and environmental benefits and reduces the reliance on virgin material. And this is not only for the special waste but for the even for MSW.

If you can reuse paper or plastic, rubber leather, metal tin glass, C and D waste, even e-waste, even some biomedical waste could be possible to reuse. So it is always beneficial because we will be required less virgin materials and is suitable for the environment. First, we will start with biomedical waste.

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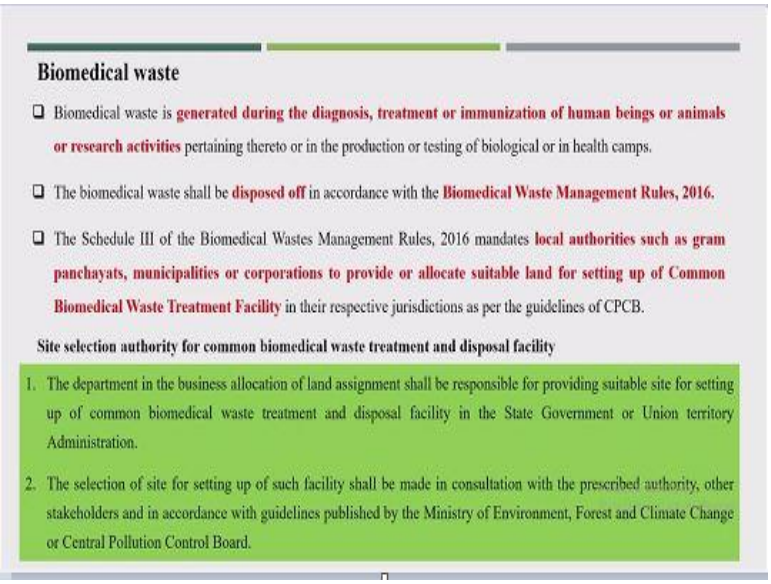

So, this biomedical waste generated during the diagnosis, treatment or other activities in the hospitals. So these biomedical waste shall be disposed of under the biomedical waste management rule 2016, and schedule 3 of these biomedical waste rule 2016 mandate the local authority, such as Gram Panchayat municipality or corporation or any you will be provided to allocate suitable land for setting up a typical biomedical waste treatment facility in their respective jurisdiction as far as guidelines of CPCB.

So, this schedule 3 must be implemented in every corporation or every urban centre to have provided one centralized or common biomedical waste management facility. So they are the not only the storage, segregation, some recycling and final disposal, maybe incineration or landfilling also has to be provided in that particular facility. Under schedule 3, site selection is essential.

The department in the business allocation of land assignment shall be responsible for providing the suitable site for the setting up common biomedical waste treatment facility in those in the state government or urban or union territory administration; the selection of location for a set of such facility shall be made in consultation with the prescribed authority or other stakeholders and accordance with guidelines published by the Ministry of Environment forests, climate change and Central Pollution Control Board. So, this site selection is also essential here; this is also a similar site selection for sanitary landfill.

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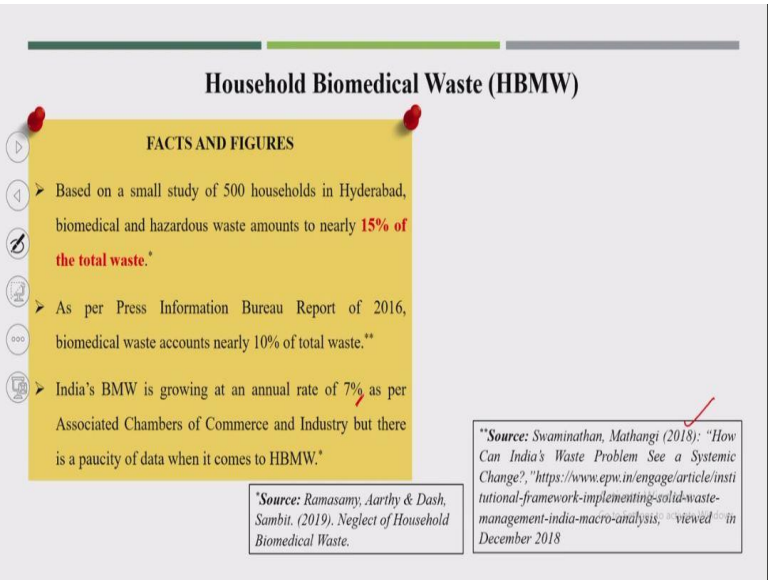

So now we will talk about household biomedical waste; like based on this small study of 500 households in Hyderabad, the biomedical hazardous amounted to nearly 15% of total waste, so is a good percentage of household biomedical waste. So, suppose you can read this particular source, as per the Press Information Bureau Report. In that case, biomedical waste accounts for nearly 10% of total waste, and India's biomedical waste is growing at an annual rate of 7%. As per the associate Chamber of Commerce and Industry, this good percentage is increasing. This is regarding household biomedical waste.

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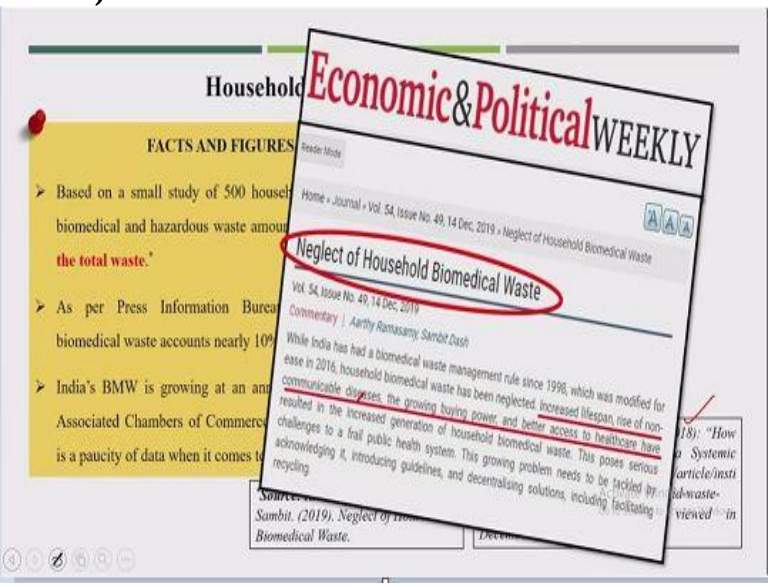

And also, you can read about the neglect of house biomedical waste, so, if you can read this line, there the increased lifespan rise or for non-communicable disease the growing buying power and better access to health care facilities. Because of that, biomedical waste generation is also getting

improved because of the better access to health care facilities, which has resulted in an increased generation of household waste.

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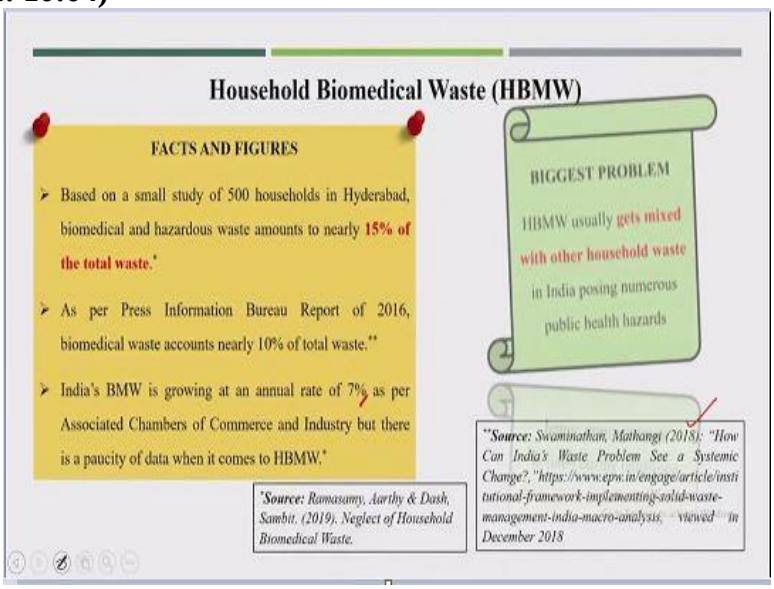

And the biggest problem is that these household biomedicals usually get mixed into the other household waste in India, posing numerous public health hazards.

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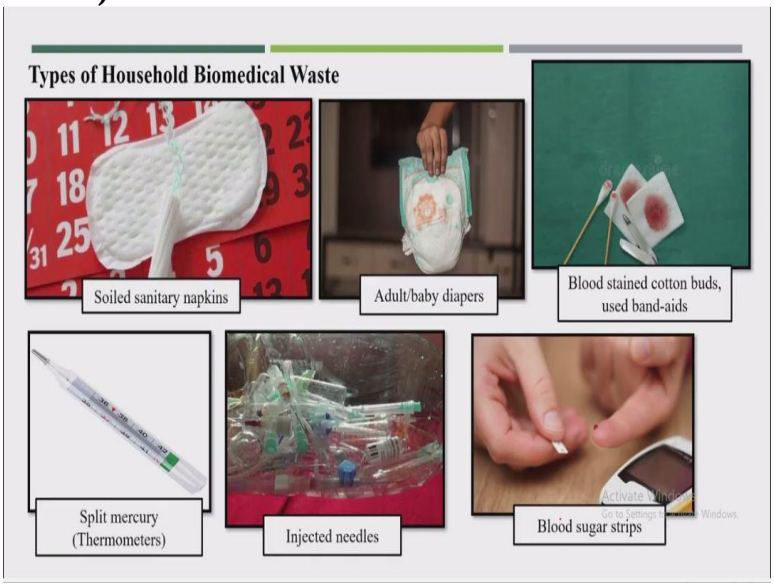

So, what type of household biomedical waste here soiled sanitary napkin and the problem with the sanitary napkins could contain blood these are highly toxic and problematic. Once it mixes into the MSW, it is now challenging to segregate. That's why the MSW rule notified that the entire household waste should be segregated into three wet waste, dry waste, and household hazardous waste. So, this comes under household hazardous waste.

Next is the adult or baby diapers; blood pieces of cotton could be split mercury from the thermometers, injected needles, and these blood sugar strips also contain blood. So, usually, when you take the blood sample, we never thought this could be one of the very hazardous kinds of material. And usually, when you take this one, the blood is getting dried out. So we will dispose simply into that plastic bag our household will mix into the household waste without thinking that this blood could create further issues also discarded insulins.

