Transcript – Ways & Means Podcast – S4E3

Emily Hanford: From the Sanford School of Public Policy at Duke University, this is Ways & Means. I'm Emily Hanford. And this is the third of a 4-part series looking at policy ideas for understanding and dealing with a changing climate.

A billion people in the world don't have electricity. That's billion, with a "b." And there's only 8 billion of us in total.

If you don't have power, there's no refrigerator, no hot running water, no washing machine, no TV. There isn't light at night for kids to study. There may not even be a reliable way to cook that doesn't put people or the environment at risk.

Nepal is a country where most people don't have access to reliable electricity.

> **Tourism video: Nepal is a land of snow peaks and sherpas, yaks and yetis, monasteries and mantrees. Where else can you trek for weeks among the world's highest mountains…**

Eighty percent of the country is mountainous. The big power grids that people in the developed world take for granted – they don't exist in most of Nepal.

> **Robyn: Yeah, so the higher mountain areas are definitely much harder to reach…I'm pointing at this map of Nepal which is showing electrification rates in 2011. So this area that particularly has sort of low or zero electrification rates is this sort of higher mountain range.**

This is Robyn Meeks. She's a faculty member at the Sanford School and she focuses on energy technology and policy in developing countries.

She says because so much of Nepal is off the grid, people have turned to other ways to get power—like solar. But even getting solar power is a challenge. Solar panels are delivered by truck, and the roads aren't very good. Sometimes there are no roads at all.

> **Robyn: And you can imagine sort of if the roads aren't actually reaching certain villages that people are actually carrying the solar panels on their backs up to the houses.**

There's this other way that some people in the mountains are generating their own electricity. And they're taking advantage of the very thing that makes getting power so hard – the steep mountains – and the water that flows fast down those mountainsides.

Music and flowing water sounds

To generate electricity using water, people in the mountains don't have to build a big dam. They build a small, simple system instead – one that diverts some of the water rushing down the mountains into pipes. The water then flows through a turbine that's connected to a generator. The electricity is delivered by wires to homes and businesses nearby. The system is called a micro-hydro minigrid.

Subhrendu: Micro-hydro is literally you're using elevation in a stream and the flow of the stream to trap it and turn a turbine.

This is Duke professor Subhrendu Pattanayak. He says micro-hydro minigrids don't produce a whole lot of electricity, but it's enough to make a difference in many communities.

Subhrendu: So you get lots of lights on maybe small appliances and that's about it.

Micro-hydro has been operating quietly in the mountain communities of Nepal for decades. But in policy conversations about getting electricity to more of the country, the discussion often turns to talk of how to expand the grid, to bring big power to small places. But what if small power is the best option for these mountain communities? Not only might it be the most efficient way to power homes and businesses there, it might be the greenest way to do that. Hydro has a lot of benefits – most importantly, it's renewable energy. That's why Subhrendu has come to Nepal with a team of researchers. They're going to trek up into the Himalayas and investigate the decades-old micro-hydro minigrid system, find out what's working and what's not, and see if it's time to invest more in this kind of power.

Music

Coming up on this episode of Ways & Means – reexamining a little green idea – the micro-hydro minigrid. How something born of necessity could hold a key to bringing green power to remote places around the world.

Subhrendu: Hi everyone. This is Subhrendu Pattanayak, a faculty member at the Sanford School of Public Policy. This recording could easily be labeled 'Sleepless in

Pokhara.' After about four flights from Raleigh to Doha to Kathmandu and then Pokhara, we are finally here.

Subhrendu Pattanayak is in a hotel room in Pokhara – Nepal's second largest city. He's lying alone in the dark, recording an audio diary on his phone.

Subhrendu: As I lie here somewhat sleepless, jetlagged, thinking about the place we are going tomorrow, to see a micro-hydro mini grid system – these are the kinds of systems that provide electricity to people who are off the grid. How are they coping, how are they trapping the river system at a micro scale – lots of exciting stuff to see. And with that, I'll stop and check in sometime later.

Music and background noise of travelers

The next morning, Subhrendu and his team head out early. The snowcapped peaks of the Annapurna mountain range tower at the edge of the city.

First, they travel along the flat city roads of Pokhara. But the paved roads soon turn into dirt roads.

As the researchers drive higher into the mountains, the roads get narrower and narrower. Now the mountain is crowding in on the left – and on the right, the earth drops steeply away. They pass a team of pack horses. They're getting closer and closer to the clouds.

They drive for hours. Eventually, the road runs out, and the researchers continue on foot.

Subhrendu: It's about a 300 foot climb.

They climb huge hills – where the earth is naturally cut into what looks like the staircase of a giant. They walk carefully along tiny catwalks. To their left is the mountain, ever rising. To their right, a sweeping view with mountains in every direction. They're getting close to a micro-hydro minigrid.

