Course on Integrated Waste Management for a Smart City
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Module 11
Lecture No 55
E-Waste Management

Okay, so welcome back we will start our discussion where we left yesterday. If you remember towards the end we were talking about that we need to recycle this electronic waste rather than sending them into the dumpsite. Right now as I also mention that in Indian context very few of electronic waste that you and I are producing or the institutions are producing the companies are producing are actually ending up with the recognised recycler.

When I say I would rather use the word authorised recycler there are certain authorised recycler as per the e-waste management rule which you we will talk about that. So there is only a little bit of e-waste is reaching them, most of the waste is actually going into the informal sector and which is managed in a very crude manner leading to lot of environmental and human health damages.

So will continue with that discussion, that why the recycling is more should be the way to go forward in terms of electronic waste. And what are the different I will also introduce some of the companies which are out there, what other companies which are out there which are already working in India, but they are struggling based on my personal interaction with most many of them, they are actually struggling to meet to run their plant at the capacity at which they have design, they are not able to get the e-waste.

So that is all that is kind of really we you produce a lot going into informal sector but things are not coming into formal sector and the basic reason for that is informal sectors they are not ready to pay any money for collecting getting the garbage from you. The informal sector is actually ready to pay you few hundred rupees, but if you think about the few hundred rupees what kind of environmental damage it is doing and ultimately we may and up in more cost in more high health cost.

I am not advocating for any particular company here, I am just stating the fact. It is not really possible for a well-established company with a very good technology out there to really start giving money to individual e-waste producers to get the e-waste from them. If some companies tells you that he can do that, he or she is actually basically cheating on us.

It is because it has been possible, why it is not being done in Europe? Why it is not being done in North America? The people there are not is not that they are they do not want money they also would like to have money, but it requires lot of investment setup those plants and maybe later on there could be some cost sharing, but right now with all this capital investment those company needs to survive and they need to start getting those electronic waste.

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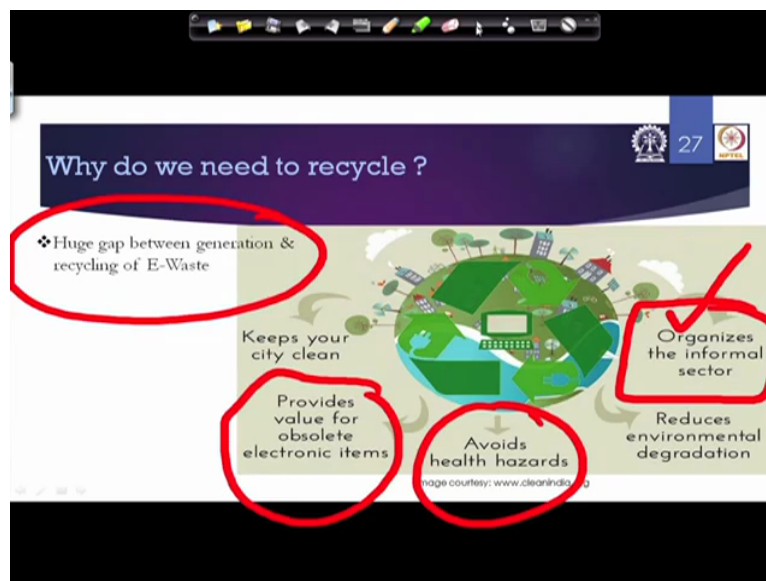
So why do we need to recycle? Huge gap between generation and recycle of e-waste, as you saw in the previous if you remember from the previous video only less than 10 percent actually is getting recycled in India. So that is a that to some more maybe in informal sectors, but there is a huge gap between the generation and recycling of e-waste, so we have a huge gap there.

And we need to organise we need to get these electronic waste start being recycled to avoid the health hazards, to provide values for absolute electronic items, keep your city clean, reduce environmental degradation and one of the things that needs to happen is organise the informal sector. There is lot of informal sectors working in this area, but somehow we need to bring this informal sectors and formal sectors together and to that is how this may we say in terms of electronics waste, if you think about the CPU, what we have? We can it is essentially a either a plastic box if a newer one or if a older one it may be a metal box you need to start with, there are lot of screws.

So in terms of dismantling of this electronic waste that can be done by informal sectors, but the processing of those circuit boards, processing of those where you have lot of hi-tech where it comes in in terms of lot of acids, chemical processing or those kind of processing, that should be left to the formal sectors. And so there is has to be a merger between formal and informal sector, we do not want this informal sector to go away, their livelihood is also needed, but not at the cost of the environment at the cost of their own health.

So it is basically what we need is a merger of informal and formal sectors and at the same time getting them trained under some programs like Skill Indian Mission and all those different missions that we have program. They can do, they can organise the informal sector and bring into the formal sector stream, so that is an even some companies are trying to do that.