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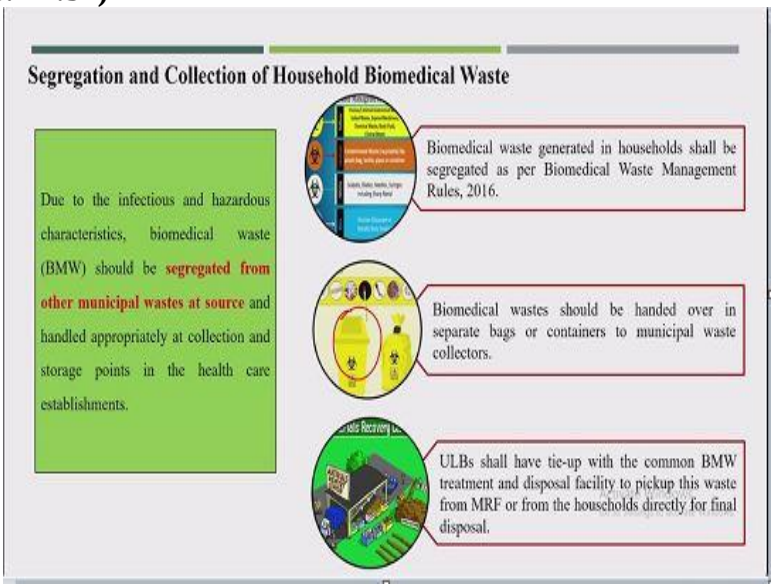

Due to the infectious and hazardous characteristics, biomedical waste should be segregated from other municipal waste at source and handled appropriately at collection and storage point the healthcare establishments So; for that, the biomedical waste generating the household shall be segregated as per the biomedical waste management rule 2016, and biomedical waste should be handed over in those separate bags or containers to the municipal waste collector.

Typically, these yellow bins are proposed to each house to store the household hazardous waste and ULBs that local authority shall have to tie up with the common biomedical waste treatment facility to pick up these kinds of waste from the MRF centres from the households directly for the final disposal.

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And now the biomedical waste from the healthcare phase establishment like hospitals, nursing homes or pathologic laboratory these waste should be segregated the point of generation and stored in colour coded containers, which I will show in the next slide separately and based on whatever the biomedical waste rule, that first rule came in 1998 amended in 2011 and 16. So, do the segregation.

Typically, there is a four coloured segregation waste under these category waste hardly 25 to 30% of total waste generated by the healthcare facilities could be hazardous that 25 to 30%. So, primarily people think that entire biomedical waste is hazardous, but that is not true. Only 25 to 30% is hazardous; sometimes, it is well below these kinds of one sees again depend upon what type of health care facilities like the hospitals do not have nursing facilities and only small hospitals.

I think the hazardous waste production will be minimal, and there is no surgery facility in the hospital. So in those cases, I think a lot of your hazardous waste does not come out from such facilities and this biomedical waste against sent to further treatment disposal. So when I say here 20 to 25 to 30% is a hazardous means remaining could be recycled. So this is essential to ensure the MSW generated from healthcare establishment is not contaminated.

And does not pose any health environment risks to the waste handlers, processing plants and users of the end product of the MSW processing facility. So, usually, these biomedical waste classified into four categories as per the rule 2016.

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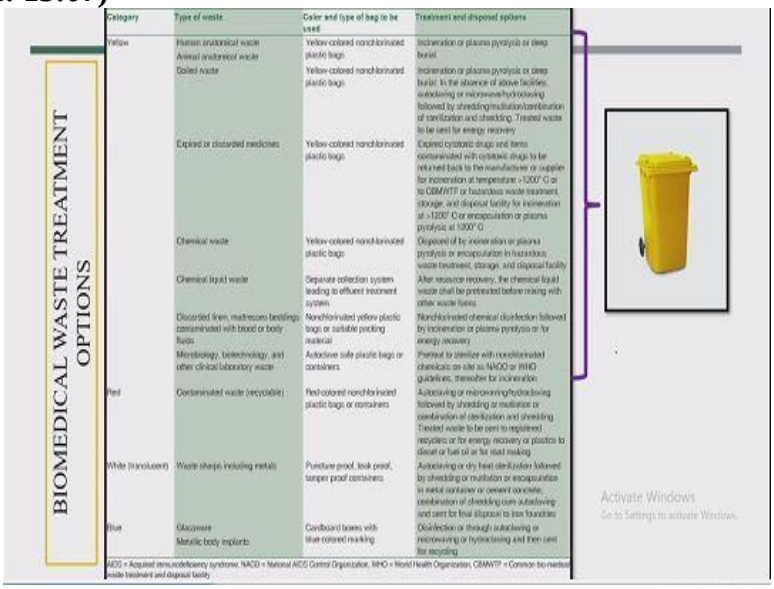

So, these are the four categories; these are colour coded categories yellow, red, white and blue. So, this is the yellow part, and I think if you visit any hospital, you will find these four kinds of containers the yellow, red, white and blue, these four containers different floors also you can you will find it in this kind of facility properly covered, does means. So, like in the yellow bins, which will be what sort of waste is suggested to dispose of like human anatomical waste or chemical waste.

You can also go through that even the biomedical waste rule 2016 also suggested the type of waste and what kind of treatment and disposal is proposed the mostly this yellow waste is typically proposed to go for incineration facility.

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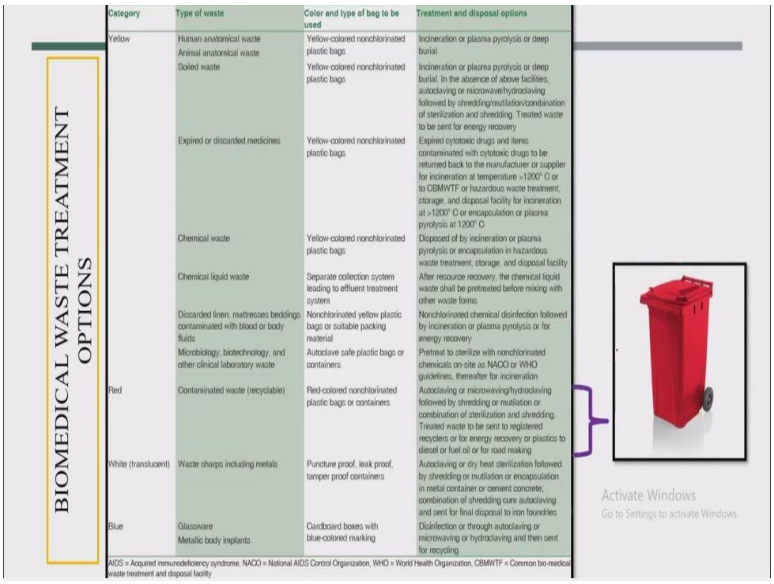

Next is the red one that is a contaminated waste these are the recyclable one should be separated one.

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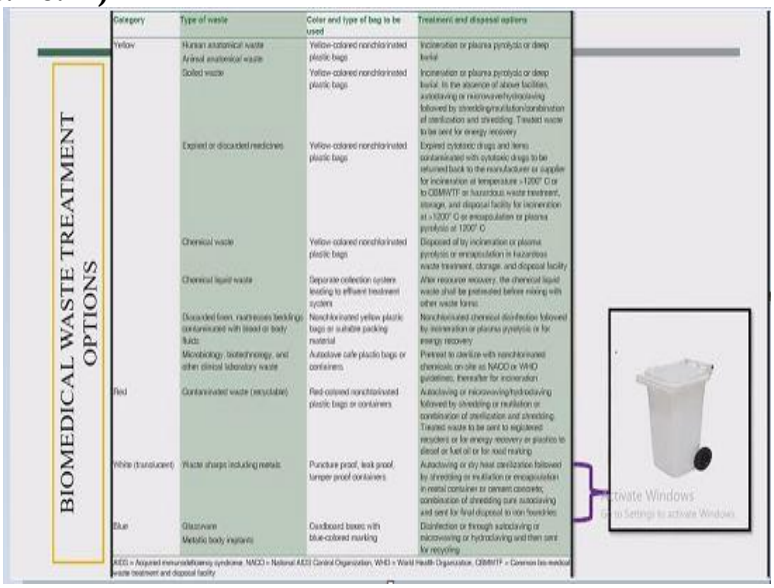

Next, is a white one white colour one that wastes sharps, including metals? So, these are sensitive material like needles will come into this category.

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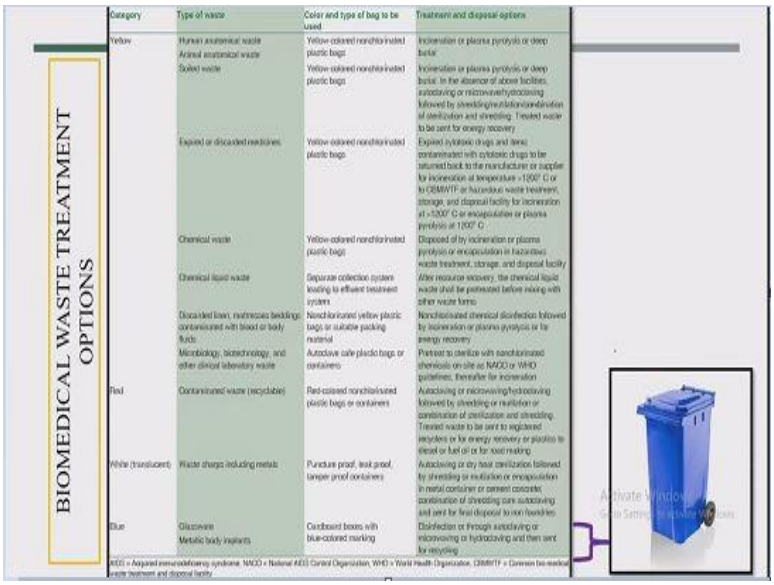

And lastly is the blue, blue because glassware or metallic body implants or cardboard boxes that will come into the blue bin are also recyclable. So, the primary concentration will go to the insulation facility that is yellow dust bin a waste.

