Environmental Remediation of Contaminated Sites
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Lecture – 10
Hazardous Rules and Regulations

Hello everyone, so welcome back to the latest lecture session, so today we are going to discuss the relevant aspects let us say or the relevant laws, let us say that you know cover some of the aspects that we discussed in class let us say, right or those we are going to discuss in class, right. So, typically in this class we are looking at hazardous waste right, so obviously we are looking at aspects relevant to hazardous waste.

There other laws out there but again, we did look at the relevant document let us say that was published in The Gazette of India let us say, regarding this particular set of rules and we looked at that in some detail but you know we are still missing the bigger picture or the overview that is what we are going to do today let us say, right.

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So, let us go forth, so let us look at some of the waste management rules that you know were promulgated or passed recently let us say, right, let us look at what we have right, we have the plastic waste management rules 2016 and I believe again in 2018, right they again amended that and again thus I mentioned and 2018 and e-waste and 2016 again, so biomedical waste, 2016 construction and demolition waste, 2016.

Earlier you know this set of rules was a part of solid waste management but now due to the booming construction industry and the relevant what do we say, issues associated with it let us say right, you know the people went ahead and you know classified them as in the rules relevant to the construction demolition waste let us say, separately let us say, right, so thus we have this particular set of rules, right.

And obviously, we are looking at hazardous and other ways primarily, we are concerned with management and trans boundary movement, the rules of 2016, so this is what we are typically concerned with throughout the course let us say, right but we are just going to have you know we need some background obviously about what are the some of the other courses, not courses pardon me; some of the other rules that are relevant here let us say, right.

And obviously you are going to have the solid waste management rules now, right obviously, we have other aspects let us say with respect to water, wastewater and also air pollution but we will touch upon them or you know talk about them very briefly here, right because again we are primarily concerned with only the hazardous waste for this particular class let us say but obviously, as you can see there are other rules that deal with let us say biomedical waste that is greatly relevant in Indian context.

Typically, most of biomedical waste they just incinerate them let us say, right because of relevant issues, e-waste management I believe we looked at a particular example, let us say in this particular context relevant to Moradabad let us say, right but again you know we know that you know the relevant issues are what we say they overlap here, let us say right for example, by dumping electronic waste at a particular site let us say, right you end up creating a particular contaminated site where let us say the hazardous and other waste rules come into picture.

Why is that; now you have soil and groundwater that is contaminated and which with heavy metals and which set of rules you know govern the particular relevant aspects obviously, the hazardous and other waste let us say, right but again keep in mind that e-waste management though as I said separate set of rules for it or has separate set of rules for it, right, so these are the some of the waste management rules, right.

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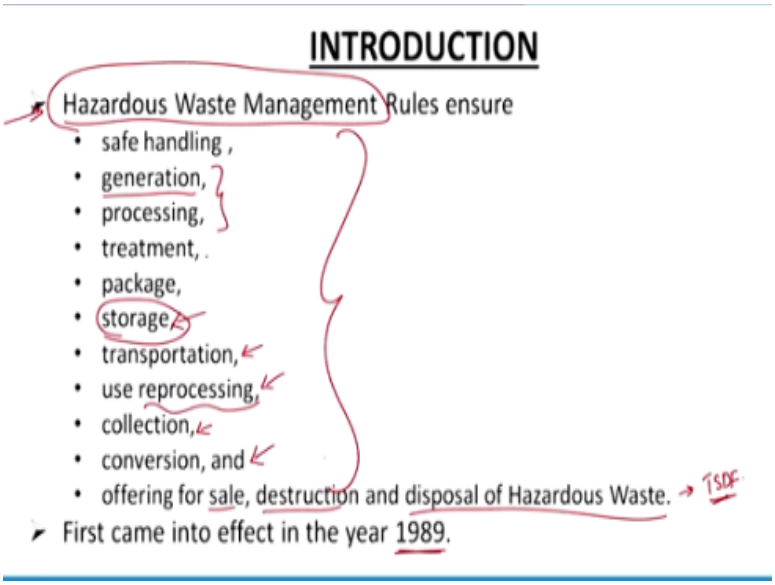

So, let us move on, so some of the relevant aspects here obviously, they ensure that you know hazardous waste management rules let us say, right again, it was I think you know initially it came about in 1999, if I am not wrong and then various amendments from time to time, right so what are some of the relevant factors that push for these amendments let us say, right. Obviously, you know we are now you know moving from an agricultural economy to a more initialized or industrial economy, right.

So, there are different or new sets of challenges obviously to be able to address these challenges we need new guidelines and rules you know, obviously that is one particular factor other than that you have these UN conventions let us say, right that most of the relevant countries are signatories too, right, again they set the standards let us say for you know other countries to follow if I may can say so.

So, some countries are obviously head of those standards and some countries depending on their economies let us say, right or behind those standards but they set more or less a particular threshold not threshold if I may say so, right again they said the standards that other people strive towards, right so, these are some of the aspects that are relevant and obviously, you have the relevant nongovernmental organizations or public. Let us say that you know point out loopholes in the previous set of rules and such.

And typically, they are tried to address or their address let us say in the next set of rules now right, so again what are we typically looking for here; we are not looking at one or two aspects but we are looking at management here, right, so that encompasses the complete cycle now,

right so, it might include let us say the aspects relevant to the person handling or working with those wastes let us say, right.

So, some of these wastes let us say or heavy metals let us say, let us take an example, let us say are used in different manufacturing processes, so obviously even these aspects are processed or those workers involved in the production of relevant products let us say that use these kinds of waste that are classified; these kinds of products that can be classified as hazardous let us say you know, fall within the ambit of these rules as in their health, their safety and so on obviously comes into the picture, right.

So, then you know you have either you can go for recycling, you can go for co- processing or you can again have the ultimate what do we say aspect which is disposal now, right obviously with respect to disposal let us say or improper disposal, you are going to have to know look at remediation and that is where I guess people like us come into the picture now, right. So, again let us go forth and look at what are some of the aspects that hazardous waste management rules of 2016 plan to look at.

Obviously, safe handling right, generation so, during different process let us say or you know manufacturing or industrial process or such chemical process, you can end up have generating some of these wastes that are all products or compounds or chemicals that are classified as hazardous waste, right that is what we are talking about here. So, processing let us say right again, you know we discussed this briefly.

So, they can be used in processing let us say or processing or during different process, they can what do we say, the some of the by-products right, so that is something we have out here, so both of them there is some overlap obviously, so treatment let us say right, even treatment of the relevant waste, so packaging let us say, storage is a huge issue at least in the Indian context as in that let us say the industries let us say though have or generate some waste let us say you know during their process or daily operations let us say, right.

So after that obviously, you know they cannot dispose or everyone cannot dispose the relevant hazardous waste on-site let us say, right so what do they plan to do or what can they do; so as we might have briefly discussed, do they need to send it to a hazardous waste landfill which in

India we refer to as a TSDF or treatment storage and disposal facility typically, you have 1 or at maximum 2 per state, there can be more.