In Bombay what is one of the oldest e-waste recycler in India is based out in Mumbai, Eco-Reco. One Mr Jain is heading that company and I had seen in some of the meetings of waste related meetings and he advocates that too that we have to get this informal sectors. And informal sector is very good in collection of e-waste, informal sectors can do the dismantling part, but then it has to come to the formal sector for those, but off course how the economics will works.

So because the money that you can make is actually from those gold and other stuff which is out there. So how the economics will work that has to be some somebody has to be there, maybe government has to make a small body which can bring those bodies together, all these stakeholders together and try to mediate between them to come up with some sort of solution, so that it can you work in that area.

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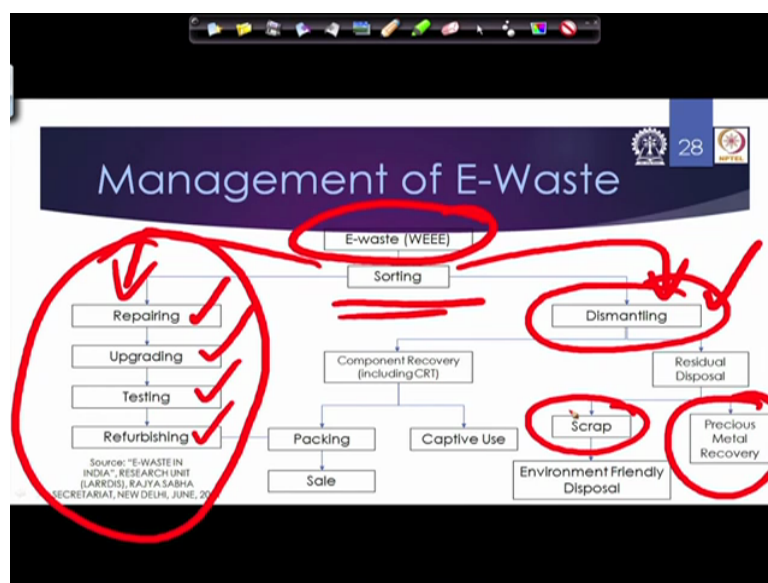
So the management of e-waste that is what I was trying to say this is in terms of e-waste management in terms of recycling. What is really typical way how it is done in developing country or sorry developed countries, you will have the e-waste coming in and then it will get sorted. Sorted if there will be some electronic waste which can potentially be repaired and can be used, can be repaired, can be upgraded, so you tested it and if you think that it can be used, it can be refurbished and things can go back into the market.

Places like OLX, like eBay and there are a lot of sites these days now, where you can refurbish computers. Even on a Amazon and Flip Kart times you see that they say that this is not the brand-new product this is a refurbished product and people are there is a market for that as long as it says it is from a trusted supplier people will buy it. So this is one one-way of going like you can repair rate, test and refurbished.

So if there is one only one item is bad that can be always replaced and things can still start working. But if you have to if it is of no use it has to go into the cannot be used at all then it has to dismantled and this part is this part does not involve that much of chemicals and other stuff there is not much human health and environmental degradation happening with this part.

What is happening problematic is, when we start getting in a residual disposal, we try to have precious metal recovery and that is where all these heavy aquarasia processes are being used by these informal sectors in a very crude way. And then there would be scrapped which just gets dumped on the side of the road or in sometimes in the low-lying area, sometimes very close to river or sometimes close to a pond.

There are instances where people have found that the pH of a water body near that is almost 0, lead concentration is almost several hundred times more than of what should be there in a like a surface water body, so those becomes problematic. And then there is a CRT which used to be big component, gradually our CRT's will go down to stop CRTs is actually we are not using that much CRT still everything is becoming flat panel and even computers, monitors, TVs every CRTs are gradually phasing out, but in the disposals stream you will still see some CRTs showing up.

So if you have the CRTs which you would be packed it can be used for some if it is can be used for captive use, can be packed, sold if it is in a working condition, if not, that glass can be recycled and lead can be recovered from that and those things can be done. So in general this is in a big picture this is how the e-waste managed typically works when we try to keep it outside the landfill, that is the goal here to keep it out of the landfill.

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So let us look at some of these top e-waste management companies in India, just like in case you, so we have E-Parisara which is the India's first e-waste recycler, they claim themselves to be the first e-waste recycler. It is a very pretty big company based out in Bengaluru and then now they have branches in some other places as well. So it is a they try to recycle in eco-friendly way and the objective of the E-Parisara they are trying to like a collect the e-waste and do the recycling in a eco-friendly way.

