Carbon Accounting and Sustainable Designs in Product Lifecycle Management

Prof. Deepu Philip
Department of Management Sciences

Dr. Amandeep Singh Oberoi
Imagineering Laboratory

Dr. Prabal Pratap Singh
Department of Management Sciences

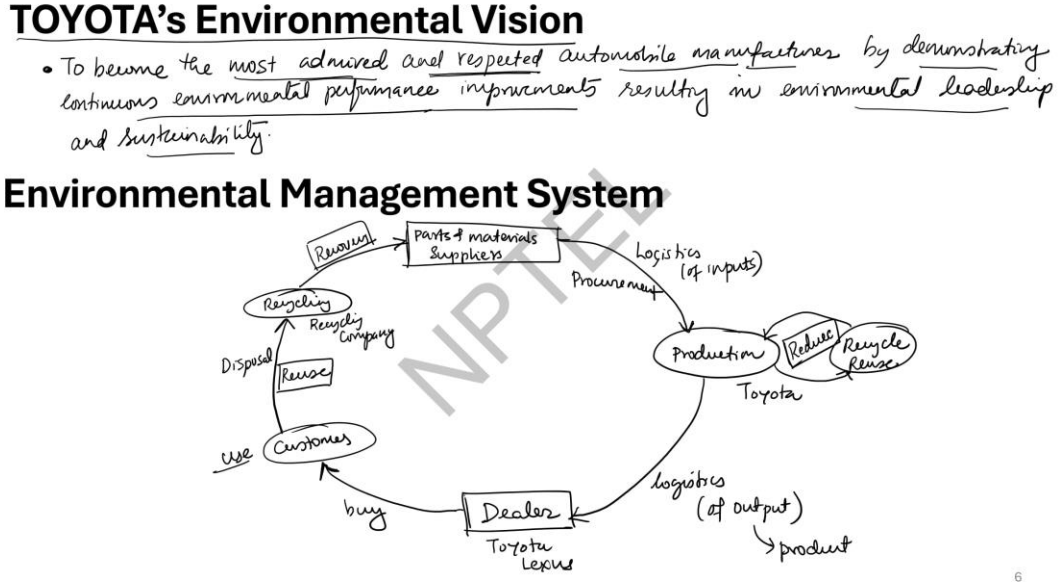
Indian Institute of Technology, Kanpur

Week 01

Lecture5

Environmental Management system

Good afternoon, everyone. Welcome back to yet another lecture of the course. And today we are talking about Carbon Credits and Sustainability in the Product Lifecycle Management. And we have already gone through different aspects of sustainability in the course. And we already talked about economic and social sustainability in the previous lecture. We had mentioned all of this.



So now let us look at few examples. And we will start with a Japanese company called 'Toyota' and the Toyota's environmental mission. And the Toyota's Environmental mission can be stated as, to become the most admired and respected company.

Respected automobile manufacturer by demonstrating continuous environmental performance, improvements resulting in environmental leadership and sustainability. So, what if you look at this vision statement, it says, most admired and respected automotive manufacturer. So, they are limiting themselves to automotive manufacturing and Toyota is an automotive manufacturer. So, they want to stay in their domain. They don't have, they are not saying become an aerospace manufacturer, but they are talking automotive manufacturer.

And how do they plan to achieve this admiration and respect? They are planning to do that by demonstrating continuous environmental performance improvements. So, they are continuously improving their environmental performance, so that it results in environmental leadership and sustainability. So, a reasonably very well stated vision statement. And how are they planning to do that?

So, if you look at their system, let us start from what he called as the dealer of the Toyota, okay. So, they have Toyota or Lexus, both of them. Those are their luxury brands. Toyota is a normal one. The Lexus is the luxury brand.

And the customers, the dealers. Customers buy their cars from the place, okay. So, they buy. The operation is bought, okay. And then, they buy and use, okay. The customers buy, okay. Not use there.

They buy from the customers and they use it here, okay. And after that, what happens is, once the customer uses it, it becomes old and then it goes to what you call as recycling, okay. So, from the customer, it goes to the recycling. So, this is what we call as Disposal or Reuse, okay. The reuse angle of the 3R is coming into picture.

So, this is recycling. It is any recycling company. They are doing this. So, the customer, after using it, they will send it to the recycling. And from the recycling, what happens is, it goes into, we can call it as, this system of parts and materials. suppliers, okay.

