Carbon Accounting and Sustainable Designs in Product Lifecycle Management

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Week 05

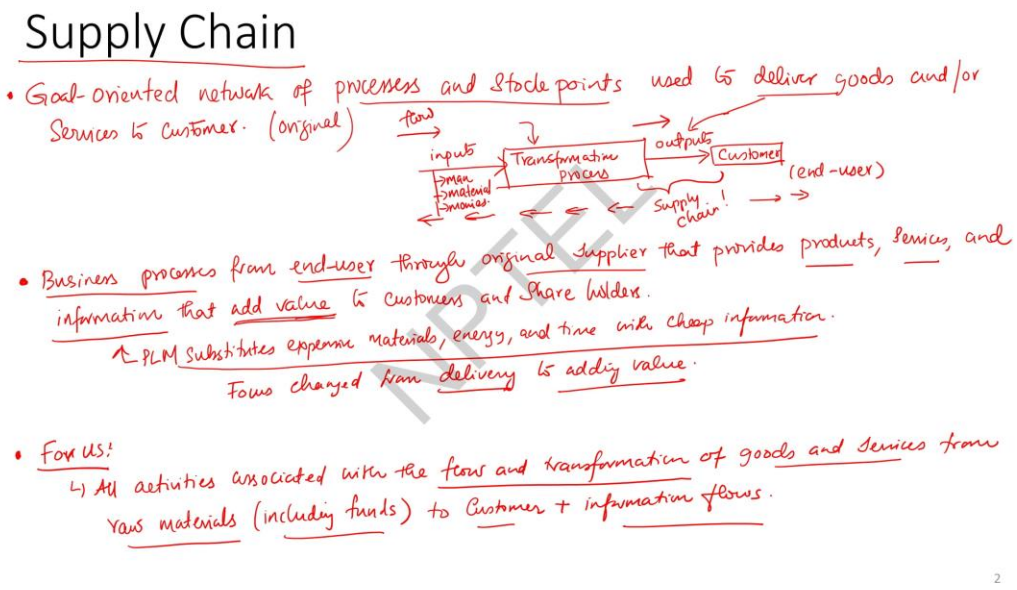
Lecture 19

Sustainability and Green Supply Chain (Part-1)

Good afternoon, everyone. Welcome to a new topic in the course titled Carbon Accounting and Sustainable Designs in Product Lifecycle Management. This course is offered as part of the NPTEL MOOCs Endeavor Initiative from IIT Kanpur. And we are in the week four of this course. My name is Prof. Deepu Philip.

I am from IIT Kanpur. And along with me, Dr. Amandeep Singh Oberoi and Dr. Prabal Pratap Singh are co-teaching this course. And today, we are getting into a new topic, a new concept that is called Sustainability and Green Supply Chain. So, these are the two topics and because this is important for us to, we are already seeing carbon footprints and other kind of things. So, and there are so many questions that are coming as part of the course.

So, we would like to address all of those in today's lecture. So, without further delay, let us get into the next topic.



The Supply Chain, this is a word that is used and misused and abused. So, there is many definitions and all those kind of things. So, let us talk about the commonly used or, the popular one.

It's a goal-oriented network of processes and stock points, okay. So goal-oriented network of processes and stock points used to deliver goods and services to customers and or services to customer, okay. So, if you think about it, it was original, as we discussed earlier in the class, we had inputs and we had a, what we call as transformation process, then we had outputs and we had the customer here, okay. So, this journey from the transformation process to the customer, where processes and stock points, this is originally what people called as the supply chain, okay. Now, then after people saw the benefit of this analysis, it started coming to here also.

To the, then it slowly started percolating backwards, okay. All the way through to the input and beyond the customer, also it started percolating both directions. So with that the definition got updated which was business processes from end user. Who is the end user? This is also the end user. From end user through original supplier that provides products, services and information. This is more important information that add value to customers and shareholders, okay.