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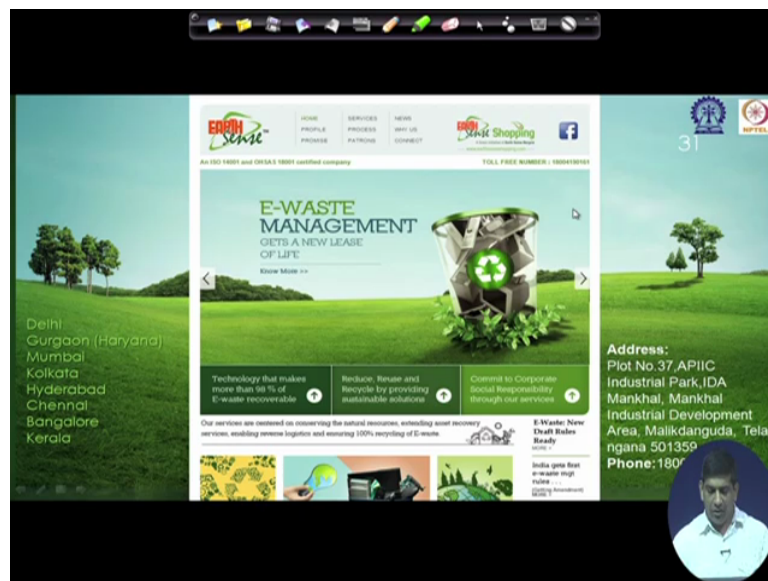
Then you have Earth Sense, which is another company which is based out of it is in a like a in Andhra Pradesh and then you have sorry Telanagana now not in Andhra Pradesh, Telanagana now. And then it has it services in area of Delhi, Gurgaon, Mumbai, Kolkata, Hyderabad, Chennai, Bangalore, Kerala and other places. So that is that is where they are doing their work.

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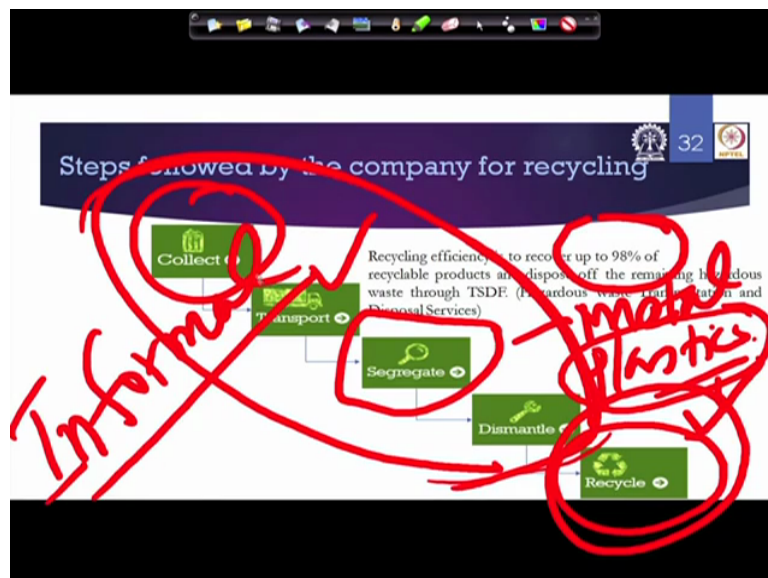
Then what they do actually in terms of steps, they collect the garbage, they transport it, they segregate, dismantle and recycle. So recycling efficiency is the basic they can recover from e-waste, one of the good thing about from the e-waste is almost 98 percent of the things can be recover. So if you just look at any electronics, say if you have a old computer at home, just

take it apart if just take it apart you are if you are an engineer we should be good in that, is not it? You should try to take things apart and try to learn what is what is in there.

So if you take it apart what you will see? If it is an older computer the casing will most likely will be of iron, so you will have the iron there, you will have some plastic wiring, you will have some cables, you may have some like a another mostly plastics then you will have metals. So these are the major components there and then you will have several circuit boards, motherboard and those kind of stuff some.

So those motherboard, circuit boards where you have this printed wiring PWB like printed wiring board they have heavy metals and of these capacitors and other things also have heavy metals. So those other than that aspect which could be maybe around 15-20 percent depending on the model and so other than that 70-80 percent can go just directly into the recycle stream. So if it is a metal it can just go to metal recycling it does not have to go to e-waste recycler.

So once it is dismantle, so once the e-waste is collected from the generation point and then it gets transported to the facility they do the segregation and after the segregation, so like a any metal can go for metal recycler, if there is a plastic it can go to a plastic recycler, the problem with electronic plastic is that, it is always a mixed plastic. It is not PET, HDPE like that it is always blended plastic together so it becomes little bit difficult but still plastic could go to a plastic recycler.

And then the problematic elements are those things which has heavy metals in there and that is where in terms of recycling of those heavy metal components require specialised kind of process and that is where these companies comes in picture where we need to get this done. So up to this point, say up to this point still you can have this informal sector do this work for us.

