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Keynote 2: **Are conservation and energy SDG complements? Panel data evidence from the Himalayas**

What I'm presenting in the next 27 minutes is two strands of work over the years. I think when I first started coming to SANDEE, you must have seen more work on conservation, on nature, and not so much tourism, but sort of very much biodiversity conservation. That's what my thesis was on. While I've been coming in and out of SANDEE over the years, work has clearly drifted into infrastructure, energy, climate, climate mitigation. And so this is one project where those two threads come together, very much in the spirit of how I was involved with trying to help ICIMOD. Sometimes people get stuck in their silos and it's difficult for them, those working on tourism, to recognize that energy has something to do with that. And like Mark was saying a lot about water and food and poverty. But unlike the presentation you saw, this is very much a nuts-and-bolts SANDEE-ish project. We have a couple of hypotheses. How do we go test it? What do we find? What are the implications? The first point is that in my work on clean energy, I don't work at the facility level, mostly rural energy, so clean cooking, micro hydro. It's the same old fundamental problem. You need money. And there's governments who want to spend money or not, and donors who want to spend money or not. A lot of that kind of disappears somewhere for all kinds of good and bad reasons. Where is new money going to come from because energy is scale sensitive. Unless you have 100, 200, 500 households signing on, it's difficult to deliver energy. And certainly, when you're sitting in Nepal and you see, oh, the next household is there, and then there, I mean, bring the people to the energy rather than trying to bring the energy to the people, right? So this kind of question comes up. And without clean energy, you have all kinds of problems, which I may not have time to describe.

Things are sensitive to scale. Ecotourism, where foreigners with money in their pockets are showing up in places that donors and governments are often not going, might be one way to buy you some time and drive that demand stimulus. And so ecotourism might be the answer in remote areas. And to prove this, we look at every year for the last 15 years, every VDC in Nepal, and we look at microhydro. And there's a reason we pick on that in the mountains. And look at whether that has responded to the demand from tourists showing up in these places. Tourists often come, they want light at night to read and recharge their Kindle, charge their phones, do Instagram posts, whatever they want to do, drink cold beer, have warm bread in the morning from German bakeries. All of this then makes it somewhat easy for local hoteliers to sort of cooperate and then get that extra stimulus to build a small plant that is going to charge up people. Right? The fundamental question is infrastructure is scale dependent? Scale needs cash. Cash in remote rural areas is difficult, unless you are a very, very benevolent, well-functioning donor versus a government. But tourists are volunteering and showing up in these places. We find that where there are tourists, there is microhydro a few years later, and that's the basic result. And then there's about 45,000 tables proving that it couldn't be. This would be that like, that's what our field is now good at, like, questioning. Have you checked this and that basically we have for the econometrics side of this conversation, which we can probably hold offline and not take up much of the time today. We have an instrument that predicts where tourists go. Nepal happens to have many peaks which are above 8,000 meters. Those peaks came first. Tourists followed. Microhydro and energy came after that. That's the sequence. And we've done a variety of checks of this. And I'll tell you all the ways in which we try to convince ourselves it couldn't be this, but really the result has helped. More energy is being used, more appliances being used, productive use, more businesses are opening up, people are switching out of forestry into tourism, women are starting businesses.

All the kinds of things that different units of ICIMOD is doing in their green, resilient mountain economies kind of work, I was trying to get them to sort of get involved in the study, or at least test it out with more ground realities. And that's what's happening. Now, tourists are they coming and then mucking up the world? Most of us, Western tourists think, okay, I'm a good tourist, but the other person coming is an idiot. Right. And so, it's very hard to get wall to wall coverage of something environmental. But of course, if you work with Francois, the leaf area index, or which I learned yesterday, there's a better name for it. The lie index, as opposed to the truth index, right. People were calling it the lie index. So the lie index is, you do see that the forest cover hasn't deteriorated, but you also see that we are using some sort of citizen science here, eBirds. That's not actually just a bird on your app, but a bird that you've seen and recorded. Bird usage conditional on the effort of recording is also going up in these places. These are nature tourists. These are not idiots who are just mucking up the environment. In pursuit of conservation, you might get an energy goal. All those people fussing about SDGs, do they work? Do they compete? This is one of those win-win situations, possibly. Now, does this generalize? SANDEE, ICIMOD is a good place to test this in Pakistan, to test this in other parts of the mountains. Does it generalize to coastal communities? I don't know. You could think about that.

