Topic 4e - Monitoring human impact on fires and enforcing policy

[MUSIC PLAYING] Tell me a little bit about the work that you do with wildfires.

OK. So most of my work has focused in China. It's about the agricultural fires in China. So what happened in China is after harvesting, those farmers have really short time to get rid of the previous crop residue. And they have to replant the next round. So during the shortest time, the quickest way they can get rid of that crop residue is to burn them.

Which obviously each individual fire is very small. But when you add up together, because China is a very big agricultural country, it could become like massive fires.

So it will become regional questions. And it impacts when the wind direction is right. It can impact around the bigger cities, for example, Beijing and Shanghai, which air pollution already exists, and is pretty bad already.

So tell me about the map here. What's it showing? What can we see?

Yeah. So this map here is to show a general distribution of how the fire all create in China. So you can see in here around eastern China is the most serious burning area, which is exactly also most people in China, where they are living.

So, for example, here's Beijing. Here's Shanghai. So one, the wind during summer, during the harvest season, the wind would normally blow from the north to the south. So it's exactly blowing into those cities. And, of course, lots of concern and issues there.

And are most of the fires in China agricultural fires? Or are there some wildfires as well? How much of it is manmade?

So obviously all the agriculture fires are manmade fires. And in China, most of the fires are agricultural fires. There are some grassland fires, maybe in inner Mongolia. Or northeastern China have some forest fires. But that's quite limited compared to how many more agricultural fires going on.

So humans are lighting these fires. But presumably, the smoke that comes off them must damage human health. How much of a health hazard is it?

It's happening very seasonally. Like, for example, every year there are, during summer after harvesting, and during autumn. There's another round of harvesting. So after harvesting, two weeks after that, it's intensive burning season.

So four weeks in total around the year. It's not a very long term. But for the short term, obviously it has some impact to human health, because the local PM 2.5 goes up to like three or four times higher. Even if it's like 100 or several hundred miles away from where it burns.

What is more extreme is it will make the visibility decrease very quickly. So, for example, some farmers burn those crop residue just next to a highway. It will cause really serious accidents when the visibility is really bad in this area.

And tell me about your work and your results. So you were measuring in the field and looking at satellite data. What was the outcome of your research?

Yeah. So these kind of agriculture fires used to be an issue in the remote sensing study, cause they are very small. The traditional sensor we were using called MODIS, it is not capable to detect such small fires.

So a few years ago there was a new sensor available called VIIRS. It has very high resolution. It can detect, theoretically, fires down to 5 to 10 meters square. So it's very suitable for these kind of small fires.

So what I have done basically is we combine this data with some validation, some ground based in situ measurements together. And we created this kind of new data set, the emission data set, which is available here through four years.

And here is to show the results of the very nice seasonal pattern and the area distribution in eastern China so we know where those fires have come from and how much it has emitted. Like in our very first results, it shows every year it can produce millions of tons of carbon dioxide and thousands of tons of PM 2.5, which is quite a large number in such a short period.

And also, it compares the result to what already exists, some products here, like we call it GFAS and GFED is what people normally use. You can see it has the issue of underestimating those emissions quite badly.

So we can see here, this is three years along the bottom. And it's the same time of year. There's a spike at the same time of year.

But the spikes are different. Cause that spike's hardly there. So the spikes are different in different years.

Yeah.

So can you now begin to predict that? Or are you just measuring the outputs of those fires?

For now we're just measuring it, because these kind of agriculture fires, as you can see, it's quite low here. Cause that year the government had spent a lot of resources to try to reduce this kind of burning. So you can see it was quite effective on what we measure from the space.

But I would say, it's not that easy to predict whether they will burn it or not. Because it's a very pure, manmade activity.

But you can see here on your map at the top here you can see very clearly exactly where everything is happening. And there's a very short spike. And then it all dies away. So you've got all the detail that would allow policymakers to take action if they wanted to.

Yes. Exactly. So from this map they can go down to which village, which field this fire has just occurred. And if they want to do any regulations, say, they want to focus more on certain areas, that it's all available.

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