If government the problem right now is what is happening is although we have the e-waste management rules but is our suppliers sorry our these companies recycling companies are not working at their full capacity, they are not getting the garbage, they are not getting e-waste coming to them. So if we can take this informal sector to do this job, which is they are doing it anyway right now for most of the electronic waste and then get this this area get our authorised recycling company which has like a good technology out there.

If we can use them on this site that it is a win-win for both, but somebody has to make it happen and I think it is only the government organisation there are some sort of semi-government or government, quasi government organisation has to set up which can facilitate that is what that is how they are doing it in other countries, like in Ontario there is a e-waste stewardship program and that is it is a very small organisation, government funded, what the government does? It gets money from all these e-waste sorry electronic producers who sell their product in Ontario.

As I was telling you in the previous video, you have to pay 35 dollars extra for the laptop you buy, 35 is just approximately and depending on what the type of what is the cost of laptop. And that money part of that money go to that e-waste stewardship program that funds that program and there is a few like couple of people who are hired and their job is just to bring these people together all these stakeholders on one table, facilitate this kind of stuff.

And since they are semi-government they have the backing of government, so they can enforced certain things, say if you leave it to the private parties and let them talk to each other, they always will be one person will be looking about their benefits and the other person will be looking at their benefits and it is very difficult, sometimes it may happen but many times getting them together is difficult.

When there is a government oversight, as long as it is an honest ethical oversight it can work and it has been shown to work. Same thing they are doing for EPR concept, even for municipal solid waste say rather than having all these different companies doing their individual collection they put they get the money from all these different producers bring it to one pool of money and then let the person come and say for example Philips or Samsung or Dell, they are good in making the product and selling the product, they are not good in collecting the waste coming out of it.

So there are people who are good in collection of the waste, so let them do their job, rather than forcing Dell, Samsung do, take the money from this Dell, Samsung and Philips set up a body and that body should do the oversight and let the people who are expert, who actually knows the business, who are doing the business mostly in formal sector let them do the collection there is no proper, as one as they do it properly. They have to do it properly to get the money and then get the formal sector also integrated into that.

So that is how things have been done in many other countries and that is the model. If you force each and every reducer to setup their own recycling station sorry setup their own collection points that is so it is very difficult like and the volume is not there for them, it is not profitable for them to do it and then they do not know how to do it. So that is the bottom-line is that they are not expert in that area.

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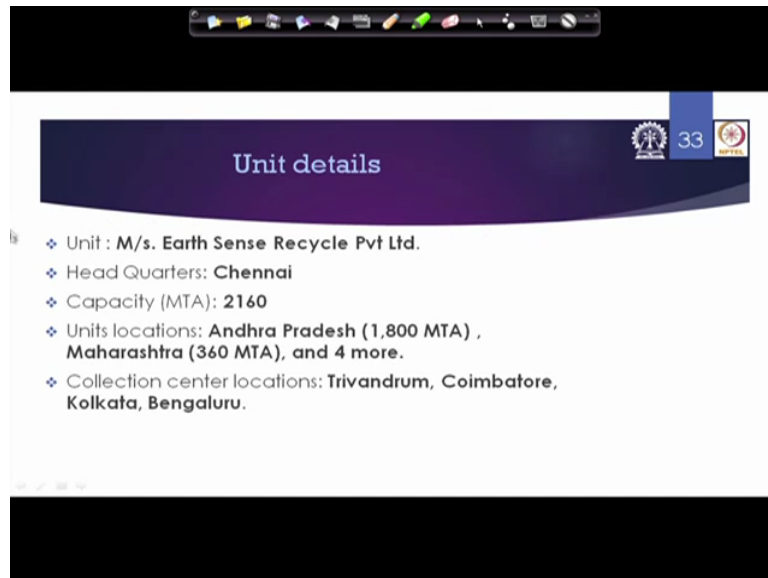
So other so this is some detail of Earth Sense recycle based out head quarter is in Chennai, unit location is in Andhra Pradesh and Maharashtra and they have four more units pretty much collection centres they have Trivandrum, Coimbatore, Kolkata and Bengaluru, so that is where they have their facility.