Clean energy is very important. I don't have time to explain this. Everybody here, half of them do projects on this. There are all kinds of ground level, regional level, global level problems. A lot of economists working on this tend to get more involved in sort of the pollution side and proving that this is not really their comparative advantage, but that's what they focus on. What some of us have instead focused on, assuming that clean energy is important, how do you get into people's hands? And so most of the studies are about adoption, whether it's information or subsidies. I am much more on the supply side, like what institutions are needed. One example is ecotourism might be that channel that is doing this. Of course, it's not just an externality story and efficiency story. It's very much an equity story. Most of us woke up and pressed a button this morning and good things happen. That is not a choice available to millions, billions of people around the world. And that's just unfair. You should do something about something that's unfair. It's a climate justice type of point as well.

I've already made this point. This has got some sort of an anthropological part. I was not a big fan of tourism or tourism research, but it's true. In places where we are trying to do development, one of the few sources of exogenous cash that is showing up is tourists. And they bring a certain set of preferences, but they also bring money. Also, in my experience with solar projects in Africa, you'll notice that if there is another sector, if there's a cell phone tower, that justifies another cell phone tower. Therefore, then the households can access the solar work. And I've already talked about how tourists literally ask for more energy. We've done all kinds of reviews. You can see that both in the energy access space and in the tourism space. And knowing my style, you probably know there's a systematic review that's already done or in the making, mostly all to justify that there is very little causal work linking tourism and development outcomes and environmental outcomes. I don't have time to go through that review. It's a joint work with a PhD student who's finishing up. Here we are back in Nepal, everybody's favourite country almost. Even though we are in Sri Lanka, it's true that almost a third of our studies tend to be about something in Nepal. Most of you recognize this. This is a classic sort of tourist site. You're looking at the peaks, you're walking up there, you're doing homestays. The question is whether that can have spurred some interest in infrastructure and especially clean energy. Especially clean energy, not – so this is micro-hydro-solar and biogas, but that's not relevant for our study site. As you can see, tourism has kept going up. This map probably should be extended. There's probably a dip around COVID, and then it's back up. The numbers are up and up and up and up. These are places where tourists go. These are places where tourists don't go. And I'll describe that in a second. And you see the uptake of renewable technologies, micro

hydropower, biogas, and solar home systems. The question is, if these are taller than these, all are equal. Where there are tourists, is there more clean energy? Yes, of course, you're thinking, is the direction the other way around? And that's why we have all these statistical tests to sort of check that. This is another graph. That is where tourists are going and see what is happening in the exact same VDCs in terms of microhydro capacity installation a couple of years later. It's almost tracking it. That's basically the result that I'm defending with thousands of graphs and figures and all right. Well, this is the evolution of micro hydro projects.

This is your favourite, everybody's favourite renewable technology. Small is beautiful. These are not mega hydro. These are not even massive hydro. These are 30, 40, 50, 200 households, one pipe going into a generator. I'll show you a picture in a second. And it's very EF Schumacher, small is beautiful, that kind of thing. This expansion is what we studied over the years. Almost nothing in 2015. Meanwhile, tourists have also been increasing in increasing numbers. There's two ways to define it. There's a protected area. Yes, there was some debate about conservation area versus protected area yesterday. And those have not really increased, but the number of people coming there has increased. And the unique part of foreign-based tourist is, those of you who've done this in Nepal, you've got to stand in a line somewhere, register, have them enter all that information. And when one of your co-authors turns out to be an important government guy, you can get access to that information. You know which village had a set of tourists passing through it. That's what we have coded. If someone has passed through it, is there a microhydro a few years later is the question we answer here. This is the microhydro installation over time. These are the tracking routes and people coming across time. We have three days to measure it. Your village happens to be in a protected area. The number of visitors to that protected area and your village. Your village happens to be on a major trekking route, and the number of trekkers coming through your village over time. Every year, over the 15 years, what is going on?

