[Automatic captions by Autotekst using OpenAI Whisper V3. May contain recognition errors.]

[SPEAKER_02]

So hello, everyone, and welcome back to the newest episode of Challenging Nordic Innocence, which is a podcast that kind of thinks about the idea of the Nordic region as particularly benevolent, egalitarian, or green.

Through a series of conversations, we aim to make an online archive that compiles a catalogue of critical scholarship and activist accounts that's seeking to undo this master narrative.

So my name is Sebastian Lundsteen, and I'm a postdoctoral researcher at the University of Copenhagen.

And with me today, and as usual, as always, we have Anders Riel Müller, who is an associate professor at the University of Stavanger.

This podcast is a collaboration between the Social and Spatial Justice Network at Stavanger and the Center for Sustainable Futures at Copenhagen.

And today with us, we have a very cool guest that I've been looking forward to have on this show.

This is Cody Skahan, who is a PhD in anthropology at the University of Oxford.

He did his MA in Iceland at the University of Reykjavik or the University of Iceland.

[SPEAKER_00]

Yeah, University of Iceland.

[SPEAKER_02]

University of Iceland.

And currently his PhD is about carbon capture and storage, a theme and a technology that I've also been super, super interested in.

So I'm really looking forward to having this discussion today.

So welcome, Cody.

[SPEAKER_00]

Yeah, thanks, Sebastian.

Thanks, Anders for inviting me.

[SPEAKER_02]

So, just to give the listeners a brief kind of like fly-in, can you kind of describe, you have like this very beautiful section in the beginning of a text that we have been reading about your first encounter with Iceland and kind of like give us the context of your research.

[SPEAKER_00]

Yeah, sure.

Thanks.

So I first came to Iceland in 2021.

And this was I was 21.

I was just finished my bachelor's and I had a scholarship for my university to do research abroad for a couple of weeks.

Originally, I wanted to go to China, actually.

I was going to study Buddhism.

That was kind of my thing at the time.

I was really into also like environmental Buddhism and intersections there with people really meeting at the intersection of spirituality and environmental action.

But, yeah, I first got the scholarship in 2020.

And then I think something happened.

You may have heard of it, COVID.

And so basically, everybody who got the scholarship, in particular me, since I wanted to go to China, they said, oh, you know, you could have another year to figure things out.

Perhaps things will calm down.

So it was 2021.

And then I was like, okay, I can't go to China, but I can go to Thailand.

And so I was planning my trip to Thailand, and then they had a surge in COVID cases.

So I was just kind of searching for anywhere I could go as Thailand closed their borders.

And one of the places that was open, and

perhaps I think this quite actually connects to the theme of the podcast quite well, because one of the places that was open was Iceland.

And, you know, the borders in Iceland were open and they had a lot less restrictions because they have quite advanced methods for basically keeping track of the spread of diseases and things like that in the country.

There's very high levels of security and safety, but also they have very world-class, like,

uh genetic um uh companies here biotech companies who are who are really helping to uh track code cases and figure out how to address them in the small small country um and so since i was kind of continuing on the theme of uh spirituality and environmentalism i was kind of really drawn to the idea of of studying this in a country where it seemed like they had really excelled at

environmental action.

So I had seen and heard about advertisements from Iceland and talking to other people about, you know, Iceland had over 99% renewable energy, and it was just this green utopia to come to.

And then there was also this pagan revivalist religion called ÁSATRÚARFÉLAGIÐ,

that I was really interested in.

And they were also like, you know, this spiritual, environmental earth movement, you know, that was like really connecting to things.

So I said, okay, let's go to Iceland.

And so I came to Iceland and I started interviewing some people in nature conservation and Ásatrú and things like that.

And I was like, okay, this is fun.

But it was a very short trip.

So I, you know, I learned some things, wrote a small report and then kind of put that in, you know, in a drawer and

left it alone and had a gap year and just did some traveling.

But then I was applying to grad school to start in 2022.

And I kind of thought, OK, do I want to go in the US?

Do I want to go somewhere else?

And I was applying to grad school.

And I had remembered that this guy I met in Iceland told me about a scholarship for Americans to study in the US or to study in Iceland and Icelanders to study in the US.

So I applied for that.

I got that and came to Iceland.

um and yeah so i had this idea okay let's study the environmental movement let's continue this project i had kind of begun previous year before and you know see what it's like um and i quickly joined a youth environmental organization here and eventually was able to get on the board but

you know, I guess my image of Iceland really shifted when I was on the board of this organization and getting to know people there because, you know, I came in with all this interest and passion of learning about how they had done it, what, you know, how had they achieved this sort of environmental utopia.

But that sort of image didn't last super long, and they began to pop that bubble and suggest, okay, maybe Iceland isn't as green and perfect and utopic as I thought it was from the outside.

And so that became kind of the focus for my master's thesis, was looking at this kind of tension between the environmental activist movement in Iceland and then this kind of projected image, both from

within the country you know in domestic narratives but also this external advertising that of being this green utopia and yeah so that was kind of my master's thesis and that evolved eventually into my PhD project focusing on CCS in Iceland and kind of exploring how it's emerging into the real world in Iceland and the kind of tensions with with some of these things I noticed during my master's

[SPEAKER_02]

Yeah, thank you so much.

And just for the listeners, CCS means carbon capture and storage.

And this is going to be like a combination of letters that the listener will encounter a lot during this episode.

But that's so fantastic.

And also, I guess, like how you kind of like encounter Iceland in specific ways and also through kind of like this environmental...

activist movement and you also have like this kind of like pagan revivalism and so on.

There's a lot of things going on.

But just like speaking to your PhD project, maybe you can just explain a little bit about like the context in which CCS kind of like rises, you know, the political landscape, perhaps like also this idea of the green utopia, like how does just

Briefly, or you can also elaborate on that, like how does a technology as CCS fit into that kind of like image space?