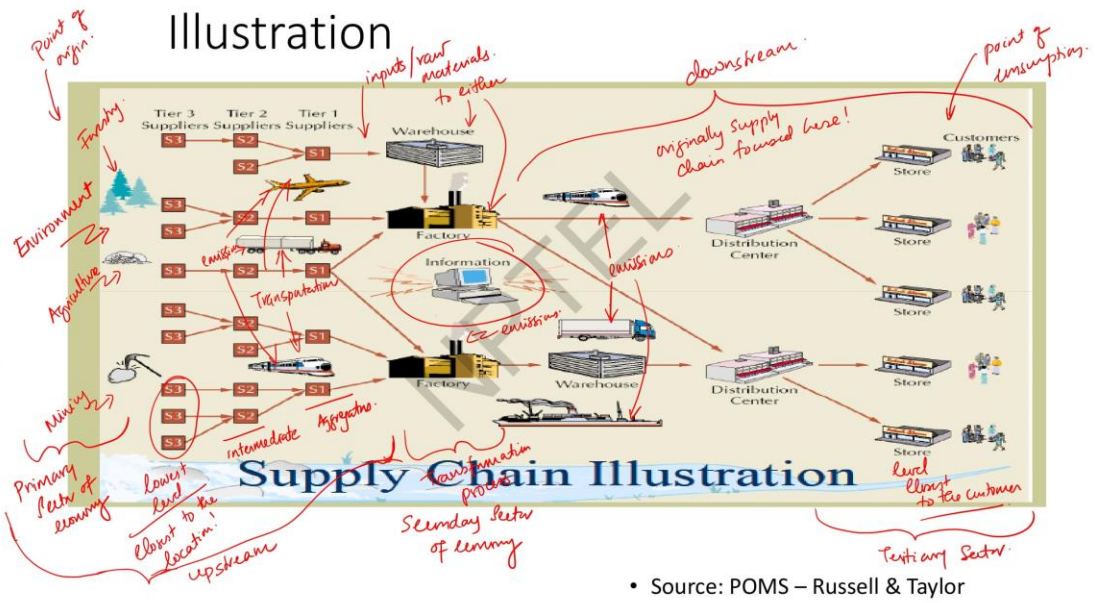
This definition is little bit more updated. Because originally the initial definition. This is the original. Or initial starting point definition. Where processes and stock points is to deliver goods and service, where the delivery, the delivery is happening here, okay.

Instead of doing this, I'll just draw like this, so delivery was of the outputs, from the transformation process to the customer. But when people found out that this is good, so then what they started is, the business processes from end user, okay. Through the original supplier, so from end user to all the way to the original supplier, that provides products, services and information. We saw yesterday that it is PLM substitutes expensive materials, energy and time with cheap information. We have already seen that, okay.

So, that kind of a thing. So, information became get added. And instead of just delivery, the focus point is adding value, okay. So, the focus changed from delivery to adding value, okay. So, once this happened and people started seeing the benefits of it, again it became updated and things got modified.

And then, now we know that this is a transformation process. So, with respect to our course, we can redefine. So, for this course, we can redefine this like this way. All activities are associated with the flow and transformation of goods and services from raw materials including funds to customer plus in addition to that, information flows, okay. So, for us, the input, if you remember, the last part of the input, we said man, materials, monies, etc.

So at this point the flow of flow and transformation both of these things, there is flow this is the flow and here is the transformation and then it flows out again, okay. So the transformation of goods and services from raw materials, so the goods and services are created from the raw materials which also including the funds, how does the funds flow into the system? To the customer, the target is the customer. And in addition to that, how the information also flows along with it. This is the major criteria or major definition for this course.



So let us have an illustration. Let us look at here. So you can see, this is the environment, okay. So, like an example is, you may get the raw materials from the forest, from the nature, from mining, okay. So, this is an example is mining, okay.

This can be agriculture. This is forestry, etc, okay. So, this is all of these things, we call it as the primary materials sector of economy, okay. So the primary sector of economy, from there things get it is either timber gets harvested or food grains get harvested or coal get mined, etc. From there, multiple tiers of suppliers see local suppliers these are the lowest level job's level means closest to the location.

And from there, they aggregate. There are people tier 2. They are intermediaries, okay. And these are aggregators. Tier 1 suppliers are actually aggregators, okay.

They are large aggregators in this case. And from there, they aggregate everything and they use different means of transportation, okay. So, there are different means of transportation by rail, by road, by airline, using different means of transportation, okay. These aggregators through intermediaries and lowest level suppliers aggregate the necessary raw materials. And here is the inputs or the raw materials go into the warehouse and some of them directly goes to the factory, okay.

