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PROFESSOR: Basically, the goal for today-- we're going to sort of go through the case study that we had to do just as a basic framing tool, and then talk about what it means to do a corporate carbon footprint. What are the mechanisms of it? What are the issues that you run into?

And really the goal of it is this. One, understand. It's a pretty simple process, in terms of there's not much complexity or theoretical complexity to it. In practice, it's much more a matter of data gathering, decisions, talking with your marketing communications people-- things like that.

But just to get the mechanics of what goes into a corporate carbon footprint down and how you might use it to identify where the emissions are in your company, probably the more important things are this, right? Understand the measurement approach. What is a corporate carbon footprint? How does it compare to other things, like a supply chain carbon footprint or a product carbon footprint, and how do they go together?

And the other one is to understand what this means, since most big companies do release their greenhouse gas emissions, right? But as we go through this stuff, we will see that there's a lot of discretion that goes into what exactly they do with that.

So the goal would hopefully be that, as you go out, as you're working on your class project. Or as you start seeing companies doing press releases or things about how they cut x amount of emissions or whatnot, understand what went into that and be able to challenge whether they're really making much of contribution or what goes into that.

So that's sort of what we're hoping to get out of today's lecture. And at the end, we'll

probably wrap up by talking about how this relates to next class, which will be about life cycle assessment, which is going to be about a more detailed methodology for doing product-level comparisons.

So what I want to do first is just take maybe 10 or 15 minutes here and just sort of recap the case study and go over the basics. And then I'm going to have you get into groups and sort of small groups to discuss and come together as a consensus about what your approach is going to be in terms of what you're including and what you're not in the calculations.

Partly just because just to make sure we've all arrived at sort of the same general conclusions about how this works, I did look through most of what you submitted, though. Most of it's not too trouble. There's usually a few things that sometimes trip people up. So I'll go over what those are so you'll have a chance to sort of-- in your groups, you can revise or make some changes if that's the case.

So again, what we're looking at-- we're putting you in the shoes of WidgetCo. Essentially you are a chair manufacturer selling office-type chairs, where you manufacture them. You own your own manufacturing. You sell primarily to customers in the US, both at the retail level and to industrial consumers.

Facilities-wise, you have two manufacturing plants. One is located in Shanghai. The one is located here in US in Michigan. The one in Michigan is fully owned. The one in China as a 50-50 joint venture with local investors. You have two distributions centers in the US-- one in California and one in Georgia that you use for finished goods. And you also have a partnership with a large retailer that sets aside some dedicated space within each of their large big box retailers dedicated to just showcasing your products.

Transportation. You use a 3PL to bring in imported materials and finished goods. So you have the raw materials that come in by ocean that get sent to your factory in Michigan. You also have finished chairs coming in from the plant in China. Those come in over a dedicated 3PL by ocean to get to the US and then by rail and by truck once they arrive.

For the retail channel, you service that primarily with your private truck fleet. So you own a fleet of trucks that you use to deliver to retailers. And then you make up for the rest of the volume that you can't handle, either by air or by lessened truckload shipments. And finally, for the industrial channel, most of your customers, they actually come and pick it up. So you don't handle that transportation. The remaining 40% are done by deliveries. I think it was by LTL.

So that's basically what we have here, is sort of the supply chain flow. Most of your suppliers are located off in China. That's where your raw materials and parts of coming to, shipping it out to your plants in Michigan and Shanghai. Again, this in channel, all this goes on in the US. And just if we look at it in terms of this flow, this is sort of where our transportation has come in.

So pretty straightforward and simplified example of a supply chain. And the goal is to go through and figure out what your carbon footprint is based on a couple of things, right? You're getting pressure from investors. You're getting it maybe from some of your customers asking about it. So now it's starting to get some attention within the organization, from the CEO. And basically you're the one put in charge of figuring out what that is.

The pressure's sort of ratcheting up. So FerretCo is basically your main direct competitor. They operated a little bit lower price point. But they're starting to try to increase their profile by doing some of the sustainability initiatives. So part of that is they want to move into the retail space, whereas previously they've mainly served industrial companies.

So as part of that, they've released their carbon footprint publicly disclosed in the carbon Disclosure Project. And that came out at 55,000 tons of CO₂. Based on their sales and their product, that was 1.1 kilograms per product. So that's aggregate emissions. And this is sort of a per-product or per-unit level.

They've also announced a plan that they're going to become carbon neutral. And also they're exploring putting a carbon label on their retail products. A new entry into

the market-- they're trying to appeal directly to the end consumers that they'll be trying to sell to.

So with that in place, if we look at the supply chain, we have a number of different emission sources, right? We have all these different transportation pieces that are linking these different flows that we have some data for. We have emissions coming from our plants, in terms of electricity and direct emissions.

So obviously you're consuming electricity that generated emissions of PowerPoint when it was created. You also might have some direct emissions. We don't specify where that's coming from, but you might be burning natural gas or fuel oil in the facilities.

Other types of manufacturing processes-- might release chemicals directly, especially in chemicals. Agricultural companies, right? They produce other types of direct admissions. But we'll just leave it as direct emissions in this case. You also have some of these different facilities that are consuming electricity. So if your DCs and also what's going on at-- you have those dedicated little show rooms in big depot.

So this is essentially the calculation set up that we gave you. I do want to go over just two quickly. So first, facility is pretty straightforward-- electricity consumption times the emissions factor. This is in general how basically every calculation goes, right?

You have these emissions factors that are published by organizations like the Greenhouse Gas Protocol that are going to tell you what the emissions are-- four different factors. So different fuel types and different electricity consumptions, where they're going. How much do they emit? And then basically it's your job to gather data about how much you consumed or how much of that material you used, a factor in the direct emissions.

For some of these other things, when that data is not available-- especially if this is the case in transportation-- you might have a choice of several different methods.

So in this case, we had two different ones-- one based on ton-miles and one based on fuel consumption.

So this would generally be the preferred choice-- fuel consumption-- mainly because it's simple. If you know how much fuel consumed, you know the emissions factor, you know how much emissions it produce. And in cases like diesel or gasoline, the CO2 emissions are pretty much directly tied. It's basically a one-to-one correspondence in terms of, every gallon of fuel you consume is going to produce a set amount of emissions. It's not going to change too much.

So you'd like to get to that fuel consumption. But that's not always easy to get, especially when you're hiring a third-party carrier or, more importantly, when you're using shared transportation assets. So on a dedicated transportation, I hire a truckload company. They come up, they put my goods on the truck, and they take it someplace. It's nothing but my goods on there. So all of the emissions that are generated when that truck is going would be dedicated to me. So I can just try to maybe make an estimate of the fuel consumed and get how much the emissions would be.