[SPEAKER_00]

Yeah, thanks.

So yeah, for context, like I said, Iceland has over 99% renewable energy, which is true, but these renewable energy sites, geothermal in particular, still have greenhouse gas emissions, so they release both sulfur dioxide and carbon dioxide.

And so it was around the early 2000s, 2004, when there was a president, Olafur Ragnar Grimsson, who's quite well known as being one of the most monumental presidents in Iceland in the short history of having presidents.

But he was really passionate about sort of advocating for Iceland on the international stage and bringing forward this image of Iceland as this green utopia and generally just like sort of a very progressive and great place to live in.

And so he had been in conversations and attending events at Columbia University in New York, which at the time was host to some of the leaders of researching on carbon capture and storage.

And so after having conversations with them and Jeffrey Sachs at Columbia at the Earth Institute, he invited them to come to Iceland for a conference.

And this included some nature conservation organizations, some of the leaders in carbon capture and storage research globally, but then also Iceland's world-leading geochemists.

because Iceland has this long history of really world-leading geochemists and volcanologists studying the volcanic landscape of Iceland, as you might expect.

And this was key because having these geochemists is very particular for this form of carbon capture and storage that was being developed in Iceland.

It relies on the basaltic rock that Iceland has in abundance, and basically what they do is they capture CO2 from these geothermal sites that still have emissions despite being renewable, and they inject that into the ground.

And within two years or so, the CO2 then actually forms carbonate crystals with the rock, so it mineralizes and stays in stores with the rock.

And so, yeah, this was kind of developed at the behest of Olafur Ragnar, who was really pioneering, spreading the knowledge and also trying to make sure that Iceland would stay relevant in terms of also having skilled labor and, you know, exporting their expertise and knowledge abroad and developing these really strong epistemological connections across with universities such as Columbia, you know, this kind of science diplomacy approach.

And, you know, although Olafur Ragnar wasn't necessarily the first one to pioneer all of this in this image of Iceland, because, you know, since the 1900s, Iceland had been really developing geothermal and becoming known for having, being one of the world leaders in geothermal energy around the world.

So he was just kind of continuing this legacy and really, really bringing it to the forefront in his work.

in his reign and really also continuing the sense of innovation and world leading spirit that Icelanders kind of see of themselves of being this very like, yeah, innovative group of people who had, you know,

managed to live on this isolated and really, you know, terrible to live on.

Like, you know, you talk to anybody from 100 years ago, about 100 years ago, and they're like, Iceland was not a great place to live in.

But Icelanders somehow managed to make their home here through this sort of, like, can-do and innovative spirit.

And so that's kind of some of these other broader historical things that Olofur Ragnar is kind of tapping into to continue this, like,

really innovative and hardworking and sort of can-do attitude of Icelanders and adding to the narrative of this with developing a sort of unique process of carbon capture and storage that hadn't been really tested at scale anywhere else.

So he was really trying to bring that in and, yeah, sort of raise up the profile of Iceland in that regard.

[SPEAKER_02]

Yeah, cool.

There's so many things to pick up on here, but I just want to stay a little bit with kind of like this, the green imaginary, because like it seems like and you also kind of touch upon

this in the text that we have been reading about kind of like, you know, the perhaps like a little bit contrasting

image between, you know, you have a tourist industry that really promotes Iceland as like this pristine nature, you know, nature with a capital N, you know, it's very kind of like, you know, came out of the Atlantic or the North Sea, you know, and is to some extent untouched.

But then you also have like, I guess, like another narrative where the

both to nature, but also like have been, you know, very invested in making that little volcanic island basically livable.

So perhaps you can talk about a little bit about this kind of like tension or like this duality.

[SPEAKER_00]

Yeah.

And I would say this sort of, you know, pride in nature also has a quite long history in Iceland dating back to sort of the independence movement.

I mean, even before.

But that's what really kicked it off.

And with the contemporary attitudes towards nature, I think, and being having this identification with nature.

because there is this really identification both on one hand in terms of sort of nationalism and poetry and there was a lot of writing about Iceland as like the people but also as the country so it was people really identifying with the nature with the landscapes and with everything that really helped drive their nationalistic movements and when they wanted to get independence from Denmark

in the late, starting in the late sort of 1800s, moving into the early 1900s.

But yeah, you can really see this manifest today too, and sort of contradictory ways, as you mentioned, like there's on one hand, this really strong

drive to use these natural resources for the betterment of the nation.

So it's this idea of like building renewable energy around the country.

You know, the country doesn't have a lot of other natural resources.

So energy and using the hydropower and the geothermal power is one way that Iceland can actually bring itself forward economically and develop its economy.

And that's what was done in the later half of the 1900s.

And then in early 2000s, there was this in around, especially around 2010, after the Eyjafjallajökull eruption, there was this really strong tourism boom.

And so this also introduced another idea of, you know, Iceland and its connections with nature and using that as both like this source of pride, but also as a economic resource.

So tourism has now become Iceland's largest resource.

contributor to the economy.

It's the biggest industry in Iceland.

And part of this is, yeah, caught up in these ideas of visiting the last untouched wilderness in all of Europe.

It's visiting, you know, which is obviously some, you know, quite a narrative construction that, yeah, makes me chuckle now.

But

You know, you can see why that would take people in where it's this sort of also this, you know, last last chance tourism in some regards of visiting, you know, the glaciers as they're melting and, you know, it's this beautiful landscape.

But as you sort of contradiction with both like this energy expansion, but also with tourism expansion is that

more it happens, the more it actually destroys the nature that the sort of that's being advertised and it's being sort of shown to the world.

And so this sort of sense of untouched nature is becoming less and less true as you get increasing numbers of tourists and build up of infrastructure and very isolated places in the highlands and things like that.