So, these people supply the parts and the materials to the Toyota company and so what in this process happens is, from here, they basically comes to the production, and from the parts, it comes to the production. And you have one aspect is the logistics and procurement. Both are part of this system, and the parts comes into this picture, and then

this production is Toyota, Toyota company and from there, there is, they go to the dealer, okay. But there is also logistics, okay.

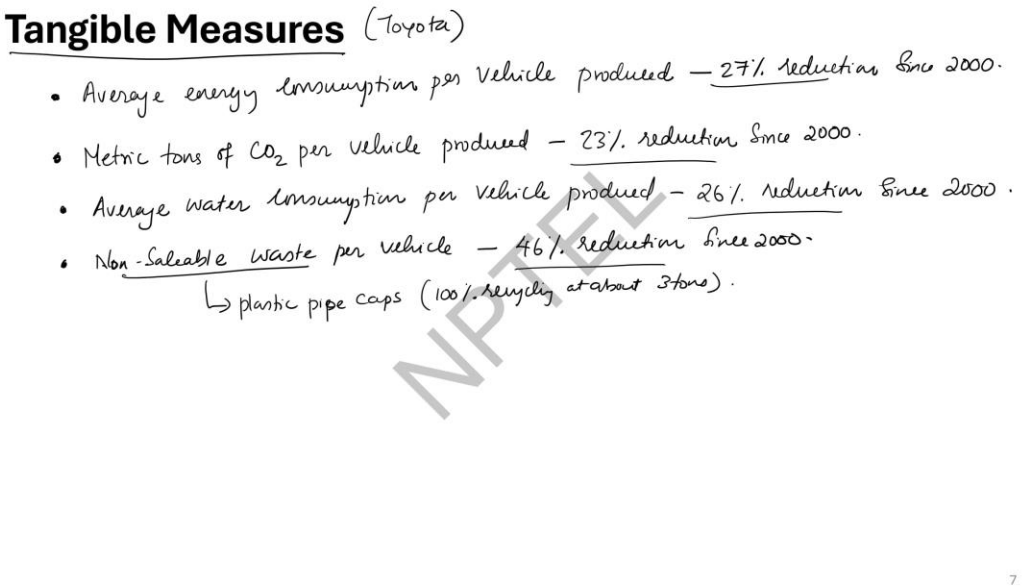
This is logistics of input, okay. Here is the logistics of output. Output is a product, cars, okay. So here is input, different form of parts, electricity, all those kinds of things, okay. And this logistics is of the output to the dealer.

But there is also another one is, recycle, reuse. So, some of the aspects, like in a machining coolant and other kind of things can be done in the production side itself. So that aspect take care of the system right here. So, this whole thing, this chain that we talked about. Where the parts and materials supply are from there, the logistics of the input or inputs comes into picture to the production, which is a Toyota one.

From the logistics of the output, okay, output of, output here in this case is a product. The product is cars, vans, etc. And then, from there, it goes to the dealer. And after the dealer, it actually goes to the customer. The customer procures from it.

And once the customer procures, after the usage of the customer, then it goes into the disposal where it's recycled. And so here you have recovery of parts. Okay, recovery is another important aspect going in this recycling aspect, precious metals, etc., those kinds of things. Okay, and then when you are doing this recycle here, you do reduce aspect in this cycle. So, some of the things, raw materials and other aspects when you recycle within the production system itself.

You allow to do reduce there in itself. So, these aspects, you can see the three Rs, they are building it into the system in one way or other so that they can do a better environmental management system as part of it. So, this is how the Toyota achieves its, so it is a Japanese way of looking into this.



So, some of the tangible measures of Toyota, Okay. What are some of the tangible measures as part of it is, so some of them are average energy consumption per vehicle produced. Okay.