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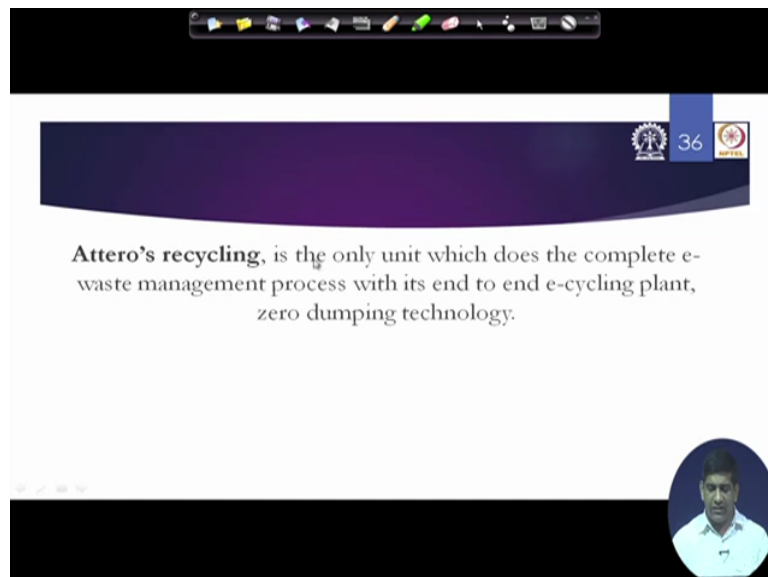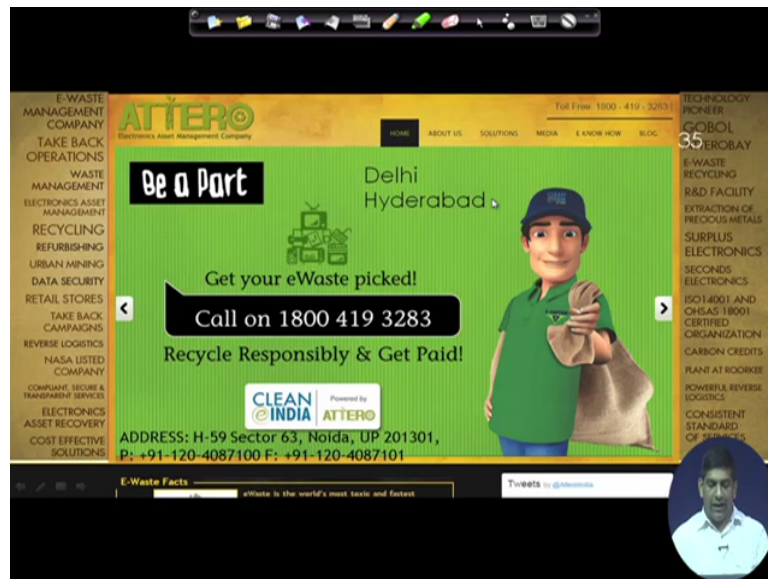
Then SIMS recycling, which is a it is they are trying to do it they have in Karnataka, Tamil Nadu, Uttar Pradesh again that companies is out there which is they are trying to do some work in this area. ATTERO that is another recycling it is in Delhi and Hyderabad. They are doing some they are also doing some work in this area. So again very similar concept, everybody is using a similar concept. Here is the only unit which does complete e-waste management process with end to end recycling plant, zero dumping technology.

Many of the other plants what they do? They do some of these like basic stuff for very something very highly complicated stuff for example like a batteries and those heavy metal recoveries from batteries and other stuff that actually get sense over all the way to Belgium because it is the technology is not out there it is mostly done in Belgium and there is a company called I think Unico which does that in Belgium and our but it is that is in which is

collected in the formal sector. Whatever is collected in the informal sector it just gets somehow recycled in that is actually not recycled they just try to recover some heavy metals to make some money in the process damaged the environment.

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So Attero the way they work they will come to your house and they will collect the e-waste, all electronic from your door doorsteps. It is a NASA recognised technology inventors sorry and they wide range of service a countrywide pickup and they take it to centre for processing, they are recycle it and use it for that.

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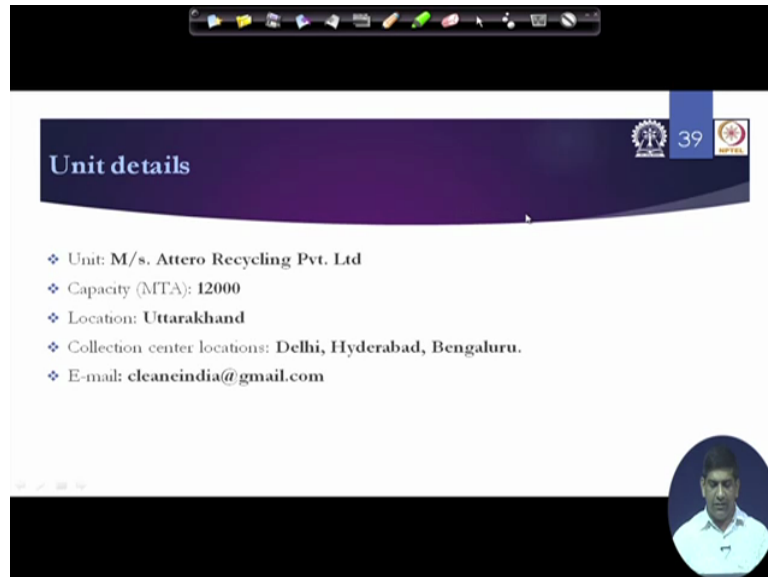
Recycling technology aims to take today's waste into conflict free, sustainable resource for tomorrow. They do mobile phone recycling, display unit recycling, battery recycling, PCB recycling, IT goods recycling and all those things is being done by them, so that is for that.