Yet there's still this very strong tourism campaign and that was

first sponsored by the government in the, as I said, in the sort of mid 2000s, really trying to, you know, hold on to these images of untouched nature and a place where you can experience something like you can't anywhere else.

And these really narratives and associating that with also the environmental profile of the country.

So saying like, you know, Iceland, Icelanders are great stewards of the country and, and,

we've been uh treating the country right because we have geothermal energy we have hydropower which is much more environmentally friendly than other parts of uh types of power but you know that also doesn't account for the great cost that these uh these since these energies since uh types of energy have so for example there is a probably the most controversial energy project in recent history was Karahnjukarvirkjun which is in the northeast of the country

And it was started to be built in 2004.

And there was a group of protesters called Saving Iceland who were very, very vociferously protesting against this this dam.

And although, yeah, they just kept powering forward for the dam because it was supposed to be built for aluminum smelting.

That's what most of the electricity in Iceland is go towards is luminous melting.

And eventually the dam was built and it resulted in the flooding of like hundreds of thousands of acres of land.

And that so destroyed natural ecosystems.

And then there's this great book about it by Andri Snær Magnason, a great Icelandic author calledDraumalandið.

And it was kind of saying like, you know,

Us Icelanders, we talk about how great the nature is, we identify with the nature, but we also have this sort of drive to modernize and to build up our economy.

So like, who are we?

It was kind of asking the Icelandic nation, who are we as a people?

What do we want to do with our resources?

What do we want to do with our country moving forward?

And I think that's a question that still resonated with people since, although for some more than others, for my friends in the environmental movement, for sure, it's still something they ask themselves quite often, but perhaps some people in government still quite on the side of developing this energy and never ending energy and using things like carbon capture and storage to kind of also clean up the image and address some of the environmental problems that Iceland has created for itself in the meantime.

[SPEAKER_02]

Yeah, I mean, this also kind of like goes into a concept that you are unfolding in your thesis.

And this is kind of like the nationalistic or the national path dependency.

And perhaps you kind of like outline two positions and maybe you can, you know, elaborate a little bit on that concept and why you think it's fruitful to think with, but also like what are the implications of the two kind of like positions within that kind of larger framework?

[SPEAKER_00]

Yeah, so this concept of national path dependency comes from my old master supervisor, Helga Ögmundardóttir, that she developed in her PhD thesis.

And she was writing about this specific river called the Þórsá that's in Iceland, and it was being

proposed to have a hydropower plant there, so to dam the river for a power plant.

And the local shepherds and sheep herders and farmers there were quite against the project, as were many environmentalists.

But there's also this very strong, and they're kind of continuing in this trend of identifying the country with the people in this very nationalistic, but also like this sense of wanting to protect the nature because it identifies with the country and it really

they identified with it as people so they had this sort of protective impulse of wanting to do nature conservation um and then on the other hand there was also this very strong force of also now coming from this nationalistic perspective but as i said kind of wanting to utilize these natural resources for the betterment of the nation for the modernization as they kind of put it

So there's a strong tension that she talks about really kind of came about, especially from the 1970s onward, which was kind of the birth of nature conservation as it is known today, like the modern institutions of nature conservation in Iceland.

And this is when the like sort of really strong tensions between the nature conservationists and the modernists, you could say, on the other hand, really started to kick off.

So the modernists are still, yeah, they're the ones still pushing forward for building more and more energy plants.

And they want to use this to power different sort of so-called sustainable industries to help Iceland's economy, to keep it innovative, to help bring jobs.

But, of course, the tractors, on the other hand, on the nature conservation side, would argue, you know, you're bringing in industries that aren't really helpful to the country and you're destroying the nature along the way.

And, you know, in recent years, as opposed to historically, this has been kind of more aluminum smelters and silica factories, that kind of thing, increasingly has become data centers and, you know, newfangled things like also carbon capture and storage could be argued as part of this.

And there is an interesting tension here between, again, the sort of idea of Iceland as being this innovative place, because some of these industries are coming from domestically.

It is domestic ideas.

It is people wanting to bring these Icelanders pioneering these sustainability projects.

But then it's also, to a certain extent, foreign companies coming in and kind of benefiting from Iceland's local resources.

So there's also a bit of a tension there between like, yeah, domestic use of energy and, you know, supporting the country in that way versus what is, you know, these sustainable industries that may be coming from abroad and aren't as sustainable as they appear from the outside perhaps.

[SPEAKER_02]

Yeah, I think it's so fascinating that you also kind of like mentioned how kind of like the way that Nordic countries kind of like see themselves in a new, I guess, like industrial landscape or like how data centers, you know, with their inherent ideas and portrayals or depictions as kind of like,

somewhat immaterial and kind of like um how the Nordic region kind of like attracts those kind of like in industries um because it kind of like it's a do it like it's a dynamic movement or like a dialectic where the industries can kind of like feed off the green imaginary and the

So that's such an important aspect that you kind of like, I think, foreground in your text as well.

But there's like something that I want to kind of ask you.

And I don't know if I'm jumping the gun a little bit, but because this can kind of like lead a little bit, you know, outside of what's within the text that we have been reading.

But you as an American and kind of like or you come to to to Iceland to kind of like also try to unearth and do this kind of like critical research.

So, I mean, there's a lot of people on our podcast.

They're either like they have some kind of like family or some kind of like connection in some way to the Nordic countries.

You know, either they were born there or brought up there or something like that.

But like how was it for an American also doing like some critical research within in in an Icelandic setting?

And also, I guess, like drawing from your own background and so on.

I mean, North America, you know, has like a long history.

tradition of both environmental justice, environmental racism, settler colonialism, and so on.

How do you navigate that kind of space?