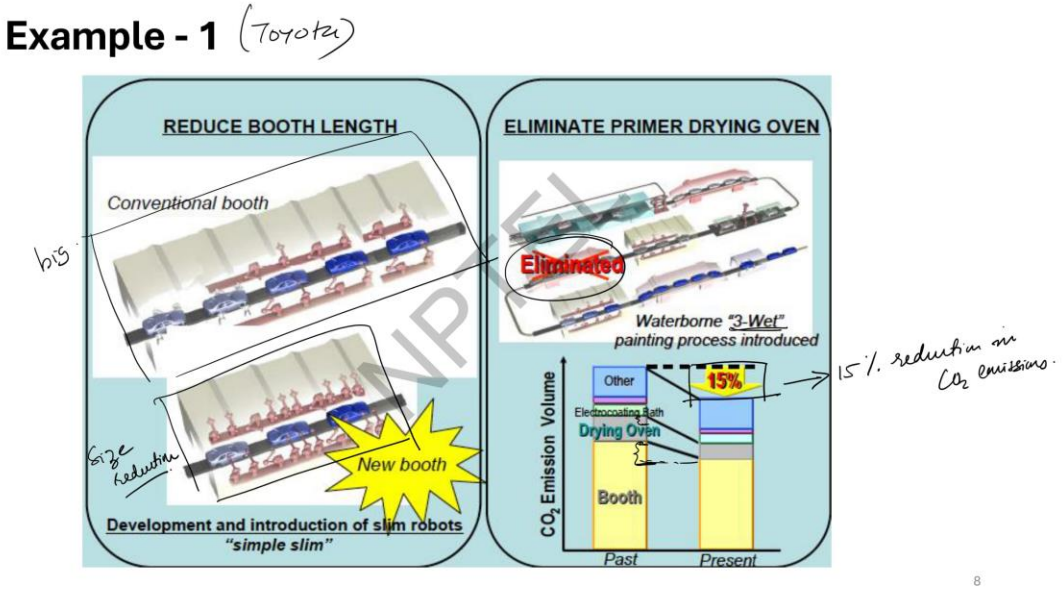
That is 27% reduction since 2000. Okay. So, the first one is average energy consumption per vehicle produced. They have reduced it on an average 27% reduction. One-fourth, more than one-fourth reduction happened after 2000. Then, the second point is metric tons of carbon dioxide, CO2 per vehicle produced.

That they have achieved 23% reduction since 2000. So, metric tons of carbon dioxide per vehicle produced, 23% reduction is achieved as part of it. Then, average water consumption per vehicle produced, okay, that is 26% reduction since 2000, so water consumption the quantity of water required per vehicle, they've been able to reduce it by 26% okay. Then non-sailable waste per vehicle. Okay.

These are the waste that is not like packaging materials, bubble wrap, plastic caps, etc. These end caps, they are all done that. So, they have reduced it by 45.6% reduction since 2000. So, the examples of non-saleable waste, is plastic pipe caps. Currently, Toyota do 100% recycling of it, at about 3 tons.

So, that is what they are recycling. All of them is recycled. So, these are some of the tangible measures of Toyota been able to achieve since 2000. 27% reduction in the

average energy consumption, 23% reduction in the carbon dioxide per vehicle that is produced, 26% reduction in the average water consumption per vehicle, and 46% reduction in the non-saleable waste. So, this actually demonstrates their environmental commitment from Toyota as a company, which agrees with their environmental mission to become admired and respected, as we mentioned earlier.



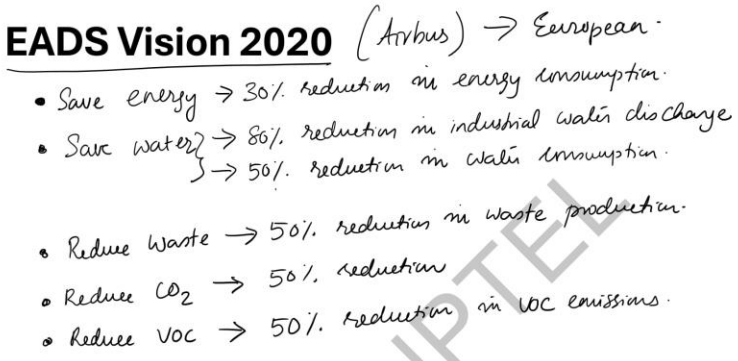
So just to showcase to you one example of how Toyota did it. This example is of Toyota again. What they have done is, in a typical paint booth, in a conventional paint booth, what they have done is, they use what they call as a slim robot. So, the simple slim. So, the size of the booth.

The conventional paint booth, you can see, this is the conventional booth. This is big. Whereas, the new booth, you can see the size reduction. So, they developed what they call as the slim robots, to actually achieve this. So, the space saving is one example. Another one that they have done is the primer drying oven.

So, when you paint, actually in the primer, there used to be an oven that is created that actually dries the primer paint. But that is now eliminated. You can see it is removed from here. So, what has happened is that, so now the primer, you paint the actual paint on the wet primer, okay. So, it's called the three wet processes that Toyota has developed that.

So, now by doing that, what has done, what has happened is they have been able to reduce 15% reduction in CO2 emissions. So, because the drying oven, which is not there, you can see this drying oven has been eliminated. The painting requires, the paint requires a drying oven, but the primer doesn't require a drying oven. So, this drying oven is required. So, that actually reduces the energy requirement also.