But typically that is what we have until now that is what I observed until now, right so they transport these wastes to the TSDF, let us say, so again they cannot do this every day, so they typically store it for a period of 3 months, let us say before it is transport or such, again such storage and such you know again if they are stored improperly let us say again leaching and contamination of the groundwater soil and such can occur.

And these are some of the relevant aspects or examples let us say right, so obviously as I mentioned storage and then transportation let us say to the different sites let us say or for processing or such right, so use reprocessing let us say, reprocessing; that is the key aspect here so, collection of the waste, right obviously, people coming in and collecting the waste and such that is something to keep in mind.

So, conversion from one form to the other either from non-toxic to toxic or typically toxic to non-toxic after co-processing and such, right or you can offering for sale, destruction and disposal of hazardous waste typically that is the job of the TSDF operator typically let u say, right and as I mentioned typically; not typically they came into the effect in the year 1989, right.

Again, here as you can see they are now trying to look at all the relevant aspects let us say, right as in people exposed to it or as in what do we say the people that are working and collection let us say, transportation let us say, right or even the generation of waste and such, so more or less they are trying to you know cover the entire lifecycle of this particular hazardous waste as in we are not just looking at disposal but all the relevant aspects let us say, right, again that is what they want to ensure rather, right.

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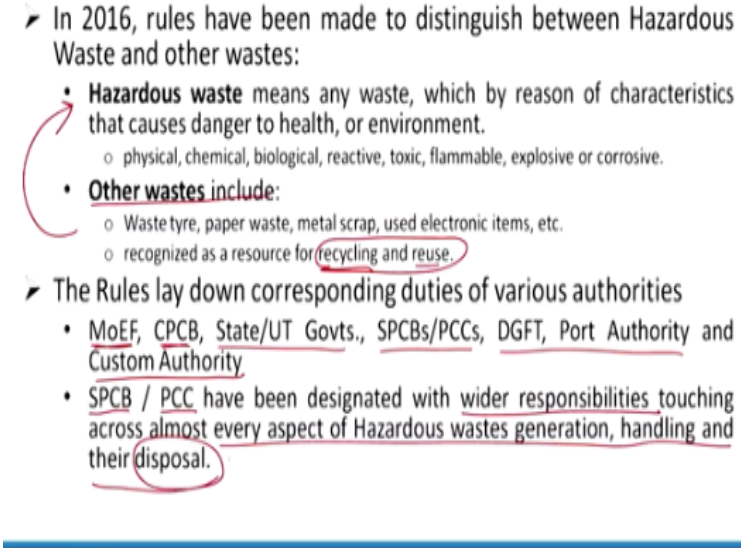

So, let us move on, so in 2016 you know to distinguish between hazardous and other ways that is one of the key aspects that this the rules published in 2016 let us say are looking at or have looked at so, hazardous waste as we looked at let us say I think, you know in the document we looked at different cases with respect to toxicity, right and flammability, corrosivity and so on and so forth.

So, we have different characteristics by based upon which we can characterise the particular waste as hazardous waste, I think we have physical characteristics, chemical, biological, reactivity, toxicity, flammability, explosivity and corrosivity, right and there were different details about how to measure let us say for a particular compound can be determined to be explosive or such let us say obviously, there are you know relevant procedures laid out there right.

But in this particular new set of rules, 2016 rules, what is the one unique aspect I guess compared the other rules, it is that other waste let us say, right so, waste such as tyres, paper, metal scrap and only a few not all obviously, very few used electronic items now, right come under the ambit of these particular rules, earlier let us say waste tyres, paper waste let us say and metal scrap as you know they are pretty relevant to the Indian context.

But earlier you know not as much emphasis on them let us say but now, they you know or you know under the ambit of this particular set of rules let us say right, so now you know the relevant effects are going to be felt by the relevant operators or generators of these particular

what we say, kinds of ways let us say right, obviously they are not under hazardous waste but under the other waste let us say, right.

So, again they are recognized as resource for recycling and reuse, right so without proper recycling and reuse, some of these other waste after disposal can end up as hazardous waste let us say, right so obviously, the emphasis here is on recycle and reuse now, right so, let us move on. So, one other aspect is that you know they have trying to they as in the relevant people or the MOEF here, let us say by passing these set of rules let us say, while bringing in other kinds of waste into within its ambit.

Is also looking at you know, streamlining the relevant process let us say and also bringing in more stakeholders let us say, earlier I believe it was mostly the CPCB, now even the state institutions and such some of the relevant bodies such as SPCB let us say or State Pollution Control Board or PCC and so on are now or share some other of these duties let us say, right, so that is one particular aspect, right.

As an earlier primarily CPCB now, you know different roles for Ministry of Environment and Forests, CPCB, the relevant governments let us say SPCB, right, port authorities even the Custom Authority which looks at import and export let us say, right and these aspects you know, so again it is relatively more clearer let us say, so thus let us say typically, many people might have experienced red tape or you know issues with respect to bureaucracy, right.

Again, there are particular reasons why you know such issues exist and one of the reasons is that you know some of the laws are unclear let us say or they is a considerable overlap between one over the other or such or there are loopholes let us say, alright, so this time they try to plug in some of those loopholes let us say, right. So, let us move further, so the State Pollution Control Board or Pollution Control Committee have been designated with wider responsibilities let us say, right.

And almost every aspect of hazardous waste generation handling and more importantly obviously, their disposal let us say, right so, you know it is more or less delegating the relevant tasks, right and now SPCB has a considerable role to play, right but again you know for the relevant authorities or the people to imbibe the spirit and also you know either in letter or in practice let us say, right you know and get things rolling that will take a few years.

But again, you know the push needs to be there and the push is from these particular set of rules let us say, right, so let us move further.

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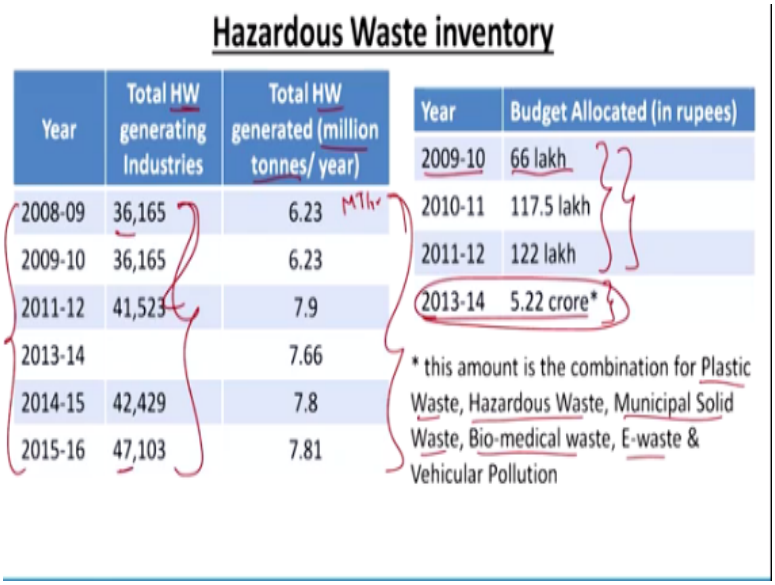

So, hazardous waste inventory; let us just look at a snapshot of what we have, so we have it from the years to 2000 and 2016 and this data I believe is from CPCB, so number of hazardous waste generating industries as you see there is a steady increase, right, 36,000 to 47,000, the considerable increase if I may say so, right hazardous waste generated in million tons, right million tons per year.