[SPEAKER_00]

yeah that's a great question i don't think it's jumping the gun too much uh i appreciate it because it is yeah i mean it is something i have to confront and think about in my research um and i would say it was definitely more challenging um i guess not at the very beginning because at the very beginning that's when i was still like moon eyed and like oh my this this country is fantastic like i would like to learn from it and see what i can export abroad

But then sort of as I got further and further into things and kind of having this tension, I mean, it was definitely difficult, but I had a lot of conversations about this with my master supervisor at the time.

And she was very, like, very much enthusiastic about it and about me taking this very critical view because she thought that

Iceland kind of needed this outsider perspective.

In some ways, it's quite an insular culture.

It's an isolated island.

It's difficult to import things.

It's difficult to import new ideas.

And so having this outside perspective on the Icelandic scene for her was quite refreshing.

And then also within my own sort of in the environmental movement, you know, at first it did take a bit to kind of like get to know people and really, you know, understand them.

But eventually, you know, they really embraced me and they're like what I was talking about resonated with them, like what I saw, you know, and a lot of things they sort of initially set me on the path of and pointed me in the direction of, you know, looking at these critical things.

And so what I brought additionally was this kind of like

social science perspective of having um you know being raised in these critical traditions and things like that from my education in the states um which of course is also present here but it's just there wasn't there's not very many anthropologists or people kind of focusing on these topics in Iceland um and so in this way you know I sort of became

more and more accepted by the community and more and more sort of a part of it.

And people began to recognize me and, you know, they knew who I was.

So it became quite a bit easier to have this critical view and not feel like I was stepping over the line.

And that's not to say I still, you know, occasionally I still kind of get small pushback from people who say, oh, you're not from here.

You know, like, how can you criticize about this?

And that happens.

And

you know, I think in some cases it's definitely fair to say like, um, you don't know what it's like to be, you know, to have like lived here and grown up here and, and, and really have the Icelandic attitude of things.

Um, although my friends sometimes say like, yeah, I'm more Icelandic than American these days, but, uh,

But definitely there's still some things where it's, you know, it's difficult for me to say, like, really go out on a limb every single time and say, I know the answer.

So I try to really also be somewhat humble and, you know, realize that it's a very different context than what I'm used to and that there's parts of things where I can...

Although I take a critical perspective also, I would say my general lens on things is not criticism for the sake of criticism, but it's this sort of position of we all have certain things about society and certain things about the world we live in that we're not comfortable with, that we wish would be different.

And so how I always phrase my criticism is not something, throwing stones from the side or something, but to say that, like, okay, this is what I think we could do better.

And I think this would perhaps make the like Icelandic society or the world better for everybody.

So I think the perspective we should take is to come together collaboratively, talk about what we would like to do differently, what we would like to do better, and work towards that.

And so, you know, this is kind of the ethos that comes from the environmental movement here, which I've been, you know, really lucky to be sort of engaged with and

I think when I really strike that tone, then people begin to like really understand and accept my criticisms too and say, okay, actually we see the same things as you.

We want to work together to work on this.

Because, you know, it's not really this sense of, I think, you know, me being an American and accusing Icelanders of these things, but it's saying like, okay, actually Iceland does a really good job in some ways.

But it could be better.

And if you really want to be the progressive leader of the world as well, if you want to be the shining light, the shining example, you know, you should actually walk the talk.

Because if countries like Iceland don't actually walk the talk, then where does that leave countries where the U.S., where, you know, we're just a shadow of some of the good things that Iceland has done?

and you know even Iceland isn't perfect so that where does that put us that puts us in a really shitty situation if the people who were holed up in the countries who show up as a shining light don't actually live up to the example they're trying to set so you just go and fill in if you have any questions right Anders yeah

[SPEAKER_02]

Yeah, but it's I mean, I think I think you're touching on something like a subtext throughout this kind of like podcast, which is like, what is the role of criticism?

within a region that is you know generally accepted we can talk about it's a produced narrative and it's a performed narrative but like as you know in this kind of like utopia you know are we being unfair and like you know usually it's like you'd get like the okay but you know the consequence would be you live in you know

The US, you live in, you know, China and so on.

I mean, Scandinavia and the Nordic region is doing so much better, which I think is like, yeah, it's a weird way of framing that kind of like, yeah, you know, the role of criticism and so on.

Yeah.

[SPEAKER_00]

Yeah.

And one thing I'll add to is the way I sometimes also couch this criticism is to say that, like, you know, some of the a lot of the good things that Iceland has done is like it is a combination of like, you know, this social pushing.

It's, you know, grassroots.

I mean, that was part of also the transition to geothermal.

It was coming from.

some housewives and people working who had very laborious jobs and there was a lot of pollution in the city of Reykjavik and elsewhere because they were burning peat before for energy.

And so there was this push from the grassroots to be like, okay, we need, we should change.

We need something cleaner.

This is bad for us.

This is bad for our health.

This is bad for our society.

And so it was really this powerful push from the grassroots.

But at the same time, you know, you can't do a lot of these things in many other places.

The conditions, the environmental conditions in Iceland are actually quite well suited for renewable energy.

And so it's also this sort of.

almost in a way uh luck or you know this this privilege that they have of being able to very easily um relatively easily to many other places uh use these natural resources for geothermal energy and you know that's part of the reason why they're so far ahead of every of most other countries in these things it's this kind of wonderful gift of the the nature and the geological forces here and so i kind of also use that as an example of saying you know

Like because there's this, for example, also that I just for context, there's this the former one of the former environmental ministers just before the current one.

He was from the Conservative Party, Independence Party.

It's the biggest conservative party in Iceland.

And he would often talk about this transition to geothermal and say it was my party that did this.

We led Iceland into modernity.

We cleaned it up.

And so he kind of covers over the story of both the grassroots leading this and the housewives that that really pushed for this.

And, you know, trying to show this using this like 80 years later or more as this great thing for his party, despite it being very easy for them to do, economically efficient.

It helped, you know, everybody thought it was a win.

It could have been anybody in power who did it.

It didn't matter who was in charge.

