Plastic Waste Management
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Lecture – 09
Global Sources

Welcome back, so, we are now on lecture 9, where we have been looking at the Plastic pollution different sources of plastic pollution. So, as you will remember in the last video towards the end we were looking at plastic getting into the ocean from different sources. Especially, we were referring to a study which was done in environmental science and technology which has listed the top 10 rivers from where the plastic was getting into the ocean and top 10 rivers were mostly most of them were from Asia and some from Africa.

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So, we will continue that global sources of plastic in this particular lecture as well and again just a recap. In this particular week which is the week 2 we have been looking at the sources of plastic waste the production and global and Indian data on plastic waste production.

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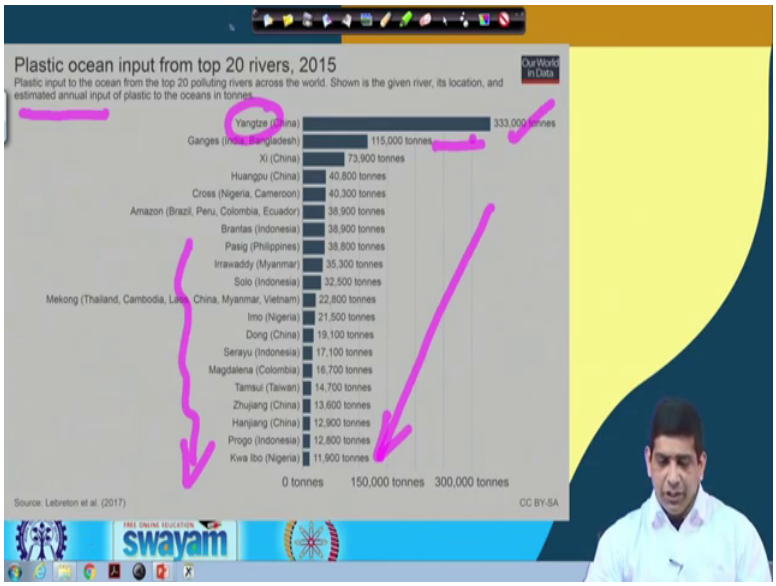

So, from where we have left earlier in terms of the plastic ocean getting into the 20 into the 20 rivers in 20 this is the again the data coming from 2015 in terms of plastic getting into the into the ocean from top 20 rivers, which is coming from one again another paper published just last year. And most of these plastic related studies have been done in last I would say within last decade or so.

So, most of these papers are pretty new paper and again this date this also kind of confirms what we just saw in the previous last slide of the previous video the ranch Yangtze river from China which is the showing as the biggest source of plastic. And then Ganges which includes contribution coming from India as well as Bangladesh is nearly half of what coming from the Yangtze River, then there is a Xi river Xi I am assuming that the pronunciation is correct if I am wrong just let me know.

Then Young Pooh river which is another Chinese then we have a Nigerian river cross Amazon which comes from Brazil, Peru, Colombia and Ecuador Brantas which is in Indonesia passing a Philippines river and as you can see there is a lot of list kind of goes down in there.

And these kind of shows you starting from 333000 tonnes all the way to a 11900 tonnes. So, as 20 polluting rivers of across the world shown estimated amount and again this is an estimated amount this is not the total its an estimated estimated annual input which is of the plastic; plastic getting into the ocean in tonnage. So, its in the weight form as you

can see mostly you see what we have is Asian, Asian rivers from China India Bangladesh again China some from south America also showing up there in then again Asia, Asia, Indonesia, Vietnam, Nigeria, which is Africa, China, again Colombia which will be in South America, Taiwan, China, China, Indonesia, Nigeria which would be in Africa.

So, mostly Asia, Africa, South America and those are the places again if you remember from the waste management class as well where we are looking at the global waste management practice those of you have taken it. If you have not taken it there you can go Google and find it in waste management practices around the world and you will find that Asia, Africa, South America there are several countries where the things are not in a better shape things are not in good shape and there is still evolving where as opposed to North America or in European Union. So, that is the reason why you see many of these plastic getting into those rivers.