So, the booth and the drying oven reduction, you can see that this is the reduction in this aspect of the booth. And the drying oven, you can see that this much of reduction actually happened in the drying oven as well. So, they do this step by step.



Now comes another company called EADS. A lot of the time people also don't call it as Airbus, European Aerospace and Defence.

So read about the company, the details of it. And same is true for Toyota. Read about it. So, the EADS vision, that some of their main vision is, they instead of writing a statement, their vision, they put it in some targets actually. So, the first one is called Save Energy. Okay.

So, their target is 30% reduction in energy consumption. Okay, so they are targeting reduce energy consumption by 30%. Then second one is saved water. Okay, this is a broad statement. They want to reduce 80% reduction in industrial water discharge.

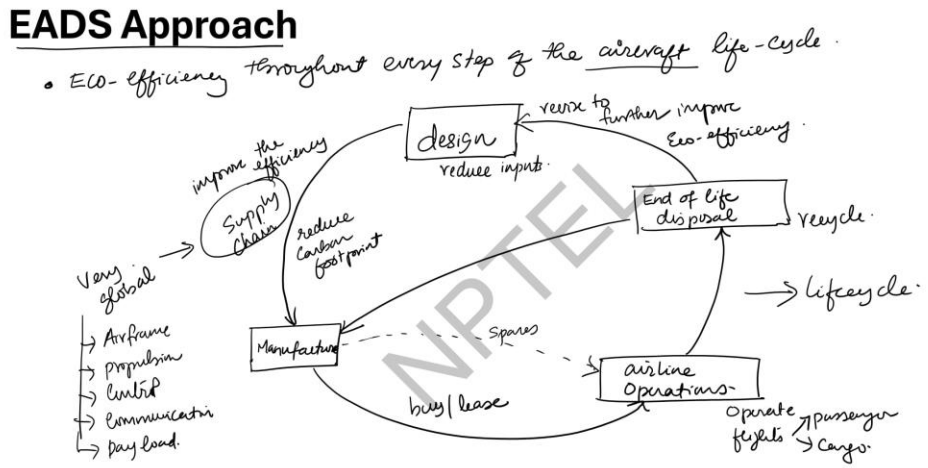
They want to reduce industrial water discharge by 80%. Then below this also, another one is 50% reduction in water consumption. Okay. So, they, in the water they have two angles, 80% they want to reduce the industrial water discharge, the water that is discharged into the water bodies, but 50% reduction in the water consumption, okay. Then the third one is reduced waste, okay. So that is the third vision according to them, 50% reduction in waste production.

That is another aspect that they want to achieve, 50% reduction in the waste production. Then the other one is reduced carbon dioxide, CO2. They want to achieve 50% reduction. The overall carbon dioxide production. Then the other one is reduced VOC.

VOC stands for volatile organic compounds. So, 50% reduction is again reduction in VOC emissions. VOC stands for Volatile Organic Compounds, okay. So, that methane and all comes as part of that. So, if you see, they have given numbers, okay, instead of writing a statement like Toyota has done.

So, how they plan to approach or how they want to achieve, okay. So, in another way to talk about this, read about Airbus, okay. So, how is their approach? What are they doing? And how is it?

But you can say that this is a, I would say this is a European company. And Toyota, as we said, it's a Japanese.



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And EADS, how are they going to approach that? So, their logic is eco-efficiency throughout every step of the aircraft life cycle. Okay. So, the Airbus.

They produce aircraft. There is an aerospace industry. So, their focus is on aircraft. We talked about automotive one. And this is we are talking about the aircraft in this.

So now let us talk about. Their first step is the design, okay, of the aircraft, starting with the design. And here itself, you know, they talk about less materials, okay, reduce inputs, less materials, less energy, better process, okay. And then after the design, then it comes to the second step, is manufacture, okay. So, there is supply chain, okay, because considering the, so here is reduced carbon footprint.

Okay, then achieve efficiencies by, you know, combined shipping and all those kinds of things. Empty backhaul, there's done so many aspects of it, but the logic is improving the efficiency. Okay, so that the supply chain from the design and this is because the supply chain is very global. So, in an aircraft, typically what you have is your five components. You have airframe, then propulsion, control, then communication, and then you can talk about payload. Okay.