And so he tries to use this going forward and say, actually, we're great.

We're a great party.

We've done a lot of things, despite him, you know, setting environmentalism back many, many years while he was in office.

So, you know, I think these are additional context factors that really allow, you know, if you put them in perspective, you can see, OK, it's not just me throwing stones.

It's not just whatever it's it's, you know.

There's quite a lot of reasons for Iceland to be where it is, and some of those are social, but some of those are kind of more luck-based or just based on environmental circumstances.

[SPEAKER_01]

Thanks, Cody.

I just wanted to maybe go into a little bit about the case that you're sort of

documenting in this paper, the Carbfix project.

Could you say a little bit about the background, but maybe also something about the technical details so that people understand what are we actually talking about when we talk about these CCS projects and technologies?

[SPEAKER_00]

Yeah, for sure.

Yeah.

So my main kind of case study is Carbfix, which is an Icelandic company.

And I kind of went into the history a little bit earlier about with Olafur Ragnar Grimsson bringing together these scientists from Colombia and bringing them into contact with people in Iceland.

And

So from the first meeting that all of Ragnar arranged in Iceland, there was this basically continued conversations between Reykjavik Energy, which is one of Iceland's largest energy companies.

They do geothermal and hydropower.

And some of the scientists from Colombia and some of the scientists from the University of Iceland and also Eric Oelkers from CRNS in Toulouse.

And so they continued these conversations forward to say, okay, this is actually something we could do.

This is a research project we could build going forward.

And so they got together, applied for some grants, and then Reykjavik Energy offered their geothermal power plant that powers Iceland.

It was, and I think it still might be, the largest geothermal power plant in all of Europe.

It's at Hellisheiði.

And this is also a very, very interesting location, because it's located basically at the meeting point of two of like the continental plates of Iceland and this giant lava plume.

So it's like underneath the country that really helped form the country.

So it's a very geologically active and very suitable place to have a large geothermal plant, but also to try things out like the Carbfix process.

And so what their research in the Carbfix program was trying to establish was the idea of mineralization of carbon.

If you inject CO2 into the ground, will it actually mineralize with the rock and how long will this take?

They had shown this kind of in lab studies before.

There are some small-scale studies elsewhere around the world, but it hadn't been done in an external, out-of-the-lab environment.

And so this was the first Carbfix research program where they began injecting CO2 into the ground.

I had to say that they captured from the geothermal power plant and they were able to show that it mineralized within two years.

So what they do is they mix CO2 with water and this water has some very trace elements in it.

So it has some tiny bit of iron and magnesium and calcium and other things like this.

So then when the water in the CO2 mixture is injected, then the CO2 eventually starts binding with the local basaltic rock using these ions, the magnesium, the iron, the calcium ions from the water.

And this is what accelerates the mineralization process because they knew this happens.

This already happens naturally where carbon forms carbonates with the rock, but this usually takes

you know, 500 years plus, like many, many hundreds of years.

But because they had this high concentration of water with these ions on it mixed with the CO2, then it would actually mineralize with the rock.

And that's what was unique about the Carbfix process.

Because in Norway, actually...

And in the US, they've been technically doing CCS for a very long time.

Norway, I think now at least since the 80s.

And in the US, they were doing enhanced oil recovery since the 70s.

So this is where they would take CO2 and then inject it into oil reservoirs that still had some oil in it, not so much.

They had, you know, sort of extracted most of the oil, but there were still some lingering traces.

And they would use CO2 to basically pump the oil out of the ground by pressurizing it.

And so the oil would come out, they would take the oil, but then the CO2 would stay there.

So they called it carbon neutral oil because they were basically claiming that the oil, you know, the CO2 they sequestered made up for the oil that they were ejecting from the ground.

But the unique thing about the Carbfix process in Iceland is that it's operating at a geothermal plant, which is extremely clean compared to oil.

And they could actually prove that they were keeping the carbon there for geological timescales.

Because when you inject CO2 into the ground, say in Norway or with the enhanced oil recovery, it can be quite safe in old oil reservoirs.

You know, it's still just sitting there.

So, you know, for example, in Norway, they've shown that it migrated across different reservoirs.

They put it in one reservoir, but it will move to another reservoir.

And they didn't want this to happen.

They didn't control for it, but it happens.

But in Iceland and with this mineralization process, then, you know, it stays there because it's literally forming with the rock.

It can't go anywhere.

unless there's like this huge extreme temperature, which, you know, I've seen some papers that shows that maybe, you know, eruption there with very hot magma could release the CO2.

But the CO2 is also spread out over extremely large area.

So it'd be very difficult to really release it.

And I should also say, just to explain a little bit more how this works, because it confused me for a while.

I thought there was this sort of big reservoir in the ground that they were injecting the CO2 in.

And then it would like,

form like crystals around the reservoir or something.

But the way it's described is actually the basaltic rock in Iceland is kind of like a sponge.

So it's very porous and the water CO2 mixture spreads throughout these pores and then it forms crystals in these pores far away from where it was actually initially injected.

So that's why there's also this sort of no concern about running out of space.

There's space for basically, you know, the annual missions of the entire world could easily be stored in Iceland based on this method.

And that's why it's so unique.

And that's why it's so sort of celebrated throughout both in Iceland and throughout the sort of international community in the CCS world.

[SPEAKER_02]

That is so fascinating.

And there's so many things in what you just described to kind of pick up on.

But I guess like one way to begin with this is like carbon capture and storage, you know, as you also say, you know, it's very intimately connected to the fossil fuel industry.

And kind of like a lot of the, like, it's very kind of like, as you say, enhanced oil recovery and so on.

But you also see like a lot of actors from the oil industry being very, very kind of like invested into this.

carbon capture and storage.

And also it's been like, I mean, since, I don't know, like around 2000, 2005, it has kind of like moved from this kind of like efficiency regime of like efficient production or as in Norway with Sleipner, it was used to kind of like clean the gas to kind of to sell it commercially for the European market and so on.