When you're looking at rail or ocean, where an ocean ship might have thousands of different containers on it and maybe only one or two of those are your goods, you're not really interested in how much the total ship or the total rail car might have emitted. You want to know how much is essentially dedicated to you. So in this case, usually what we do is that. We would measure the efficiency of the vehicles in terms of how much fuel they consume or emissions they all put per ton-mile, right?

So a ton-mile is a pretty common indicator in the transportation, right? And that's just 1 ton times 1 mile. If you move one ton of goods one mile, that's one ton-mile. So you can think about it. If you have 20 tons on there and you go one mile, 20 ton-miles. So if you had one ton and you took it 20 miles, also 20 ton-miles.

The reason we would do it like this is because generally those larger vehicles-- the larger the ocean ship goes, the more fuel it consumes, say, per kilometer that it moves. But as it's starting to aggregate, it carries more and more goods on it. So it's

actually becoming more efficient in terms of the actual goods that it moves, because it can move a lot more product that same amount of distance on a less amount of fuel. So lower fuel consumption.

The trick with this-- and this is something that tripped a few of you up on it-- is when you have aggregated data, right? So if you look at the data that we had, we don't have a breakdown of every single shipment, especially when you're a company that's maybe making thousands and thousands of shipments. You may not have a direct record of every single shipment that you send, in terms of its distance and its total tonnage.

So what you might get is something like what we gave you. Say you knew that you had-- let's do a quick example. Say we just add two shipments. That's all we sent. And the first one, I had 10 tons on it and I sent it 10 miles. So pretty simple. That's 100 ton-miles.

The second one, we have five times and we send up five miles. That's 25 ton-miles. So in total, I moved 125 ton-miles' worth of goods. The trick is this, is that if we were to aggregate this-- and this is what you are given in the exercise. You know something like, you sent two shipments. And you moved a total 15 tons. And you moved a total of 15 miles, right?

The problem is that if you try to take these aggregated numbers and just multiply them together-- 15 times 15. It's 225, right? It's very different from what you actually did. And this goes back to our--

If we go all the way back to, I don't know, our junior high math, right? $A \times B + C \times D$. That does not equal--

Right. So I can't add these two and add these two and multiply them. You just get a different number. So if you just take the aggregate you did, especially when we had 1,000 shipments. So you moved 26 million miles or whatever it was, and you moved 50 million kilograms and just multiplied them together. You got some really huge number. And it probably threw off the calculations. You ended up having, say, your

ocean transportation or something being by far the largest source of emissions. So that's just one thing to look out for.

When we've done this-- we've given this in the past with the executive ed participants. And 99% of them always do the same thing. So I knew that would possibly trip you up. But I think in the examples that we gave, we broke it out is that one way to get around this would be to assume it went the average distance and the average weight, and then multiply those together, and then multiply it by the number of shipments.

It won't be exact, but it'll be closer, because if you just add them up and then multiply them, you're going to be off by orders of magnitude. So in terms of the calculations, that was just one of the things I saw that that is tricky to look out for.

The emissions factor. So we only gave you a limited set here. But if you go out and look at the greenhouse gas protocol, there will be an emissions factor for basically every type of fuel. So you'll have coal, natural gas, fuel oil, diesel, gasoline-- all different sort of ones.

So even though we just basically did electricity and diesel in here, there are a whole host of other factors. So if you have a company that's consuming different types of energy, the same principle applies. You know how many cubic feet of natural gas you consumed, and you know its factor.

For most companies, you're not going to really need much more than this to do the calculations, because most companies aren't doing much other than either burning fuel, either in furnaces or bunkers or in vehicles or consuming electricity.

They do make some specialized calculators for different sectors-- cement manufacturing, certain chemical production, paper pulp. Things that actually produce emissions through, say, different chemical processes that are not going to be covered by that. But for the most part, most companies and most facilities are just going to be able to be done by these pretty simple calculations.

And just in terms of the actual underlying mechanics of this. So most of the time,

when we're talking about a carbon footprint, we're talking about the six gases that are usually known as the Kyoto gases. These are the six gases that were covered under the Kyoto Protocol.

Carbon dioxide, especially in transportation and fuel consumption, is by far the largest contributor. They usually also produce perhaps a little bit of methane, nitrous oxide. And other processes might produce HFCs, PFCs, sulfur hexafluoride.

There are other gases that contribute to global warming, other greenhouse gases. But they're not necessarily covered under Kyoto. So this is just something to look out for, especially refrigerants and some of the others that were covered under the ozone, the Montreal Protocol, which covered ozone. Since they were already being regulated, they weren't included in the Kyoto Protocol. So a lot of things, especially like the greenhouse gas protocol, don't require you to measure those. But you can measure those and report them separately, because they do contribute to the overall greenhouse effect.

Our emissions factors are usually represented in a single unit, carbon dioxide equivalence. Essentially we're trying to measure different gases, contribute to global warming and different amounts, based on how much radiative forcing they cause.

So essentially, every kilogram of methane, say, contributes, say, as much global warming as 34 kilograms of carbon dioxide. So essentially what would happen is that every kilogram of methane you would multiply by its global warming potential to determine how much carbon dioxide that would be equivalent to. And so all of these factors that we give are in terms of carbon dioxide equivalence. So they're incorporating the amount of methane and nitrous oxide that might be emitted in there as well.

Part of this is that these constantly get updated-- or not constantly, but occasionally updated as part of the IPCC process. So they actually just released in 2013, I think, the fifth version of this. And so some of these factors have changed. So that's something to keep track of, especially for a company that's doing it long term.

Those factors can change as you go, which sometimes means you need to go back

and recalculate and figure it.

And one thing to be careful for is that people typically refer to things as carbon footprint or the amount of carbon they're doing. Sometimes when they say that, they actually mean just the carbon dioxide. Most the time it includes all of these gases. But you should be careful and look out for that, and make sure you're stating that upfront when you're doing this sort of thing, whether you included all of these or just carbon dioxide.

The other thing we asked in here was the emission scopes. So this is actually pretty straightforward. Once you think about what is included in your organizational boundary and whatnot, scope one is direct emissions, right? They're direct because you could put a CO₂ to monitor and actually monitor it, because they're directly coming from your facility, either from your burning fuels usually or from one of those chemical processes.

So they're the emissions that are coming from the vehicles you own-- they're yours-- or within your facilities, directly coming at those facilities, usually basically through fossil fuel combustion.

Scope two are the indirect emissions that come from electricity. So your facility is consuming electricity. Those emissions are actually occurring at the power plant, where they're burning the coal to supply that electricity. So we report that as a separate scope, because most companies and most buildings are making use of electricity. So usually this falls into sort of the basic minimum carbon footprint that we would consider for an organization-- scope one and scope two.

