ORY ZIK: Thank you. It's a pleasure to be here. So I'm going to talk about Greenometry. Greenometry is a new nonprofit that enlists the market in solving climate change. Enlisting the market means that we want to allow everyone to know the carbon footprint of everything. And for that, we need to fix carbon footprint. So that's what I want to talk about. And it's not a secret to you that the country took like a different trajectory than reality. 16 of the last 17 years were the hottest on record. And then policy is going on the opposite direction.

So if we would expect the emitters, the supply side, to be a major part of the solution, they have less incentive to be a major part of the solution right now because they're not forced to. So the power that we want to engage is the market. And if you think about it, the market is maybe the largest force on the planet.

Think about nearly 7 billion buyers, trillions of dollars of investors. About 400 companies control 70% of the commodity trading. Think about the decision power these entities have. Universities, every university, including this one, has a climate action plan. Cities, about 70% of the carbon emission on the planet is related to cities and so on.

So we want to engage the market. The oxygen of markets is metrics. Markets need to be run by numbers. And the problem is that carbon footprint is broken. The system doesn't add up.

If I would ask any of you what the carbon footprint of nearly anything, you wouldn't know. It's so vague. So we need to fix carbon footprint to activate the market to be part of the solution. And I want to talk more about this point.

So if you look at how many searches are done for the term carbon footprint on Google, you would see the rise and fall of carbon footprint. It was high and then went low. If you look at newspaper articles, it also went lower. On the other hand, academic publications went up.

So there's a gap between knowledge and actual public engagement in the actual information of what is a carbon footprint. And part of the mission of Greenometry, in order to allow everyone to know the carbon footprint of everything, is to bridge this gap between knowledge and actual behavior. So what makes a good metric? So how do we build a good carbon footprint?

To answer this question, a few years ago, I went to meet Daniel Kahneman, the Nobel Prize winner in Economics. And we had a long conversation about what makes a good metric. And essentially you need to think of two components. One is simplicity. It needs to be simple. We need to be able to make estimations, to make back-of-the-envelope quantitative reasoning. And you need accuracy.

In most decisions in life, we use this ability to make estimations. We estimate distances. We estimate price. We estimate the probability that the jury will be more in our favor. We do those estimations all the time. Someone on a diet can estimate calories with pretty good accuracy. If you like sports, then you would know that an Olympic athlete will run 100 meters at about 10 seconds.

But then you need the accuracy in order to have a race to the top. Who is the best? It's fractions of seconds. And if you think about carbon footprint and you want to compare two products that are the same, two running shoes, you need the accuracy in order to determine between the two of them. So you need simplicity, and you need accuracy.

The simplicity is this quantitative reasoning or quantitative intuition, which is sort of vague or sort of elusive. But quantitative intuition, the way to build it, according to this beautiful book, *Thinking of Fast and Slow,* is by thinking about two things, practice and consistency. If you have a consistent signal, like the calories of food, and you think about it daily, it becomes intuitive.

So how well are we doing on carbon footprint? And the easiest thing to think about is a gallon of gas. This is like the one major decision that we really make daily, put gas in our car. It's very energy dense, and this is like the largest emission that we do. And about two hours a year, we have nothing better to do, just fuel our cars and look at the price. That's why the price is presented with fractions of cents.

So how well can we tell the carbon content, how much the carbon emission of a gallon of gas? So we were curious about this question. And with a friend at Northeastern University, we've asked 300 people, how much carbon they emit when they put one gallon of gas in their car? The variation of the answer was two to three orders of magnitude between grams and tons, sort of, or tens of grams of tons.

Think about going into a Starbucks wanting to buy a cup of coffee and don't know if it's going to cost you $300 or 0.3 cents. That's how bad we are. So what does the market have to fix this problem? If we look at numbers in an anecdotal way, it's adjectives. Grams, tons, everything is confused.

It's either that we don't care, or that we're too lazy to actually do the math, or something else is wrong in the system that we want to fix. By the way, we were so surprised by this result, that we asked 1,000 people and got the same result. This is a log scale. The x-axis are questions that are also relevant to the daily life, like what's the weight of the car? You don't lift your car. And still it's orders of magnitude better estimation than carbon. Something is fundamentally wrong with carbon footprint.

If you put the same data in different carbon calculators online, the result varies by 300%. So MIT wants to reduce its carbon footprint by, let's say, 30%. And we use a system with uncertainty of 300%. So where is the math? And that obviously gives rise to all kinds of anecdotes. We can see newspaper articles about saving the planet by sending less emails because an email is 0.3 grams. And in the world of anecdotes of adjectives, a gram and a ton is the same. So you don't bother to do the math.

It's 0.00003 a gallon of gas, right? If you look at the way that companies are handling this problem, look at Timberland. Timberland is probably one of the companies that were the best geared to have a good sustainability program. They had a committed CEO, committed shareholders. The customers are the outdoor people. So it's better.