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So in terms of unit details, Attero recycling capacity is 12000 metric ton, it is in Uttarakhand central location is Delhi, Hyderabad and other places they do that. So other so and then the next is it is a commitment from GREEN EARTH, so that is this particular company they are based out in Bangalore E-waste recyclers India EWRI, which is they do the recycling of e-waste.

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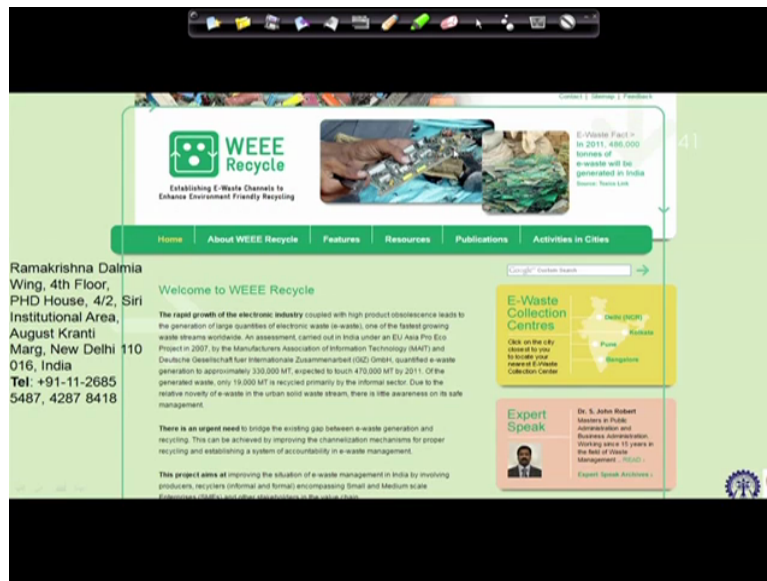
So there are as you can see there are companies out there it is not that companies are not out there in India. WEEE recycle that is another one, again based out in Delhi. So they try to do a collection of e-waste and Green Scape that is again based out in Delhi, so they have heading fulfil social responsibility, so sustainable practice.

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JS pigments which is serves mostly in West Bengal, Orissa, Assam, Madhya Pradesh, so that is their area. They do have an office in Kolkata as well, so that is where they are working in this particular area. Again action plan followed; the collection of disposed zinc, brass, recovery starts with separation of collecting metals. They try to use magnetics, skin-float, hand sorting, Pre-treatment, melting, refining, so JS pigments trying to do it as per this environmental sustainability and all that.

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So this is just to give you some idea about what other different companies out there, so you do not have to know where. So there are just to provide you information, that there are lot of companies out there, so which are trying to do sustainable e-waste recycling in the country. So it is not that things are not there, it is only that there is a gap between this companies are not able to get their e-waste coming to them and it is mostly going into the informal sectors right now. So they their headquarters are there in Kolkata.

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Then Hi-tech Recycling India Private Limited that is another one, so here they do e-waste can be that does the e-waste recycling. Then again removal the covers, removal of of cable assembly, dismantling of rare panels, so what I was trying to explain you earlier there were cable assembly and wiring, dismantling of rare panel, removal of PCBs, dismantling of other components, so that is that is they try to do that and recover different metals different metals and plastics and other things out of that.

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So they have in a Maharashtra in Pune. So if you remember Maharashtra was the highest producer of e-waste in terms of in India, so that you see lot of plants based out and Maharashtra, off course with the market is. So then Earth E-Waste Management Private Limited, that is another company and some of this companies like this I recollected this information few months back almost a year back, I hope all these companies are still working, if they are not working let me know I would like you to go and search and to these companies website and find out if they are still working, because some of those companies were really struggling to survive because they were not able to get enough e-waste coming to them.

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So it is an Earth e-waste management there they again sorting, identifying usefulness. So they every company has the same sort of process, sorting, identify the usefulness if it is good, if it can be used can be refurbished and sold off. Then what are the hazardous components there? You dismantled them, segregate them, whatever is the hazardous stuff you treat it, if you can treat it in your plant, if not you send it to some other plant which can treated and then whatever is cannot in case you are disposing it, disposed in a safe manner you can put it in a safe disposal of electronics component, so that is how they try to do it.

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That based out in Gujarat, collection centre is in Surat, 6000 millions tons per annum. Most of the companies are pretty big, so this is how the different companies which are out there. We will just talk about some of the stuff that is being done in Bangalore which is the IT capital of India. So Bangalore in that this was one study done basically it is a summary of this particular study and they were trying to do e-waste management. Companies are there is in terms of E-Parisara, so they were they looked at one-to-one interview, some did software modelling and they looked at the sourcing, logistics, processing, current handling, status of technology and all that.