Scope three is all the other indirect emissions, right? So one thing to remember is that all these emissions are somebody's direct emissions. But they may not necessarily be what you're consider your organization. So anything that's not in your scope one or scope two is going to be scope three, probably because it's somebody else's scope one.

So when you're going through and thinking about what's in your organizational

boundary, what you've decided as part of your carbon footprint-- scope one, emissions you're directly producing; scope two, the ones that are coming from electricity that you consume; and basically everything else is scope three.

AUDIENCE: For transportation, if I owned a fleet, would that be scope one? And if I hire someone to move it, would that be scope three? I'm not really sure how that works.

PROFESSOR: Yeah. In general, these are going to be things that occur directly owned by you or in your-- sometimes you may not own it. But if you have direct control over it, especially like some facilities where you have a long-term lease or if you have an arrangement where you put down a long term for hire with a carrier, they still might be scope one even if you didn't do it. It's Based on what you defined as your organizational boundary.

So scope one and scope two are things that you basically have to report, because you directly admitted them or they have electricity. Scope three are things that you might want to consider within your carbon footprint boundary but aren't directly owned or within your organization.

AUDIENCE: Generally emissions from the usage would not be considered [INAUDIBLE] for the purpose of this?

PROFESSOR: Of the products that you produce? Yeah. Yes, so we'll talk about this a little bit later. Scope three is anything that's not scope one and scope two. And you may be mandated on a minimum that you need to include. But usually there's no regulation that says you can't include something in your boundary. So you could include those within your company's boundary. But if it's a product you're selling to a consumer, that would fall under scope three of indirect. And we'll talk a little bit more about this at the end when we go through this.

Again, so the case study, basically go through. We sort of listed all the activities in the spreadsheet, asked you to go through, identify the emission factor, and identify the activity driver. So how much you consumed of that. How much you wanted to include in your company's carbon footprint, anywhere from 0 to 100. So if you were

excluding it, zero. And then if you are including it, you'd have to give some percentage for that and why.

And identify whether they're scope one, scope two, or scope three emissions. Decide whether you're going to disclose this, and what you're including. And also, given what FerretCo's doing, how do you feel about pledging to become carbon neutral or labeling your products?

So we've already gone through it. Hopefully you all did originally. But I want to give you a few minutes now just to sit in small groups and talk it through. And then we'll use that as a-- so you'll have a chance to go back through the calculations and settle on as a small group one number that we'll use as the discussion within your group. So you can go back throughout. We've talked it through and revised any of the calculations or the scope, if you need to do that.

So let's just separate into small-- I don't know-- three, four, two, whatever. Just get together. So you have somebody else to go over it with. Hopefully each group has a computer with them that they can pull up the spreadsheet on. And let's just take-- I don't know-- 10 minutes, 15 minutes, or whatever and go through and come up with those. And then we'll sort of run through all of this.

So the first question we have is, what is WidgetCo's carbon footprint. So why don't we go through. And tell me how many times you said WidgetCo's carbon footprint was. How many thousand tons.

AUDIENCE: The total aggregate carbon footprint?

PROFESSOR: Yeah.

AUDIENCE: 393.

PROFESSOR: 393. Yeah, a thousand tons.

AUDIENCE: 395.

PROFESSOR: Others?

AUDIENCE: We had two different [INAUDIBLE]-- 399 and--

AUDIENCE: 1725.

[INTERPOSING VOICES]

AUDIENCE: 378.

PROFESSOR: 378?

AUDIENCE: [INAUDIBLE].

PROFESSOR: 680 was the other?

AUDIENCE: 650.

PROFESSOR: 650. [INAUDIBLE]?

AUDIENCE: Do I need to do something? Hello?

PROFESSOR: Yeah, we hear you.

AUDIENCE: 305.

PROFESSOR: 305?

AUDIENCE: Yeah.

PROFESSOR: OK. So I went through it earlier and compiled the individual answers from the people that had submitted. So here's what they look like. So we had a couple outliers, because this is basically just a calculator. And they're in the calculation overestimating the ton-mile or something like that. So if we bring it down to scale or something like this. Most of you answered in that range that we talked about-- 300 to 400.

Some high or some less. We can see where did those emissions come from. I went through and pulled out a few possibilities. The highest level-- if we included

everything on that list, right? 100% of the emissions for everything that was on that list. That would be essentially our supply chain emissions for this portion of the supply chain.

That comes out to about \$580,000 tons, right? So on a per kilogram of product basis, that's about 6.93. So that should be probably be the upper end of the range, because that's including everything that we had in there. You might have made some different assumptions in how we calculated some of these things. So that's probably why some are 395 and 399. Things like that can make them smaller. Differences in there.

The real question, though, comes to be-- I mean, the main thing is, how much of that Shanghai operation are we considering? So if we look at the supply chain emissions, we have the manufacturing in the US. And most of you-- everybody was pretty consistent on that. Straightforward once you make the calculation. We pretty much have to include that. We own that. It's all scope one or scope two emissions.

The plant in China-- same deal, right? Scope one or scope two, if we've included in the boundary. But we can make some different calls based on what sort of organizational boundary we want to set. And so if you look at it in the greenhouse gas protocol-- so as one of the standards and probably the most popular standard.

It basically outlines two different approaches you can take. One is an equity share approach, right? So you say, well, how much of this do I own? And I'll calculate the whole emissions. And then I own 50% of that plant, so I'm going to take 50% of those emissions.

So if we were to do the equity share approach, those emissions from the China plant get cut in half, right? And so I get a lower, right? The important thing to remember about this is that, at the corporate level, it was mentioned earlier, right? It's accounting, as you guys say. And if you look at the greenhouse gas protocol, it's a corporate accounting and reporting standard.

Nothing changes in terms of the supply chain or the actual operations, the actual

emissions that were out there, right? We're just changing how much of them we're going to take responsibility for or how much we're going to include in our own.

So that's the equity share, which is basically, anything that I own a percentage of, I take that percentage of emissions. And so all the things that I own are 100%. And actually it can go down even more if we want to exclude all of the-- there's all these scope three activities out there as well that I don't actually own those, so I can exclude those as well.

The other approach is what they refer to as a control approach. And they can do financial or operational control. So this, we would probably need to know a little bit more about what's going on at that plant to decide what the right approach was, because it could easily be, I'll take 100% of those emissions or I'll take 0%, depending on who's actually running the plant and who's actually making all of those decisions, who ultimately have responsibility for everything that's going on in there.