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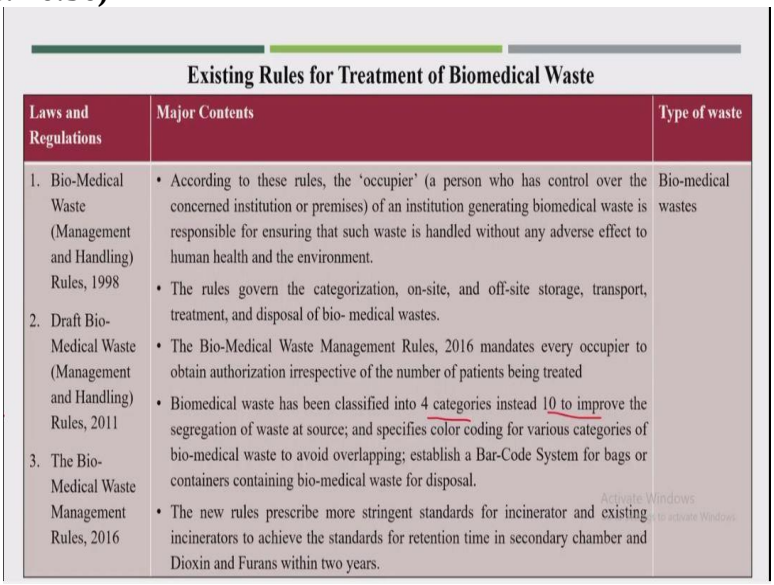

So, what is the existing rule for the treatment of biomedical waste? So, as I was talking about that biomedical waste rule, it came in 1998 with the idea that the proper handling and disposal of waste is now modified 2016 and 2016 classified in 4 categories. So, earlier in 2011, there were ten categories. They minimize because all these ten categories are the most of the other category few categories used to go for incineration facility.

Now the major here is the understanding here in biomedical waste. If you visit any biomedical treatment facilities, few facilities like the important facility will be the incineration facility. So, whatever that yellow dust bin waste is coming that will go for the conversion process insulation facility and what kind of insulation the similar kind of insulation we talk for MSW.

But in MSW, also we talked about waste to energy plants. Still, I think there is not much discussion on waste to energy or energy production in biomedical waste because operation or handling of hazardous waste is difficult. So, the only conversion is enough and how best we can dispose of the residues and clean the polluted air that guidelines are given in the rule under the remaining will goes to the recycling facility, mostly the plastic items, even some metal items also is recyclable one that facility you will be able to find also.

Because during segregation because many healthcare wastes or biomedical waste content liquid, that liquid has to be emptied, may be manually or mechanically mostly the manually a lot of manpower was involved in clearing out that material even the many times these kinds of material is under the pockets. So, this could be paper made pockets or plastic pockets that particular material has to be taken out manually only as possible.

So, there is a lot of manpower's you will see that while segregation of the material and that, liquid lot of wastewater is also getting generated. And you will find one wastewater treatment facility also onto the biomedical waste management facilities. So as I told you there are 4 or 5 facilities like start from the incineration facility. Next is the recycling facility, a plastic and metal segregation facility and wastewater treatment facility.

Likewise, you can find and is a fascinating sight to see, but only take care puts a proper mask and do not touch in such kind of locations because mostly these materials are hazardous. Now we will go for E-waste. When you say that e-waste, anybody can understand electrical or electronics waste.

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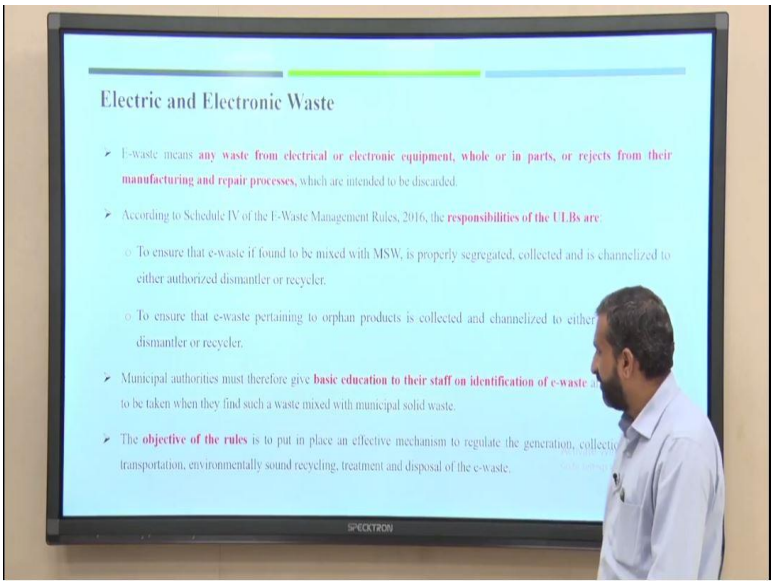

So, e-waste means any waste from the electrical electronic equipment's or whole or part could be rejected from their manufacturing or repair process. And according to schedule 4 of the E-waste management rule, 2016 the responsibility of ULBs are to ensure that e-waste is found to be mixed with MSW is properly segregated, collected and is channelized to either authority or recyclable and to ensure that e-waste about an orphan product is collected and channelized to either and authorize recycling facilities.

So, usually, these e-wastes also you can find in the MSW. So, the local authority must have one particular mechanism to take it out through that e-waste from the MSW, and municipal authority must give a primary education to their staff on identifying E-waste. So, in one of the lectures, I talked about the primary collection by how staff collection facilities so, if that particular person is well level or well understandable to what kind of e-waste.

And if you do the proper awareness in the local areas from the local authorities like corporations and the people will store these kinds of e-waste even biomedical waste also they will be stored in separately. I think the local authority can plan such a kind of collection on one particular day. Maybe you need not arrange to collect such kind of waste every day because everyday generation would not be possible. So, maybe once a week or perhaps for such a kind of waste collection; the excellent idea is to drop off facilities in the particular locality.

So, you can well aware the local authority local people to drop their waste either is an e-waste biomedical waste even the bulky waste like table chair these kinds of in e-waste could be a frozen refrigerator, or more astounding is a big size material even though the tri recycle person also can collect and also you can make it that drop off-centre to the buyback centre. So, maybe somebody can collect such kind of material, when there are a lot of recycler people can be utilized such kind of material also can plant some kind of incentives to the local people, so, that they can prove they will be interested in disposing their waste into such kind of facilities.

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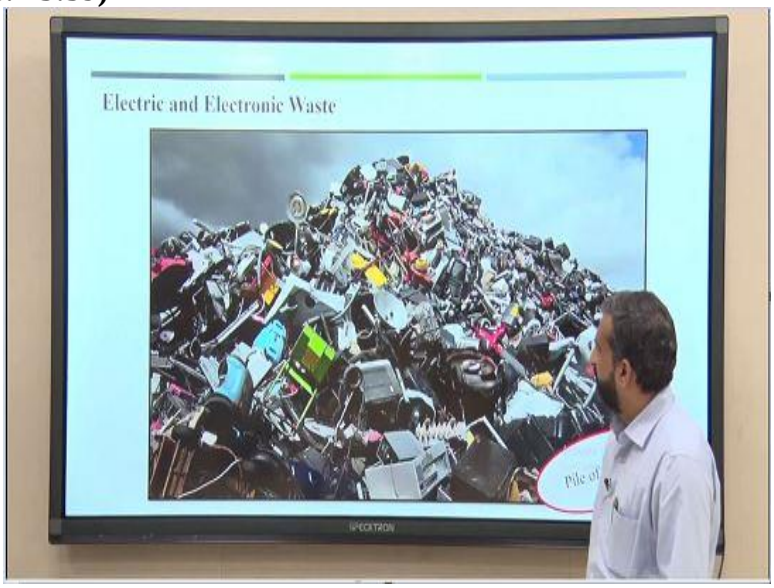

So, this is the pile of e-waste; you can see here is mixed e-waste.

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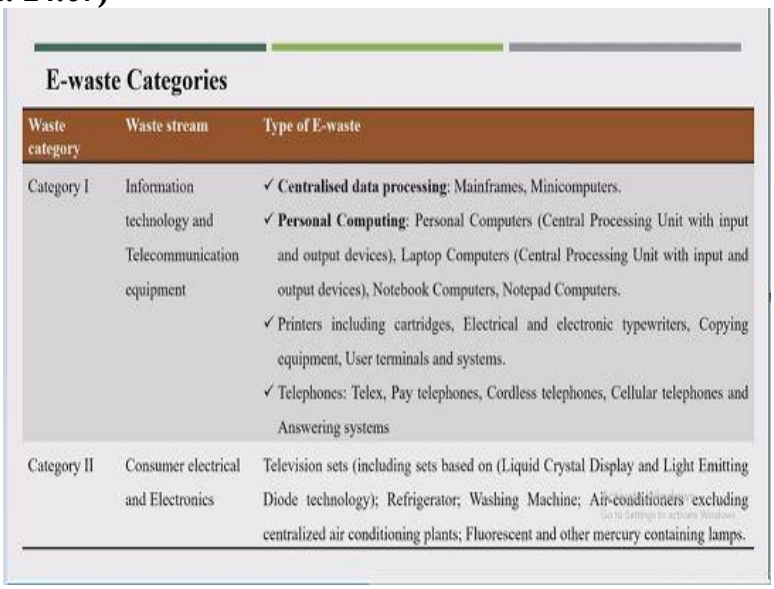

It has been suggested that e-waste has to be categorized into two categories, category 1 and 2. So, category 1 suggested the waste from information technology or telecommunication equipments like printers, telephones, and notebook computers. This will become in a special category and other categories consumer electronics like television set refrigerator washing machine the air-conditioned this should be in the separate category.

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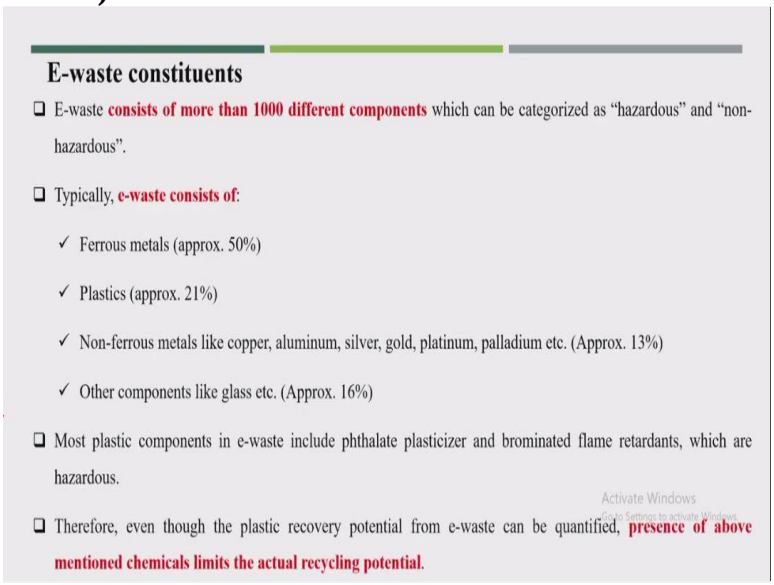

Now, e-waste constituents e-waste consist of more than 1000 different components, which can be segregated a hazardous and non-hazardous. So, typically e-waste consists of ferrous metal, plastic non-ferrous metal like copper aluminium, silver gold could be possible other components like glass and most plastic components in e-waste include that usually is hazardous.