Like I said, this is not mega hydro. This is basically the gist of a micro hydro. It's using gravity to channel some water. It goes into a turbine, turns, and it does some magic for about 50, 200 households max. The capacity is sensitive to how much cash you can raise and what happens. And this is where we say the presence and absence of tourists is sort of bumping it up one scale or from nothing to having it. We are going to regress the capacity of energy in a village. On the tourists visiting, and then we worry about all kinds of other things. And so with Nepal, over time, you can get all kinds of data. And you sort of control for everything else that might be explaining why some place has more microhydro compared to not. Did the tourists hear that there was beer there and there was electricity and internet? Therefore, they decided to go there. We will say that you can explain tourists based on, can you see the, or do you have access to the peaks that you're looking at? Most of these mountain tourists are going to see the snow on the peaks, okay? So we use the distance to the peaks as a predictor of whether the tourists will show up, and then use that predicted number of tourists as an explanator of microhydro sites. And basically, the result is robust to using this instrumental variable approach. This is stronger. Ecotourism increases demand for microhydro. What else happens? As I said, fridges, computers, internet, mobile phones increases. Increases. Radio that doesn't need electricity, there's no effect. Number of employers increase. Number of employees increase. Working for yourself goes down. Wage worker increases. People shift out of forestry, shift into tourism. These channels are there. This is not just a reduced form story. Could something else be going on? So this is like the fourth or fifth time I've been doing this, and we've acquired questions over there. Is it tourist-tourist, or is it religious-tourist? Okay, is religion messing? Is religion confounding things like many things in life? Is there better ways to instrument this? How about the environment? Is conflict, which happened over this time period in Nepal, a source of problem? And a bunch of other things, right? In the interest of time let me just talk about a few of these. First, Tourists are eco-tourists, mountain trekkers, are going to different places than

where religious tourists are going. There's only one site, Muktinath, blue, where there's overlaps. It is a different kind of tourist. That one is out. It's not so much as the crow flies to the peak, because most of us are not crows and we can't fly that way. It's how many peaks do you see? New work that has happened in the last six months. That kind of work. Where you from any village, you can compute all the peaks that you can see. The view shed. The more peaks you can see, the more tourists will come. That is what we are using to predict the presence of tourists. This view shed work with a PhD student. Annapurna can be seen from all these places, for example. But from any one of these places, you can also see more than Annapurna. What is the maximum number of peaks that you can see? So why am I doing this? Again, I'm trying to make sure that the way I can predict tourism is truly exogenous to the presence of the microhydro. There's a lot of processing.

And then basically for every village, you can compute the maximum number of peaks. And that is what you use to explain whether the clean energy supply in those communities go up. Okay. So that is the second check. Third is, and so then the rest of the results, et cetera, et cetera. Now, are these tourists messing up the environment? Because then you might have created a wicked problem. You solve one problem and create another one. It's difficult, other than forest cover and land use to get wall to wall coverage of environmental outcomes. What I'm really interested in is solid waste, recycling, that kind of stuff especially as SANDEE does a lot of work in that. But you don't have VDC to VDC plastic kinds of measures across time. What we do have is using a bit of citizen science, which shows when a bird is spotted, the time stamp, and the geolocation of that bird, and whether it's rare or common, etc. Thanks to, this lab at Cornell, you can sort of compute where birds are being seen across Nepal. Of course, it depends on whether the tourists are recording it or some other person is recording it. So you have to control for the tourist effort and your regressions.

So, yes, the number of bird watchers is growing, and that seems to overlap with tourist sites. And the number of birds is also going up, which is also overlapping at tourist sites. And then as of a few days ago, we've also computed the same sort of results for leaf area index, which is sort of a proxy for forest quality degradation. We can have a whole 200-hour discussion about leaf area index. We have 1 of the world's experts in in this room. And so that also seems to be improving in tourist sites, which means that they are at least not destroying the local environment and that they're cutting down all these trees, and then that's what's, undermining sort of what you might get out of it. We need scalable energy solutions. It fundamentally runs into issues about availability of capital. It's just not enough money for local communities to install that. Some exogenous source of money is helpful. Tourists are self-declaring and volunteering into these places that you want to protect anyway because they're special from a nature perspective. So you might actually be getting both, conservation as well as energy access in some of these places. And we have actually been not just writing long papers about this but done some podcasts and things. So if what I said didn't make sense and you like to listen to interesting things then this is one of the more professionally done ones.