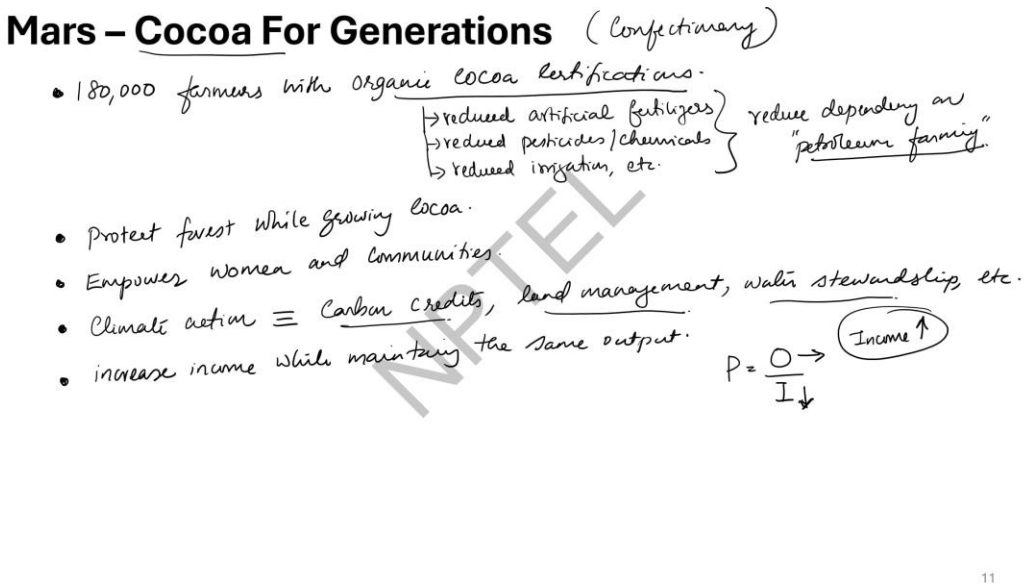
So, payload includes the sEADS, the passenger amenities. There is airframe. So, Airbus typically manufactures airframe, but many aspects are being built from different parts of the world and brought it to them. Okay. But after the manufacturing, then what happens

is the, it goes to, we call it as airline operations. Okay. So, they basically do is that the airline buy or lease and then they operate, okay.

They operate flights, okay. The two types of flights, passenger or cargo. Okay, so there are different operations, but in the operations also, they aim at reducing the carbon, reducing the fuel costs and all those kinds of things. Then comes is the end of life. So, disposal, Okay. So, here is like, you might have read about how Air India has sold one of their old Boeing 747.

It has gone to some place. Okay. So, here you have recycled, get the parts and other things. From there, it goes in back into the design where they incorporate some of the learnings and improve the design. So, the recycle and one part of it actually goes to manufacturing part of it. But the design is, what they do is revise, to further improve E-coefficiency. Okay.

So that kind of things, and sometimes from the manufacturer, there is spare parts also go to the airline's spares or maintenance. This is more complicated of a system but I get at the end of the day you can understand the how they are supporting or how they are achieving this through throughout their life cycle. So, this is the life cycle that we are talking about and in the previous one, this was the life cycle of toyota, so this is how the EADS is achieving, what they tend to achieve, okay. So, we already seen a japanese system, southeast asian country and a european system, now let's talk about mars, okay.



Mars Cocoa this is a confectionery or chocolate producing company. Okay. So, let's see how they manage this at this point.