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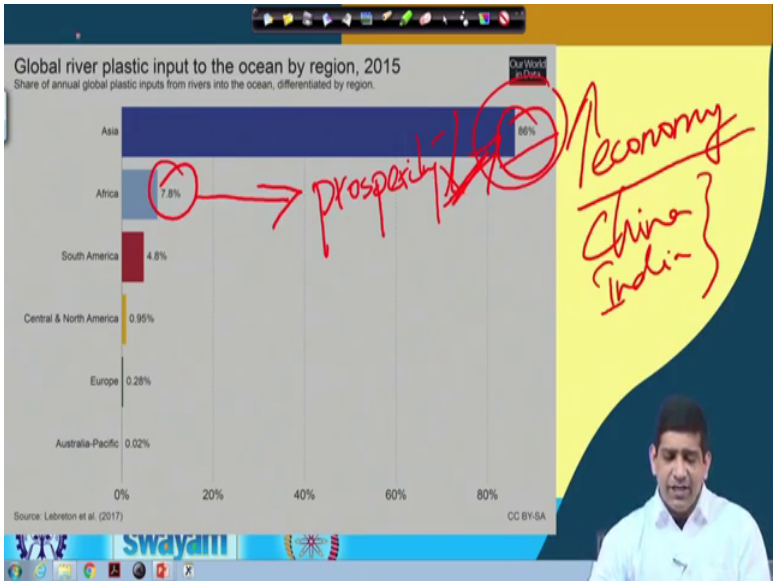

And similarly if you look at the global plastic input into the ocean by region here again Asia contributes nearly to eighty 86 Asia from the Asian sources 86 percent we have lot of people we have huge population in Asia and most of the countries the waste management practices are a still evolving. So, that is the reason why we see a lot of plastic getting into the ocean from these Asian countries 86 percent that is a lot of plastic getting in there. Africa 8 percent another thing for thing to think about is Asian many of these economies are developing we have a economy is going up.

So, more as the economy is improving in China India and many of these South Asian countries and we are producing we are using lots and lots of plastics and these plastics are not managed properly our waste management system has not evolved has not developed that much. So, we are using lots of plastics, but we are not managing those plastics properly and they are ending up in and contributing to this particular number right there. Africa people are there, but now as compared to India population is much less and their prosperity is also low comparatively they are less since people are less prosper and since prosperity is low plastic usage is low and plastic usage is low so, plastic waste is low.

So, that kind of gives you a some I some indication of why you see. So, much in India as oppose to those a like in Asia as oppose to an Africa South America we again less number of people 4.5 percent central and North America around close to 1 percent. Europe very good waste management practices 0.3 percent, Australia pacific not many people out there Australia population is what I think it was close to New Delhi population if you take the NCR probably it will be less than NCR population. So, which national capital region of India that if you take that particular like Delhi Gurgaon and Noida and Ghaziabad and Faridabad and all those areas Australia population will be much much less than the population of that particular area.

And New Zealand is only I think it was close to at 5000000 and so, even less around 5000000 Australia is 2.5 crores. So, its a not. So, less number of people so, where you will get lot comparatively you will get much less and good management practices they have a good recycling system in place comparatively everything is in comparativeness. So, they are NVC less plastic showing up from their sources.

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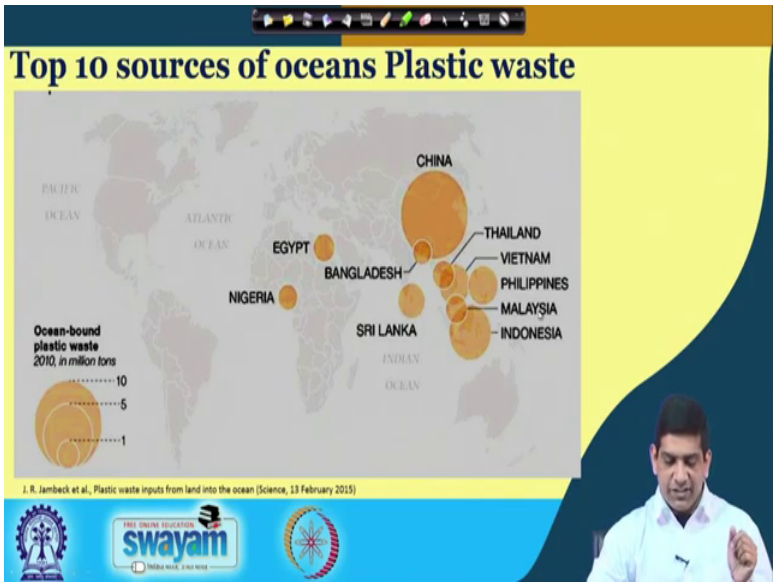

So, to a top 10 sources of ocean plastic waste China is a pretty high we see lot of things coming from China then Thailand and India is right there as well China, India, Bangladesh.

So, this bubbles you see the ocean mount plastic waste in million tones. So, as you can see China, Egypt, Bangladesh, Nigeria, India is kind of overlapped with India and China is kind of in the together over here Thailand, Vietnam, Philippines, Malaysia, Indonesia, Sri Lanka. So, those were the top 10 sources of oceans plastic waste surface plastic waste.