If I've just invested in it and my partner-- I've invested and I've done a joint venture, because they have all of the local knowledge. They're the ones with the expertise. They're basically running the plant and making all the decisions. And I'm doing an operational control. Then maybe I say I have 0%. And so I might throw that out of my emissions in my company.

Most likely, if it's a 50-50 joint venture, supplying directly to you, you have some operational control over that, right? They're manufacturing your product almost exclusively. So even then, you might say, even though it's a 50-50 joint venture, I'll go ahead and take 100% control.

You don't really have much of a decision other than 0, 50, or 100 on this, right? The emissions that are there, you either account for them or you don't. That is, they're in your boundary or they're not. And so that's a 0% or 100% on the operational control side. And on the equity share, it's basically just decided 50-50. So you don't get to really hedge and say, well, I'm only going to take a third of these emissions or something like that.

At the lowest level, we could do something like-- just my corporate emissions, which is just going to say, this would be what you would get if you said, I'm only going to include things I directly own-- 100% ownership for. So that's going to be just my Michigan plant. Adjust my distribution centers. Adjust my private fleet. Those are the things that I own, I have direct control over. I'm only going to include those. If you did that, you'll get something just a bit over 200,000 tons on that.

So one of the other things is that, when we look at all those different scope three activities that we had, especially with the transportation-- I had the LTL. You have the air, the long haul, the short haul, the ocean. Usually that's going to be the same case, where the decision is going to be whether I include that or not.

And once you do, then you need to account for 100%. You're saying, do I have some operational control, or is this fitting within what I consider my company's boundaries? In which case, I'm going to account for them. And when I've decided to account for them, you have to sort of go ahead and take all of them.

They don't contribute a whole lot to the overall carbon footprints. So a lot of times, you may spend a lot of time making these sort of decisions that turn out to be a pretty small case overall. For some companies, it can be a pretty large share of their emissions. And this is generally for the transportation and distribution environment. We'll talk about all the other scope three.

AUDIENCE: My question's about not putting it in between percentages. Couldn't it be OK to put, I don't know, a 10% or 15% just to pressure the company into starting relationships with your suppliers and trying to talk over these topics. If not, there's no pressure, and you're just like, OK, it's fine. I don't care.

PROFESSOR: So it's almost two separate issues, right? Whether do we want to account for the-- you're my supplier. You provide transportation service. Do I want to account for your emissions within my corporate carbon footprint, within my organization boundary?

And that's a yes or no decision in that sense. I should include these. Especially for the transportation, when we talk about operational control, that's very hard to

separate. If you're a carrier that I have a contract with and I'm telling you, take this truckload of goods from point A to point B, it's your truck and your driver. But I'm the one that's made that decision to send those truckloads.

So a lot of companies-- we'll see in a bit about what percentage of companies start to account for these different things. But a lot of companies would feel that that's their emissions, especially when it's going from my factory to my DC or something like that. I would maybe consider that part of my selection.

So that's generally yes or no-- I'm going to include these or I'm not. And if I'm going to include them, then you usually are going to include 100%, because part of this is that it's trying to be a standard. So it's trying to apply a certain set of principles and have companies follow it, because while different companies may make different decisions about what they include or not, you start getting into a really gray area when you start saying, well, I'm including these, but I'm only going to include 8%, 15%, 25%.

So as to the answer of which is the correct one, there really isn't one. So if we look through what it means to do the corporate carbon footprint, it typically starts with defining your organizational boundary or what method you're going to use to define that. And once you've done that, it all starts to flow from that.

And there's usually a minimum standard slide. So if you look at the greenhouse gas protocol, they say, in order to follow our standard, you take this approach of deciding what your organizational boundary is. And then you must account for the scope one and scope two emissions, right? So once you've decided that organizational boundary, scope one and scope two, you have to include it.

The scope three tend to be optional. And so it's up to the company to decide. And I think most people would say it's the more scope three you include the better so that you're bringing more into-- more of them become your responsibility. You start taking more care about what you're doing with those. But there's no requirement that says you have to for most scope three.

There's also one other issue, which is that for some regulatory issues, you may actually even choose something less than this. So the California Air Resources Board has regulations. There's different regional greenhouse gas initiatives.

If you're operating in Europe, you may have things where you're required to report on emissions that happened in a even smaller boundary, right? So California might be just in the state of California. Or if you're involved in the EU Emissions Trading Scheme, you might have some emissions that occur just in the EU. And you might report even a subset of these that fall within that boundary.

So there's a lot of different ways of how we dice up what the company's carbon footprint is. So that's sort of the first thing to look for is when a company starts reporting and starts making announcements of this. How much information do they give about what they included? And can you start looking at where those emissions in the supply chain came from.

AUDIENCE: Change the standard to make it a little more uniformed in terms of people should report on this to try to make the numbers make a little more sense for companies across a certain industry?

PROFESSOR: Yes. So a couple things. So one is, it's basically they're trying to take accounting principles and just apply them to carbon. And it's hard enough getting the accounting principles worked out, which is why you get all sorts of obscure rules and different companies making different choices about what they include and where they include it.

So the greenhouse gas protocol has taken the approach of a generic standard that will work for a lot of different uses. And what you'll find is that then you might have different programs, that if you want to participate in this program, they might specify certain rules that, say, you're going to have to do this or this or this.

So voluntary climate, carbon exchanges, things like that. They might decide that you must take this approach to doing it and then you must include these emissions. So it's more that there are many different programs. And the greenhouse gas protocol

is one standard and sort of more of a framework perhaps to think about how we would go through doing this. It's the most widely used one.

If you look at, for example, the Carbon Disclosure Project, which is collecting all this information from companies, they usually ask them what they're using, or what approach did you use to do this. And it's something like 90-plus percent of companies that use the greenhouse gas protocol. And typically that means scope one, scope two, scope three. They specify that they use operational control equity share and things like that.

AUDIENCE: So suppose [INAUDIBLE] scope three or [INAUDIBLE] 25%. It should be scope one for the first response. So we'll [INAUDIBLE] twice, or is that 25%?

PROFESSOR: So this is where it gets into different-- so generally, a program has money at stake, right? Then a lot of times they're very concerned with double counting, so especially when you reduce things. So if you're under the Emissions Trading Scheme or things like that, you want to make sure two separate organizations are not taking credit for, say, the same reduction or not counting it twice.

So in that sense, if you're participating in a program like that, it might say-- and this is how most of the regulatory programs work-- you only report scope one emissions. So they're actually going after the power companies, refineries, the main manufacturing plants, and not getting down to the level of individual cars. It's starting to move that way, especially as transportation is added in the EU Trading Scheme.