Subhrendu: We've climbed about oh I don't know 800 feet, we've been climbing for the last 30 minutes, you can hear the whirring of the engines as we pull close. The path is a bit treacherous, so I should use my camera and feet carefully. And we are almost there.

The researchers come to a tiny one-story stone structure. This is the powerhouse for the micro-hydro system.

The door has a sign in English that says “generator room.”An operator takes the team inside.

Sound of the hum of the turbine

The room is clean and mostly bare, with a concrete floor. There’s a turbine in the middle of the room. It’s pretty small - about waist high and six feet wide. It’s enclosed, so you can’t see the water flowing through. There’s a big pipe between the wall and the machine.

After looking carefully at the system setup – and taking video and photographs – the researchers walk outside and around back. There are power poles and wires that go up a steep hill, carrying the electricity to the village above.

Sound of dog barking

In the village, Subhrendu’s research team meets entrepreneurs who use the electricity from the mini grid to produce some of Nepal’s famous handmade paper.

Papermaker: Before making the paper, we dry it out for one day, or 12 hours.
Researcher: So you dry it here for a day?
Papermaker: For a day
Researcher: And where do you put it…

Subhrendu: The paper is called Lotka. Anyone who's gone through any part of Nepal, you will see that – they will tell you handmade paper in Nepal. And it's really it looks nice, it's very attractive, and it all comes from a reed that just grows in the countryside.

***Papermakers continue*.**
Researcher: After that?
Papermaker: We just put in the boiler.
Researcher: What does boiler do?
Papermaker: It’s hot water…you clean from there, you put it here, you mix water here…

Subhrendu 8: Without electricity you would sit there taking much longer to pound it, grind it, make it into a pulp and then strain it and then the paper has dried and you get paper. With electricity or just a small engine that can do every one of those activities without quite as much effort.

Sound of bread slicing

In the village the researchers also find a baker slicing bread that was freshly made in a commercial oven, using electricity from the micro-hydro minigrid.

Later in the day, Subhrendu sees another baker. She has a basket on her back held in place by a strap around her forehead and in the basket she is carrying 50 loaves of bread – *50*.

Subhrendu: And I knew that every restaurant would have bread for the customers in the morning because this woman was supplying that…She had bread that she could bake and make because of electricity. So her livelihood and the whole region was prospering because of micro-hydro. That was a magical moment for me to see that.

It isn't all perfect, though. As the research team travels to other villages, they see some of the challenges of micro-hydro. Often the systems don't provide enough power to meet demand. One business owner has had access to electricity for 22 years through a micro-hydro system, but…

***Business owner talking*. Interpreter: So they don't have sufficient energy. So they find difficulty in operating the motors over there, they have some motors there.**

Micro-hydro has been in use in Nepal since the 1960s and 70s. In 1996, the government teamed up with groups like the U.N. Development Program and the World Bank to build a thousand minigrids with the idea that they would be a short-term energy solution for Nepal's mountain communities. It was understood that minigrids wouldn't provide all of a community's electricity needs. But it was a way to get by until the grid reached these communities.

Twenty years later, the grid still hasn't made it to many of these mountain communities. The initial funders of the minigrids are gone, and many communities are struggling to maintain the systems.

Approximately a third of Nepal's micro-hydro minigrids have fallen into disrepair, or flat-out don't work anymore according to Robyn Meeks. She's the Sanford School faculty member we met at the beginning of the podcast.

She says sometimes the problem is mechanical – like trouble getting replacement parts, or having the funds to pay for regular maintenance.

Sometimes the problem is keeping the skilled workers who operate the powerhouses – because once workers are trained, they tend to get hired away – even to other countries.

But the biggest challenge the researchers observed on their trek through the Himilayas was not with labor or maintenance – it was trouble running the business side of the operation.

> **Subhrendu: It's people not getting along with each other and setting up these systems and collecting money and trusting each other and fixing things and appointing someone to look after it. And it's not so much a technological thing although - you know - it is an engineering marvel if you listen to the whirring of those engines and all that pipeline there is certainly engineering involved. But I think what makes them succeed or fail is the human dimensions to that.**
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> ***Music***

After seeing so many micro-hydro minigrids firsthand – even with the challenges – Subhrendu Pattanayak still believes that micro-hydro shows promise. So does Robyn Meeks.

In fact, they think the technology could actually be expanded to become an even bigger part of the effort to provide sustainable energy to Nepal. This trip was just the beginning. Both researchers plan to continue their work in Nepal, to try and figure out how to avoid the problems that have plagued some of Nepal's micro-hydro sites.

They say what's likely needed is reinvestment. The funds could come from a variety of places – the government, nonprofits, NGOS. This money could be used to train people on the business skills needed to run an enterprise like a micro-hydro minigrid.