So this whole thing that we call, okay. This much portion, of it up to here we talk about., this is called as the upstream, okay. Then you have a factory. This is where

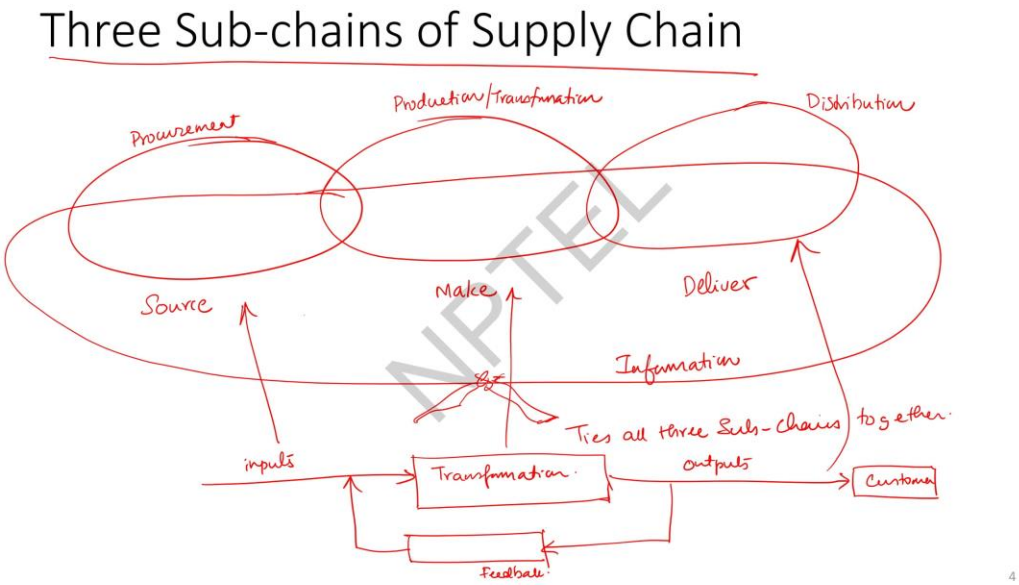
transformation process happen, okay. This is where the transformation of raw materials to finish the good happens.

This is also known as the secondary sector of economy, okay. So you can see the factory they use, you can see emissions also, and here also there is emissions and energy is being used. So, emissions like this, okay. And the secondary sector transforms it into finished goods, okay. So, this is the from here onwards to the customer.

We call it as downstream. Originally supply chain focused here. The downstream was the focus of the supply chain originally. How do you get it from the factory to the warehouse, from warehouse to the distribution center? Okay. And from distribution center to the stores, and stores to the customer? Okay.

So, this is the level of closest to the customer, and the customer buys it from the store, okay. So this portion also you can say somewhere from here can also think about as a tertiary sector, okay. And so, we now know the upstream is how we take the raw materials and other things from the environment all the way to the factory where the transformation process happens.

And the downstream is how the finished goods and services move from the factory to the customer and you can see the information this is the information flow. Which is also what I mentioned earlier that along with the raw materials and finished goods and other things the information also flows as part of the system. So how is this information works.



So let us understand this in the form of Three Sub-Chains of the Supply Chain. So the first chain, I will draw it as, let me draw it like this and I name this chain as the procurement chain, okay. Some people also call this as a purchase chain. But this is on the source, okay. Or sourcing of the goods. And then I am making another one.

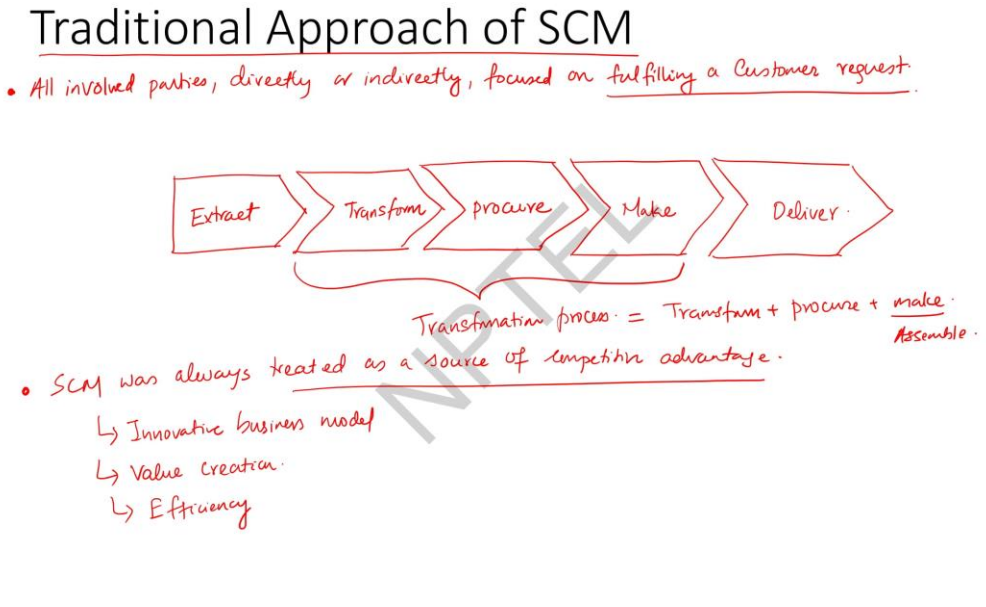
And this is what I call as the production chain or transformation process production or let's say transformation. And the one is source here, the verb is make, then the third one, third chain you are assuming that these are connected like a chain. Third one is this chain is called as let's call it as the distribution and the verb here is Deliver.