So, again even that is you know increasing let us say, more than 10% increase out here, right and that is what you see out here or even 20% if I may say so, right again, as you see you know we are you know at either more industries are now what do we say within the ambit or you know we obviously have more industrialized society let us say or economy and thus you see you are going to observe such changes.

And obviously, you know in the relevant rules need to be able to stay ahead of the game, right so, let us look at one other aspect as in just framing laws is not good enough obviously, you need to be able to allocate resources and in a country like India let us say, this is one of the issues that we face let us say right, obviously we do not have enough resources for either enforcement let us say or even monitoring or such or even for basic data collection let us say, right.

Obviously, you know we are more or less you know in the nation stages of our particular growth, so it does take time but let us understand the picture, so for example in 2009 to 10, you know it was just 66 lakhs let us say, right keep that in mind let us say and why is that because let us say if a site is contaminated takes maybe a few crores of rupees let us say to be able to really you know remediate that right really remediate as in bring it back to more or less near its pristine state let us say, right.

You will never get it back to you know, the original condition or priory spill condition but again considerable amount of money, resources and such is required, so typically the emphasis should be on prevention and that something you know they are trying to do while passing these rules, we look at that later but as you can see you know, if you look at the amount or resources that were put in you know they were not as much.

So, in 2013, 14 you see that you know there is considerable increase but that is because you know this 5.2 crores let us say is for looking at let us say the plastic waste, hazardous waste, municipal waste, biomedical waste and e-waste and so on and so forth, let us say right, it is not only for they has a relevant to the hazardous waste and such management let us say, right. These figures are for hazardous waste and relevant management let us say.

But this figure where it is slightly higher let us for what do we say obviously, all these other kinds of waste that we just discuss now and I believe this data is from CPCB now, right, so that is something to keep in mind, so let us move on. So, what are obviously the some of the applications now? Right, again there are many aspects that are relevant here but you know before framing or coming up with amendments you know, the relevant policymakers have some key aspects in mind let us say, right.

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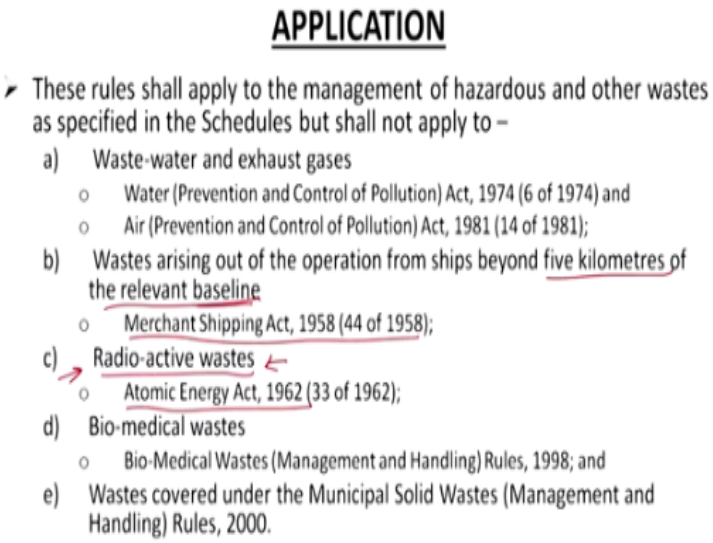

And they did spell them out, let us say through various press bulletins or releases, let us look at what they are or I guess obviously, before I; we go further we need to look at those what we say waste or such that are not under the ambit of this particular hazardous waste and other waste, as in we did look at some of the other kinds of rules but there are some general kinds let us say as in wastewater and exhaust gases.

They come under water pollution, Prevention and Control of Pollution Act of 1974 and there for the amendments for that air pollution, again 1981, the relevant act right and waste arising out of the operation of ships beyond 5 kilometers of the relevant baseline as and there is a way that they define the shore line based on the relevant tide level I believe, right and so from that particular baseline 5 kilometers beyond that obviously, let us say there are different rules and what are they that they are covered by the merchant shipping act, right.

Radioactive wastes again keep that in mind that they are not under hazardous waste but we have a separate act that looks at the radioactive waste let us say, right, so that is something to keep in mind and many hospitals, labs and so on have what do we say, constable amounts of radioactive waste let us say, right. Why is that; obviously, you know many of these analytical pieces of equipment or even a critical medical care equipment have what do we say, a radioactive material in them.

So, you know either their handling or their disposal is a critical aspect maybe not as much attention is paid in that regard, we stop piling them and may be a relatively you know, foolhardy manner if I may say so, right again that is one aspect to look at let us say. What again

that is something to keep in mind that radioactive wastes do not fall under the category of hazardous waste.

Obviously, biomedical waste right again, you know they did not fall under the category of hazardous waste, this is something we looked at and other ways such as municipal solid waste again you know they are not classified under hazardous waste, they are different sets of rules again, for hazardous waste as in typically let us say you conduct the TCLP test, look at the thresholds for different contaminants that are listed in different annexures of this particular hazardous waste rules.

And then you go about looking at let us say or trying to characterize a particular waste as either a hazardous waste or non-hazardous waste which would then fall under the ambit of these municipal solid waste let us say, right.

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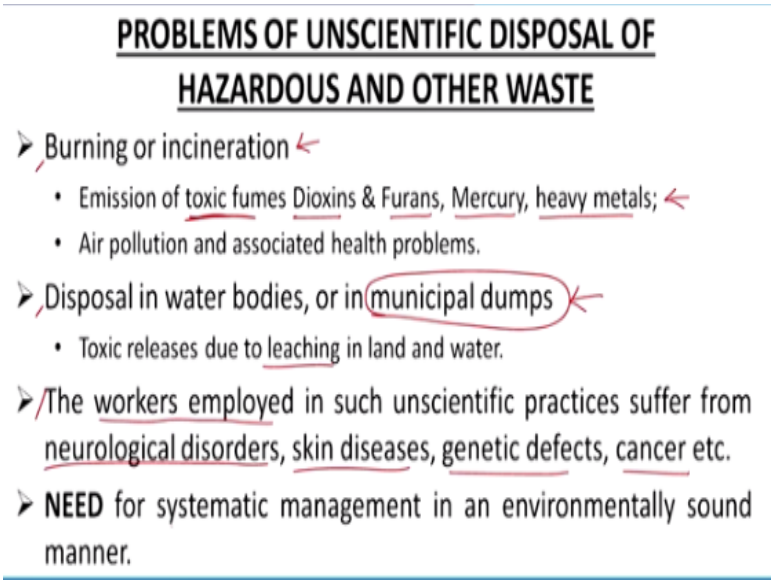

So, let us move on so, as we were discussing earlier we know, what were some of the key aspects that the policymakers who are trying to consider or look at let us say and trying to address these aspects or come up with these sets of rules now, right. So, burning or incineration which is followed widely in the Indian context let us say, right and again emission of very toxic these dioxins and furans are remarkably toxic compounds let us say, right remarkably toxic right.