So to begin with, carbon capture and storage had this kind of like practical things around them.

Um, but I mean, so there's both the oil industry and something practical about it, but you have like Iceland as being like, you, you mentioned a few, a few kind of like hard to abate sectors, aluminum industry and so on.

Um, but really no excessive, um, in that sense, um, emitters, uh, no, I mean, compared to other places.

Um,

So, I wonder, like, you talked also a little bit about the innovation thing and, you know, positioning Iceland as being, like, you know, some kind of, yeah, I don't know, like, first mover or something.

Like, they can achieve this.

But from, like, an economic, political economy perspective, like, what...

Like, what are the interests in Carbfix?

Like, what is the business and why do they do it?

Are they connected to the fossil fuel industry or like, or how does it?

Yeah.

What's the relationship here?

Like, why?

[SPEAKER_00]

Yeah, good question.

Great question.

So the current economic business plan of Carbfix is, or at least I should say before they kicked off the co-determiner project, which I'll get into a little bit in a second.

But with these small scale sort of geothermal injection, the business plan is actually not necessarily from the CO2, but from the sulfur dioxide.

So these, as I mentioned earlier, the

The geothermal plants also emit sulfur dioxide, which is a pollutant.

It smells really bad.

So, you know, if you think of the rotten egg smell with sulfur, but it's also like, you know, can lead to health problems down the line.

So this was an issue.

The geothermal plants in Iceland are required to do something with these sulfur emissions.

And the normal like sort of strategy with geothermal plants of dealing with the sulfur dioxide is to basically capture the sulfur and then turn it into like literally physical sulfur.

So it's taking the gas and turning it into a solid.

So they have, then they would have mounds and mounds of sulfur around, you know, located and then they have to do something with all that sulfur.

But what they were able to do at Hellisheiði with the Carbfix research program, and they called it Sulfix, is they actually captured the sulfur dioxide and used the same method as the CO2 storage with the sulfur.

And so this saved the company, Reykjavik Energy, loads and loads of money because it was much cheaper to do it this way.

by that, but you know, because their own problems, but by their own doing, but it really kind of served as a potential negative point where the Carbfix problem could have ended.

Later down the line, Carbfix has kind of done a couple of other projects.

They expanded their CO2 and sulfur collection operations.

So they've been doing some of Iceland's other biggest geothermal sites.

But even like you said, you know, these emissions total, like I think I've had to say that it's

Quite small.

It's 40,000 tons a year, maybe, I think, with this request or something like that.

And then this is for comparison with, you know, the CODA terminal project that they're planning was aimed to store 3 million tons of CO2 per year and really to have a economically viable project.

in the CCS world, you need scales of this size.

You're not going to continue very long with these small scale projects.

And more importantly, I think for Iceland, as much, you know, and for Carbfix, it's not just the economic case, but it's also this, you know, retaining the status as the first mover.

I think that's really important.

They, you know, they want to continue this international reputation.

You know, they had the science paper in 2017 that brought lots of attention and

You know, so they needed another big window after this to really continue their momentum as they had.

And so they had the proposal for this coded terminal project and they applied to the EU and they got an EU innovation fund for this.

So they have about one hundred and fifteen million euros, I believe, something like that to.

import up to three million tons of CO2 per year from Europe and store it in the ground in Iceland.

So why are they taking European emissions?

As you mentioned, there's emissions from aluminum and from silica and other factories and industries in Iceland.

But these are very hard to capture.

They're very, very expensive because the waste streams are a lot less concentrated than they are in geothermal and other industries.

And even if they weren't that, even if they were super concentrated, ISIN just does not have enough captureable enough emissions to reach that 3 million tons per year.

So for really to scale up, Carbfix needed to attract customers from abroad who they could store the emissions for.

And so Coda Terminal was still in the very early stages.

So they were proposed to do it in this town called Hafnafjörður, which is in the Reykjavik capital region.

But there was a lot of political, there was a lot of local pushback against that project.

So it didn't end up going forward.

But so they were such an early stage, though, that they didn't actually discuss who their potential customers would be.

It was quite amorphous, it was quite vague.

It was some, you know, industrial actors in West, North Europe and Central Europe who, you know,

you could perceive or you can kind of uh realistically think this is probably chemical manufacturers this could be fossil fuel industry it could be the oil you know the natural gas sector um these these these hard to abate sectors could be concrete as well it's really unclear um

But it's clear that it would have to be from basically one of these hard to abate sources who have obligations with the EU and the EU ETS to reduce their emissions.

These are the companies that are mostly working towards CCS and to reduce their emissions.

And why would they transport it to Iceland?

Well, there's quite actually some concerns about Europe not having high enough storage capacity for all of the emissions because some of the projects...

Northern Lights in Norway is continuing forward.

It's quite a big project.

But once all that storage is gone, then there's the question of where else can we store it?

And it's also a different, as I said earlier, like the Carbfix program is, they consider it or more permanent firmer storage because it's geologically binding with the rock.

It's quite unique in that regard.

And so economically, Carbfix is in a bit of a question mark.

They're in a bit of a, I think, uncertain phase right now because they still have this EU innovation funding.

The timeline's not forever, so they kind of have to develop something to be able to use that funding.

But also, CCS projects in Europe have really suffered if they don't have both EU innovation funding, if they don't have national subsidies, and they have private investors, essentially.

So Carbfix only has one of those three.

They only have EU innovation funding.

They don't have subsidies or grants from the Icelandic nation, which is different than Norway.