So, the product, after the transformation, the finished goods and service actually gets delivered to the customer through the distribution. So, where is the information? I call this thread that goes through this one as the, this is the information.

So, we can think about it as Think about it as a; so information ties all three sub-chains together, okay. So, if you look into this, if you talk, this is the transformation inputs. That is the sourcing chain, okay. You have the outputs to the customer, okay.

This is the delivery change and the transformation obviously is the make change, so these are the three but, we just have been only focusing on transformation. Because this is where we talked about a lot of the time, the studies around the transformation process because that's where the maximum amount of energy is. And we also had what we call as

feedback was like this, we drew this, where we said productivity was a feedback and etc. But that is part of the transformation process or the make as part of this, fair enough.



Now, the traditional approach of supply chain. How is the supply chain? And because you can see that in this kind of a scenario, the carbon footprint of this entire operation is very large. In addition to the emissions, there is emissions in this. There is emissions associated here, etc. So, there is another emission going on with the ship.

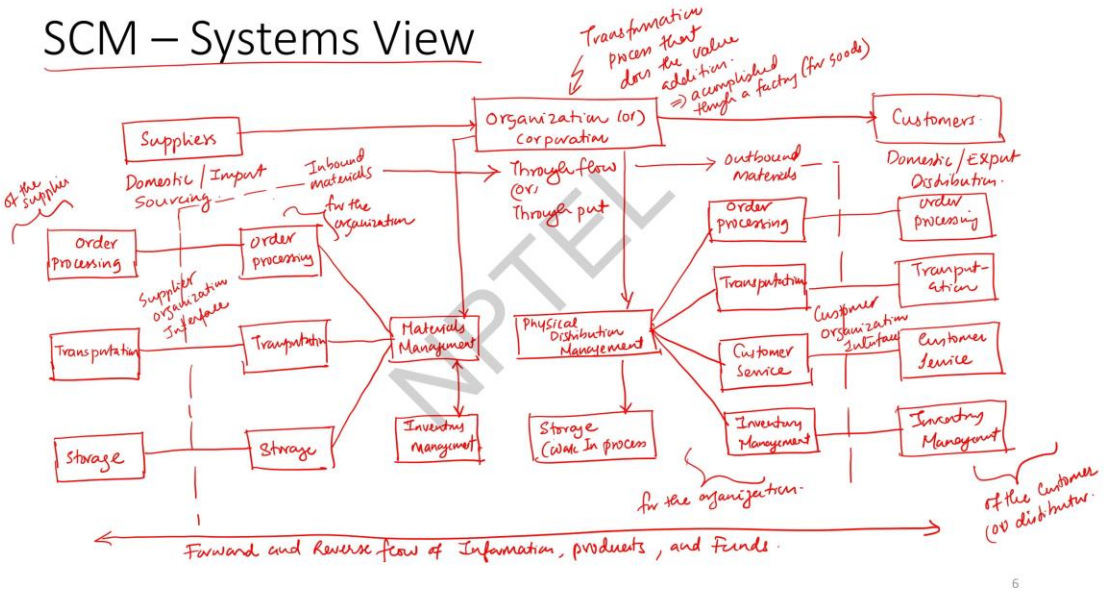
It's all like that. So, in the traditional approach, the focus always have been all involved parties, right. Directly or indirectly whether you are involved directly or indirectly focused on fulfilling a customer request. So what is that the focus is on fulfilling a customer request. That was the only focus at that time in traditionally.

So, if you think about it, one way to do this is the first function is extract from the earth. Then we have what we call as transforms. Then what we have is procure, okay. Then what we have is Deliver, okay. So, the transformation also has this aspect.

Here, the transformation process, okay. So, it is a sum of equal to transform plus procure plus make. Make, you can think about it as assemble also is one part of it. So, the process have different aspects. So, like for example, you may have a raw material and you may transform the raw material to a new shape.