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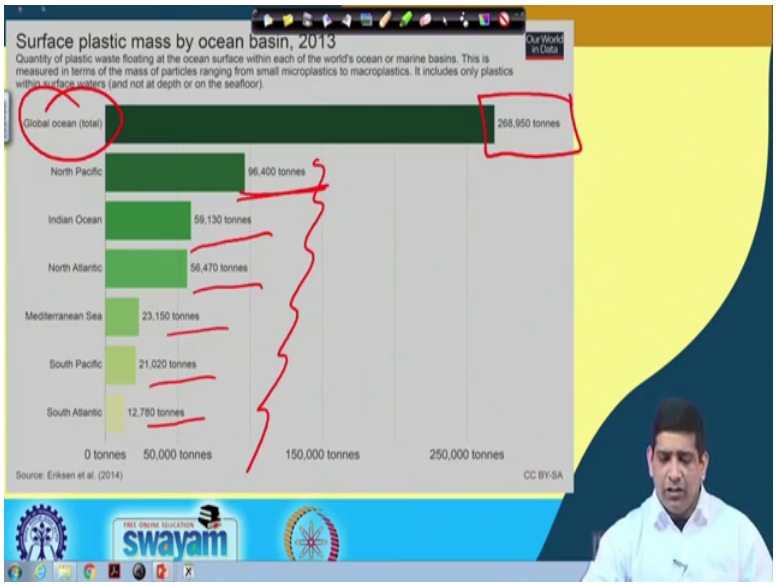

If you look at the ocean like basin this is again 20 2013 data global ocean as you can see there are different data sources out there and each data source has more or less similar numbers the numbers if you look at the relative terms, the values absolute values keeps on changing because the data has been collected in different time of the year sorry different time periods.

So, here they talk about this particular study they talk about quantity of plastic waste floating in the ocean surface within each month of each of the worlds ocean or marine debris this is measured in terms of the mass of particle ranging from a small micro plastics to macro plastic includes only plastic within surface water and not at depth or on seafloor. So, they are just looking at the surface water surface of the ocean and they saw found that in again these are more many of these are again estimates. So, global ocean total is close to 270000 tonnes North Pacific ocean 96400 Indian ocean close to 60000 North North Atlantic ocean military and say South Pacific, South Atlantic.

So, as you can see we have there was close to 3001000 tonnes of plastic debris floating in ocean as per in a study and reported in 2514 done in 2013 which was close to nearly 5 to 6 years ago. So, now, these numbers must have gone up and as you will see in one of the video which will a small video which I would like to show you as part of this module you will see that the plug there are several plastics floating in the oceans and we have lots and lots of plastics getting into and getting into the ocean. And what is happening in

the ocean is that plastic is not a static plastic its not only confined to one particular area it keeps on moving.

If you remember from the previous slides that we have discussed in this video and the previous video although the major source of plastic was from the more Asian countries or the African countries. But here as you can see it kind of gets into all the different oceans because the water is connected, the plastic debris keeps and floating keeps on flowing away with water from one ocean to another ocean. And that is how we have a great we have get an example of great pacific garbage patch, which was the form of the first one identified, but there are lots of patches out there. As you will I will explain that and well we play that video and you will see that in couple of minutes from now.

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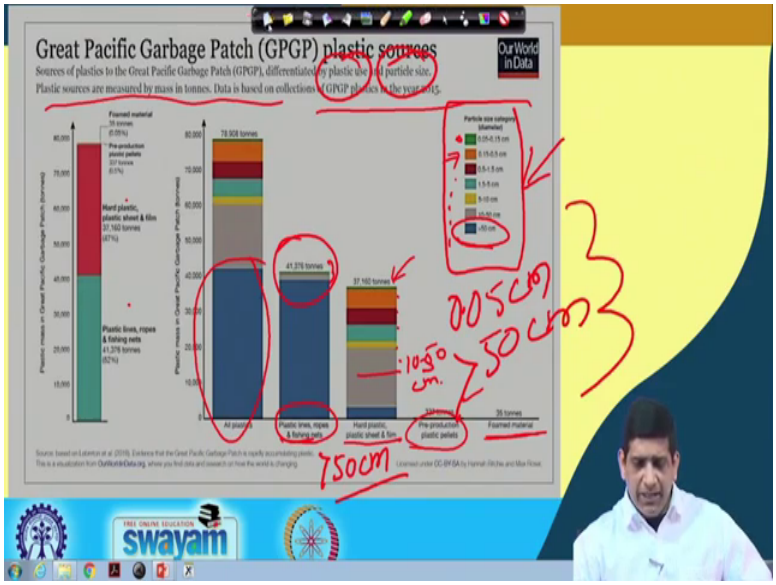

So, great pacific garbage patch which is one of the biggest plastic debris in ocean which has been reported a few years back and that is this was one of the eye opener for plastic waste improper plastic waste management problem of the globe. And here it was there were different types of plastic we had different types of plastics and as well as the particle size different particle size were there. And plastic sources were measured in mass in tonnes data is collected in the year 2015 and if you look at the particle size diameter it was from 0.05 centimeter all the way to greater than 50 centimeter.