But that usually then takes a different approach to what it means, right? So you would likely report specifically to the EU Trading Scheme based on their requirements for it. And what you do as sort of your own corporate disclosure, whether in your CSR reports or something else, it's up to you to include.

So both of you may be claiming the same emissions. But in general, the question is whether that's a problem or not. And if there's no money or anything changing hands, there's not a defined financial payment going on, it's usually not a problem to

include the double counting, because you have two companies taking responsibility for it and trying to work through this. But yeah. So all the emissions at some point are somebody's scope one. Somebody burned the fuel or did whatever to produce it.

OK. So in terms of the carbon footprint. Even with the standards and things in place, there's a lot of discretion about what a company can include. The more important thing is to recognize how you draw an organizational boundary and then sort of what you have to report, whether it's through a program or a standard or these minimum requirements.

The other thing is-- so on the emission sources, because especially when we get into this idea of that if you're a program, you have to report scope one or scope two. Identifying where they are is going to be sort of an important piece and typically when you report admissions, they're going to ask you to report them broken out by scope one, scope two, and scope three.

So if we look at the supply chain and these different sources of emissions in here, where are the scope one emissions going to be?

AUDIENCE: Scope one is going to be the direct emissions from both factories and the emissions from the trucks that we actually own.

PROFESSOR: Right. So we're going to have our private fleet. We own these trucks, so the admissions they burn are direct emissions. We have the Michigan plant, which we own. So those direct emissions are going to be our scope one. And then these would be scope one, provided we are considering the Shanghai plant to be part of our organizational boundary.

If we excluded it, then those would moved to scope three. And it may be that if we took that equity share approach, 50% of them would be scope one and 50% of them would be scope three. So perhaps a little confusing from the reporting standpoint. But usually it follows straight through from the nature of the activity that's going on and where it happens in relation to my organizational boundary.

So our scope two.

AUDIENCE: The electricity in the plants as well as the distribution center?

PROFESSOR: Right. So are the other source of electricity we have is that the retailer, since we have those big depot. We have those dedicated shared spaces. That's usually not something that you're going to have direct control over, operational control over and whatnot. And it's not an equity share or not a stake in the company.

So that electricity is generally going to go under the scope three, which scope three is everything that's not scope one and scope two. So it all pretty much comes out in the wash once you've done that. So the important thing is to identify what our scope one and scope two is. And again, that just comes straightforward from the nature of the emissions and where it falls within your organizational boundary.

AUDIENCE: For this, when would you [INAUDIBLE]?

PROFESSOR: So that's a decision you would make before you even started the exercise, would be to the right thing to do, right? Is to decide what the first step in the process is, to decide what your approach is going to be.

AUDIENCE: Just wondering.

PROFESSOR: Yeah, so then I would divide the emissions. So in your worksheet, it won't work that way, because I only gave you one column to do it. But then I would report 50% of those as scope one, 50% of these as scope two, and the other 50% of each as scope three.

So this is what the share of scope one, scope two, and scope three emissions look like, from what people reported. Some a little thrown off, because if you miscalculated it a little bit, then the ocean shipment or the LTL might have contributed a vast majority.

Most of you included some manner of scope three in the carbon footprint. A few at least didn't, right? So you could. There's no reason that you would necessarily have

to include all of the scope three. So you could easily exclude those. So that's one thing to keep track of, is when we look at the corporate carbon footprint, scope three is the green. For most of you, it was pretty small, because we were only looking at-- in terms of that worksheet, we were only looking at things like the transportation and the distribution.

But as we'll talk about in a minute, that's not necessarily really be the case in reality. But in terms of what we report, that's what I saw from what you guys did. So this is data from the Carbon Disclosure Project, where they looked at-- this is from, I think, the 2014 reports.

So this would have been companies that reported their emissions to the CDP in 2013 out of the *Financial Times 500*. And it was asking them percentage of companies reporting scope three categories and how much the emissions were by category.

So this is saying, for a category like business travel out of the 500 companies surveyed or whatever, almost 80% of them reported the emissions from business travel in their carbon footprint estimate. So you could tell that's by far the highest.

And some of the things that drive these are-- whether you include it, whether you consider it really part of your business, and generally if you're sending your employees on travel, you would consider those your missions. That's things that you're doing. You had control over that. Even though they flew on United Airlines or whatever, it's something that you had control of whether to decide to send them on travel. So you sort of feel a responsibility to include that.

That was clearly much higher than all of the rest. if you look down into getting some of these other things, like investments, end of life of sold products. Only 10% maybe of companies reported that. And they have some data.

Now, the problem on this is these bars are representing how much the actual emissions were. So the company's accounted for their business travel. But it's basically an infinitesimal share of what's included. Part of this is driven by how easy

it is to get this sort of data, right? Your airline will happily sell you a carbon credit when you go to buy it. Most of them well.

But if you go back, I did a corporate carbon footprint with a large retailer. And they have all of this information sitting in their travel database. So they just dump it out and say, here's every flight every employee took from this city to that city, how far it was, et cetera. So it's very easy to calculate some of these.

Figuring out what happened to the end of life of every single product you sold, right? Pretty difficult to track down and get that information. So probably explains why less companies did it. And then you look at, only 20% percent of companies reported, say, on the use of their sold products. But you saw magnitude-wise it's more than basically every other category added up on the ones that did include it.

So part of the thing with scope three is that it's always sort of at your discretion of what to include. And the decision that drives it within companies is not necessarily how important it is but a lot of times how easy it is to get that information.

And also how much responsibility you feel. Do you feel that what happens to the end of life of your products is your responsibility? Or do you consider that the consumer's, the one that decides whether to recycle it or throw it away or do whatever. So maybe you decide that's not emissions that you want to consider in your boundary, because you don't have the direct control over it. Whereas employee travel, that's something you do have control over.

OK. Any questions about the scopes?

OK, just to recap some of the mechanics of carbon footprints, the first step-- determining your organizational boundary, right? And generally, that starts with deciding what approach you're going to take. And probably you want to decide that and think about it ahead of time.

The greenhouse gas protocol spends a lot of time talking about aligning this with your financial and accounting reporting. So it probably makes sense, especially a large company publicly traded, that when you're going to go through it, it makes

sense to go through and set this up in the same way that you've got your accounting system set up to make that process a little bit easier.

Once you've got the organizational boundary set up, then you need to start determining your operational boundary. So anything that's in your organizational boundary that's scope one or scope two of your operations, that's the things you're going to have to include.

But then you need to identify which of the scope three emissions you're going to include. And generally, the decision of this should generally be separate from the decision of actually gathering the data or doing the emission, in theory. In practice, they're related because you might want to include something but you can't get the data on it.

