Plastic Waste Management
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Lecture – 08
Plastic Waste Sources and Production

So, welcome back so, we are now on lecture 8. So, we are on 2nd week 3rd module. So, we will continue our discussion we were looking at Plastic Waste Sources and plastic waste on variety of sources getting into the environment. So, we will continue this discussion in this particular module and then we will talk about the production of plastic waste kind of put some numbers in there in terms of the quantity.

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So, again to recap the concept that we are covering in this week, we talked about sources which will kind of wrap up in this particular module and then we will talk about production. We give you some data on global and Indian statistics on how much plastic waste is being produced and how much is getting into the different environmental stream.

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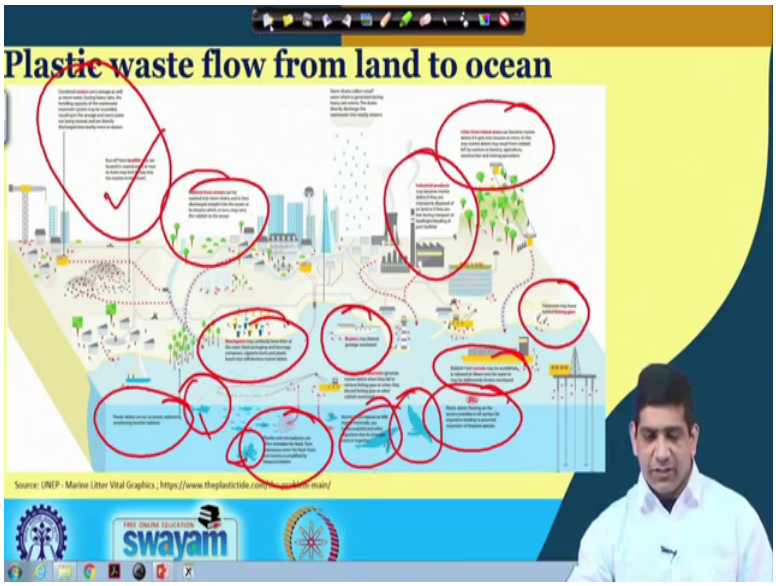

So, one of the big problem that we see of plastic waste today is on plastic going from land to ocean. So, we are lot of see plastic by itself is not of a problem, it is the plastic waste which is a problem. So, many times when we start discussing about the plastic waste management we start thinking about that banning the plastic, banning certain types of plastic will solve the entire problem that is not the case. We will be using several types of plastic all whether we will be with the ban is mostly for single use plastic less than 50 micron size plastic.

Once the highest power sizes are like higher power particle size plastics and the different types of plastics which will be there and it is part of our daily life as we have explained in previous videos. So, we will continue to use them and they will continue to come into the environment and they also present some risk, it is not that there is no risk previous case only from a single use plastic, the other plastic also present certain risk to the environment and that risk needs to be managed.

So, what we are we need to focus on is better management of plastic waste, rather than just plastic banned, plastic ban is only a part of the solution and that too only a certain types of plastics are being banned. We cannot really ban all the plastics that are being produced because, we do not have other material which can takes the place of plastic. Once we have those material maybe and then when we say material the material has to

be structurally compatible, material has to be financially viable and then it should do the function for what it is designed for and that is why the plastic is so popular.

So, plastic waste one of the biggest problem which highlighted this whole issue of plastic waste management is plastic going from land to ocean and we will spend some time in this video talking about that. So, as you can see over here plastic waste is produced in our houses. So, if you can look at here with a combined sewage carries like a storm water during heavy rain. So, that wastewater is getting into the ocean, wastewater is getting into the our surface water body, runoff from the landfills and that are located in coastal areas or near to the coastal areas, near to the river that also has lot of. If you visit any landfill especially the ones which are not managed very properly and many of those dump sites in developing countries you see a lots and lots of littered plastic around there.

So, those plastics get into the storm from the storm water into our surface water finally, to the ocean. Then we have rubbish from the streets, that also goes into the ocean, we have beachgoers they may leave many litters along the beach and that gets into the ocean. Plastic debris are finally, when it gets into the ocean the plastic debris has kinds of travels, the ones which is heavier will tend to go into the bottom and will go into the sediments.