They have a lot of Norway's really funding the launch of project, and that's why it was able to sort of kick off.

and they don't have any private investors because basically in it was around 2022 they split into two so it's a public company technically they're owned by Reykjavik Energy a public company and they split into Carbfix the public company and Carbfix the private company to try to attract investors in their project especially this was around the time they announced the CODA Terminal so it's you know this exciting shiny object but I think

they're expecting a lot more attention because they didn't get the public the private investors that they expected

And so now I think, you know, they're kind of in this really questioning phase of, okay, if we don't get this coded terminal project off the ground, we don't get funding from the town we place it in, we don't get funding from the country, then it's going to be really difficult to build this and continue the momentum that they had been amassing.

So it's, yeah, I would say it's a bit of an uncertain economic situation.

And I don't think they're specifically going to work with fossil fuel, just to answer your question exactly.

But I think definitely these other hard to abate sectors like concrete, chemicals, that sort of thing.

[SPEAKER_01]

Thanks so much, Cody.

I think one of the things I find really fascinating about your paper is also that you do a lot of like,

field work and you and especially there is a lot of like local resistance to this project.

And I think one of the things that I found really fascinating was this, these encounters between the scientists and, and the people who were local people who were critical of the project, and especially this, you like how the scientists want to talk about risk,

in particular ways which i found really really fascinating so could you talk a little bit about that because i think it'a really interesting also this tension between sort of the eco-modernist and sort of more conservationist perspectives

[SPEAKER_00]

Yeah, for sure.

And yeah, this has been kind of a really central part of my research recently for my Ph.D., because I was this is what really drove me to finalize and say, OK, this is the research topic I want to focus on.

Was this sort of the local resistance and the kind of conversations between Carbfix and the local communities?

So as I said, with the co-determiner project, their idea was to put it in Hafnarfjörður, which is, again, yeah, quite a large, it's price and standards, it's quite large.

For world standards, not at all, but it's in the capital region.

So also, you know, people in Hafnarfjörður, I think, somewhat see themselves as being part of this broader sort of Reykjavik area sometimes, not always, but, you know, this very urban population in a way.

And they had many concerns about the Carbfix project.

And I think the sort of biggest one that really came out to me was the process of public engagement itself.

So when Carbfix first approached and presented the research, the CODA terminal project in Iceland, they presented it as...

relatively small scale or at least that's the perception that a lot of the local people that i spoke with had of it that it was you know it was going to be located to this next to this aluminum smelter because there's a there's a harbor there at Straumsvík and you know it would require building the harbor bigger but you know it was it was an industrial area most of the operations were going to be constrained to this area it was going to be just a few

you know, some boreholes located in this area and not expanding into residential areas.

And then after this, there was some more presentations.

For example, when Carbfix, the environmental impact assessment came out with the consulting firm that Carbfix was working with.

And then they did another presentation of the project.

And the residents I spoke with explained that the project had gotten much, much, much bigger.

It had become, you know, many, many times scales bigger.

They didn't see it as like this pilot project anymore.

They saw it as this huge, large scale industrial project that, you know,

isn't really there's some you know cases of this in Iceland but it would have been on a scale that would have just been mind-boggling for them and also the boreholes for injecting the co2 got much closer to people's houses so there's one neighborhood called Vellir and they were estimating and they measured that the boreholes from the new uh sort of project presented the new plan presented by carb fix would be about 700 meters away from their houses

So this brought in additional concerns also, not just over the process of public engagement and how it sort of, you know, felt like they were being sort of misled, but also in terms of material risk and how they would feel, how it would impact them.

There's several sort of strands of risk that they were particularly worried about.

This includes poverty.

possibility of inducing seismic activity.

So, as I said, volcanic nation, lots of earthquakes, they're used to this kind of thing, but it's not comfortable.

They don't want more earthquakes, even if they're used to them.

So, there's other cases of, you know, geothermal boreholes actually inducing seismic activity.

So, this was an experience that Icelanders had felt before.

And, you know, Carbfix being connected to the Reykjavik energy, it's like, it's not hard to see why they made that connection.

And then another concern was polluting groundwater.

So Hafnarfjörður has one main source of their drinking water and tap water.

It's called Kaldársel.

They took me to see it when I visited with the locals.

And it's, you know, there's some parts where you can actually see above ground.

And so, you know, I think it really...

strikes this, you know, tone and this image of vulnerability.

If you can see your main source of drinking water, you can see it with your own eyes.

And, you know, this idea of it being polluted and having these chemicals, this CO2 injected to the ground, which, you know, they were looking into it.

And often when you capture CO2 from industrial sectors, it can have trace elements of it, of, you know, arsenic and other poisonous things that, you know, you don't want to consume, you don't want in your drinking water.

And so they were worried about this getting into their groundwater.

Those are, and then, yeah, some of the other concerns were sort of more nature-based.

So there's, you know, protected lava formations in Hafnafjörður.

It's kind of known as like the lava town of Iceland.

It has a lot of cool lava areas that people use for just recreation and hiking and walking through and things like that.

So they're worried about that.

But they brought up their concerns with Carbfix in some of these presentations.

And they really felt like when I was speaking to them that they had been sort of almost talked down to because the scientists were saying, you know, that's not really a risk.

You don't have to worry about that.

It's no problem.

There's little to no risk.

Like, I could, you know, I could live here.

I would drink the water with the CO2, fizzy water, they called it, with the injected CO2 in it.

And then the residents were like, OK, then drink it.

And, you know, they described they actually didn't drink it.

But basically what they also took real concern with was this idea of additional risk.

They were really concerned about any additional risk.

They really talked to me and said, OK, yeah, even though the scientists are saying there's little to no risk, I don't want additional risk.

And from a scientific point of view, you never want to claim that there's no risk.

That's just when you're an engineer, when you're a geochemist, when you're from these fields, you know that there's no such thing as zero risk.

And it could come back to bite you later down the line to say, oh, there is no risk.

But then something happens, and then everybody points fingers at you and says, you said there was no risk.

And then the residents are saying, well, yeah, but like, what are the benefits of this project to us?