And you know, obviously mercury and some other heavy metals, so looks like these were you know and what do we say, at the top of their mind let us say or priority, so air pollution and

associated health problems from burning and incineration, so disposal in water bodies or in municipal dumps as in hazardous waste is dumped in municipal dumps again, this is a dump not a landfill right.

So, you do not have an impermeable layer beneath that will stop or you know inhibit the leachate that is generated from this municipal waste, right or the transfer or it will not inhibit the transport of this leachate let us say, right that is going to be generated from this decomposing municipal solid waste which might also have or which typically has different kinds of hazardous wastes in the Indian context let us say, right.

So, obviously that is something that they wanted to look at or address, right and from that obviously we have toxic releases due to leaching into land and groundwater and more importantly, they were also concerned with the workers employed in unscientific practices let us say of either handling or disposal let us say suffer from neurological diseases, skin diseases, genetic defects, cancer and so on let us say, right.

So, 3 or 4 major aspects I believe right, so thus what were they trying to look at it is that the management needs to be systematic as in the entire lifecycle of a particular set of or you know or the relevant hazardous waste needs to be looked into and we need to take a holistic approach right that is what we need to look at or they need to or want it to look at and that is what they have been trying to incorporate let us say, right.

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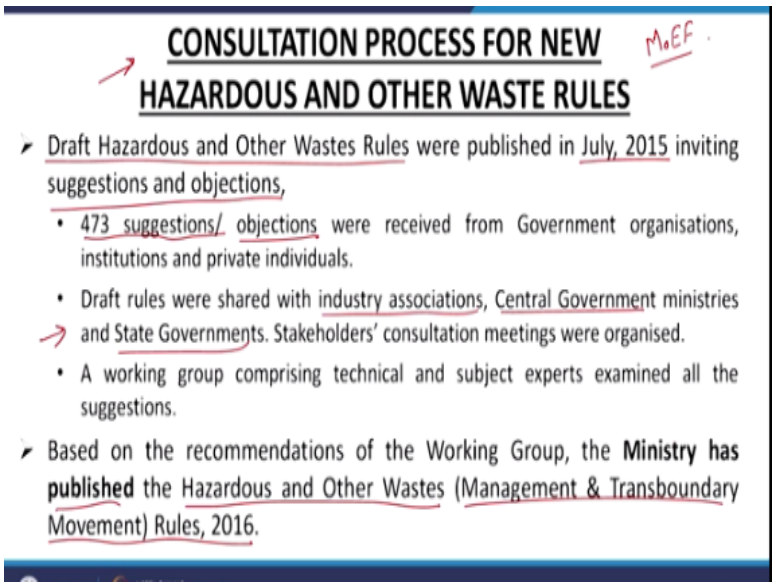

So, again how are these rules brought about let us say, you know typically we have the MOEF that publishes them and the Gazette of India I think that is something that we have seen let us say, right but how does that come about now, right so, first the draft hazardous and other waste rules were published in July 2015 and then suggestions or objections were invited and then let us say the draft rules were also shared with obviously, industry associations, central government ministries and state governments let us say.

I mean the relevant aspects here are twofold, suggestions to maybe improve the law better or you know to make it better and more often they are not also to see to it that the relevant law is not too ambitious as in considering the state of the Indian industry, the relevant options available to treat particular kinds of what do we say, ways or meet the relevant objectives as an if our capacity is only at this level, we do not set the standards at out there that we set it somewhere out there let us say right.

Let us say graduals or step by step process, right so that is something that also is taken into account as in you do not set over ambitious targets that cannot typically be met considering the practical or ground realities, right so that is again something that comes out in such cases again, so looks like 473 or so suggestions and objections were received from various such institutions that we discussed about.

And working group comprising you know technical and subject experts let us say, consider them and then the relevant rules, what are they; hazardous and other waste and now they also added this management and trans boundary movement rules of 2016 were published by the MOEF, let us say, right, so that is what we have out here, so let us move on.

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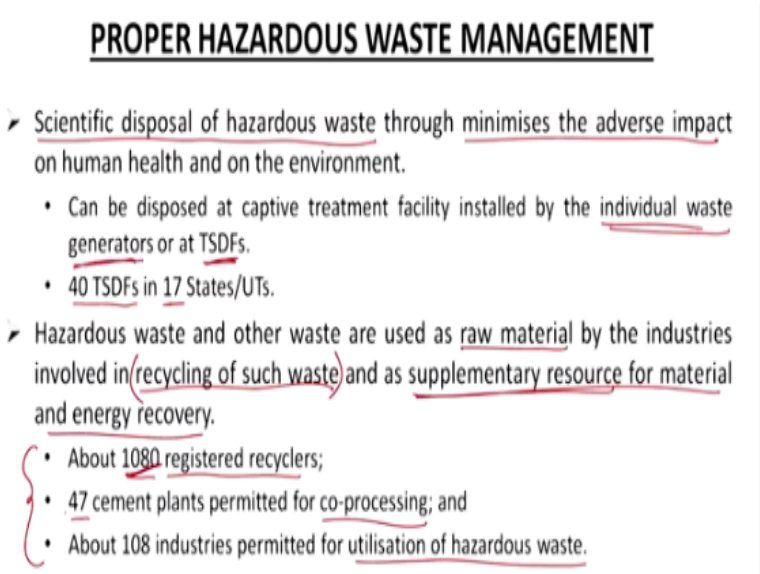

So, proper hazardous waste management let us say right, so obviously unscientific disposal let us say has considerable issues, right so they want to look at primarily the scientific disposal of hazardous waste let us say and obviously, now as we talked about previously and also we are going to do so throughout this course, once you have a release of a toxic compound onto the land or water ground or surface water let us say, it is remarkably difficult to remediate site.

So, the key aspect is that you want to minimize the adverse impact let us say right, so typically prevention is obviously better, so they are looking at let us say disposal at captive treatment facility at different TSDF's or at the generators of the waste itself as in you can have one TSDF operator per state or 2 in general or at maximum or the industries also can apply for relevant permissions and you know, set up the relevant infrastructure such that the hazardous waste can be stored there.

But typically that is not done, right again there are different issues because it might not be uneconomical and also different kinds of what do we say, people or experts are required again that is not feasible in the long term for most industries to have individual waste or you know to have individual treatment facilities let us say, right. Again, so what do we have currently; we have 40 TSDFs in 70 states, so you get the picture, right.

So, hazardous waste in other ways are can be used or used as raw material by industries involved in the recycle of such ways or as supplementary resource for material and energy recovery, so now one of the aspects that you know this particular set of rules pushes for is that

you know, they are laying a great emphasis on recycling of waste and also using it as a supplementary resource let us say, right, so that is something to keep in mind.

So, there are again only registered recyclers can get that and not many as you can see, right so if you want to you know give out or sell your particular waste that classified as hazardous waste to for recycle let us say, only these authorized recyclers obviously can handle those relevant wastes let us say, right. Again, one example is that for cement plants are permitted for co-processing for certain kinds of waste let us say, right.