The things which is lighter will stay on the like the floating on the water body and that becomes like food for many of the marine organisms. So, plastics and then they get broken down as well, they get broken down and then they becomes part of what is known as the micro plastics. So, plastics and micro plastics are often mistaken for food and they are toxic substances entered the food chain and the toxicity is amplified by bioaccumulation.

So, when things gets bio accumulated from a smaller say you have the smaller organisms and from the smaller organisms to you look at the smaller organisms here and from the smaller fish from there at the bigger fish. And the finally, when the humans eat that and that becomes a problem in terms of a bioaccumulation. And that these chemicals BPA and other plastic related chemicals comes into the food chain and it becomes a problem for us in terms of managing them.

Then some other sources, the boats going around they dump some plastic, there are few years ago this Nike if I remember correctly I think it was Nike. Nike shoes on one

container of Nike shoes by accident actually got dumped into the ocean and when they started looking for they try to clean those shoes out of the ocean; they found lots and lots of other types of plastics, other plastics in the ocean where the Nike shoes where accidently got dumped into the ocean because of the problem with the container.

So, there are many times the fishing companies they go and do for fishing in the ocean and they end up dumping will leave they lose those fishing lines, they lose their fishing nets and they just leave it there. They do not try to make an effort to take it out of the ocean and those again contains lots of plastics and many of the marine organisms marine life gets entangled into those plastic web and it becomes a health hazard for them. It becomes sometimes, actually it becomes a life and death question for them because we have seen these marine life's, turtles and other things getting entangled into those plastic web and not able to come out of it. And, they get they eventually basically die in that particular entangled into those plastic which was dumped there, either knowingly or unknowingly or accidentally. So, that is how it kind of ends up there.

Now, the rubbish from the vehicles from the vessels that also goes down in there plastic debris floating on ocean provides a raft surface for organisms and that is leading to potential expansion of invasive species. So, invasive species can in there, some of sometimes a fisherman may leave behind fishing gear, litter from inland areas, from the storm water goes in there, industrial product they also becomes part of become a marine debris. So, as you can see there are a variety of sources by which these plastic from the land eventually ends up in ocean, that is why when in June this year the National Geographic came up with that particular June issue of their magazine which was the plastic or planet.

If you look at the cover of that magazine which made lot of media coverage around the world, there was actually a plastic bag floating in ocean that was the picture. And, I will show you several of those pictures will in the subsequent slide where it is that is the plastic getting into the ocean where, people are thinking that there would be actually more plastic in ocean than fish by 2050. So, think about that, we do not want. So, it is a so is it and they and that is as you will see they are not only single use plastics all sorts of plastics are actually ending up into the ocean.

So, it is not only those filled plastic which is ending up there it is all sorts HDPE LDPE even the thicker material they are ending up in ocean. So, we have to banning of this single use plastic is only a simple step, it is a first step what is needed is a proper plastic waste management program globally. And I will see some countries are contributing more as opposed to some other countries and which we will talk about in subsequent slide in this video and the subsequent video as well. So, lot of variety of ways when the plastic is getting into the ocean.

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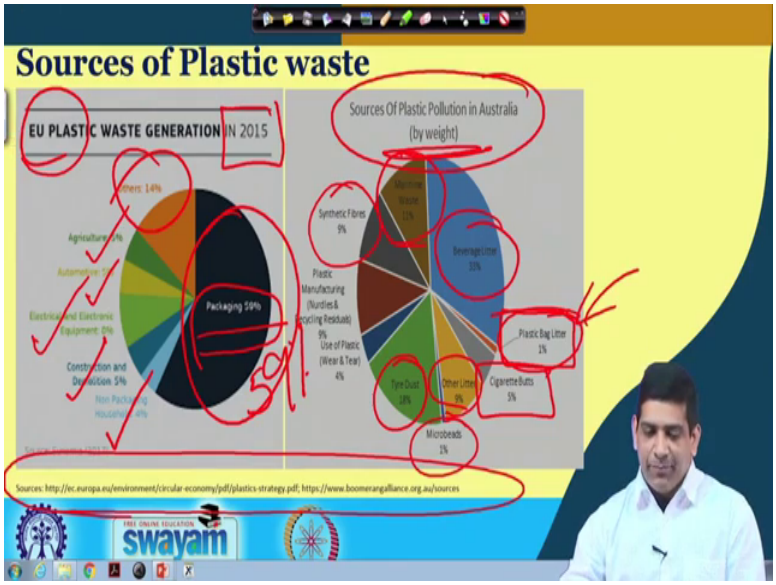