But otherwise, you're looking at the situation of, I'm going to measure the emissions, and then I'm going to include all the ones that are really small. I'm not going to include the ones that are big. So generally you can think of these as a set of principles of sort of work down in order. So you're going to decide whether something should be included or not. Then once you make that decision, go out and do the work to gather the data and calculate it.

And finally, once you've decided what's in and what's out, what you're including, running out and gathering the data and getting the appropriate emissions factors from it. So this is usually the tricky part of going through and figuring out all those facilities, all that transportation, anything related to the scope three and getting that data, because they tend to come for a lot of different data sources, if you think about who knows.

Again, a lot of times if you've paid the bill for it-- electricity, fuel, things like that-- it's pretty easy to track down a little more. But as you start getting into it, if you wanted to talk about the waste that you're generating at your facilities, the transportation where you're trying to get. How far did things go? What sort of mode did I use? You have to start going out to basically all the different parts of your organization to start gathering that data, because there's usually not a single repository where that is.

So the big pain for a lot of companies is that it's a very manual process at this stage, because you're pulling from the transportation management system, your warehouse data or your facilities. You're getting from the facilities manager. Your procurement group is the one that knows what you're buying and who you're buying it from, where it's coming from.

And so usually they're going to dump all that data to an Excel spreadsheet or an Access database and something like that, and somebody in your organization is going to get stuck with the responsibility for taking all of that, translating it into the calculations.

If you look at the GHC protocol, they have a bunch of calculation tools. They're just spreadsheets. So it's still a very manual process at this stage. Big ERP vendors and things like that will happily include some of this carbon calculation in there.

So there's a move to try to get some of this automated. But that's one of the big barriers right now, is that it usually just takes some time to get it up and get it running within a company, to figure out the processes for how you calculate the data, what format it comes in, who does the calculation, and how you report it, et cetera. So as part of that data, integrity is a big issue, because you have different people that don't necessarily know the overall picture, calculating, pulling the data for their bit, sending it in.

The biggest problem I run into in doing these are missing values. So you go to one of your distribution centers, and they come back with a report that said they used electricity, fuel oil, natural gas, refrigerants, all of this. Your other facility comes back and says, here's our electricity bills. Are they missing all of this data, or did they really just not use any of that. So making sure the data you're getting is complete.

Aggregation issues, right? So we saw this. I'll look through your spreadsheets a little bit at greater detail. But when I went through it and did this-- so if we look at the data that we gave you in this, we had a bunch of data about the shipment you sent, x number of shipments by air. You knew the average weight of all the shipments

you sent. But we didn't have it broken out by specific modes.

So when I did it, I just used the average weight of the shipment times the number of shipments times the average distance I had for those modes. It doesn't make sense that my average air shipment is going to be 11,000 kilograms and that my average truckload shipment was going to be that. Probably sending my air shipments by a few hundred kilograms at a time, I'm probably sending the truckload right by that 20 tons or so.

So once you've got the data, figuring out what you can do with it, how you get it out in the right way, to sort of separate it out can be an issue. Making sure you come up with appropriate approximations. And finally, finding the right emissions factors.

One of the big things-- pay attention to units. Everybody will report back in different numbers, especially if you're a global company. You're going to get natural gas back in therms, cubic feet, cubic meters, joules, whatever. So figuring out the units that everybody's using and make sure that you convert those to the appropriate way.

And apply a consistent set of emissions factors. Especially on things like electricity, you're going to be able to break it down by the country level, regional levels, by where the grid is. You can find information at the state level, even some at the municipality level.

The question is, what you don't want to get caught doing is cherry picking the right commission's factors. So in areas where they use a lot of nuclear, I'm going to use my local factor. And when I'm in an area that gets its energy from coal, I'm going to use my national factory to sort of keep me from ever looking too bad. So those are just some of the tricks going in with it.

So one thing is absolute versus relative measures. All of this carbon footprint data in this sense is getting reported at the aggregate level. That's what's important on a national or a global scale, right? How much total carbon are we pumping into the atmosphere?

But for our company, especially as your business is growing, you probably want to also have some kind of relative measure, like in there, we were just measuring per kilogram, as well. Just to understand, are you getting more efficient or not? Because as your business changes, either growing or shrinking, that's going to change your aggregate level of emissions.

But you may actually be getting more efficient at the same time that you're producing more aggregate levels of emissions. So you probably want to have some other measures that you calculate in addition to the absolute one. And expected carbon footprint will be refined over time.

The main use of these things is to compare an organization's year-on-year performance. So you're picking some year as a baseline year and trying to measure how you're doing from that. Most companies are going to set some target that says, we want to be at 80% of 1994 levels or something like that.

As your organization changes, as you make acquisitions, as you sell off pieces, a lot of times you're going to have to go back and restate previous years' emissions so that you can keep that consistent baseline going. As the emissions factors change over time, you may have to go back and revisit old calculations and things like that.

So just be aware that, if you're trying to do this for the goal of comparing year on year, expect to occasionally have to go back and think about what your previous year's emissions actually were in comparison to what your business looks like.

So that's the main thing about the organizational carbon footprint. But it doesn't really get into the other big issues, which is, what do you do once you have them, right? So how many of you would disclose? So what are the reasons that you would disclose?

AUDIENCE:

That if you were higher than your competitor, the disclosure to the list itself is probably more of a specific group of users who are consuming that data. So it's probably not going to hurt your consumer base, even if you are a little bit higher and it probably sets you up to be maybe a more transparent organization in the eyes of

the people who reviewed this data. So I sort of thought, well, as long as you don't have any egregious numbers in there, that it probably can only help you. And the general public isn't probably going to see this data anyway.

AUDIENCE: If you disclose, even if you're higher than your competitor, it gives you an opportunity to win the Most Improved award over time. And a lot of these numbers don't really mean anything to consumers. So you're able to do so much business market. So if you're able to have a headline that says you decreased your carbon footprint in your products by x percentage, that could actually fall apart there.

AUDIENCE: Yeah, I think not disclosing would [INAUDIBLE] worse, because then people might assume that you're-- though you might be actually worse than your competitor, by disclosing, you set it up where you can defend that and say, but we're improving and these are the reasons, rather than not disclosing, which they could just assume you're [INAUDIBLE]. That's why [INAUDIBLE].

AUDIENCE: [INAUDIBLE] that probably what the other company ended up doing is defining a very limited scope. So in terms of comparing the two, I think it's not a debate about what the script should be and how each compare to the two companies. So for me, not realizing the data was even worse, that means that they'll give you a paper. [INAUDIBLE].

