The Grand Challenges

Each year, humanity releases 51 billion tons of greenhouse gases into the atmosphere. How can we start to make sense of a number that big? This lesson will give you a better understanding of the types of things that release emissions, how they are connected, and what makes reducing emissions so challenging.

0:00 *Video of a cake being made starting with a white plate on a white background, layers of brown cake and brown fudge are added to the plate, ending with pink frosting with blue swirls, black and white soccer balls and tan graham crackers.*	Let's say you're going to make a cake to celebrate your soccer team's winning season. You find a recipe for a layered chocolate cake with fudge filling and buttercream frosting.
0:17 *A video of a cake being made with a blue bowl in the center of a white screen with white eggs, flour, and butter on either side. Flour, sugar and a cracked egg are added to the bowl Followed by a montage of a hand holding a whisk mixing the yellow batter, the cake sitting on the racks of an oven, and a hand writing on the finished cake with pink frosting.*	You buy ingredients like flour, sugar, and eggs. And spend an afternoon mixing baking and decorating your cake. Several hours later you've made an incredible cake and added more greenhouse gases to the atmosphere.
0:31 *A black and white globe on a black screen which zooms in and shows white oil towers around the world. The screen zooms back out and shows red heat around the globe with white writing on the left.*	Sounds dramatic, but it's true. Since the industrial revolution in the 17 and 1800s people have been using fossil fuels like coal, petroleum, and gas as a reliable source of heat and energy.
0:46 *Video of an orange sun on a white screen, blue water and black rocks moves up from the bottom of the screen with red lines moving upwards from the rocks.*	Unfortunately, burning fossil fuels releases greenhouse gases like carbon dioxide and methane. That makes our planet warmer and leads to things like rising sea levels agricultural changes and more intense storms.
0:59 *Black and white earth on a black screen with red heat*	To fix that we'll need to figure out how to stop releasing so many greenhouse gases and remove some of what's already in the atmosphere. That process is known as decarbonization and it's not easy to do. That's because pretty much everything we do

moving around the globe. White writing appears at the bottom of the screen. Followed by a green circle with white numbers in the center on a screen of crumpled notebook paper, with blue writing on the bottom. The green circle is replaced by the pink and blue cake.	releases greenhouse gases. In fact, we're putting around 51 billion tons of greenhouse gas emissions into the atmosphere each year. That's a huge number and it's really hard to think about where all those emissions are coming from or how to stop them. But we can start by breaking this huge problem into five smaller ones we call the grand challenges. They help us understand exactly where those 51 billion tons of greenhouse gases are coming from and why even your soccer team's cake is part of it.
1:46 *Video starting with a pink and green pie chart with a pink plug coming out of it on a crumpled notebook paper background with black and green writing on the right side. Sections are added one at a time starting with a red section with a red gear coming out of it, then a blue section with two blue leaves coming out of it, then a yellow section with a yellow car coming out if it, then a tan section with a thermometer coming out of it.*	The first grand challenge is how we plug in. It includes the emissions released when we produce electricity which we use for pretty much everything including running the mixer and the oven when we're baking. Overall, how we plug in is responsible for 27% of the total emissions released each year. Next, is how we make things, and we don't mean cake here. Think more like constructing the house where you bake the cake or the packaging ingredients come in. Activities in this category release a massive 31% of our total emissions. The third grand challenge is how we grow things. Like when we grow the wheat that becomes flour or raise the chickens and cows that produce eggs and milk. Agriculture contributes around 19% of our total emissions. Then there's how we get around like when we ship sugar from a processing plant to a grocery store or drive to the store to buy that sugar. The emissions from these activities make up another 16% of the total. The fifth grand challenge is how we keep cool and stay warm. It includes things like heating and cooling our homes and businesses, like grocery stores. These activities are responsible for about 7% of the total emissions released each year.
3:06 *The pie chart rolls to the center of the screen. The Pie chart is replaced with a blue and white container of milk, then a tan cow, then a blue and white fridge, ending with a blue truck.*	Those five categories are helpful because they show the primary areas releasing so many emissions but they're also imperfect because of how interconnected everything is. For example, the milk used in the cake involves emissions from the cows that produced it, the refrigerators that kept it cold, and the trucks that moved it from the farm to the grocery store.
3:27 *A tan computer with a blue screen and pink keys is in the center of the screen with two hands. The screen zooms into the computer screen*	These interconnections can make decarbonization seem even more difficult. There's no one simple way to reduce emissions plus reducing emissions in one area might increase them in another or create a whole new set of problems to solve.

which shows a black and white news article.	
3:42 *A black screen with blue and green triangles, squares, and circles. A spinning blue fan appears in the center of the screen. The screen shifts down to a group of green figures which turn red.*	Like as Earth gets warmer, more people need air conditioning to keep cool, the more air conditioning we use the more greenhouse gases are released, and the warmer Earth becomes. But cutting back on air conditioning might mean that more people experience health concerns from extreme heat, or it might make more emissions in other areas as people try to find ways to stay cool.
4:03 *A crumpled notebook paper screen with the pie chart in the center appears with red and green arrows pointing to different sections.*	But even though the grand challenges are complex understanding these categories and the connections between them can be really helpful for figuring out the best decarbonization solutions. Thinking through the grand challenges helps us see which parts of a process released the most greenhouse gases. That can show us which problems to tackle first, and which solutions will do the most good across different categories
4:28 *A black and blue thermometer with white numbers in the center a hand appears and adjust the thermometer. The thermometer is replaced by a blue windmill and an orange sun.*	For example, almost everything we do uses electricity so finding better energy solutions like using wind or solar power could lower emissions in every other category.
4:39 *Grey blocks of concrete are stacked in the center of a white screen which is then replaced by a montage of circles staring with the pie chart, then the cake place, then a black and white globe, then a blue fan, then an orange sun, then the black and white thermometer, and finally the pink chocolate cake.*	And concrete is the second most used substance on Earth so coming up with different kinds of building materials like low carbon cement could help lower emissions for all kinds of processes and industries. In the end we'll need solutions across multiple categories to help lower emissions in everything we do. It's a huge challenge but it's one we have to face.