So, different sizes of plastics were floating into that great pacific garbage patch and you had and the distribution if you look at from 0.05 to 0.15 is the green color here then 0.5

0.15 to 0.5 is the other second color then there are as you can see there are different color coding as per the size. And we see even the big pieces there to like the bottom one is the blue color which is greater than 50 centimeter and you see a big chunk of that blue color among the all plastics that you find.

Lot of blue color and the, what is the major source of the blue color is the plastic lines ropes and fishing nets which people just leave it there when they go for fishing. So, this plastic lines ropes and fishing nets, that was the source of major source of this size greater than 50 centimeter. So, that is plastic showing up over there then you look at and that was close to 417376 tonnes and had some other sources there as well its not only that, but close to maybe 37 38000 tonnes was greater than 50 centimeter and if you look at from the smaller sizes like a hard plastic seat and film pre production plastic pallets of course, is the smaller size foam material was there as well.

So, hard plastic plastic seat and film we saw is smaller sizes like the smallest one and then all the different sizes showed up in here pretty much and as you can see most of it was between 10 to 50 centimeters this is 10 to 50 centimeter 10 to 50 centimeter range and which you can see it from here as well and then there were a smaller sizes than that showing up in there. So, then there was some formed material, there were some hard plastic, there were plastic lines and ropes.

So, as you can see the great pacific garbage patch which was actually in invented or found by chance by one of the sailors again you should go on YouTube and look at the great pacific garbage patch video regarding that chemistry PhD guy who was a sailor actually and he had his he was just going through the sailing boat and then he saw all this floating debris and then he started looking at that became.

So, a basically his carrier and then I spent a lot of time looking at this waste in waste plastic in ocean especially in some of these pristine beaches in Hawaii where lots of plastic waste is showing up. So, let us by saying that let us look at a small video which we will play which is done by the discovery channel and. So, we will I have muted the audio. So, the video will play in the background and I will try to explain things while the video is playing and you will see how this plastic what are the different variety of plastic getting into the ocean. So, let us look at this particular video.

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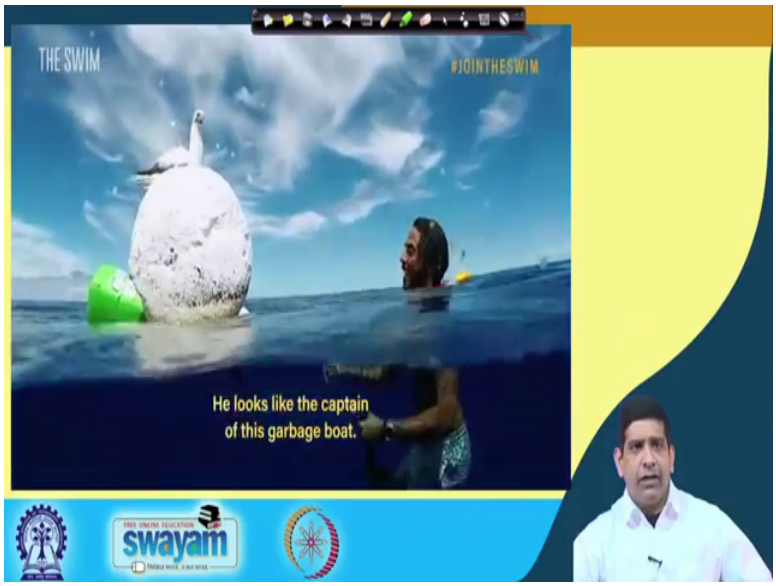

So, this as I said this was done by the discovery channel here you see a plastic bottle and even all different types of plastics.

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People they are just taking it out different plastic waste coming into the ocean coming collected from the ocean you see every day we will they were saying lots and lots of plastic here.

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You can see that this particular girls is trying to look at different types of plastic coming out from the ocean different sizes that is how the data was collected. Again this video is available on YouTube you can I would we have just put a small clipping of that here I would encourage you to go and watch it say this is, what you see here is the fishing net and even some toothbrush.

Now, what was the source of the toothbrush could be the sailing boats or could be the toothbrush that we and I and you throw in our dustbin that may end up there as well. Fishing nets lots and lots of fishing nets getting in there and here they are trying to just look at different types of plastic and then you can see this is the garbage patch.

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This is the and large system of circulating ocean currents are making this plastic there as you can see this plastic from the surface water. From the land to the surface water and this is how it gets there and from the surface water by floating it finally, goes into the ocean. So, here they have looked at all this different garbage patches which is going around in the ocean current with the ocean currents this plastic is moving around the globe.