Now, if you look at the source of plastic generation it packaging. Packaging which is the bigger chunk this is this packaging waste, that is a big. So, we have this is from a European Union, European Union plastic waste generation in 2015 slightly 2 years old data, 3 years old data and packaging is for 59 percent, 59 percent of plastic waste is actually coming from this packaging. So, lots and lots of waste plastic is used in packaging.

Then we have as you can see construction and demolition is 5 percent, non-packaging household 4 percent, electrical and electrical operators that is around again 8 percent. We have automotive 5 percent, agricultural 5 percent and then there are some other sources of 14 percent so, but packaging is the bulk of it at 59 percent close to 60 percent. So, 60 percent of the waste is actually on packaging plastic waste. So, that is a lots of that is where we need to actually for put a lot of focus on, try to reduce the packaging material.

Packaging the way the society has evolved over the last 20-30 years that is how this we have started using lots of lots of packaging in online shopping, even mall shopping and this big departmental stores lots and lots of packagings are being used.

Now, if there was another report from Australia, where they looked at the power sources of plastic pollution by weight, as you as I told you that we will looking at board Indian as well as global. So, will whatever employee examples we could find, whatever the different reports as you know there is not a textbook on this particular subject. So, we had we have collected the slides we have prepared these slides using the information from variety of sources and from time to time you can you see at the bottom of each of our slide we do have the source there for you to go and look at more information and, but in. So, this is this is coming from a report from Australia where they are talking about the beverage litter that is 33 percent.

So, one-third, nearly one-third of the plastic pollution that is happening in Australia is because the beverage bottles are not being managed properly. So, again it is the waste which is it is not the plastic by itself it is a plastic bottle waste which is creating the problem. Now, the plastic bag litter was only 1 percent which is mostly what we see actually and that is by weight. So, remember here this is by weight, by volume these numbers would be much different because the plastic bag is very plastic bag especially the littered plastic bag or will be those thin plastic which you go to grocery stores and many of this is a smaller even the vegetable market people are using lots of those thin plastic. Sometimes when you go for these small sweet shops they also give you those thin plastic.

So, that is what and by volume it is a lot, but when you look at from a weight perspective it was only 1 percent. So, it is not that too much in Indian context may be slightly more because we have our plastic waste management is inferior then what would be possibly would be you know Australia. But it is still it is a not that much, but if you look at the beverage container the bottles which should be easily recyclables, they were 33 percent and then cigarette buds they also have some plastic in there. And then other littered material micro beads which is used in many of these synthetic cosmetics and other things.

Tyre dust 18 percent, that has also plastic 9 percent use of plastics wear and tear, you have plastic manufacturing nine percent use of plastic synthetic fibers 9 percent marine waste maritime waste is 11 percent. So, as you can see variety of sources from which plastic is getting into the ocean or plastic is getting into the environment and a plastic bag litter which is mostly what the ban is focusing on is only 1 percent. So, it is not that banning there single use plastic bags is going to solve our problem, yes it is a important step it is a good step I am not saying it should not be done.

But sometimes what we feel like is that we will we have done it we have solved the problem, no. We have just started looking at the problem, that was the easiest thing to do and sometimes even that is not being easiest thing to do as we have seen with a bans happening in India and after the ban especially in some of these states where the ban has been there for few years, we see some of these plastic bags coming back into the market. Again the reason for this as plastic is so convenient, that is the problem that is the biggest problem actually we need to find a material which is better than plastic then only we will be able to really take this plastic out of the environment.