You may buy a tool bit and which will be used for the transformation. And once the parts are there, you will assemble it to make it into a new bigger product. So extract and deliver is the input and output chain part of it. So the main thing here is the SCM was always treated as a source of competitive advantage. And the reason why it was treated as a source of competitive advantage because of what he called as the innovative business models associated with.

We discussed what is a business model in the previous class. So, please understand that. It also talked about value creation and also is efficiency. Because of these three things, innovative business models, value creation and efficiency, the SCM was always treated as a, if you have good Supply Chain Management, you could always have a competitive advantage.



With that in mind, you can also think about Supply Chain Management from a system standpoint. So, it is a very messy way to look into it, but look at it. It doesn't matter to us. Supplies and let us call it as organization or you can also talk it as corporation. Let's call it as an organization and then you have the suppliers to organization to customer. The traditional flow of from suppliers to organization, organization transforms it to the customer.

Now, the suppliers, they can procure things through two ways. This is either domestic or import sourcing, okay. So, the thing you can think about it is suppliers will have main things as main functionalities. We do it as functionalities. It is order processing.

The organization has given an order. They are processing the order, okay. Then they also have the transportation, okay. And third one will be storage, okay. So these three things they have to do, okay.

And the they will keep on having. So in a place we will put it something like this, okay. They have, let me put one more order processing. Then there is a transportation. And then there is storage.

They are connected, but this is where, I am going to draw a dotted line where I am saying that it is the supplier organization interface. The supplier may be supplying to many other organizations. They may not be supplying to just the one organization. So, they will have their own. So, this is dedicated.

This is of the supplier. This is for the organization. So, the supplier may have a large fleet of trucks. But when he dedicates a truck for the organization to deliver that product, then that becomes a part of it. So if you think about it, so this causes what you call as inbound materials.

The inbound materials are to the factory, okay. And this is called as through flow or throughput, you can think about it as, other word is, throughput, okay. And, from here, it actually have, what we call as, outbound materials, it can be, finished goods, or waste, or whatever it is, okay, and, the customer, can again be, domestic or export distribution, okay. Now, when it comes to the corporation. They will have a function which is called as materials management.

Based on the order processing. The transportation and storage, all things put together, it comes to what you call as the materials management, okay. And that is part of the organization. And as part of the materials management, there is another function that is called as Inventory management. That is the function of the organization, okay.

Inventory management. Then there is also something called as as part of the or within this we call it as physical distribution management. That is for the factory. It is a function of the factory again. But how you are physically distributing and then you have storage, but this is called as work in process, okay.

That's in the shop floor, okay. So then the physical distribution management from here, what we have is the outbound from here is the outbound and from the outbound we have four things. Actually one is the order processing, the order is a customer. You also have what we call as Transportation. We also have what we call as customer service. And the last one is Inventory management.

Now it is finished goods. Now we have much value added now. Inventory management. This is all part of the physical distribution now, okay. And now there is the similar happens here as we drew there, okay.

And they are exactly the same, but okay. So, this is called as a Customer organization interface. This is Order Processing, Transportation, Customer Service, Inventory management. So, these things are of the customer or distributor, okay. This is for the organization.

So, there is an interface where the things are mirrored, but one is dedicated to this, okay. And now, along with this, we also have a line underneath where we say forward. Forward and reverse flow of information, products and funds, okay. So, back and forth. When the customer buys things, they pay the money. Money comes to organization.

Organization pays the money to supplier. Supplier supplies the products. So, the back and forth, the information products and the funds travel back and forth as part of this, okay. All right, so if you see, this is a systems view of how the different systems and it also we know what the interfaces that are created as part of the system, okay. So, now, with this system, when we talk about it, when we look at the system, the organization or corporation, what we talk about it has the transformation process.

Process that does the value addition, you create the value addition as part of the transformation process which is undertaken by the organization or corporation. So this is where the organization or the corporation or owns the factory, okay. Accomplished through a factory for goods. If it is physical goods, then you require a factory.

So, if you look into it, it is cheaper because you can see that the associated things of managing the materials is expensive here, whereas it is cheaper to move the information as we discussed in the PLR.

So once you look at the system view, you can see that the traditional one, it was unidirectional. But in the system's view, it is back and forth because the forward and reverse flow of information, products and funds is there, how would the information the

products flow back. Because sometimes if the customer doesn't like the product or hard to be repaired or maintained, then the product flows back as well along with this. So this gives us a good point or a good stopping point for us to stop here before we get into what we call as the green aspect. So how do we make this supply chain green or more sustainable which we can continue as the lecture for the upcoming next part of this week.

So, thank you for your patient hearing and we will continue in the next session the green supply chain aspect of it.

Thank you.