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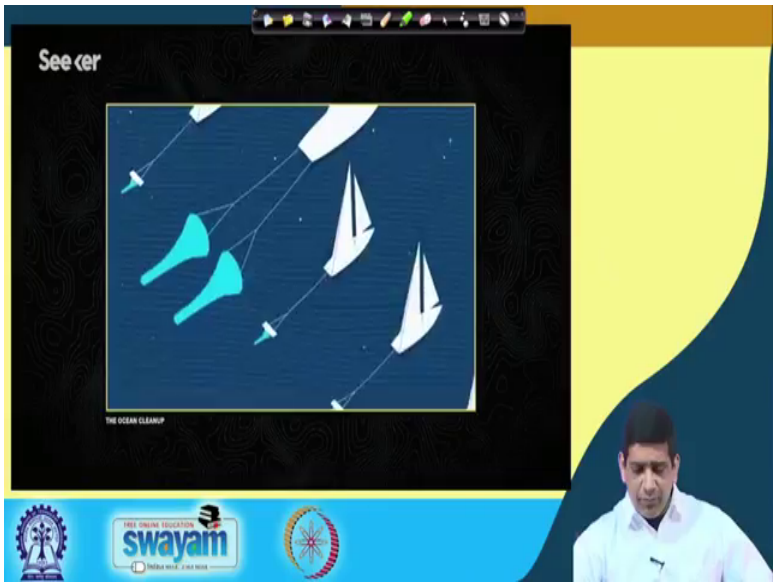

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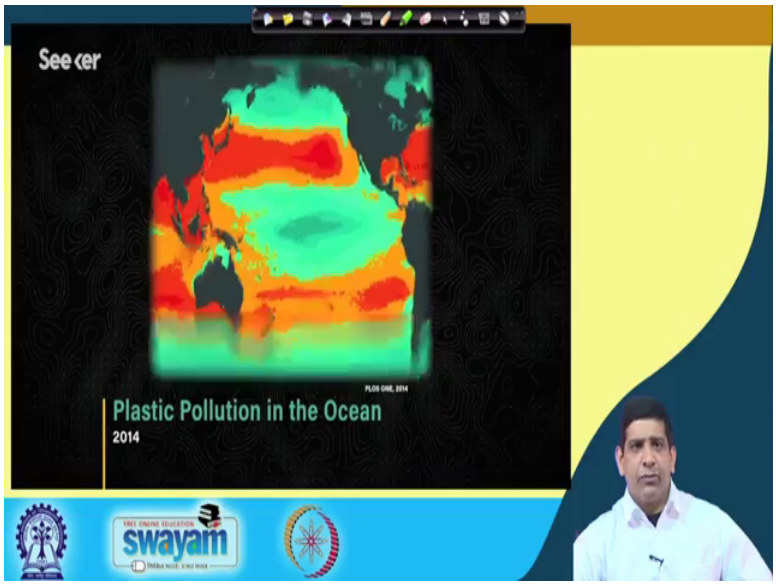

So, we have plastic which we dumped today in say in West Bengal if I do not manage plastic that plastic may end up in once it gets into the bay of Bengal then it can get to other ocean maybe to Indian ocean below and then to the Arabian ocean it just keep will keep on floating. And since they do not degrade very easily they will keep on breaking down and just floating and they will make a lots of plastic juice as which unfortunately our fish consume.

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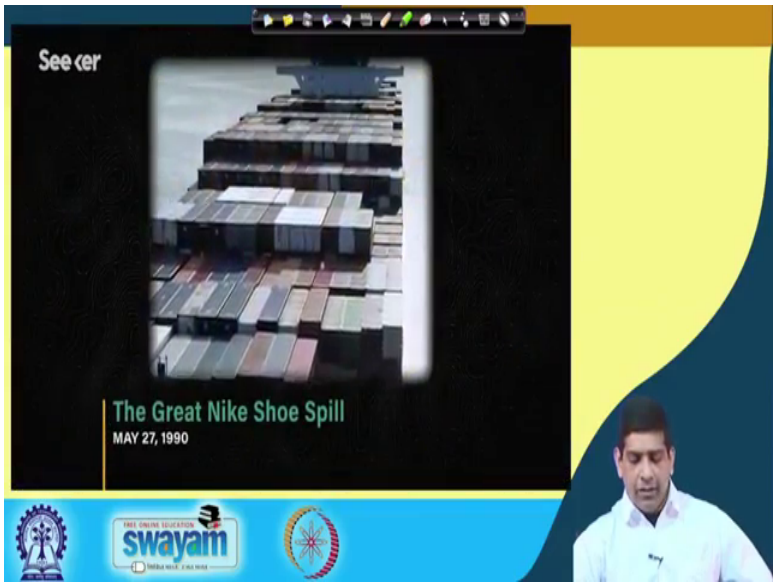

And this is what I was referring to that great Nike was Spill.