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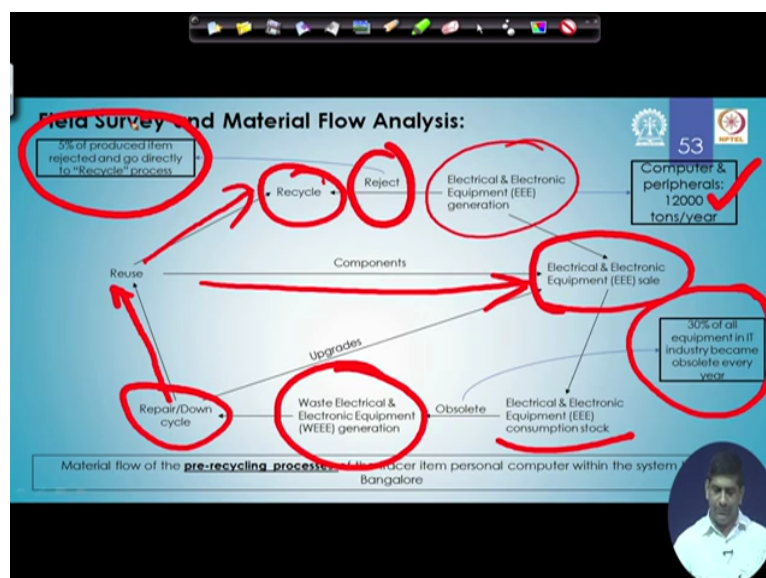
So in terms of the material flow as you can see over here in terms of the e-waste which is there, they were electronics and electronic computer that waste being generated that is getting into around 12000 tons per year and this number is few years old so this must have gone up. So out of these they may be able to sell some stuff which is still working and then that kind of goes back to the consumption stock, if it becomes absolute, it becomes e-waste generation.

Then you have to that any reject can be get recycled from here when you have e-waste you recycle or down cycle repair or down cycle if you cannot repair you have certain components either it can be the whole thing can be reused. If the whole thing cannot be reused, part of the component can be reused that can go back over here and then if you when you try to recycle the component that again goes to the recycling companies.

So this is so they what they have found that 30 percent of all equipment in IT industry becomes absolute every year. So almost one third, one third of the computer that we buy is becomes absolute every year. So it is not that the computer you buy that year it becomes absolute, because it is a computer that was bought maybe few years back.

These days computers does not have a big lifespan because software keep on changing, processor changing, I-5, I-7 different this code that code and so that is leads to a lot of because of the improvement we do have many times we are forced to buy a new computer, new laptop, so that is so that is that is goes into waste stream. One thing is that in terms of computer peripheral which is part of it also gets rejected because of it is a some bad item. So 5 percent of the produced item gets rejected and go directly to the recycling process, so that is also there in terms of the whole recycle what they have seen in Bangalore.

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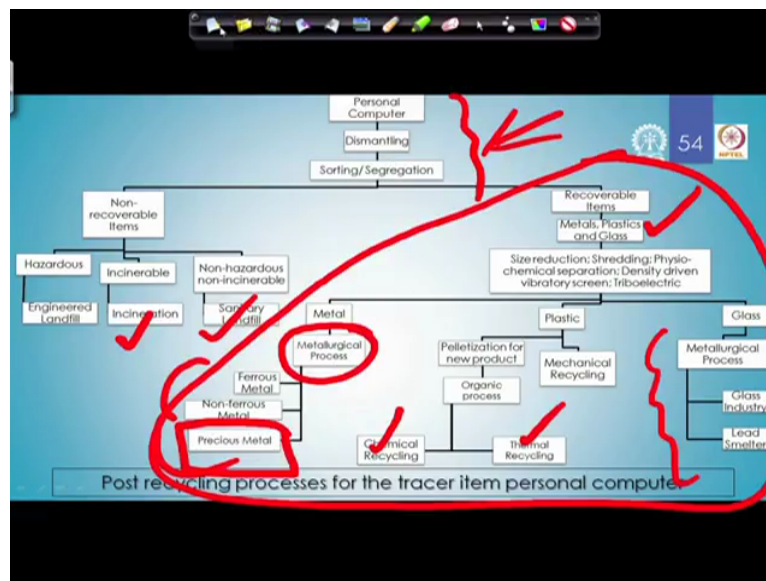
So here how they were trying to do recycling in E-Parisara or the recycling places, personal computers dismantle, sorting, segregation then here non-recoverable items, non-recoverable items. So you basically when you do the sorting, segregation, non-recoverable items, what they are? They are some hazardous component those hazardous components needs to go to a engineered landfill, hazardous landfill. If there is something incinerable, they can be incinerated, non-hazardous, non-incinerable can go to a sanitary landfill which is the municipal solid waste.