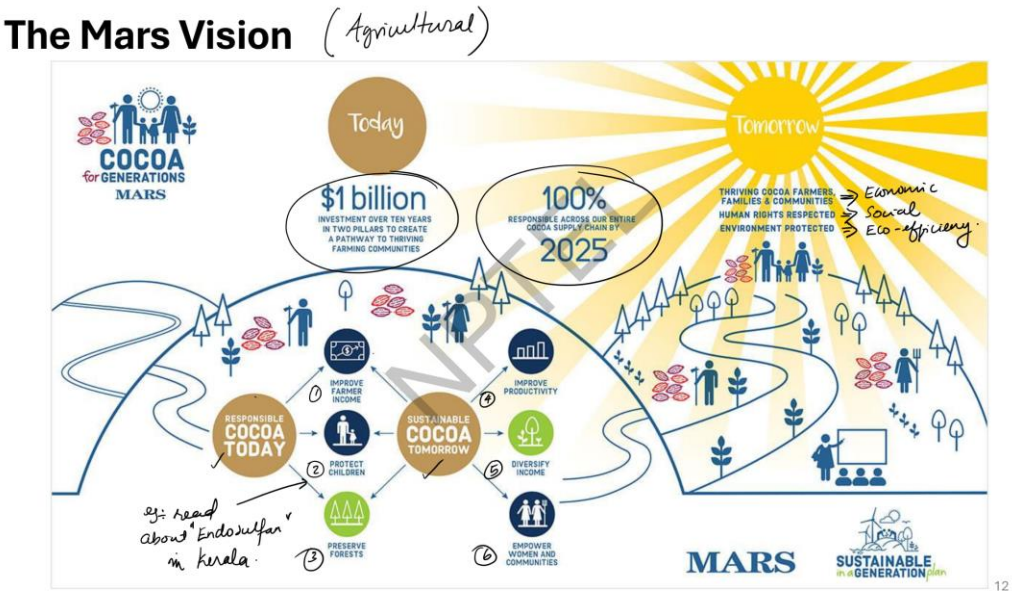
So, their main aspects is, they are focusing on cocoa, not on the chocolate, but on the raw material that is required for chocolate. That's the cocoa. Okay. So, they have 180,000 or 180,000 farmers with organic cocoa certifications, so what does this organic cocoa certification implies that means reduced fertilizers or let's say artificial fertilizers, okay, reduced pesticides or chemicals, you can call it as, okay. So, then reduced irrigation.

So, this whole thing actually is the reduced dependency on petroleum farming. Petroleum farming is where you are using urea, ammonia, all those kinds of things that comes from the crude oil side of it. So, reducing artificial fertilizers, NPK mixture, urea, all those aspects are organosulfates, organophosphates. So, by doing that, you are doing it in the organic way. So, they have created an army of organic cocoa farmers.

Then the other one is protected forests. While growing cocoa, so they earlier in Africa when the cocoa was grown, they used to cut down, they used to do deforestation, but now Mars make sure that deforestation doesn't happen for cocoa plantation, instead they try to plant cocoa in the forest itself, so that it grows in the natural way. Then comes the empower women and communities. So now most of these cocoa farming is championed in Africa by women and women-based communities.

So that way what happens is the sustainability angle is much easier to achieve. Then they have is climate action. which is equivalent to what you call as carbon credits, land management, water stewardship that I mentioned earlier. etc. So, they using reducing the carbon credits, then better management of the land and reducing the water irrigation needs. They are able to focus on climate action.

And their logic here is increase income while maintaining the same output. So, what they have done is, they have not changed the output drastically, but what, so this model that they have done is, if you think about the productivity aspect, the output over input, they maintain the same output, but they have reduced the inputs as part of it. And also, if you think about it, the income aspect, the income was increased due to the certified organic aspects of the farming. So, this is what Mars Cocoa has done.



And if you look into this, their vision, if you look into it, you can see that by 2025, they want to be 100% responsible in the entire cocoa supply chain. So, what you can see here today is that Today they have over 1 billion invested in the completely sustainable farming communities. This is their first investment. And what they do is they plant cocoa in a responsible way.

So, the farmer income is improved. This is one aspect which the government of India also tried to do that at some point of time through the farming rules, then protect the children that is by reducing the usage of pesticides and all those kinds of things, so in this example, read about endosulfan in kerala you will know what pesticide does to people. And the third one is to preserve the forest.

So, by doing all of this, what actually happens is, today they are talking about responsible cocoa, and that is tomorrow it will become what you call as sustainable cocoa. And then how do they do that? They will do that by improving the productivity. Then you diversify the income and empower women and communities. I mentioned that earlier.

So, by doing that, they intend to achieve what we call as the sustainable cocoa for tomorrow. So, if you look into all of these, the idea is that they are now, they are looking into thriving cocoa farmers and families and communities. So, this is, remember, I talked to you guys about the social aspect of it, okay. And human rights are, sorry, not social, economic aspects of it, okay. Because without making money, this process will not happen.

Then the human rights and everybody protecting the society, protecting the forest, all those things will come in the social aspect of it. And the environmental comes in the eco-efficiency part of it. So, you can see that this is also an agricultural, whereas one is automotive and aerospace, here is agricultural industry example, where people have done sustainability or people have walked towards sustainability by focusing on carbon credits and minimizing the environmental impact. So, with this we come to the conclusion of this particular topics for productivity and sustainability and some examples to give you an idea, what is going to happen, and then how do we quantify this measure, this how carbon credits fits in here to quantify, this is part of the next lecture which will be part of the next week.

So, I have given you some assignments as part of it. Please go through, do those. And if there are questions, then please let us know.

Thank you for your patient hearing.