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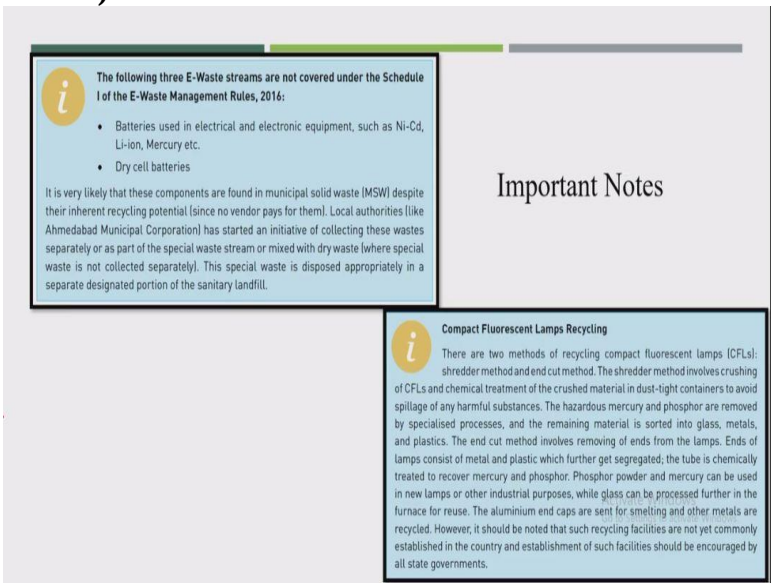

So, the important notes here that the e-waste like a battery used in electrical, electronic equipment, which is not considered an e-waste management tool, even the dry cell batteries, even the CFLs not under the e-waste category. So, only two categories remember that there are two categories 1 is an Information Technology Telecommunication equipment and 2nd categories Consumer electrical and electronics.

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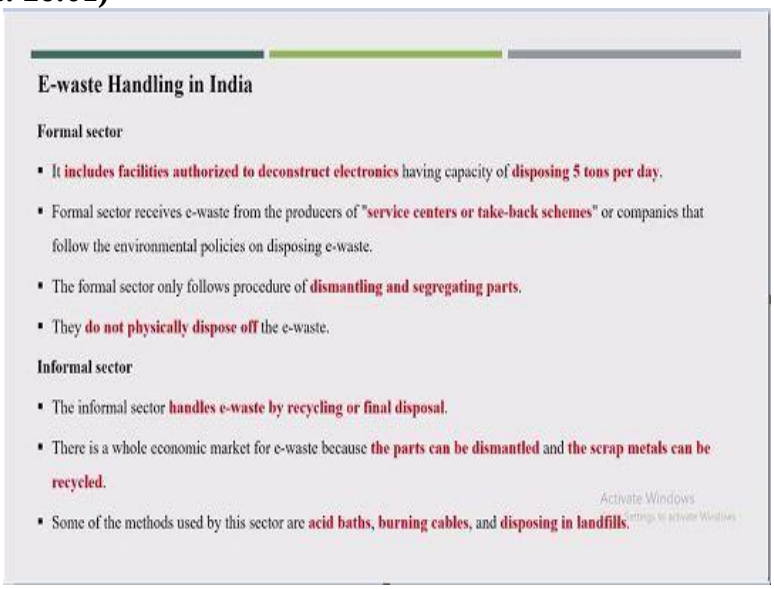

E-waste handling in India: So, formal sector like it includes the facility authorized to deconstruct the electronics and dispose of 5 tons per day. So, these formal sectors receive e-waste from the producers of service centre or take back scheme. So, I was talking about drop off centres and take back scheme; also, they can propose formal sector only follow the procedure of dismantling and segregating parts and do not physically dispose of e-waste and the informal sector.

The informal sector handles e-waste by recycling or final disposal; there is a whole economic market for e-waste because the part can be dismantled, and scrap metal can be recycled. So, if you ask me also, we do not have accurate information; we do not have data on the informal sector. Even their disposal they perform the acid bath burning cables or disposing of landfill this informal sector.

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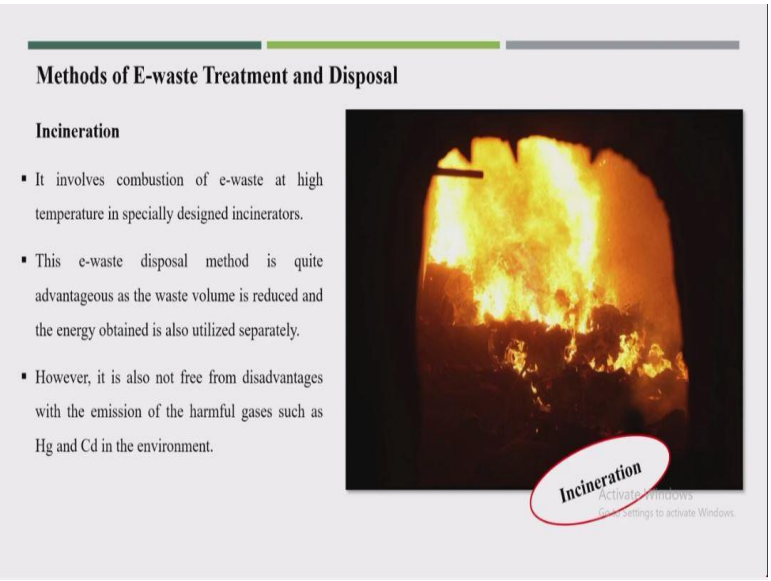

Method of e-waste statement disposal the major is an incineration same similar to biomedical waste. So, incineration the only again problem is that it is very harmful gas is producing.

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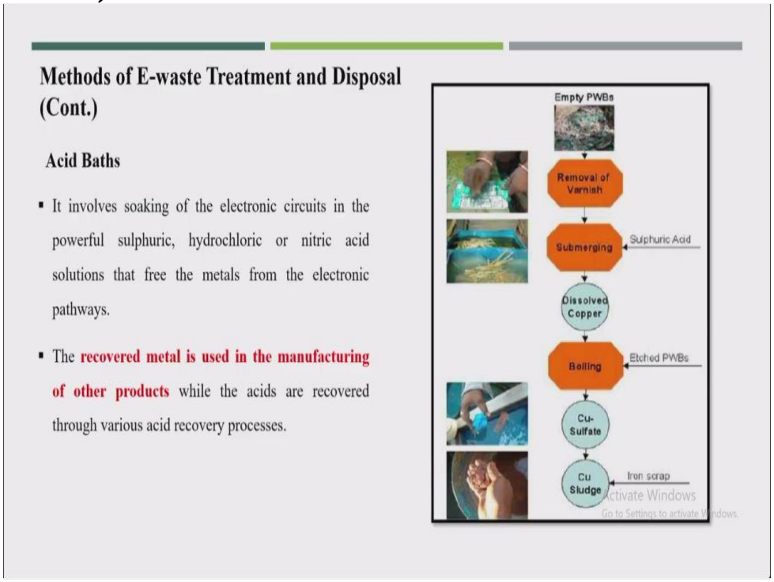

And another is the acid bath. This is also possible for a collection of the metals that could be possible from the acid bath. So, you can see by a bare hand informal sectors are trying to segregate or recover the valued product because gold, silver is easy to find. However, the concentration is low, but a still huge informal market is available for that.

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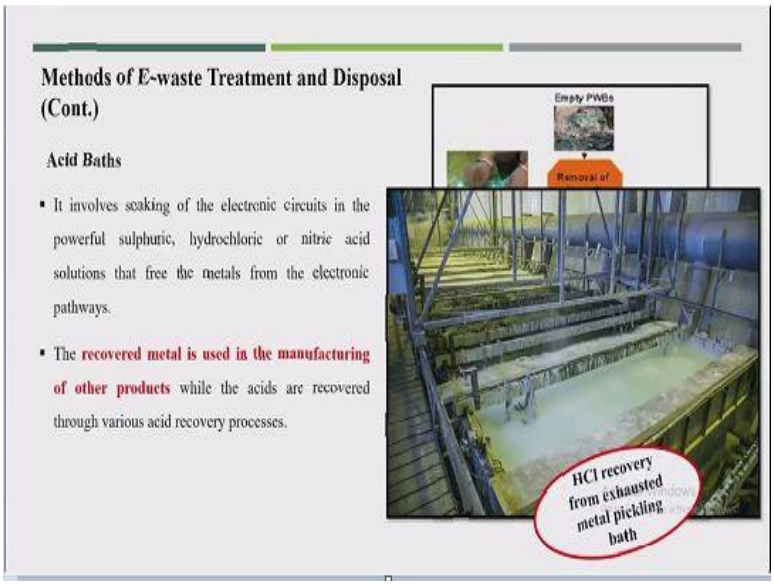

It is purely one particular plant of the acid bath.

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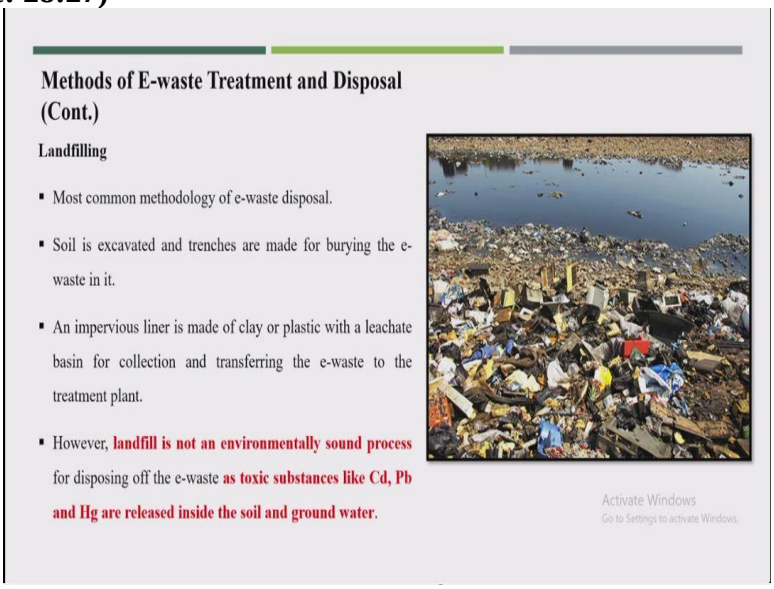

And finally, landfilling is the most common methodology. But, even I would not believe that I would not accept the landfilling of such kind of material because the landfill is not an environmentally sound process. So, it is not recommended particularly from my side also and whomever know that these kind of material can create problem in the landfill area, because it will leach out with a lot of metals into the soil and the groundwater. And a lot of gas also or many toxic substances will get released out from these kinds of materials.