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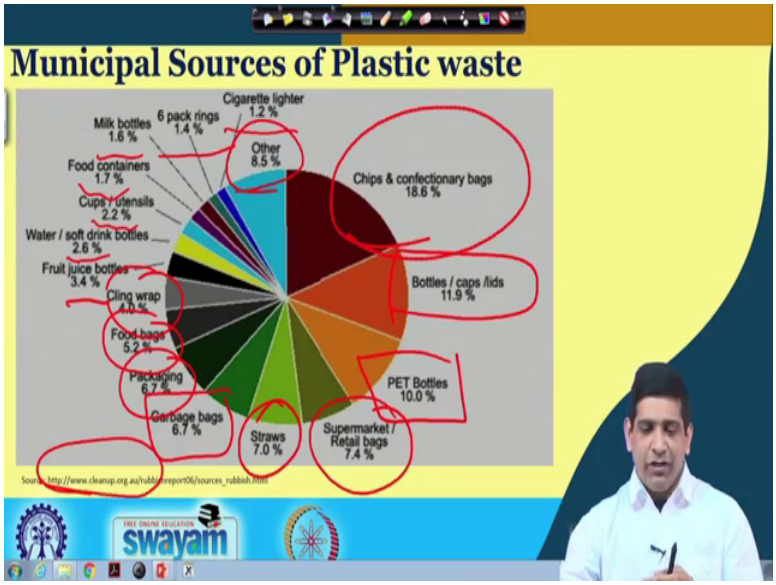

Now the municipal sources of plastic waste like here one of the biggest contributor is your chips, we all love them isn't it. You go to any social gathering or trains malls or even in some parks, some games, some like a [FL] that we call it in India that festival time. You see people having that plastic uncle chips or a Pepsi or lays or whatever

different brands and then people consuming that and that plastic bag that is a chips and other eatables which comes in those kind of container, with those kind of packaging is close to 19 percent. So, that is where you get a lot of 19 percent is coming from there in terms of the municipal sources of plastic bag.

And then bottles caps lids 12 percent, PET bottle 10 percent, supermarket retail bags again that those are the single use plastic, straw that is again a big dealer 7 percent in the municipal these are all municipal sources the previous one what you saw was overall like a by looking at all the activities. This is from the municipality like this is mostly from the usage that people like you and me will do in our house and surrounding. So, a straw 7 percent that is a lot of lots of plastic coming if you look at the percentage wise it is not easy, not small garbage back 7 percent packaging in another 7 percent, food bag cling wrap which we use for wrapping of several you go to mall Spencer's and other places there will be a tray on which you have nice [FL] will be there okra or lady's finger whatever you call it and then you have a nice wrap on it.

Similarly, you have some cake and there will be a wrap on it, that is your cling wrap which people put to keep things fresh and that is around 4 percent, fruit juice bottle 3.4percent, water or soft drink bottle 2.6 percent, cups 2.2, food containers, milk bottles, 6 pack rings and then cigarette lighter and other is a 8 8.5 percent. This is again this one is also coming from Australia so that is the numbers in Indian contest will be slightly different if we if we can get these kind of numbers and that should be our we need to get these numbers.

We need to really before even before people we go for all these elaborate bands we one of the important thing if we are really serious about managing this plastic waste is first of all go and look at what is in there, as I say I have said that in my previous courses those of you may have taken the solid waste course as well. And I tell that in many of the meetings and conferences or in class that I attend or take see first of all we need to understand the problem, the thing is that many times there is a knee jerk reaction. We have a problem, let us do something and then whether that something is going to solve the problem and what is the extent of the problem that this something action is going to solve we do not really figure that out.

So, we need to know if we need to have a similar pie chart for the Indian context, it will be such nice things to have so that we know which things we need to focus on. Is it the chips in the Indian context which is really the number 1 culprit or it is the bottles probably not, I would not expect this many bottles showing up because our informal recyclers. Or they may not be doing a great job from an environmental point of view in terms of recycling because again that is, they are they are doing a good job in terms of recycling it, but they are not recycling it properly.

The recycling process may be dirty and that might be contaminating the environment and, but they do take out lot of recyclables out of the waste stream which they should get credit for, but at the same time, what is this pie chart? How this pie chart for India will look like? And we need to have that pie chart so that our policies are designed in such a way so that we can we can try to pinpoint what are the hot spots in here, which areas we need to focus and which areas we need to kind of take make actions so that we can reduce the plastic pollution, we can reduce the impact of plastic waste on the environment.