Robyn and Subhrendu know that others might argue this is a waste of money. Better to figure out a way to bring the more reliable big grid to the mountains of Nepal. Many policymakers and experts argue that micro-hydro is simply too small.

> **Subhrendu: Right, so the question here is: is small beautiful? In economics we would learn that small systems have a fatal flaw and that there are economies of scale when you go big.**

But to that argument, Subhrendu points to a book that was written in the 1970s called *Small is Beautiful: A Study of Economics as if People Mattered*. It was written by the economist E. F. Schumacher.

> **Subhrendu: E.F. Schumacher had sort of suggested that everything doesn't have to be on a large scale.**

Schumacher was a fan of small, appropriate technology. Subhrendu argues that if micro-hydro is supported properly – it could become more than simply what it was originally created to be – a stopgap method of delivering energy until the big grid comes along. He says micro-hydro might be exactly the kind of small, appropriate, technology that Schumacher was talking about.

> **Subhrendu: What we saw was a clean source of power. This is hydro, this is green, this is not dirty. This is the best kind of power that you can. The fact that it's still small scale and micro and not the main source is a puzzle – is small not beautiful? Why couldn't more and more communities, especially in countries like Nepal that are ready-made for hydropower because of the terrain, the fast-flowing rivers, why is this not the main form of electricity in that part of the world?**

Robyn Meeks agrees. She says the grid is expanding across Nepal – slowly, but it is expanding. She hopes that policymakers in the region will actually consider ways to smartly design the grid to be able to someday include small systems like micro-hydro minigrids.

> **Robyn: I think that different technologies are appropriate for different places. I think the idea that the grid is going to expand or go to every place throughout the world is not realistic in any time in the near future. So, I think putting serious thought into which alternatives are appropriate and where and when. And then also thinking about how do we make those technologies ready, if the grid does expand, and sort of having that that forethought and planning for the future ahead is also very important.**

If micro-hydro becomes more successful in the Himalayas, the lessons learned there could have a big impact, not only in Nepal, but in other places that lack reliable electricity and also have fast-flowing rivers and streams.

> **Subhrendu: I think we are starting in Nepal because there are some successes. But our goal is to try to understand this for the bigger global story. There's other countries that also have mountains in Africa and in Latin America, the Andean Mountains and the Atlas Mountains where the same system in theory could work. You need fast flowing streams that and pockets of people who are outside of the main grid who**

could benefit from this. So it's not just a question about Nepal. It's a global story, yeah.

Next time on Ways & Means, the final episode in our mini-series on climate change. We talk to an economist to find out: How do we decide how much to spend today to reduce the costs of a hotter planet tomorrow?

And—we travel to Maine.

Clammer 1: We're standing on the Freeport town dock, and we're looking east out across the Harraseeket River…

We go to Maine to hear how the warming ocean is already affecting the soft-shell clamming industry.

Clammer 2: You can put 25 clams on the head of a pin when they first settle onto the mud. So, they're really, really small, you know…so then they start to grow, and as soon as they start growing, everything starts eating them. It's really fascinating in a way because we think that everything's just gone. But in fact, it really isn't. It's still here. It's still powering the ecosystem. It's just that the human predator, there's nothing left over for us.

Music

I hope you'll head to our website, waysandmeansshow.org. We have video from Professor Subhrendu Pattanayak's visit to Nepal. You can see the powerhouses, and some of the people that he met.

We'll also have links to more information about Robyn Meeks – she's been working in Nepal since 2013. In previous research, Robyn and her collaborator Hope Thompson found a significant positive impact of micr-ohydro in Nepal on small businesses in terms of the number of employees they hire, and how much money they make. This work indicates that micro-hydro can play a role in local economic development. We'll have more information at waysandmeansshow.org.

Robyn Meeks and Subhrendu Pattanayak's latest work is funded by the Duke Energy Initiative Seed Grant Program. Both researchers are also affiliated with the Duke Energy Access

Project, an initiative that takes an interdisciplinary approach to developing sustainable, modern energy solutions around the world.

For their work in Nepal, Robyn and Subhrendu are collaborating with the Alternative Energy Promotion Centre which is a part of the Government of Nepal in their Ministry of Energy, Water Resources, and Irrigation.

Ways & Means is available on Apple Podcasts, Stitcher, NPR One, Spotify or wherever you get your podcasts. If you are enjoying this series of stories about policy ideas for understanding and dealing with the changing climate, please tell your friends about us, and ask them to subscribe.

Ways & Means is produced by Carol Jackson, Alison Jones and Karen Kemp. Our associate producer and graphic designer is Melissa Carrico. Production assistance by Sydney Colopy and Deandrea Newsome.

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We're a production of the Sanford School of Public Policy at Duke University.

Thanks for joining me. I'm Emily Hanford.