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And this is Captain Charles Moore who I was referring to about looking at plastic in Hawaii and other beaches.

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So, there are great pacific garbage patch was. In fact, in by invented not it I have should not call it invented it was accidentally found by him and he was not very happy about that when he found it.

So, and there are. So, the ocean is getting lots of plastic and its mismanaged plastic again I would emphasize that plastic as a material has been offered lot of help that plastic mismanaged plastic getting into the ocean as you can see on this a screen behind me and this is smaller plastic. So, these are all plastics collected from the ocean.

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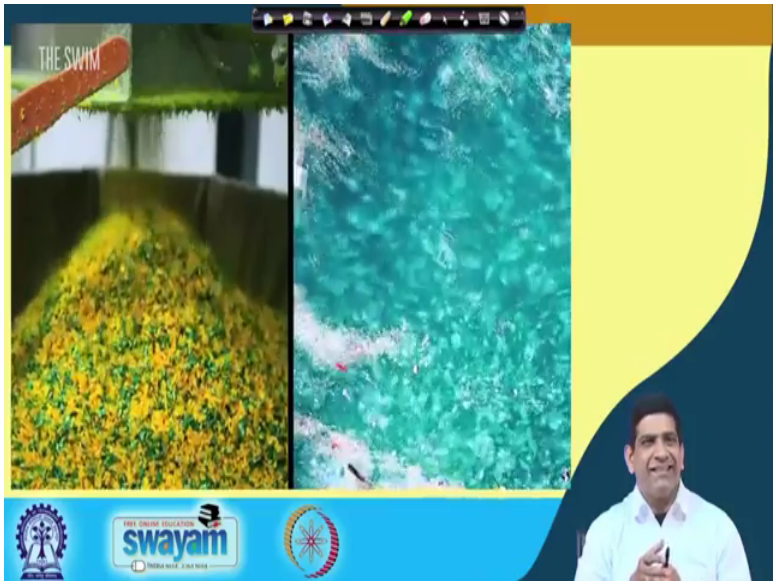

This micro beads and other things they just ultimately they end up in ocean and mixes juice think about the fish consuming this water and you and I consuming this fish consuming the fish which has consumed these plastics. So, these plastics we will end up into their body and from their body it will end up to our body because when we eat those fish.

So, that is the reason why this we got a lot of attention has been given on plastic in ocean because, most of the mismanaged plastic is ending mismanaged plastic waste is ending up in the ocean. And that is the reason why there is a lot of huge and cry in terms of plastic ocean, more plastic in ocean compared to fish. So, that is why we need to kind of further is a attention today on cleaning up of ocean from plastic.

So, that we can save out the marine life and at the same time managing this plastic waste properly so, that it does not end up in the ocean as and again I will encourage you to this is just a small snippet video and just to kind of get you excited about that different videos out there on YouTube are maybe other sources as well. Please go and look at them and if you find some nice cool videos I should not call them cool because they are actually environmental problem, but if you find something good knowledgeable which provides as good knowledge good insight into this plastic waste pollution problem. Put that link on the on the discussion board. So, that we can we all can see we all can learn from there.

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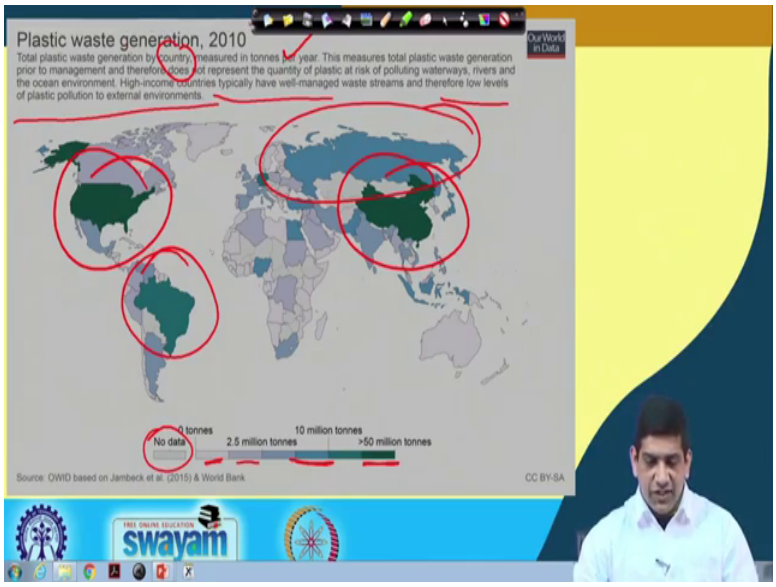

So, again and if you look at the plastic waste generation from this is from 2010 which was as again some guesstimate work was done by a paper by Jambeck et al which they had done some work in this area this is Jambeck from University of Georgia and it also some work done or the World Bank. So, taking those to work together what was found was in terms of the plastic waste generation as you can see on at the color coding anything which is no data is basically just light grayish color then from 0 tonnes to 2.5 million tonne slightly darker, then it gets darker and then from 10 million tonnes it gets a little bit bluish and then greater than 50 million tonnes is where you see greenish color showing up.