So, it is not acceptable. But now in India, several cities have their own EBS collections policies, mostly the formal-informal sectors are notified by the local authorities who can collect these kinds of waste and can go for proper treatment and disposal of such kind of waste.

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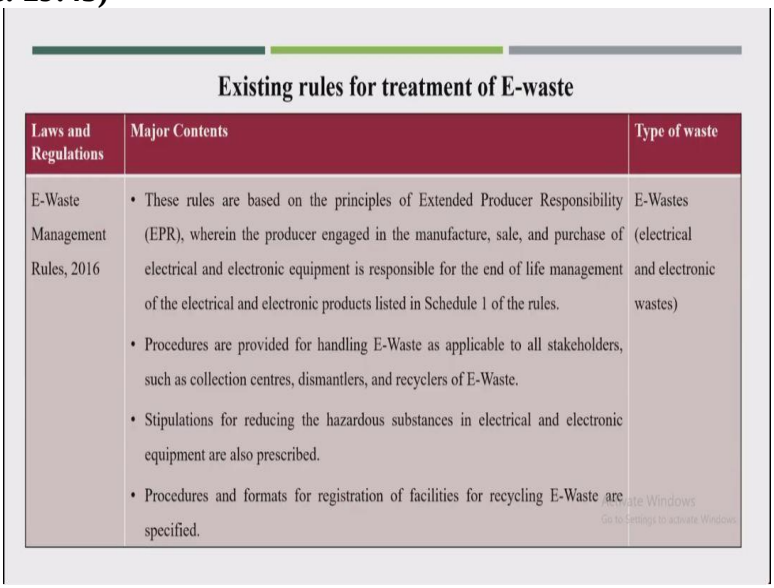

So, what existing rule the same like these rules are based on principle of extended procedure responsibility EPR wherein the producer engaged in the manufacturing sales and purchase of electrical, electronic equipment is responsible for the end of life, management of electrical, electronic produce listed in schedule 1 of the rule, I think here I will give one example. As you know, the mobile company like Samsung and LG all comes from South Korea.

So, there what rules suggested because they are these EPR extended producer responsibilities very famous. So, if you purchase any mobile in South Korea, like Samsung or LG, you will get some kind of discount the discount, if you give the old mobile to the same shop. So, if you take your old mobile and purchase a new mobile phone from the same company, you will get maybe 5% 10% discount on the why this discount is provided.

Because that same old mobile is getting recycled by the parent company, whether LG or Samsung, so, that is why the product also is coming into that country is a more recyclable one. Still, the same product of the same company is coming to the other part of the country. Though in their the recycle fractions are significantly less. If you purchase any mobile in South Korea, that will not work in the other part of the world.

And because these are the same company, they are fabricating or manufacturing the product based on their country rule. So, our modified 2016 rule is majorly focused on the principle of extended producer responsibility. So, that I think any like refrigerator company if the same refrigerator company can recycle their old refrigerator. So, I think this is the best way of reuse or disposal of such kind of material. So, I think India is also working on that, and we have to see how we can extend such kind of facilities in India in the next 15, 20 years.

Now, the next waste is inert; this is also very important in the MSW and when this MSW waste collection by the collection crew, they will collect the waste from the household area commercial areas, but also will be collected these inert waste from the street sweeping by the street sweeping activities.

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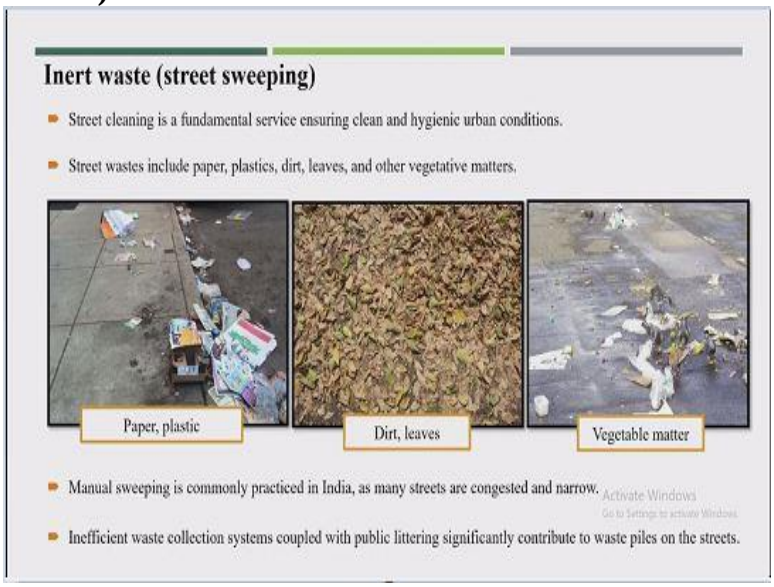

So, street cleaning is an essential service to ensure clean and urban hygiene condition. So, I think when I thought of adding these discussions into these courses because when you say those, such a is in a clean area, we usually will see the roads or the surrounding of that particular area, and that involved the only activity that is the street sweeping activity or is involved into that and nobody will see that how, whether you segregated waste generated in the household area, whether how you disposed of, but the cleaning of the streets is giving the more importance.

That is why this discussion is very important when you talked about waste management in any particular city. The street waste including paper, plastic, dirt, leaves and other vegetative matter. So, you can see here paper-plastic dirt leaves, say for when most of the cities they come up with later bins, the UK you will see some dust bins are hanging somewhere in some particular commercial areas so that all the users can dispose into that particular dust bin.

But I think you know that in India or mainly developing nations, people are not well aware of the waste management, so that is why the paper plastic also you see here, the packaging materials, you are getting into this as in sweeping street material. Dirt leaves, I think we cannot have collected it but has to be clean it time to time, and even vegetative matter also is why you will see several cattle's onto the street especially cow onto the street.

Because they are getting a lot of edible materials into the MSW and manual sweeping is very common in India, as many streets and narrow streets an insufficient waste collection system coupled with public littering significantly contribute to waste piles on the street.

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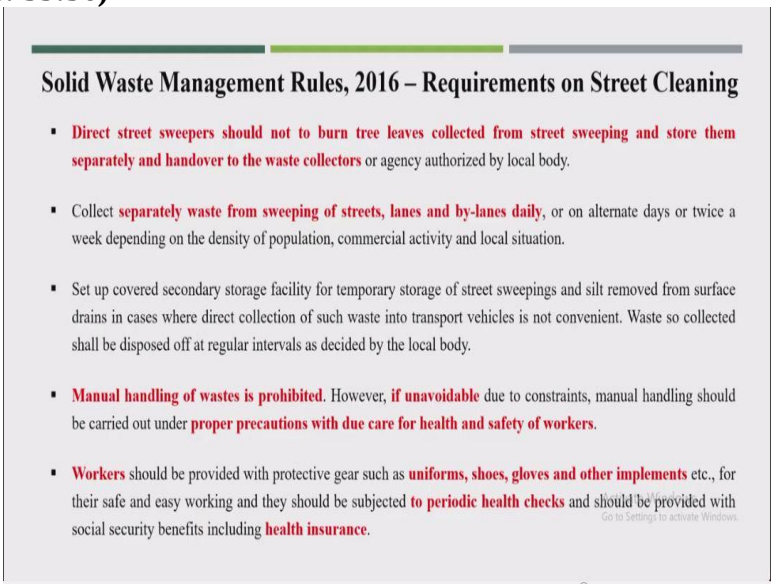

So, what is the requirement for street cleaning under the solid waste management rule 2016? the direct street sweeper should not burn tree leaves collected from the street sweeping and store them separately to the waste collector or agency authorized by the local body. So, these are important directories because, in most of the cases, what the street sweepers will do, they will pile up one

location. Still, I think it is not close to the habitations somewhere in the park or some outskirt area, and they will go for firing of that particular material.

So, the firing is not allowed actually the collect separately waste from the sweeping of street lanes and violence daily or in alternate days, twice a week depending on the density of population. So, similarly, the manual handling of waste is prohibited they have to use the proper hand gloves and proper mask. So that there is they should not have any health issue for a collection of streets sweeping waste. So, this worker should be provided with protective gear such as uniform shoes clothes and proper health insurance also should be provided to the street sweepers.

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Planning for Street Cleaning

	Small town	Medium City	Mega city
Equipment	• Long handled broom • Metal tray and metal plate • Containerized handcart or tricycle • Tractor with covered trolley • Container lifting device	• Long handled broom • Metal tray and metal plate • Containerized handcart or tricycle • Secondary storage bin • Dumper placer or compactor • Mechanical street sweeper • Container lifting device	• Long handled broom • Metal tray and metal plate • Containerized handcart or tricycle • Secondary storage bins • Dumper placer or compactor • Container lifting device • Mechanical street sweeper
Staff requirement based on road density	• High density roads: 1 person per 300–350 running meters of road length • Medium density roads: 1 person per 500 running meters of road length • Low density roads: 1 person per 750–1,000 meters of road length	• High density roads: 1 person per 300–350 running meters of road length • Medium density roads: 1 person per 500 running meters of road length • Low density roads: 1 person per 750–1,000 meters of road length	• High density roads: 1 person per 300–350 running meters of road length • Medium density roads: 1 person per 500 running meters of road length • Low density roads: 1 person per 750–1,000 meters of road length

Planning for street sweeping like will be required equipment's and staff requirement will be required. So like when you talk about equipment's will be required a broom for sweeping will require the handcarts or tri cycle or tractor or even the small auto depots will be required. So, it has been suggested for the small town medium sized medium city and mega cities. So, what kind of facilities even the staff requirement like high density road 1 person for 300 to 350 running meters and medium density road like 1 person per 500 running meters of road length. So, these are suggested for the small city medium city and mega cities.