So they wanted to reduce their carbon footprint. And they built great sustainability reports. They were prize winners in terms of the sustainability performance. The way carbon footprint is built, so they looked at only their own site emissions, what they're responsible for, which turns out to be about 4% of the total emission. The other about 20% is electricity, and then the rest is supply chain.

So they did phenomenal work reducing 20% of the 4%. And that's the best company. And then they said, let's engage our customers, our outdoor people. So they had a label, a product label on the shoes. An average Timberland shoe is about two kilowatt hour.

The accuracy was such that all the shoes were two kilowatt hour. And who is the consumer that knows what's a kilowatt hour in the context of a shoe? What buying decisions it make?

So after 18 months of building this program, they had the label, and they took it out. So something is fundamentally wrong with the way we try to fix the problem of climate change through the market because the market doesn't have metrics, because carbon footprint doesn't work. So let's look at how carbon footprint is built. What are we doing?

So it's divided to a few scopes. Scope one is what we do on site. Scope two is the electricity that we purchase. And it's divided to scope to avoid a double counting. Then supply chain is hugely complex. It is scope 3. It is complex because how do I know what the supply in China or in Vietnam or in Malaysia is doing, and how do I allocate their emissions to the different other customers? And then there are things that are really important and are not included, like water or land use.

Next step is to convert this consumption to a metric, which is tons of CO2. And then we need to read the tons of CO2. So what needs fixing? The on-site emission is pretty well. We can measure it. We can measure our natural gas, that you'll hear about soon. Everything that's on site is OK.

Electricity is a very complex problem because we need to solve the inverse problem. I'm here consuming electricity in this room. Some of it might come from the co-gen plant down the road. Some of it might come from New England ISO, from solar panels, from Hydro-Québec. How do I solve this problem? It's a problem that wasn't solved yet.

Supply chain, as I said, is hugely complex. It needs to be fixed. And then water needs to be fixed. And then I need a metric which is intuitive. So we won't talk with those anecdotes. So it's a hugely complex system, because agricultural and gradual waste and where everything comes from is-- solving for the infrastructure is very complex. And as I mentioned, we need to solve the inverse problem.

We're in the end receiving electricity. And we need to work out all the way upstream to see where this electricity is coming from. And electricity is one example. And the other problem is that your generation is busy doing something else, clicking ads.

The best data scientists in this country are busy doing not solving social problems, but solving other problem. So part of the things that we're doing with Greenometry is just trying to build a tech company, nonprofit, nonprofit that acts like a tech company. But the success criteria, instead of being building shareholder value, it will be just abated CO_2, just reducing a carbon footprint.

So we want to fix the electricity, the supply chain, obviously with the others-- we cannot do everything ourselves-- water, and have a very simple unit, which we call an energy point. An energy point is simply 10 kilograms of CO_2, very simple. But it's equivalent to one gallon of gas.

So if I bought a shoe that is three energy points. I know that it's equivalent to about three gallons of gas in my car, start building this intuition. And it's a huge path, and we're in the beginning of this road because creating a new language, a new quantitative way of thinking about things is a huge path. So let me show you a few ways that we've handled this problem with data science.

So thinking about electricity, the carbon footprint of electricity is measured in this country right now. And the US, by the way, is leading in the world. And God bless the EPA, and I hope that they'll exist and be safe for a long time. So the EPA divides the US to 24 regions, provides an annual average information, with two years delay. So just two weeks ago, we got the 2014 information, which is an annual average.

Now, as we know, electricity is traded in 10 minutes intervals. And there's about 20,000 power plants in the US. So it's a hugely complex problem that needs to be solved with more details. So we've developed a data science model, where we didn't solve it entirely. We just improved it. And then published and made the data available.

We improved the cadence from annual to monthly or hourly-- it depends on the data available from the power plants-- and the spatial resolution from 24 to 138. So it's progress. And we're not providing this information to all developers through an API that will be launched next week.

So every developer that would like to develop an app that uses electricity can use our information and develop cool apps. Because the developers market is kind of stagnant in carbon footprint if the data is so boring and in such a low cadence. Another example of solving carbon footprint is how to introduce water into carbon footprint.

So as someone who grew up in Israel, I'm very sensitive to the water issue. Just like you have college football in the newspaper in the US, you have water issues in Israel, along with other issues. So the way we developed it, we looked at the energy intensity of water. How much energy is invested in water in each location? And then what's the source of this energy, which is the previous problem? And together we mapped water into energy.

Now, there's a huge remaining work to do because it's very local. Last summer farmers in Massachusetts had to truck water into their fields. How do you account for that? How do you account for scarcity?

So what we do is we try to solve this problem, publish papers in academic journals or other places, engage into a dialogue. So let's see how the world, if we have this carbon footprint 2.0, if we have like a quantitative way to think about climate, how the world looks like. So think about the possibility that each of you will have a carbon budget.