PROFESSOR: Who would not disclose? Is it because FerretCo was so low? Most of your submissions indicated that as the reason.

AUDIENCE: Yeah. So it's assumed that there's so much discretion applied to the figures. I just computed that. It was impossible for an uninformed person looking at the numbers to know what went into the number. And so to the uninformed, they might think that he's comparing apples to apples, but [INAUDIBLE]. So that's why.

AUDIENCE: I think the customers' perspective would be [INAUDIBLE] the carbon footprint. So I thought it would be like [INAUDIBLE] to publish this just out of the blue and impossibly, because the competitor would have just published theirs. And I think the company might not already be ready to actually publish them, because they were

not ready also to take action on their manufacturing or operations to actually reduce this problem.

So I think that I would have delayed [INAUDIBLE]. I would have delayed the disclosure. The time to come out with a strategy and figure out what we can do to reduce to which part we can reduce and to which part we can make neutral make an announcement that we're moving on that half and that [INAUDIBLE] 2015 and to be carbon neutral in 2020 based on our strategy, and then move from there. But I don't think I would have just put the number of there without making sure in the company that what we can do and making sure that it's communicating properly.

PROFESSOR: Yeah. So if we look at what's driving this, the carbon disclosure project is probably the most widely done of public disclosure programs, right? And so this is data from the 2012 report, which is the most recent one that I could find this graph for.

So when they started this in 2003, right there. This is out of the top 500 companies in the world, 500 largest companies. They were getting less than a 50% response rate. And I think they might have even [INAUDIBLE]. But that's pretty much steadily grown over time until now. It's pretty much hovering around the 80% level that it's been there for the last three years.

So most of the big companies are going ahead and disclosing the emissions, probably because this is driven by institutional investors. So essentially they get mutual funds and other people to sign on to this. So it's being driven by investors [INAUDIBLE], not end consumers.

And you have the same sort of deal with that the business-to-business pressure. Most companies somewhere in their CSR or in their organization have maybe some requirements where they're asking their suppliers to do this sort of thing, to report on it. A lot of them are not yet penalizing you if you don't do it. But they're starting to ask, and enough people are starting to ask that most companies are starting to respond.

The end consumer, the average consumer I do not think is paying much attention to

whether a company has reported its carbon footprint or not. And even companies that don't respond to this may be disclosing this information on their websites or things like that.

And the other thing is that some of this depends on when these companies started thinking about it, to your point of the first time you get it, it may not be the right time to disclose that. You might want to wait a little bit. One of the companies that we did this with, I think we did it with them back in 2006. And they didn't start reporting until 2011. So, I mean, there's five years between when they first did their corporate carbon footprint and when they started answering it.

And actually at the time when we went and did it for them, they didn't even know they were getting this survey. And so I went and looked at their-- you can actually track companies' responses over time on the GDP, and you can go back and look.

And for the first four or five years, they had a mix of just didn't respond or declined to respond. And their VPs of supply chain, their CSR person, their communications director, and marketing-- none of them even knew that they were getting this and declining it, right? So I don't know who it was going to, but somebody in the organization was taking it and throwing it away.

So part of this comes down to getting this within the organization. Just the process of starting this can be useful in terms of getting the ball rolling of understanding where the emissions are in your organization, how to respond to these, giving you time to start thinking about how you're going to formulate a response to win, when the pressure might start mounting a little bit more.

Because the other thing that these investors are doing is sort of pressuring the SEC to make it a mandated requirement in the same way they might disclose other financial information or other of their public disclosures to start releasing some of this information, the mandatory SEC filing. So most companies would prefer to avoid that. So some of it could be seen as a bit of risk mitigation that if you disclose voluntarily now and enough companies go along with this, you could avoid the regulation that comes down to it.

AUDIENCE: Do you think there's industries where there is way more pressure to answer than ours? Because my original interest was doing Amazon. They don't report it. And then it was looking for comparables just in case to see if I could find a market leader in e-commerce. And I found no leaders in that specific industry. So I don't know how that is--

PROFESSOR: So this is something we've talked about informally on our researcher. And part of this comes from looking at-- OK, so what happens if you don't respond, right? So eventually there's enough buildup of pressure to get boycotts or things like that going. And the ability to withstand the research on why do companies give into these sort of demands tends to come down to the fact that, one, it tends to be cheaper just to do it, right?

You really just need an intern and some people to actually take the time to pull this data together to do this. It's not that complicated. And most big companies already have a department that does the sort of thing. So the transaction cost essentially to do this is pretty low, so they give in.

The other thing has to do with that whether you're consumer-facing and brand-oriented or not and what your market position is. And the stronger your market position is, the less you have to care what people think. So somebody like Amazon, Apple, may not feel that they necessarily have to do this test.

And again, and why did I measure? So one of things to think about this is that there's external and internal reasons that you might want to do this measure, the same way that any accounting system you might have an external financial reporting system. You might have your internal managerial systems that you use for something different.

So most of this tends to be to put it in a CSR report, investors or customers asking for you. You might have regulation to do it. You might also have some internal ones to do it. If you're setting goals internally in preparation for eventually disclosing, you might want to do this so you can understand where the carbon footprint is. You can

set targets. You can start putting requirements on your managers. You can figure out where this is.

The other thing to remember is that the boundaries we use for this don't have to be the same. So especially in the internal business, you can include whatever you want to include in that measurement. So to help you drive reductions at your suppliers, you might have an internal system where you grade managers and your procurement department of transportation.

In terms of emissions, that would be scope three. But at the same time, you may not include those in your external reports. So again, there's different uses for the information. And depending on what you want to do with it, you might draw the boundary in a separate way.

All right. So the other thing is that I want to cover before I'll wrap up here is, does it make sense to compare WidgetCo and FerretCo. We saw FerretCo 55,000 tons, right? Very small. And so the question is, is it worthwhile to compare companies that are direct competitors to each other, but because of their operations, they may be doing something differently?

So I actually the Ferret company numbers, actually-- I made a fake supply chain with data the same way I did for the [INAUDIBLE] from WidgetCo. They use contract manufacturers, as opposed to owning their own manufacturer plants. And I just assumed that they have the same efficiency as your Shanghai plant does.

They produce less, right? If you look at the numbers, their revenues are lower. You sell about 84 million kilograms of products. They sold 50 million. So they don't produce as much, but their efficiency per unit was the same here. I made up of supply chain where they had a different model, which is local sales offices serving industrial consumers, because they have a longer supply chain, because of all their manufacturing goes on in Asia.

I assume they used ocean and then rail and that they had a network of 40 seas, a bunch of local sales offices, and then a local fleet that did the transportation there.

So I actually figured out what these numbers would be and calculated. And that's where that 55,000 tons came up.