So, total plastic waste this is the plastic waste generation we are not talking about mismanage plastic here we are talking about the plastic waste that is being generated. So, this talks about total plastic waste generation by country measurement in tonnes per year this measure total plastic waste generation prior to management. Therefore, does not represent the quantity of plastic at risk of polluting waterways.

So, it is the total plastic it is not the plastic which is polluting the waterways rivers oceans environment high income country typically have well managed waste streams and therefore, low level of plastic pollution to external environment. Again if you compare this picture this graph this image where the previous data that we have talked about.

Most of the plastic pollution was coming from Africa and Asia, but most of the plastic waste that is produced is in North America, again its in China because, of the population lot of population over there and also in European countries and some other kind of rich countries as you can see over in here. So, darker the shade more the plastic waste that is being produced Russia and as to all Soviets and all that as well. So, although most of the plastic waste is produced in these countries except China, where the management which kind of shows up in both the system where a lot of plastic waste produced and lot of plastic waste being mismanaged.

But other countries where we see that plastic waste being mismanaged they do not really produce that much, but since they are not able to manage whatever they produce we see a lot of plastic getting into the ocean from these particular countries.

So, this was based on the data and most of these is the data which is reported by the government agencies. So, this is based on the data collected in 2010 now they have also this particular study I think has also tried to predict that what would be and.

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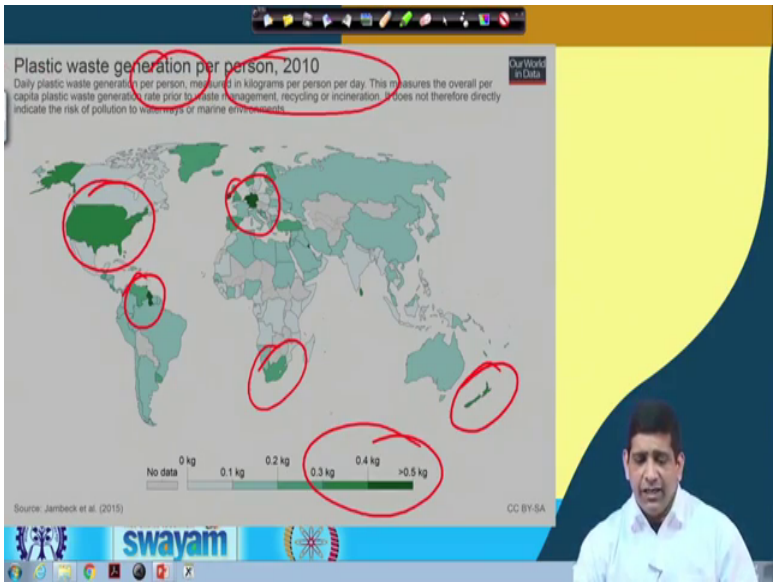

So, again they have done the previous figure was on total and then we have another figure which is based on per person because they have normalized it with the population. So, as you can see when you normalize it in population the wasteful society that shows up is number 1 over there is United States because they produce and then there are some other countries here as well some African and some the Poly South Africa and New Zealand also shows up right there.

So, and some of these European countries right there over there as well so, but because of the dark darker the shed more the voice that is produced. So, its a as you can see over here some countries if this is the daily plastic waste generation per person measured in kilogram per person per day. This measures the overall per capita plastic waste generation rate prior to waste management recycling or incineration it does not therefore, directly indicate the risk of pollution to waterways or marine environment. But as you can see the United States and some of these European countries and developed countries like New Zealand and other places they are producing more plastic waste per percent per day.

But since many of this country also have good waste management infrastructure they do not there is a leakage of these plastic into the ocean is much less as compared to some other countries. So, this data was per person just to its a good normalized proportions that you get a better idea about plastic waste that is being produced.

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Now, these talks about plastic waste generation rate it just kilogram per person per day globally and this is an interesting plot as you can see you can see over here this bubbles the smaller bubble is 0.1 kg per person per day. Then we have this as 0.2 this is 0.5 and this is 0.7 and some countries you will see is pretty high and here North America which is kind of close to between 0.5 and 0.7 which is the high over there.