In very simple terms, EP equivalent to a gallon of gas, as we've discussed. So you have a household budget. You have a city budget, a university budget, a company budget in your EP. And you have a context. If you're in Texas in the summer, it will be about 200 EPs, equivalent to a gallon of gas, or 2,000 kilos of CO_2 per month for your household. And part of it is water just because a lot of energy goes into water. In New England in the winter will be less. But it can be very specific. And you start thinking quantitatively about your impact.

So if you have, just like we've discussed, a home energy device, so a home energy device, like a sense, will give you a reading in kilowatt hours. So we have, let's say, 29 kilowatt hours. It doesn't have any carbon context unless you translate it to what happens on the grid right now.

So using our API, you can have this translation. So you can see that if I'm in Brookline and I have in my energy sources solar, this 29 kilowatt hours is less than 1 EP. But on the other hand, if I'm in Wyoming and my electricity source happens to be coal, it can be significantly more, maybe five times more. So I can have a budget that allows me to think quantitatively. Just like a diet, I think about calories, think about my carbon footprint.

If I happen to drive a Tesla, so the Tesla doesn't have an MPG rating because it doesn't consume gasoline. But if you think about this conversion of 10 kilograms of CO2 is a gallon of gas, so I can convert the same 10 kilograms of CO2 to the energy sources that feed the Tesla right now. Instead of having just watt hours per mile, which is the reading on the Tesla dashboard, I can have the Tesla MPG. So I can actually compare the Tesla to other cars.

Tesla versus Lexus, if I'm in Wyoming and I have an energy-intensive grid, actually the Lexus is better. If I'm in California, most of California or most of Massachusetts, actually Tesla is better. And if I have a cleaner power source, obviously it's better.

But everything is quantitative. It's not anecdotal. It's the actions actually add up. So I can see how much money I need to invest per unit of carbon.

One of my favorite examples is the running shoe. If I buy and Nike, Nike is very proud of the Flyknit because they have this great innovation of having one thread that ties the entire shoe. But the Flyknit reduces about 20% of the material in the shoe, which is a huge accomplishment. But if you think about the climate impact and you add the energy and water, which are pretty similar to the competing issue, the Pegasus, the accomplishment is not that huge. It's like about, let's say, 10%.

What's interesting, especially with those conversations on domestic manufacturing, is that if I will know the entire infrastructure, I'll solve this reverse problem and understand the infrastructure, and look at what does it mean for the climate, not financially? To move manufracturing to Portland, Oregon, Nike's headquarter, I will reduce the impact of these shoes significantly, by about 30%, because they have cleaner water and cleaner power. And I have this quantitative notion.

I step into a shop, want to buy a running shoe. And I know that it's about three energy points, which is equivalent to about three gallons of gas. So I can know how much it relates to my other activities. I start having a budget. Just like people that are athletes that run their lives with a Fitbit, I can have a "carbon bit." There are endless possibilities. And I'll end with the last example, investors.

There are trillions of dollars that claim to be impact investors. And they're thirsty for data. For one example, imagine that you want to invest in a solar project. Now, a solar project, if you take a mono-silicon panels produced in China, installed in a relatively clean grid in California, it can take up to nine years just to pay back the carbon.

If the lifetime of these panels is 20 years, it's nearly half. It's a serious time just paying back the carbon. So the MPG of solar using Carbon Footprint 2.0 can be calculated. On the other hand, if I take cadmium telluride produced in Malaysia installed in Wyoming, it returns its carbon within two years.

So it won't drive the decisions, but it needs to be an additional factor. The economics will drive the decisions. But if I have a carbon budget, I start thinking in numbers and not in adjectives. So these things start to be meaningful. Because today, investors can calculate their financial ROI. They're totally lost on their social ROI. What's the climate? Everything is renewable. Everything is great. And we're having a great party, and everything is green except the planet.

So only three points that I want you to remember. We must engage the market because the polluters will be less engaged. The market lives on metrics. And to have a good metric, we need to fix carbon footprint. So the privilege of knowledge brings a duty to act. So let's all act about it. Thank you very much.

[APPLAUSE]

AUDIENCE: So I have solar panels, and I pay for wind power. But by my address, I think I know

Google, at some point, it would tell you where your coal is coming from, right, based on your zip code or something like that? So there's a market in my neighborhood. I would have Pepco. It would probably be coal. But I've opted for wind power. I've had some people tell me that's not really doing anything.

ORY ZIK: So obviously it does. Having wind is better than not having wind. The way it works today, since once you have an electron on the grid, it doesn't run with an ID card, you don't know. So people are loading wind electricity on their, let's say, New England IOS, and then it's assumed to be shared.

I think we can do a better job with science for you to allow you to know your actual carbon footprint. So you can have a budget that actually relates to your activity. And I think that those numbers will create extra motivation. But obviously, your solar panels and the wind is a contribution, especially if the benchmark is coal. I mean, there's no argument about that. It's almost like the lemon problems in economics, that more transparency provides better value.