And again 108 industries permitted for utilization of hazardous waste let us say, neither energy recovery or co-processing or such let us say, right, again as you see when you look at the numbers, it is not a lot but obviously, you know now that the relevant standards have been set, there is going to be a push towards let us say this particular aspect of recycle of hazardous waste, co-processing or such let us say, right, so let us move on.

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SALIENT FEATURES OF 2016 RULES

1. The **extent of the Rules has been expanded** by including 'Other Waste'.
2. **Waste Management hierarchy** has been incorporated.
3. All the forms under the rules for permission, import/export, filing of annual returns, transportation, etc. have been revised significantly, indicating the **stringent approach for management** of such hazardous and other wastes with simultaneous simplification of procedure.
4. The basic necessity of **infrastructure to safeguard the health and environment from waste processing industry** has been prescribed as Standard Operating Procedure (SOPs), specific to waste type, which has to be complied by the stakeholders and ensured by SPCB/PCC while granting such authorisation.

So, again we did discuss these salient features but we will just have a quick overview right, so one aspect is that you know other waste were included that is how we expanded these set of rules, right and waste management hierarchy has been incorporated, we look at that.

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As an primary emphasis on prevention obviously, right so, what are some of the aspects here right, I mean there needs to be a holistic picture, so again we talked about the entire cycle and that is what we are going to look at. The primary emphasis is on prevention, right if not then minimization, if not then reuse let us say, again as we see only some industries were able to or you know went ahead with applying for the relevant permits for reusing it as we saw earlier, right.

And then recycling let us say right, recovery from this particular waste that might be disposed let us say, so if I have some hazardous waste and general waste let us say, the entire waste might end up being classified as hazardous waste or it might be toxic, so you know recovery let us say of those materials that might lead to toxicity let us say or you know as we mentioned in the context of cement plants, co-processing.

And if nothing works, then we come to safe disposal, so now you see that this is the hierarchy that the relevant set of rules are trying to promote let us say, right so again, co-processing let us say is preferential mechanism over disposal, again as I mentioned this is the list or order of priority list let us say, right and again there is an approval process let us say, right and I believe there was one earlier too.

But now along with some of the hazard issues relevant even disposal of the waste or such even for co-processing and such they have streamlined that let us say, right, so they have streamlined these relevant aspects let us see. Let us move on, so what are the other aspects; so again import and export right, permissions and relevant aspects let us say, right, they have been revised

stringently and I keep believe that is based on the UN Convention the Basel convention, if I am not wrong we will look at that.

And now I guess more stringent requirements of what do we say you know, inventory let us say that include the returns from the relevant hazardous waste let us say and such and also now there are very stringent rules about even hazardous waste being transported from one state to the other for example, if hazardous waste is generated in Uttarakhand, it cannot be transported to you know some other facility and what do we say Uttar Pradesh, Delhi or Haryana obviously, it has some advantages and some disadvantages too but again that is what they have gone with let us say, right.

Indicating the stringent approach let us say for management of hazardous waste let us say, right and again infrastructure let us say has been prescribed, right and also these SOPs or standard operating procedures have also been prescribed let us say as in for a particular waste let us say right, you are going to have certain kinds of or you know a particular kind of SOP, let us say, right that will allow people to let us say not deviate from or you know rule out any confusion or such let us say, right.

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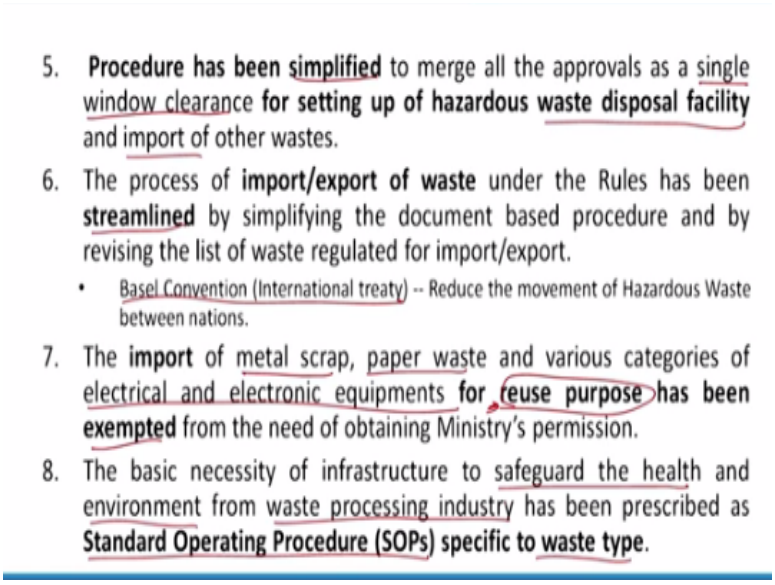

This is one worthwhile aspect that came about let us say, right so, let us move on again, procedure it has been simplified to as in to get the relevant approvals or such or processing let us say right as in now a single window clearance for setting up of TSDF or even a hazardous waste disposal facility and also for import of other waste, right. So, again process of import and export as we mentioned earlier has been streamlined.

And as I mentioned earlier we know people or we are also part of this Basel Convention which is an international treaty let us say, right and there more or less the emphasis was on let us say preventing or minimizing the movement of hazardous wastes from one country to the other as in many kinds of hazardous waste let us say typically, you know are transported from developed countries to the developing countries.

Why is that? In developed countries for their standards and for their rules which are pretty strictly enforce, it is difficult to or uneconomical to treat them let us say or look at handling not handling let us say treating on disposing those hazardous waste, so what is done let us say is that they are legally let us say you know, transported to different developing countries including India let us say.

And here obviously, the rules, the enforcement and such are relatively lacks let us say and typically we end up having issues but because of let us say you know what do we say, money involved here let us say, legal amounts if I may say so, right or the legal economy that is involved here, you have what do we say a thriving market let us say, for you know importing these waste.

But now such you know, a few of those aspects have been clamped down upon let us say, right, so again import of but there are an exceptions obviously, metal scrap, paper waste and some categories of electrical and electronic equipments primarily for reuse let us say have been exempted let us say from having the need for permission as and you do not need permission obviously you are if you are importing paper and a few kinds of electronic waste and such let us say for reuse though right, okay.

So, again as we mentioned earlier standard operating procedures specific to the waste type and also the key aspect is that they want to safeguard the health and the environment from waste processing industry let us say, right, not waste processing industry or during waste processing let us say, right. So, again SOPs and also some infrastructure to safeguard the relevant health and environment let us say, right.

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9. **Responsibilities of State Government** for environmentally sound management of hazardous and other wastes have been introduced as follows:
   a) To set up/ allot industrial space or sheds for recycling, pre-processing and other utilization of hazardous or other waste;
   b) To register the workers involved in recycling, pre-processing and other utilization activities;
   c) To form groups of workers to facilitate setting up such facilities;
   d) To undertake industrial skill development activities and ensure safety and health of workers.
10. List of **processes generating hazardous wastes** has been **reviewed** taking into account technological evolution in the industries.