The big issue, though, right? If we looked at what I would sort of consider WidgetCo's boundary and what most of you did is that you're basically stuck reporting on the Michigan plant and the California and Georgia, DC, and your private fleet.

Most of you included some share of the Shanghai plant. And as we saw, the emissions were being driven by what's going on at the manufacturing plant. That was by far the largest source of emissions. It was something like 85% of the entire supply chain emissions are coming in there.

WidgetCo's using a contract manufacturer. So none of this falls within their scope one and scope two. They have a similar distribution operation to you. I included their distribution all the way, their transportation all the way up to the industrial customers that they have.

But when we do it this way, we draw different boundaries that allows them to exclude this piece. Since they don't know it, they're buying. They don't even necessarily have operational control if they're just doing contracts with different manufacturers to do it along the way.

So this is what happens is that, under these different definitions of what we might consider in the supply chain, we're going to get different numbers. And one of the things to remember is FerretCo's always going to have a smaller looking number just because they sell less goods.

So I did at sort of the smallest level, the corporate level, which is down into that 370, level 370-some thousand tons. If WidgetCo does that, it's 4.51 per unit. FerretCo's is about 48,000 and 0.95. This is what I-- saying I was publicly disclosed, which I was going to include the equity share of what goes on at Shanghai.

FerretCo, that's their disclosed number. That includes some of those scope three, and that's what I gave you in the case. But if we look at the supply chain, if we look

at this end-to-end to what it takes rather than ignore who owns what, their emissions are still going to be less. But on a per unit basis, I came up with a higher number. So this is what a lot of you got to in your write-ups and discussion. It is reporting at the organizational level makes you look worse perhaps than FerretCo does, if we're just disclosing this carbon footprint.

So when you're going in and thinking about that as a disclosure strategy, it's obviously something you want to include. And in this case, a lot of companies tend to want to be less transparent. FerretCo might disclose this number and then say nothing about it, knowing that it's going to be low.

So perhaps transparency is your friend in this case. When you disclose yours, you can say we include these because we own this, this, and this. And then maybe when somebody looks up FerretCo and they're trying to figure out why their emissions are so low and they say, well, there's no information available, then they'll see that as there's a push for more transparency and they start having to disclose perhaps what they're including and what they're not.

It starts to come to light a little bit more that really it's because they're doing different things in their supply chain that you are. Supply chain is very similar, a little bit different in terms of how they sell. But they're doing essentially the same activities for very similar products. But it can produce a very different corporate carbon footprint depending on where you draw those boundaries.

And this is starting to get a lot more attention. So this is data that Apple released, right? So they actually have a lot of good data about their environmental impacts on their web page. But the thing that they were showing is that, out of their total end-to-end everything from the raw materials that go into their products to customer use and ventral disposal, Apple only owns 2% of those emissions at their facilities.

Everything else is outsourced. They have somebody else doing the manufacturing. Somebody else is doing the transportation. Somebody else does the raw materials, et cetera. And yet, they won the Best Supply Chain award from Gartner for the last six years.

So the idea of the supply chain is no longer the idea that I'm owning that. They're managing all of these activities, but they aren't necessarily doing them in any of their facilities. So does it make sense for me to try to compare Apple against some of these other companies.

in the computer space, they might be competing against, say, Dell. Or in the phones, they might deal with Samsung. Samsung has 240,000 employees, 40 manufacturing sites. They produce refrigerators, washing machines, all of these things, in addition to, say, the Galaxy Tab that you might compare to the iPhone.

So does it really makes sense to compare these sort of companies together on the corporate level? And the answer is increasingly, no, it doesn't. And this is not unusual for a company to have a pretty low amount of many emissions being in their facilities.

These researchers looked across a wide range of activities of manufacturers of goods-- producers of actual goods by industry. What percent of their emissions were scope one and scope two? And as you can see, the top of the red line is where the scope one and scope two end. It can vary a bit. But on average, they found it at around 25%.

So most companies, even the ones that are producing goods, do not own the majority of their emissions in the supply chain. And so we're starting to see expansion of the greenhouse gas protocol. They've actually created new standards.

One is what they call the value chain approach. So this is looking at the entire supply chain, from raw materials all the way to product use and disposal, and looking at it at the aggregate level. So this is trying to say, what are the total emissions globally for everything from beginning to end?

And what they've done is they've identified different categories and provided some guidance on how you measure that. And so companies can now start to choose which of these categories they report. I think they said only one company has reported emissions in all 14 of these categories of what they have. So it's an

ongoing process as companies try to help them include more and more of this so that we can start to see.

This carbon Disclosure Project started something called the CDB Supply Chain Report. It was started by Dell, L'Oreal, a couple other companies-- Walmart is now part of it-- where they're actually surveying their suppliers and asking them the same questions that are in the CDP. And CDP manages it and helps get those responses.

The big thing to know is that it started in 2008 with 1,402 suppliers contracted. It's grown to be over 5,000 of them. So more companies are doing this with more of their suppliers. One of the big things is that the more requests a company gets for this from different customers of theirs, the more likely they are to respond to it. So as this pressure's increasing, starting to see more companies willing to respond.

And finally, to set up what we're going to talk about next time. There's also a huge issue in protocol has started a product standard. So what separates a product standard is that the value chain-- my company produces many different products. I'm going to include everything in the value chain. For all those, I'm going to report aggregate emissions.

The product level says, now I'm going to instead focus. I'm going to still do this end to end upstream all the way down to stream. But I'm going to focus on one specific product. And I'm going to report it at the product level. So when we talk about labeling-- would you put out a carbon footprint of a product on a label?-- typically this product standard is the kind of thing you would need to do.

And that includes all of the emissions from beginning to end. So that includes, in our example, we only talked about the manufacturing, the distribution. We didn't get into the raw materials, the disposal, all of these things that go into it. So these is actually what we're going to talk about on Monday when we talk about life cycle assessment, which is basically the methodology for how we go into this at the product level.

So just as a recap for that, I posted-- so essentially there, I posted an actual report

that some colleagues here at MIT did that looked at handwriting systems. They were looking at that Dyson air blade to try to figure out whether it's more environmentally friendly to do that than have paper towels or some of these other things.

So for Monday, we're asking you to read that. So it's a little bit dry. But there's lots of tables and charts, so it should go by fairly quickly. But it's a pretty good example of what it takes to get into the product level. And we'll use that for a discussion about life cycle assessment and what it means for a company that wants to do it at this level. And then next Wednesday, we have Martin Wolf from Seventh Generation to talk about actually how their company uses life cycle assessment to make sure all the products they're selling are environmentally friendly. OK.