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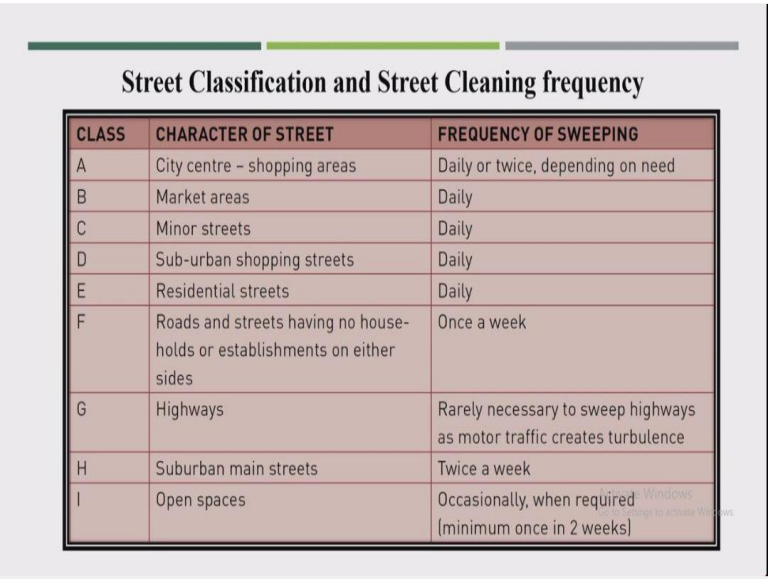

Street Classification and Street Cleaning frequency

CLASS	CHARACTER OF STREET	FREQUENCY OF SWEEPING
A	City centre – shopping areas	Daily or twice, depending on need
B	Market areas	Daily
C	Minor streets	Daily
D	Sub-urban shopping streets	Daily
E	Residential streets	Daily
F	Roads and streets having no house-holds or establishments on either sides	Once a week
G	Highways	Rarely necessary to sweep highways as motor traffic creates turbulence
H	Suburban main streets	Twice a week
I	Open spaces	Occasionally, when required (minimum once in 2 weeks)

Streets classification street cleaning frequency like these are very important guidelines is given in solid waste manual like they characterize the different states in A B C D E F G H I categories and like take example of A class A that is city center or shopping mall area that particular streets daily or twice depending on need. So, mostly the major streets need to be sweep daily under some roads, even or need not to be clean like highways only in the important occasions need to be clean or some roads need to be clean once in a week. So likewise, this is also good explanation is given on to the frequency of cleaning of roads.

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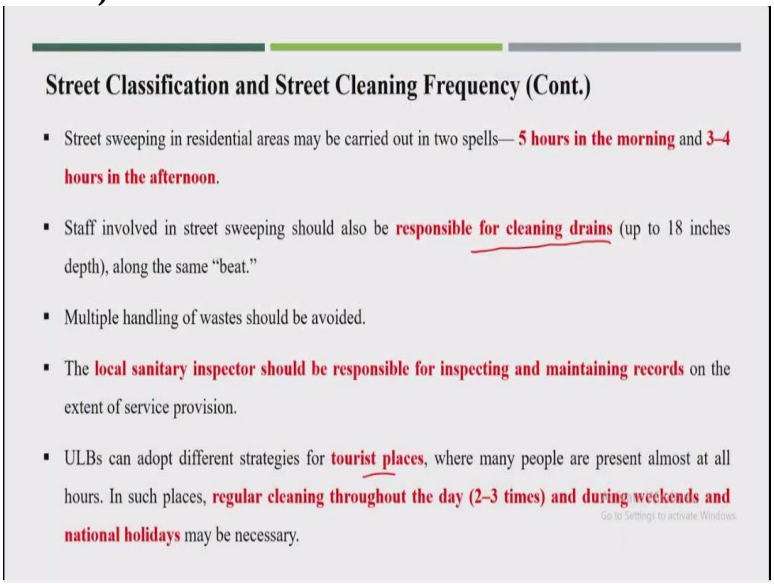

Street Classification and Street Cleaning Frequency (Cont.)

- Street sweeping in residential areas may be carried out in two spells— **5 hours in the morning** and **3–4 hours in the afternoon**.
- Staff involved in street sweeping should also be **responsible for cleaning drains** (up to 18 inches depth), along the same "beat."
- Multiple handling of wastes should be avoided.
- The **local sanitary inspector should be responsible for inspecting and maintaining records** on the extent of service provision.
- ULBs can adopt different strategies for **tourist places**, where many people are present almost at all hours. In such places, **regular cleaning throughout the day (2–3 times) and during weekends and national holidays** may be necessary.

So the street sweeping in residential area may be carried out in 2 spells 5 hours in the morning in 3 to 4 hours in the afternoon. Staff involved in the street sweeping should also be responsible for cleaning drains up to 18 inch depth and along the same beat this is also another activity for the

street sweeping staffs is not only the street sweeping but also they will be responsible for cleaning the drains and multiple handling of waste should be avoided. Local sanitary inspectors should be responsible for inspecting and maintaining records of that particular activity.

And you will be can adopt different strategies for tourist places. They can adopt different way because the tourist spots. So, maybe the sweeping could be in the different way mechanical sweeping also could be possible motorize sweeping can they can plan are you on trend clinical clean material should not be stored there. So, likewise different policy they can come up and regular cleaning they can propose for the different location like regular cleaning throughout the day 2 to 3 times and during the weekends and national holiday maybe necessary, they can make it.

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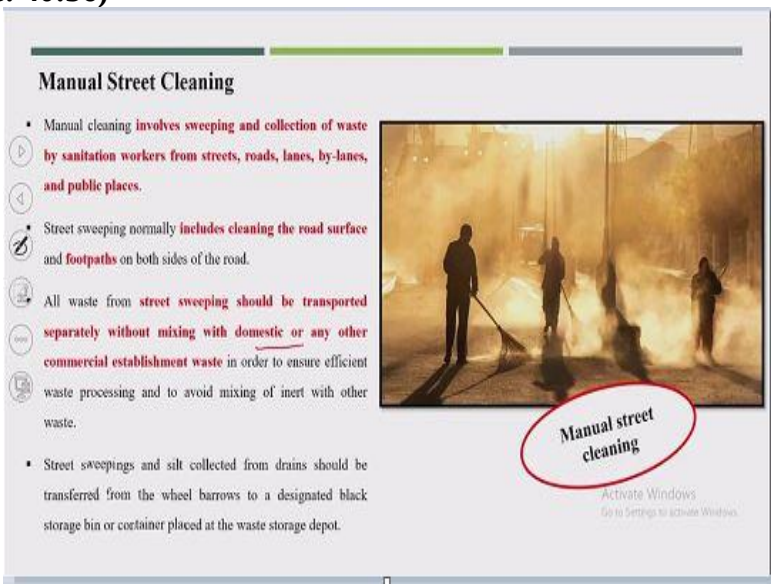

So, you will see here manual streets sweeping in the early morning. So, manual cleaning involves sweeping and collection of waste by sanitation worker from the street roads and lanes. This includes a cleaning of road surface footpaths on both sides of the road. And these streets sweeping should be transferred separately without mixing with the domestic or any other commercial establishment in order to ensure efficient. So, these whatever the waste is getting collected should not be involved into the domestic waste means whatever that dust bin is provided that these waste should not be mixed into the that particular dust bin.

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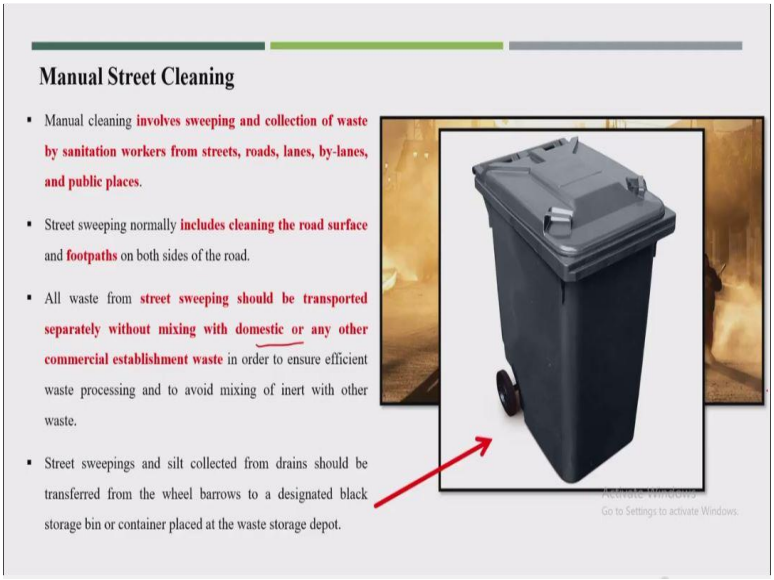

So, there this is another the black dust bin you will see in the number of cities such kind of dust bin is designated black storage bin or container placed in the waste storage depot. So, that these kind of waste we can dispose the staff can be disposed into such locations.

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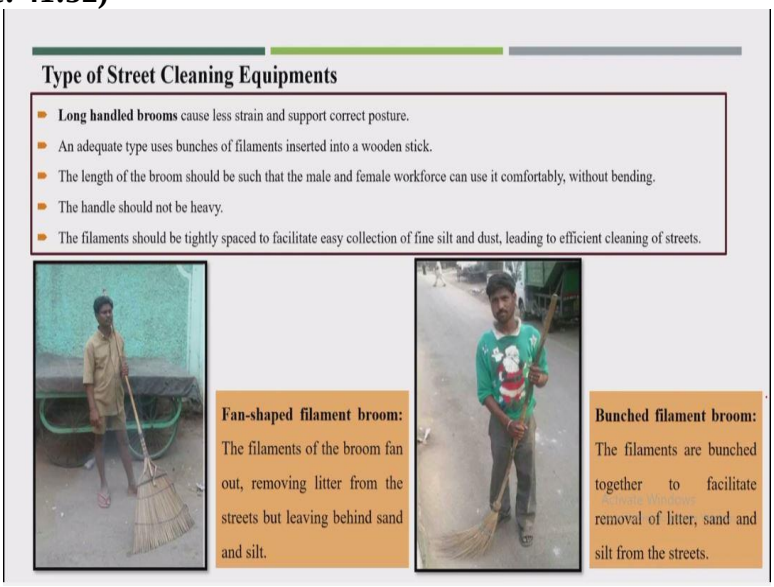

Type of street cleaning equipment: So, type of street cleaning equipment's like long handle broom is required because less strain and support correct posture and handle should not be heavy. So, likewise this is a one kind of broom that is fan shaped filament broom. This is somewhat good and they can broom it in both sides front side and backside both and this is another one the bunched filament broom these normally will do it in the only one side.