So, again it is the plastic waste problem it is not a plastic problem when we say plastic it's that is where the course name is plastic waste management. So, we are when the plastic gets discarded then it becomes a problem, plastic as a product may not be that of a problem because it is when, it is a in use here there are certain issues in terms of micro beads and those stuff which gets into we use them we when we take shower those gets into a from our face pack and other stuff gets into the water. But then again it is a plastic waste which is a problem, whether it is in the water whether it is in the solid or whether it is in the gaseous phase it is the waste which is plus one once discarded its getting into the environment.

So, we need to focus on this aspect and we need to have kind of a detailed study as I was trying to get into that many times say you need to when you write when you try to write a prescription for a problem when we go for simply I give a analogy of going to a doctor. Say I have some health issues, I go to a doctor and doctor writes a prescription and it is an complicated health issue, it is not a normal fever I feel something is wrong with our body and doctor does not bother to do a blood test or a urine test or whatever test is required he just writes a prescription in there. I does not get that much of a confidence on that prescription, because I feel like there was no diagnosis done. Similarly when people

try to write a prescription of plastic waste management without really understanding what is the extent of the problem, what is the type of the problem I do not hit confidence on those prescription either.

So, we need to really look at the problem understand it then decide what should be the better solution of taking care of this particular problem its true for waste man it is a municipal solid waste its true for industrial waste it is true for plastic waste it is true for an electronic waste for each and every therefore, for any environmental scenario first number one thing is what is what in the first understand the problem then only you can come up with a solution. We cannot just shoot arrows in dark and hoping that some arrow will hit at the right spot and the problem will be problem will be solved that does not really happen unless you are too lucky.

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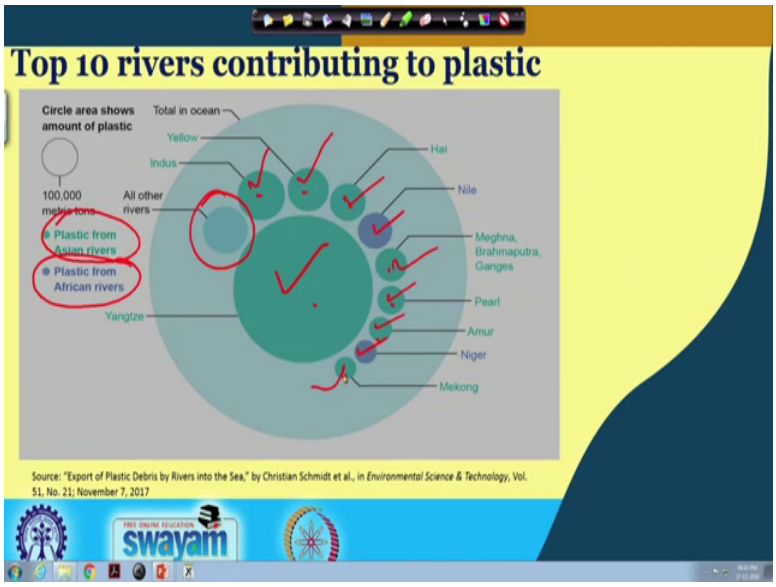

So, now, one of the biggest issue again when we are talk about plastic getting into the environment, one of the biggest problem as we have said is the plastic getting into the water; plastic getting finally into the ocean. So, there have been some studies done which this particular paper actually came out now almost a more than a year ago, it is in environmental science and technology one of the top most general very respected journal in our field, not easy to publish there. I always encourage my students to do that to publish in this particular journal, I encourage all of you who are doing research in

masters or PhD try to target this journal and publish some papers and I can it is a good journal where to target for.

So, here what we are looking at in this particular slide we have an image which is from this particular paper which says that export of plastic debris by river into sea. So, they have done some estimate again, these are the estimates these are not actual values, they are based on certain data secondary data collected from government report, some modeling exercise may have been done as well. And what they have looked at is plastic getting into the ocean from 10 rivers which is considered as the top 10 rivers contributing to plastic and the circle on the top that you are looking at this circle I am, like I am just trying to encircle that.