So, let us move on and as we mentioned earlier now, the state government has a greater role to play or the onus has been shifted slightly from the CPCB or the Central Pollution Control Board to the State Pollution Control Board let us see, so what are some of the aspects that they need to look at let us see so, typically as you know you have industrial clusters maybe State Industrial Development Corporations and so on.

So, now it is the role of this; or the job of the central or state government pardon me; to set up or allot industrial space or shed, so that you know they can be used for recycling, reprocessing or utilization of these hazardous in other ways let us say right, so it is more or less the government's job out here specifically, the state government's job, right and more importantly as we discussed again and this particular aspect of these 2016 rules are you know equally importantly let us say.

The health of the workers is a priority, there were considerable issues, right where people you know suffering from the toxic or carcinogenic effects of various you know while working let us say, so here they need to register they as in the state government needs to register all the workers involved in the recycling, pre-processing and other utilization and even the disposal relevant activities of related to the hazardous waste let us say, right, so that is something to keep in mind.

And again, obviously provide the relevant workforce required to be able to do that particular aspect and also you know undertake industrial skill development let us say, right or impart training and such to ensure the safety and health of the workers right, so you can get an idea

about where, what are some of the aspects that are they are pushing for let us say, right or trying to improve upon right.

So, again the processes generating hazardous waste has been reviewed, right and because obviously, the industries are you know modernizing, right as in if you looked at the previous set of rules or even this set of rules let us say, relevant to hazardous waste, you are going to have a list of process that are classified as you know process that are lead; that lead to generation of hazardous waste or involved utilization of hazardous waste let us say, right.

So that is typically useful in identifying generators or occupiers of hazardous waste as the term goes, right so again, these lists were obviously reviewed.

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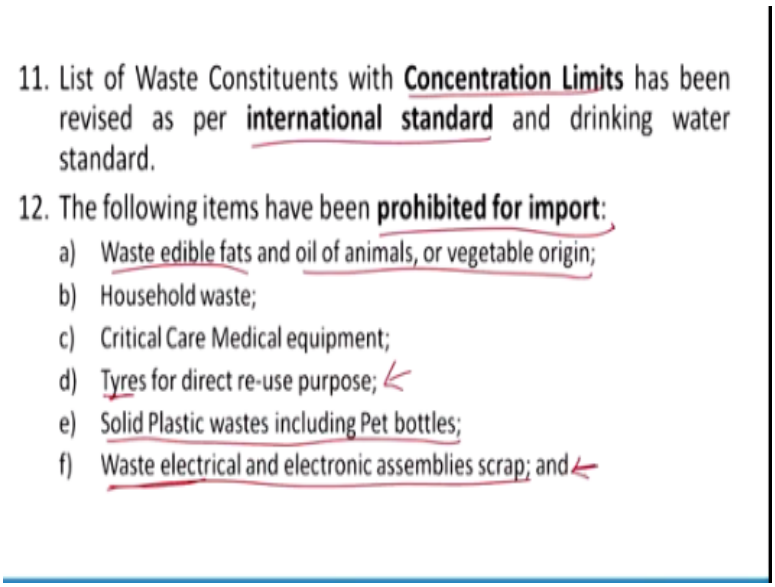

So, list of waste constituents with again the standards for the concentrations let us say have been revised based on the relevant standards, international standards let us say right, so again some items were prohibited from import, let us say, so we have the waste edible fats and oil of animals or vegetable origin let us say, household waste no more, so reused or used critical care medical equipment cannot be what do we say, imported.

Tyres for direct reuse purposes as in let us say somebody use this a particular set of tyres abroad let us say, right and maybe for their standards, they cannot use those types further but they are sometimes or there is a thriving market where those tyres are you know imported to India and then used for only a few are relatively lesser time let us say and then disposed of, so we end up,

we as in let us say the emerging economy let us say and sub-bearing the brunt of these kinds of waste let us say, right.

So that is one of the reasons I believe that they looked at this particular or banning this particular kind of import and also solid plastic waste including certain kinds of bottles let us say right and most waste of are electrical waste and electronic assembly scrap, most of them were stopped from import, so this is a very important aspect in the Indian context let us say, there is a thriving economy until there are still one for the local electronic waste.

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13. State Government is authorized to prepare integrated plan for effective implementation of these provisions, and have to submit annual report to Ministry of Environment, Forest and Climate Change.
14. State Pollution Control Board is mandated to prepare an annual inventory of the waste generated; waste recycled, recovered, utilised including co-processed; waste re-exported and waste disposed and submit to the Central Pollution Control Board by the 30th day of September every year.

But at least they stop the import of the waste from abroad let us say, right, so other chemical wastes especially in solvent form right, those are generic aspects, so state government is authorized to prepare an integrated plan but from what I have seen or observed in the past 2 years, it has been 2 years since the rules came into effect 2016, the system is yet to be you know is yet to what do we say developed infrastructure or the relevant manpower or the resources required let us say to be able to address the relevant objectives set out in these rules let us say.

We are still far out but again it pushes for the state government to develop an integrated plan for effective implementation of these provisions let us say, right and then relevant reporting to the MOEF but from what I have seen when I have looked at data or we know that the relevant feel with its, this is in the case yet anyway, right so, SPCB is also mandated to prepare an annual inventory of waste generated, recycled, recovered, utilized including co-processed, waste that was re-exported and so on and so forth by September 30th of every year let us say, right.

Again, so what is the relevant aspect that people are looking at here, they want to look at you know getting the relevant data let us say, without data you do not know how much has been generated earlier or where the waste is going to and so on and so forth, so such record keeping and then reporting let us say will allow for analysis of the relevant system to be able to make it better let us say, right, so that is one particular aspect that we have out here.

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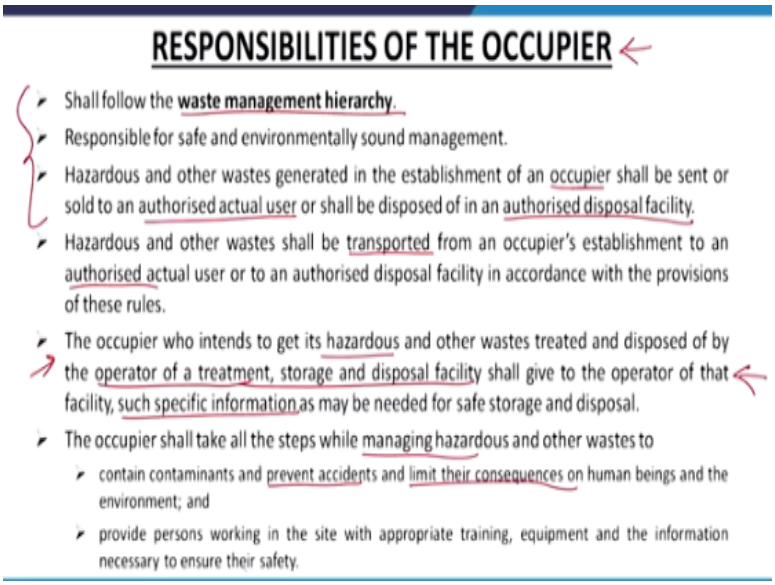

So, responsibilities of the occupier let us say, what do we have out here, so obviously, waste management hierarchy as in you know disposal last and prevention first right that is what they want to look at, responsible for safe and environmentally sound management, again these are listed in different rules and such let us say right, so the waste generated in the establishment of the occupier shall be sent to an authorized actual user let us say who can reuse it, recycle it or disposed at an authorized disposal facility let us say, right.