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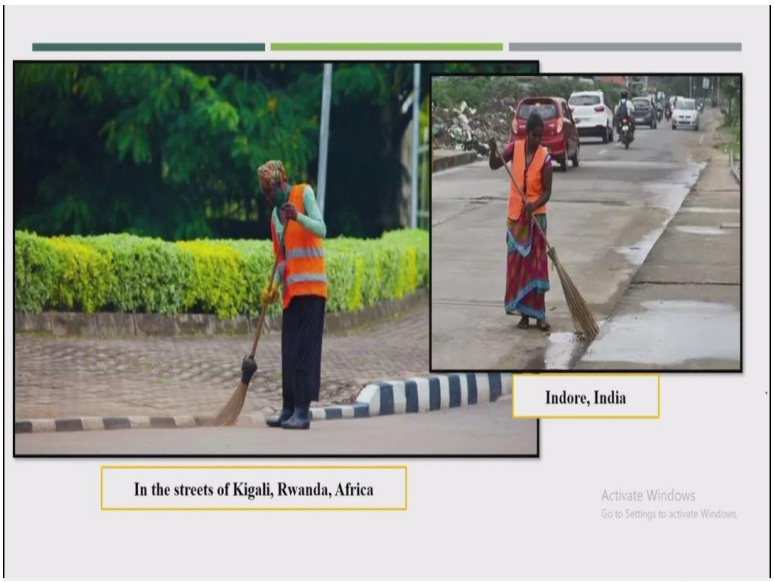

So, you can see here in somewhere in Africa in the indoor.

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This is in Hyderabad but I think still the staffs not using the proper cloth proper shoes also they have to wear.

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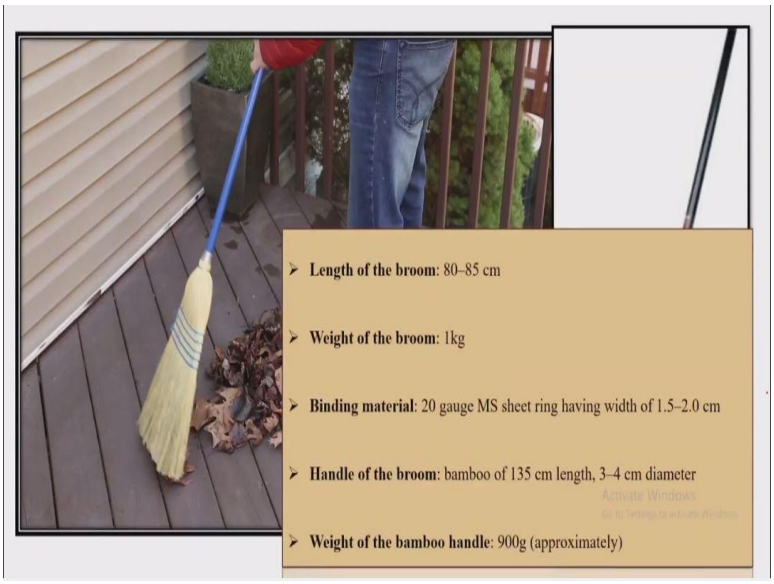

So, this is the one kind of broom to sweep the tree leaves. So, normally the length of the broom will be required and specified under the rule is 80 to 85 centimeter weight of the broom is 1 kg binding material 20 20 kg MS sheet ring having width of 1.5 to 2 centimeter. So, likewise the specification also is provided.

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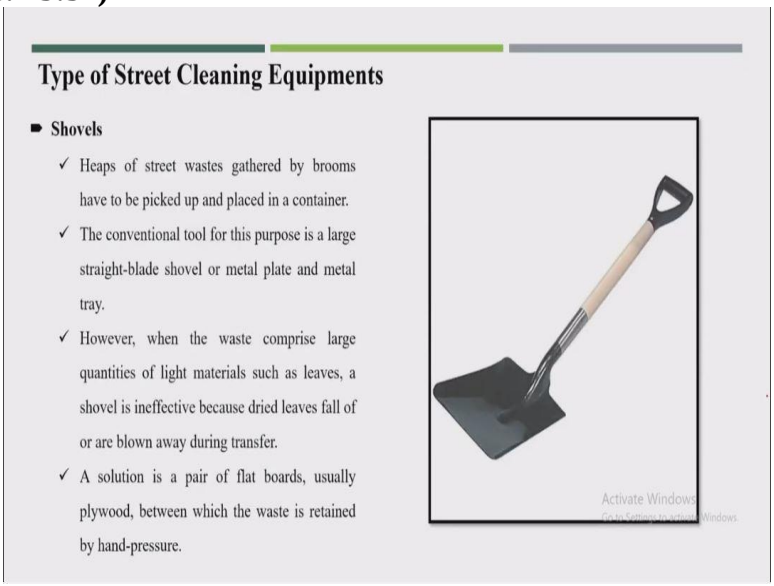

Type of street cleaning equipment's like shovel you will be required for to pick up the material once it is getting piled up, then you have to transport into the vehicle, whether is a handcart or tri cycle rickshaw. So, it will be required shovel for that purpose.

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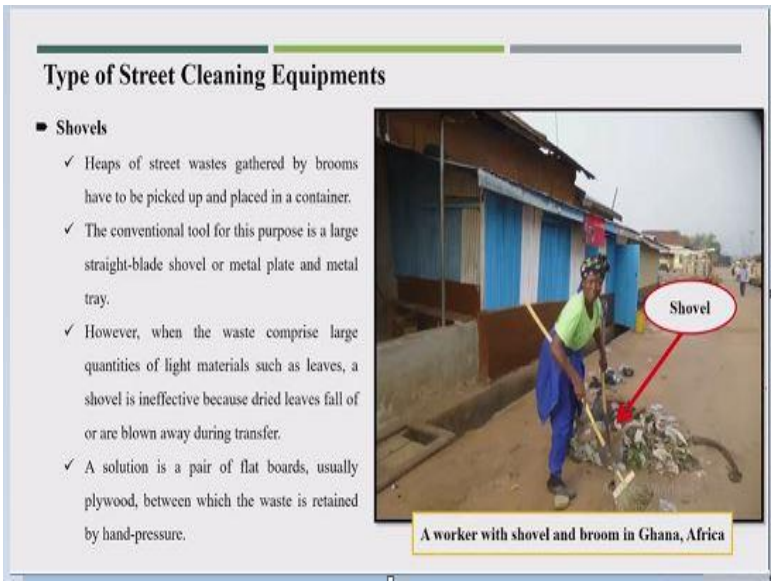

So, you can see it here are these ladies you using the shovel and along with the broom it is a properly designed broom and handcarts.

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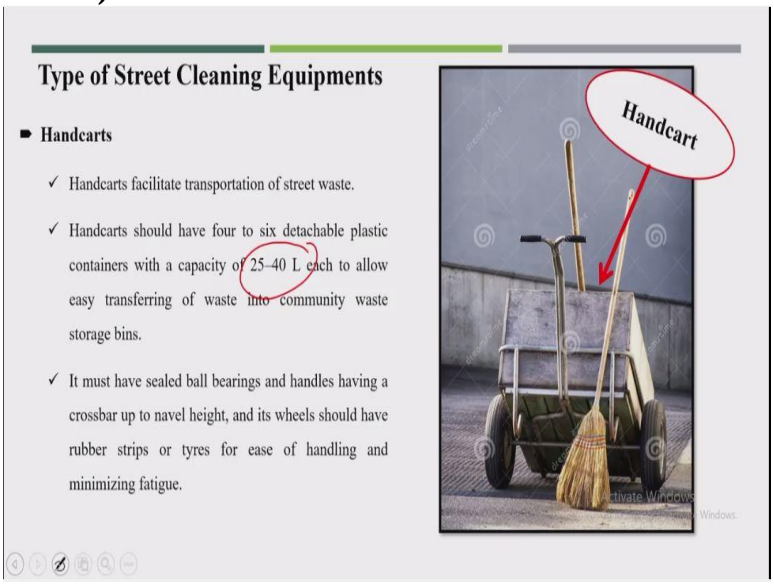

I think this is also very popular in the street scale is street cleaning, waste collection under the size is around 25 to 40 liter. So, that any staff can carry or can transport the waste material.

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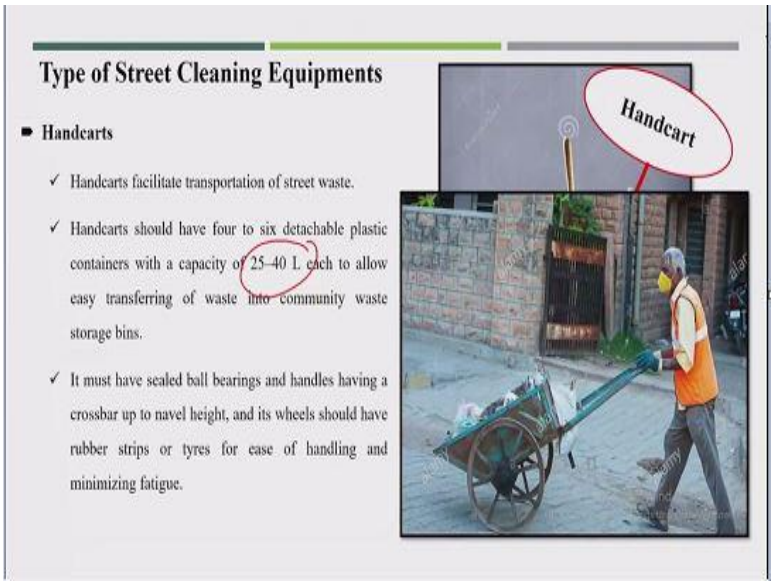

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So, you see here now mechanized streets cleaning like you will be should make a well informed decision while choosing mechanical sweeper should consider the local condition like this is a mechanical broom is provided. But I think the this is these the you will be can should properly define which particular locations they are employing such kind of mechanical sweeper maybe in the tourist spot they can do such kind of things maybe some area is a well designed area where these machines can be work very well.

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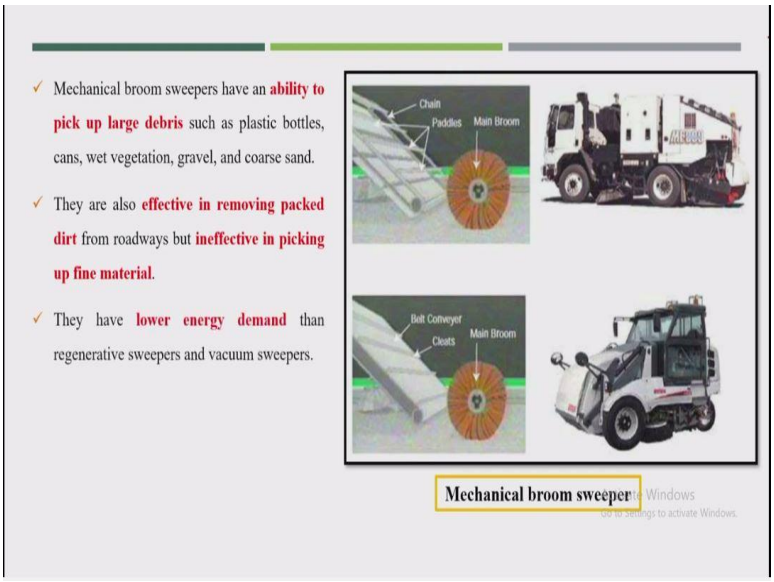

This is another kind of mechanical broom sweeper. So, can also ability to pick up large debris also possible and also they should have lower energy demand.