And recoverable metal, plastic and glass and this is actually a very good chunk, metal, plastic and glass, how you recover that? You do size reduction, you shred it, you do some physical chemical separation, density driven vibratory screen, turboelectric separation, so all those different type of things can be done.

Then plastic, it can be palletised for new product where there could be mechanical recycling, there could be palletisation, organic process, chemical recycling, thermal recycling those things are there. For glass there are metallurgical processes in terms of glass industry. Lead, most of this glass also has lot of lead, so lead smelters can be used. For metals there are metallurgical processes which are used, ferrous metal, nonferrous metals, precious metal, this is the most critical part actually where those things also used.

So this is how the post recycling process works for a different item in personal computers. So here again if you look at upto like dismantling part, upto this part whether things can be done at the informal sectors level, but when it comes to this part, it is better to be done in a formal

environment where you have some sort of environmental control and not only from a not from environmental and human health implication of the people who are of the population but also for the workers were working in these areas.

Then one of the thing for the informal sector is also those workers, many of those workers actually do not they do not survive they are post 30's maybe early 40's they just because of all there fumes and other things that they inhale they get all sorts of disease and they die very young, which is very sad. So but that happens to those informal sector people who are working for electronic waste and any other hazardous kind of work any hazardous waste

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So e-waste is separated into 4 major categories where computer and computer peripherals, PCB's which is printed circuit boards and electronic components, electrical wires and all other electronic components. So here main stakeholder, off course the government Karnataka state pollution control board, Bruhat Bengaluru Mahanagar Palika, Department of information technology. The generators which is mainly producers and consumers recyclers both formal and informal recyclers, so these are all these are 3 major stakeholders of the process which needs to get involved.

So material recovery it is in terms of if you look at the electronic waste typically you will have around 20 in a typically e-waste. This is again few years back, so these numbers will keep on changing these numbers are not these numbers have been dynamic so they do keep on changing. So here you can see that glass is around 20 percent, plastic 35 percent, metal 57 percent.

If you look at the today's electronics you will probably have more metal sorry less metal especially the ferrous metal this metals will go down and the others will the plastic will go up, the glass probably may stay almost the same, but the plastic we are using more and more plastic now and less and less metal, especially for casing and all those kind of stuff.

Printed circuit board is 4 percent, cables is 5, ferrous metal is 20, so nonferrous metal is 28. So if you look at the most dangerous part is actually PCB, so in terms of recycling process. So this 4 percent is what is causing most of the image and this 4 percent what has not all those costly material out there. So that is in terms of where the focus is in trying to recover making some money.

So using 1 ton computer waste 99 percent is used for from one ton computer waste 99 percent is used for precious metal recovery and other 1 percent is for landfill. So it is a they are precious metal recovery is being done, but it is mostly done in a informal sectors. So that is and so there are some pre-processing, current recycling operations only limited to pre-processing. Only technology being used to **(())(28:34)** Bangalore is shredding and

pulverising, so they are shredding and pulverising and then they do some Pyro metallurgical and hydro metallurgical process.

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It is for hydro-metallurgical process they do cyanide leaching, they do halide leaching, thiourea, thiosulphate leaching of precious metal, so they are it is a process they used a combination of manual and mechanical process where manual process forms a large part, still it is a lot of manual process involved in these facilities.

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So as I will close with this particular slide and you can look at this video I am not going to play this video over here, but I will encourage you to leave this particular video. There is the

Digital India campaign, there is an e-waste management initiative there as well from the government of India. So new rules have also come up the rules have been modified little bit, little bit more easy to understand, now easy to follow I we will talk about that in maybe in the video after this or the week maybe video 2 video from now.

And so but there is Digital India initiative, if you go to the website you can find there is this video the screen that you are seeing it over here you will find a very similar screen and you can play this video and you can look at details of the Digital India initiative which one of the component of Digital India initiative is also focused on how to have a proper e-waste management.

So that is what like a let us kind of wait let us kind of stop here and then we will continue our discussion in the next module, where I will talk about some of just show you some list of different recyclers and then we will go into some more details in terms of rules and other stuff. So again keep this is we are almost towards the end of now eleventh week, so 1 more week left after this.

So I will encourage you to answer those questions, do the quiz, ask questions on the question board and as at the beginning of this week we also put a question here asking you very similar what you did for the municipal solid waste earlier in terms of the e-waste management, how e-waste is managed in your area?

It would be really nice to get your feedback, it is so it is a help like a request for help, it is my personal request to all of you that please do that survey, it is only it will only take you not less than 5 to 10 minutes and then we can share that information with all of the people who are registered for this course. It would be really nice to see how the e-waste thing is happening in the country, it would be a good information for all of us, so thank you and you again in the next video.