You're not actually giving us, you're not telling us, you know, you're giving us the benefits that we're asking for.

We don't want what you're promising.

And so we're not willing to accept these additional risks.

And there's a real breakdown in trust, I think, between this sort of feel like the residents feeling like they're not being taken seriously.

And there are sort of feelings of risk and worries about these risk being minimized.

And then the company not addressing this in a way that felt satisfactory to them.

And still, yeah, that eventually led to them connect the residents collecting a petition of signatures.

And they got tons of like, I think, 6,000 signatures or something calling for a referendum around the project.

And so Carbfix eventually just decided to, with the town of Hafnarfjörður, decided to not continue discussions of the project here.

They were looking at new locations, but they said, you know, we won't do it here now, at least in the near future.

And yeah, before even a vote happened, because I think they saw the writing on the wall.

But that was essentially the sort of crux of the issue was this sort of

yeah, risk was really central to it and different perceptions, like a sort of, yeah, social construction of risk versus this really positivistic scientist view of risk.

[SPEAKER_02]

So, I mean, yeah, this is I mean, this is so interesting how like this kind of like risk communication plays out in these in these specific settings.

And, you know, the role of scientific expertise, the kind of like to explain the technicalities of it.

But also, I mean, the citizens come with like different concerns and so on.

And I can see like some of the issues that are playing out in Denmark is a very kind of like a center piece.

periphery kind of like discourse where they're like okay the plant CCS storage projects you know are usually located outside of the kind of like the larger urban areas and then you have like a local population who's being like why should we kind of like

live next to these large depositories and so on, these kind of like large storage facilities.

And then you have like a bunch of scientists who says like, oh, we've been depositing and storing gas for years and years and years.

And

there's no danger, it's fizzy water, it's like, you know, carbonated water, you know, just think of it as like a huge tank of beer or, you know, stuff like that, which is in many ways an alternative version of what's really going on.

But

Just to one thing that I think is kind of like interesting also, and it's a recurring theme in our podcast, is also like the role of the state here.

So you describe CCS both having like this political project, this innovation, and you have like the prime minister.

Then you have like the Reykjavik energy project.

company, which I guess is state-owned to some extent, but also it has been divided in two.

How do the people living in the environmental group or the local citizens, how do they think about the role of the state in these projects?

[SPEAKER_00]

Yeah, that's a great question.

So Reykjavik Energy is owned by the city of Reykjavik.

They own something like 92%, I think, of the company.

And then also there's another municipality called Akranes that owns a small part of it.

But yeah, it's predominantly owned by the city.

And when I talk to people, you know, since Carbfix is a daughter company of Reykjavik Energy, and part of it is public, there is this perception of, yeah, Carbfix being this entirely public company.

Actually, I don't think many people know that there's a private side of Carbfix.

Most people still think of it as a public company.

And that really does sometimes change their views.

Not so much the people in Hafnarfjörður, but other people that I've spoken with and said, you know, Carbfix should really actually advertise more that they're a publicly owned company, because this is like, there is some trust with that in Iceland.

Although I would say also, specifically also with Reykjavik Energy, there is some mistrust towards publicly owned companies, because...

Around the time of the financial collapse, Reykjavik Energy was making very, very... So they basically, you know, their job is to provide energy to the people of Reykjavik.

State-owned.

But what they were doing is actually they were investing in a bunch of other companies.

So they were investing in, like, shrimp farming.

They were investing in all sorts of things.

And, you know, at their own behest.

And this actually really...

destroyed the company, because right afterwards, when the financial collapse happened, all their investments went bust, essentially.

And so they lost tons and tons of public money that they had acquired over time.

And they were operating that as surplus because they were charging

you know it's still cheap electricity but they had a surplus of money and they were investing it in these risky investments and lost a lot of money and so some people still remember this story of Reykjavik Energy you know taking public money and then going bust after during the financial collapse and so there is some mistrust also to the state in terms of this um and in general there is a lot of mistrust and institutions that kind of happened as a result of the financial collapse in Iceland although you know there's still this Nordic attitude of belief in the state

um Iceland's a bit unique i think compared to some other Nordic countries and that it still also has a bit of an American influence from the time of the American military base being here and you know if you look at Reykjavik it's designed for cars it's an American city designed kind of in some ways it's this weird hybrid of Nordic and American and i think that also comes in through some of the attitudes towards the state towards publicly owned institutions you know you can look at the fishery sector too it was privatized

in the 1980s and it made a bunch of people rich so there's these families that are the richest families in the world because they are in the country because they have the fishing quotas and so there is this strong sense of also like the importance of privatization and the importance of having private industry in Iceland and the people in Hafnafjörður also say you know

Why are our public money being paid for this project that we don't want, that we don't want in our community?

Because it's coming from all the money that Reykjavik Energy has and is pumping into the Carbfix project comes from their selling electricity to the public.

it kind of goes in two ways of sense of like this trust and you know feeling oh okay this is great it's a public company you know they're going to be responsible they're going to do what's best for us but then on the other hand there's also these experiences in the case

where the company didn't actually do what was best for the people that they were supposed to serve and so there is uh some mistrust because of that okay thank you so much for um

[SPEAKER_02]

bringing that point to the foreground.

And I think that is also, I guess, like, you know, some of the, I mean, I think to the Nordic citizen, I don't like that perspective of Iceland as being, you know, different in terms of like more perhaps like American is like, could be, I mean, it came as a relative surprise to me.

But I think our time has run out and we need to stop here.

So I just want to thank you so much, Cody, for participating.

We could have talked for hours and hours and hours.

But thank you so much and thank you for joining our podcast.

[SPEAKER_00]

Yeah, thanks for having me on.

It's a pleasure to be able to rant about my research and have people actually interested and ask questions about it.

So thank you.

[SPEAKER_01]

Yeah, thank you so much, Cody.

[SPEAKER_00]

Yeah.