And hazardous and other ways shall be transported from an occupier establishment to an authorized user again, there are different or you know rules let us say that are prescribed within these set of rules that lay out the way that hazardous or the procedures to be followed when transporting hazardous waste let us say, right, so that is something to be or that is now the onus of the occupier, right.

So, again who intends to get its hazardous waste treated and disposed by the operator of a treatment let us say of TSDF will need to provide relevant details of the relevant waste let us say, right as and let us say you know toxicity characteristics and so on let us say to the relevant operator right as in more detail the information, the more easier it is for the TSDF operator to

either treated or disposed it let us say in the relevant landfill or the hazardous waste landfill or such let us say.

And that again is on the; onus is on the emphasis of the occupier but from what I have observed typically though you know they look at the waste characteristics at one particular time and they more or less concerned that the waste that the relevant industry occupy what do we say generates throughout its maybe next set of a few years let us say, right has more or less the same kind of waste and go ahead with it.

But you know that is what is happening out there in practice let us say, right, so let us move forth let us say, again they need to manage the hazardous waste let us say, right, prevent accidents and limit their consequences on human beings as and even when there are accidents let us say they are not reported, right and here obviously, the onus is on preventing the accidents and you know the relevant issues on human health.

But again that something we are playing catch-up with and again more importantly to ensure safety of the relevant people working in the relevant environment let us say, again due to either push or let us say lack of awareness, let us say or due to economic reason, the relevant people working are not given the relevant protective equipment that is something again that pushes for let us say, right.

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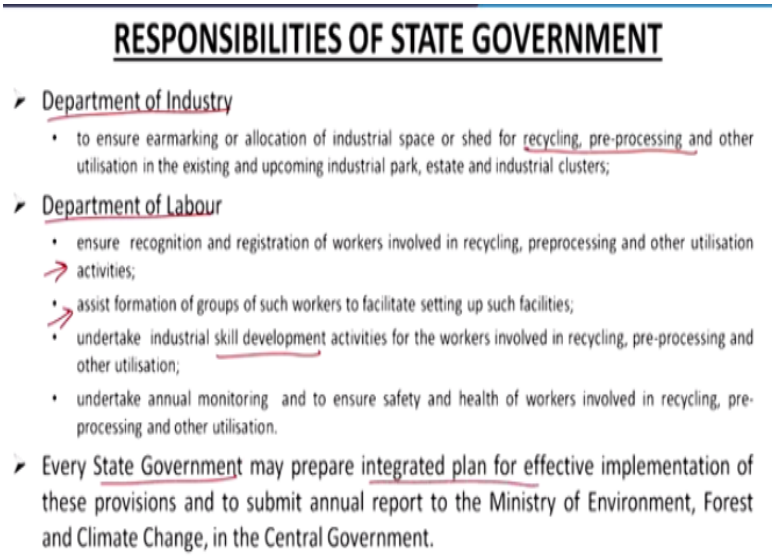

So, let us move on, so the Department of Industry for the State government let us say has to give the relevant space for recycling processing and such, Department of Labour looks at the

aspects relevant to registration of workers and such as you can see they are delegating the relevant tasks, right this is something we discussed or with providing the relevant workforce to set up such facilities and also for skill development that is the job of Department of Labour.

Department of Industry needs to provide for these space and infrastructure requirements while setting up these industrial parks and such, right and Department of Labour say again; every state government may prepare integrate plan right, this is something we talked about and report that to the MOEF let us say, right every year but again as you see they are trying to put the onus on state governments let us say, right rather than having a centralized approach.

But that will take time again, why is that; typically, let us say manpower you know is pretty short let us say or you know the these SPCB or such let us say or such organizations face severe manpower crunch let us say, right typically around 70 or 60% of the relevant posts are left unfulfilled let us say or unfilled and thus you have relevant issues but again, you know we are moving in the right direction.

But obviously, it is going to take time and more effort and one step in this direction is the set of hazardous waste and which are hazardous and other waste, the trans boundary and movement rules of 2016, I guess, so I guess I took up a considerable time, so I will end soon but I want to look at one particular snapshot of data which is from Ghaziabad let us say, right, so let us look at that particular aspect.

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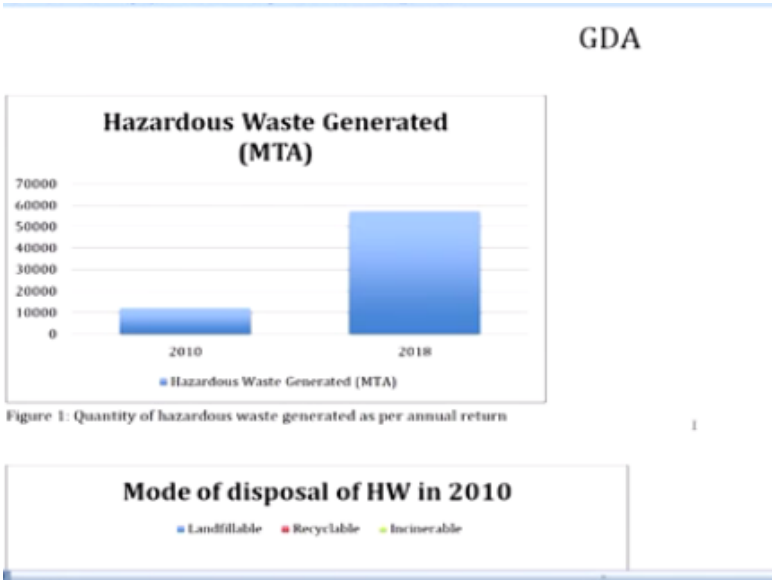

Figure 1: Quantity of hazardous waste generated as per annual return

So 2010 and 2018, you as you can see the hazardous waste generated let us say, so here around 10,000 and here around 55,000, so constable jump for Ghaziabad let us say.

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Figure 1: Quantity of hazardous waste generated as per annual return

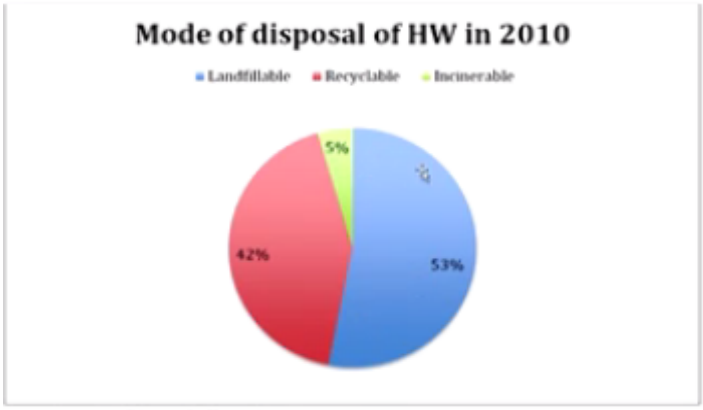

Figure 2: Mode of disposal of hazardous waste in 2010

And let us see what was the picture in 2010, so most of it let us say are constable fraction was recyclable that is what they say, 5 % went to incineration but major fraction went to the landfill let us say that was in 2010.