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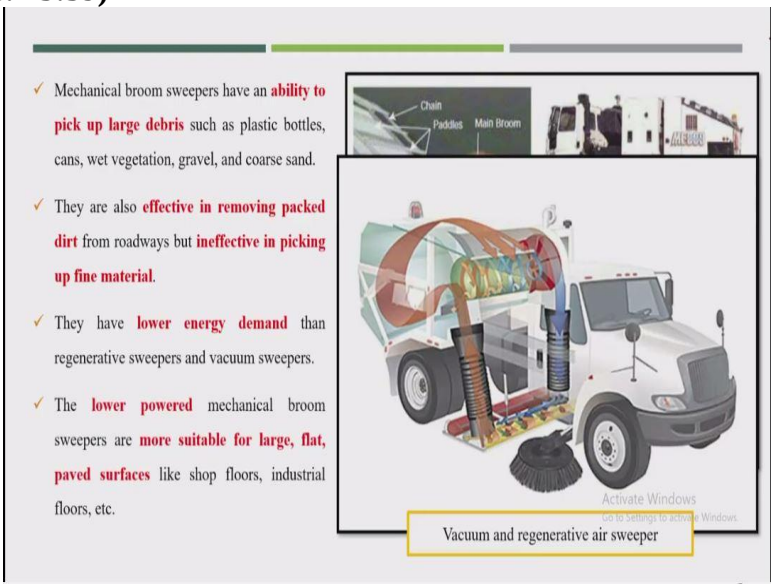

And this vacuum kind of sweeper which means the entire material or entire inner is getting vacuumed into the tank.

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So, this is also regenerating as deeper this also we can use in some of the particular locations.

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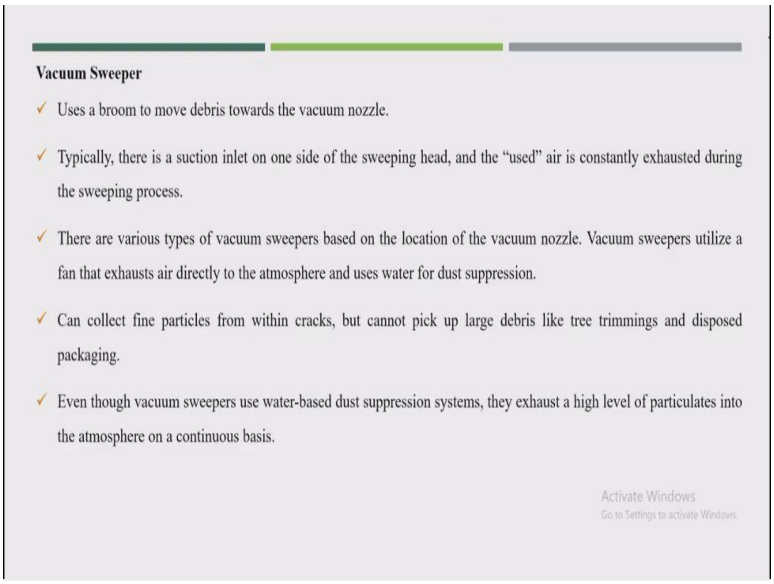

So, like vacuums or sweepers that is also available, which can take up entire inert material and can not only it will clean the area, but also the waste will be collected itself in the vehicle and get it disposed into the particular area.

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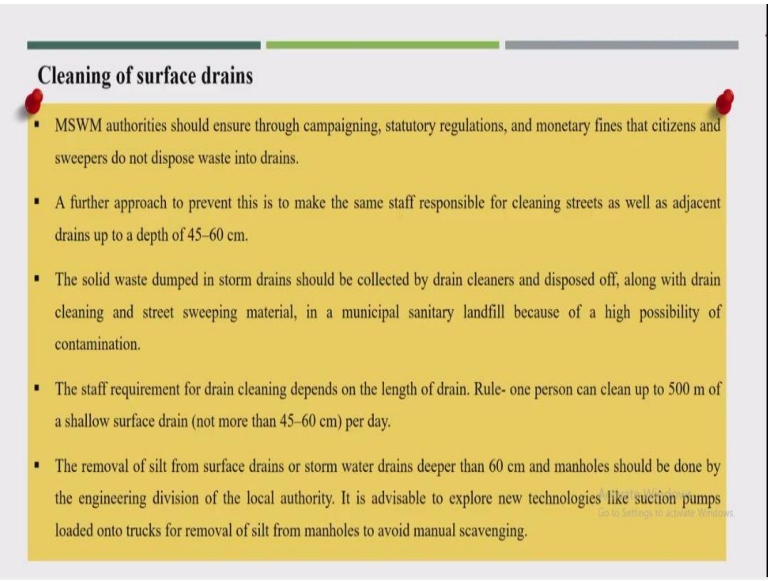

So, this is the vacuum sweeper. Cleaning of surface drains, this is also important activity like should ensure through compelling statutory regulations and monetary fines that citizens and super do not dispose waste into drain I think first thing this has to be follow if anyone you will see that waste is getting deposited into the drain, I think there should be some penalties in such cases that monitoring has to be do further approach to prevent these to make the same staff responsible for cleaning street as well as exhausts.

And drain up to a depth of 45 to say 60 centimeter if somebody is cleaning that particular road. So, in the same the close to that road whatever drains are available, that is also has to be clean it out. And the staff requirement for day trading depend on the length of the drain rule is that one person can clean up up to 500 meter of the of a shallow surface drain not more than 45 to 60 centimeter per day. So, like so.

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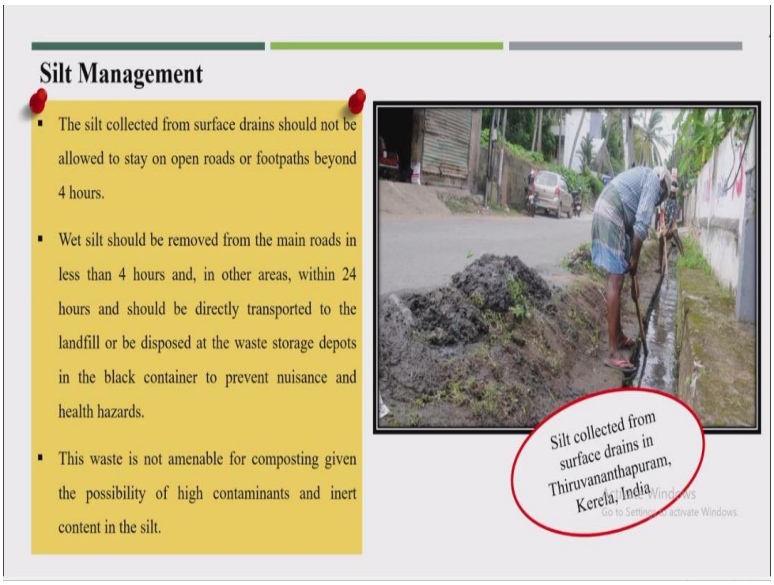

Now, this what this is the one activity you can see silt collected from surface then silt collected from surface then in Kerala you can see the silt collected from the surface and should not be allowed to stay in open roads or footpaths beyond 4 hour. This is important guideline. I think once it is towed onto the road, it should not be stored more than 4 hour and wet silt it should be removed from the main road in less than 4 hours and other areas within 24 hours should be directly transferred to the landfill, proper disposal facility.

And these waste should not be used for or mix into the composting process. This is one very important guideline because many times these kind of material is looking like black and is a fine particles and we can easily mix into the compost and can utilize but is not supposed to be mixed into the compost.

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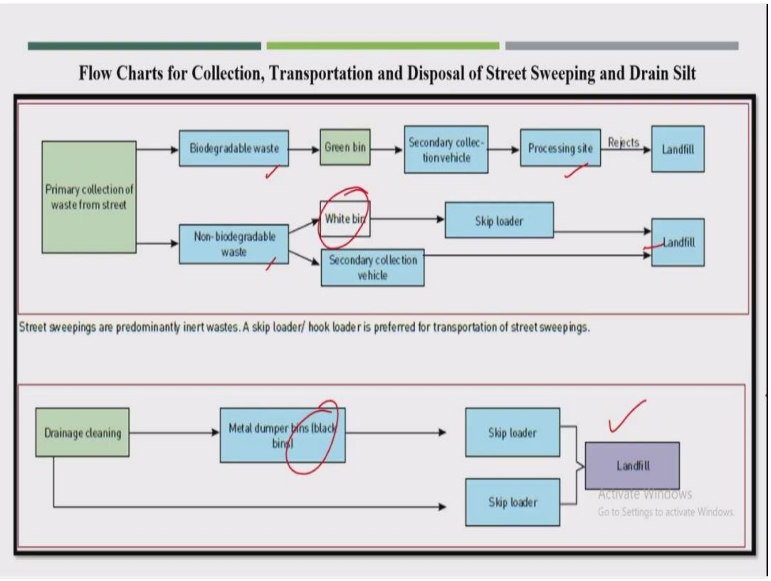

Now this a simple flowchart for the collection transportation and disposal of streets up like the ones who are collecting the primary collection. So could be possible to get some biodegradable matter which will go to the processing site or maybe can add up into the composting facility and non-biodegradable could be properly landfill properly are for filling of low line areas can be utilize under these drainage cleaning now also has to be properly disposed of properly.

So, this will be stored into the black bin and whatever the inert waste will be stored into the white bin, so that you can easily identify what kind of waste are there into the bin. So, in this module, I talked about just a brief introduction about C and D waste, biomedical waste, e-waste, and inert waste also. So although this kind of discussion you can find it in the different courses, like there are special courses for the biomedical waste, e-waste, there are special courses where complete discussion about these kinds of waste.

But it is good to have the basic information about these kinds of waste in the when you talking, talking about MSW municipal waste management. So, thank you.