So, this top line which is the grey light very lightish, greenish grayish color that talks about total in ocean. So, that is the total amount which is present in the ocean that is what it says over here, total in ocean which is their amount of plastic which is present in the ocean. Now, out of these the number one source is Yangtze River, this is the river in china. So, Yangtze River is the biggest source of plastic getting into the ocean. So, that is you are see the biggest circle over there, now for scale circle area source amount of plastic and this particular size of circle means 100000 metric ton. So, these circle kind of similar to whatever showing up into the yellow river here. So, that shows close to 100000 metric ton. So, that is our 100000 metric ton is close to that particular circle.

So, if you can, if you can take this circle and bring it here and try to put it on the individual circles here and then you get an idea about how much we will expect a kind of respect to this particular size, whether it is more than 100000 whether it is less, it is more how much more, if it is less how much less. So, pretty much it looks like something probably at this particular shape almost same as over here.

So, for that this is the yellow river which is again one of the Asian rivers. So, we are looking at some of the Asian rivers which has been listed in blue in greenish color and the African rivers is in blue color. So, out of the top 10 rivers we have Indus, Indus river is there, Yangtze of course, was the biggest one that was a Yangtze then we had Indus river we have yellow river we have Hai river, again another Asian river then we have Meghan, Brahmaputra and Ganges together, we have pearl we have Amur and we have Mekong. So, these all rivers are the Asian rivers which is contributing to the ocean.

Then in of Africa we have Nile and we have Niger those too and then there are some other sources up there as well. So, in terms of total plastic in ocean if you look at the top 10 rivers which is contributing plastic to ocean, out of top 10 1, 2, 3, 4, 5, 6, 7 and 8 just come from Asia. And which should not be much of a surprise because if you look at most of the Asian countries like China it has slightly improved in their waste management, India is trying to make some effort. But it is still our waste management is not that perfect, Japan is pretty good, South Korea is good, Singapore is good, but most of the other countries in Asia is still in infancy in terms of waste management practices.

So, since our and we have, if you look at the Asia just India is what 1.3 billion, 1.3, 1.4 if you take India and China together it is close to 2.6, 2.7 billion people and out of 7 billion. So, out of more than one-third of the world's population stays in Asia. So and then since lot of people are here Europe, North America, many countries they have a better waste management practices. Australia, New Zealand and those again European Union they have better waste management practices so that the littering of plastic waste is less because they have a waste collection system in place to take care of that. So, since system is not developed in Asian countries more plastic waste gets into the ocean from Asian countries that kind of make sense, but and there are and the population is also huge in this part of the world.

So, we see a black comparatively more plastic getting into the ocean from Asia. Same thing from Africa, African population is also increasing, Nigeria in other countries in there again the population is increasing in Africa and they are also again and they also have a poor waste management practices. So, there you see a source coming in from there as well, but as you will see in the next several slides and other slides as well, it is not only Asia and Africa are the one of the major contributors. But they are not the only contributors, lot of plastic thus get into ocean from North American from European from Australian and New Zealand sources as well, which you will which we will talk about in subsequent slides.

So, again in this particular module and also in the subsequent module what we are trying to talk about is trying to see the extent of the problem and what is what is the nature and the complexity of the problem associated with plastic waste. So, that when we talk try to get into the management aspect which we have a clear understanding of how much plastic problem is out there and what is the nature of the problem so, that we can come

up with a better recipe, better prescription as for solution rather than trying to just do a I would say guesstimate work or a or just trying to what I was what I was calling earlier trying to shoot in the dark hoping that some of this, some of our arrow will click somewhere and the problem will be solved.

So, we will continue this discussion, I hope you are enjoying the course so far and again a discussion board is for place where you should put your queries up and we will be happy to answer, our goal is to answer any query within 24 hours time. So, we are trying to meet, will be will try to meet that target and again I would take your assignment, do your like go over the videos any question put it in the discussion board and let us. If you find any new exciting information put that on discussion board as well so that we can all learn together of this new and exciting topic of plastic waste management. So, continue watching keep learning and hope you are having fun and I will see you again in the next video.

Thank you.