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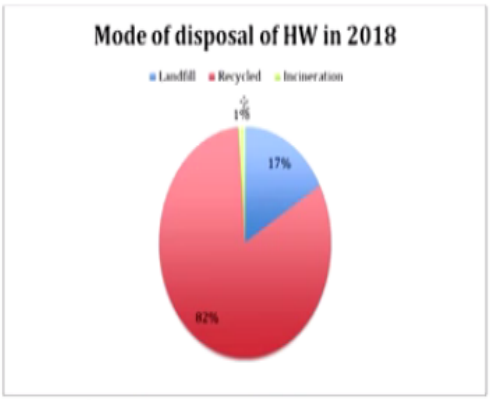
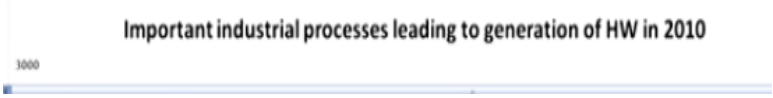


Figure 3: Mode of disposal of hazardous waste in 2018



Let us look at what the system was in 2018 though, right as you can see the picture change major; huge fraction let us say is now under or classified as under being recycled and constable chunk still landfill and insulation too but as you can see in 2018 though the picture is considerably different, as and recycle 42% earlier but now 82%, right, so even though the wastes or quantum of waste increased considerably we see that you know the relevant process

or industry has adapted such that most considerable fraction of the wastes are now being recycled let us say, right.

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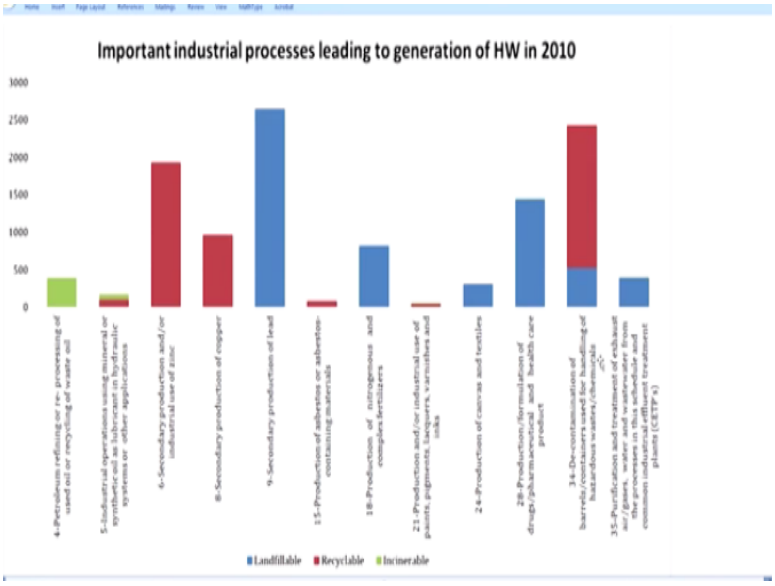

So, we talked about some of the process that lead to hazardous waste you know, generation and such, so let us look at the major aspects here, so landfill let us say, so secondary production of lead, most of it goes to landfill with respect to incineration, the petroleum refining or refinery process let us say, they more or less end up using incineration typically, so recycle more or less what did we have;

Secondary production of zinc right that is one aspect, copper or some of the aspects with respect to decontamination barrels let us say our decontamination of barrels and such let us say, right, so again that was the picture in 2010.

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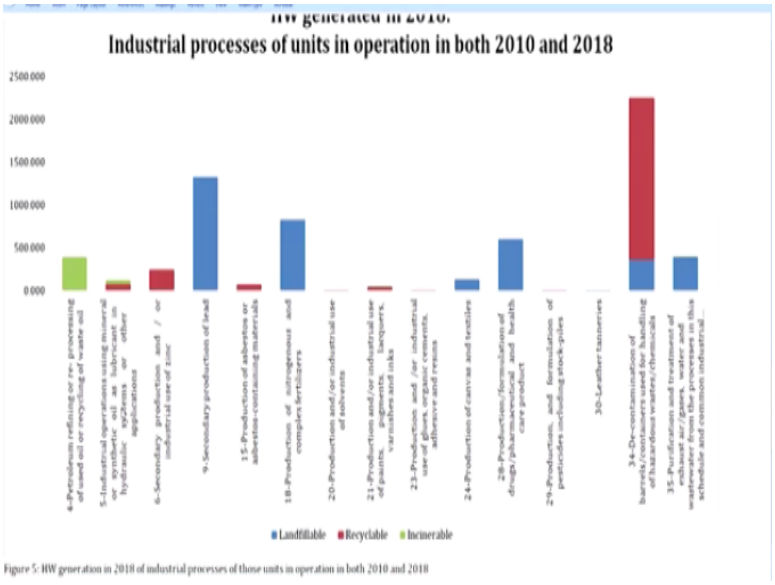

Figure 5: HW generation in 2018 of industrial processes of those units in operation in both 2010 and 2018

As you can see it changed considerably in 2018 but again what are these particular process on the x-axis, these are the different process that are classified under the relevant rules as hazardous waste what we see or you know those waste, not wastes partly process that involve the usage of hazardous waste let us say, right so now, you see that the picture has changed considerably let us say.

But again if you look at the relevant details let us say you see that those what do we say companies or process if I may say so that were involved in dumping waste for landfill or to the landfill still do so even now let us say, right but you know I guess there needs to be a push for you know a change in those sectors where will that come from through shops or tax, rebates or such, right.

Otherwise, you know there is no economic need as of now for those industries to change their behaviour let us say, right.

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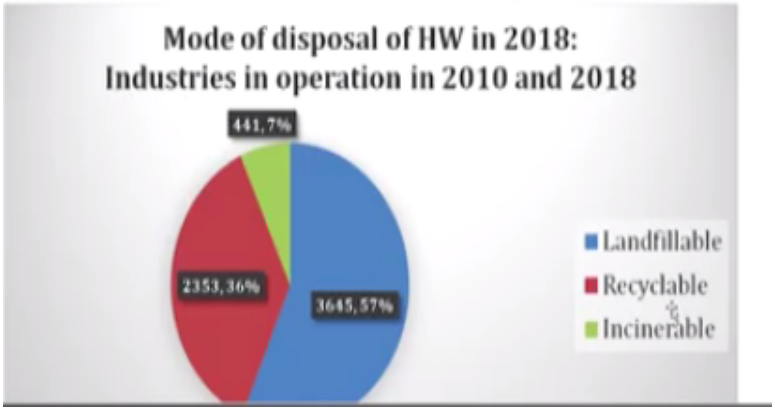
Figure 5: HW generation in 2018 of industrial processes of those units in operation in both 2010 and 2018



So, again that is the picture that we have out here let us say, right and that is the case out here again we looked at that earlier, so I am not going to look at it again right, so again as I mentioned we took considerable time today, so with that I am going to end today's session and thank you.