Then we have some of these European countries are pretty high as well here we have some European countries pretty high probably its a European union together and then we have Australia not that New Zealand actually has higher than Australia.

Ah The reason for New Zealand being higher probably is New Zealand gets a lot of tourists as compared to the number of people they have. So, if they have that on 50,00,000 people, but they get lot of tourists coming in there and when you call pay when you do this per person per day probably they are just dividing it by the population of New Zealand not with the visitors coming to New Zealand. So, that is the reason why you see a suit up on those numbers. So, that is why you probably you will not see some numbers may not make total sense if you just go by the number by the by this bubbles.

But overall since you have to take those factors into consideration as you can see there are some hot spots the bigger the bubble more the waste that is produced more the plastic waste per person per day. And say if we have to tackle plastic pollution we should tackle those countries if you are looking at globally which country produces the most. And if you have to come up with a global policy in terms of the plastic waste management we should be able to identify the countries which are more contributor. Especially the ones which have high rate plastic waste produced like China and at the same time they have does not have robust plastic waste management system as of today.

So, this is a that kind of gives a very nice picture graphs like this produce as a very nice picture in terms of global scenario again most of these data was secondary data they are not primary data. So, their secondary data their guesstimate data, sometimes their estimate data so, they may not be highly accurate, but they do present a overall picture based on certain all those data limitations all those assumptions taking into consideration. But a still its a value in terms of the overall picture of the plastic waste that is produced worldwide and this was published in science journal of science which is in 2015.

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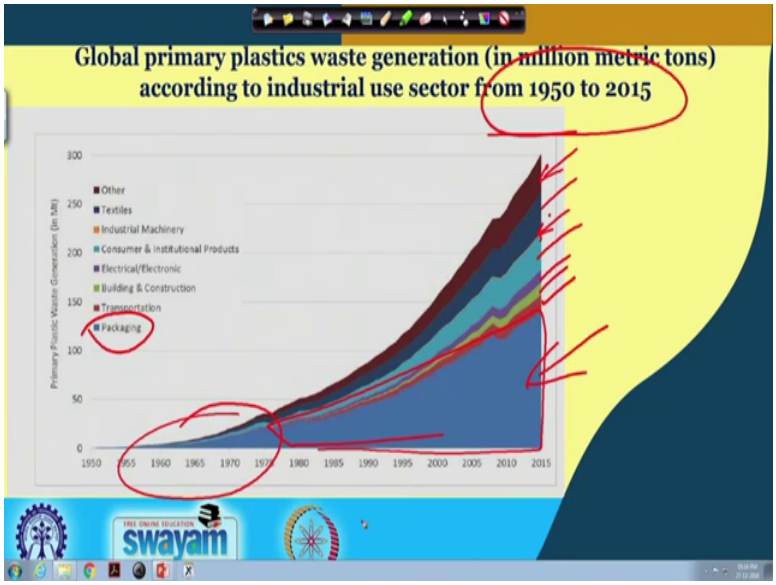

So, and then why as you can look at the global primary plastic waste generation what are the different industries which are producing plastic. So, its and again we talked about it little bit earlier as well the packaging; packaging again shows up here as you can see the bottom this is your packaging. And then you have the transportation sector we have

building and construction we have electrical and consumer and institutional product, industrial machineries we have that in there as well very small figure right there we have textile and we have others.

So, that is and that is the sector from 1950 to 1950 so, its over 55 years of period. So, over 55 years of period initially if you look at until 1960's 1975 the numbers were pretty low there in this range the numbers are pretty low, but as we go into this side we see a huge jump of plastic in packaging. And plastic application in other sectors as well its not only packaging, the other sectors are also using lots and lots of plastic.

Plastic is being used pretty much everywhere now. So, we do have not a plastic is used in industry. So, we cannot just set down plastic usage in these industries overnight. And so, that is why when we say that plastic ban is only a part of the answer and only certain types of plastic can be banned and with we have lots of other types of plastic which needs to be used we have no other option we have to use those plastic material.

But at the same because we do not have any other alternatives, but at the same time when these plastic waste does end up in the disposal stream as you saw in that video from great pacific garbage patch on the other videos out there on plastic pollution. Its not only the single use film plastic which is a creating a problem it is an entire plastic waste stream which is a problem and we need to come up with solution for the entire plastic waste ring.

So, single use plastic ban is only part of the answer its just a small percent or a small effort there are lot of other things needs to happen to have a proper plastic waste management infrastructure. And that is what this whole course is all about where we will be this is we are in the 2nd week now. As we make progress we will try to we will come up with solution to how to manage this plastic waste what are the different ways we can take care of this plastic waste. So, again I hope that you are enjoying this course you are liking so far and keep the discussion board active and ask questions do your assignments well and

Thank you and keep watching.