**Maria:** So I've already introduced told the students about the final guest lectures we have. Judith Schwartz, you are a journalist and an author. You've written a lot about regenerative approaches to to restore the land, travelled the world and seen different amazing places come alive again. And you're one of your book has also been part of the of the reading for today, one of the book chapters. I chose the introduction to that one. And so from the Reindeer Chronicle, which is the last one. But you have written three books on this topic, right? And I'm sure you are planning your fourth.

**Judith:** If yes, we can talk about that sometime.

**Maria:** Yes. And so we're really looking forward to hearing about that. And I'll just mention that Tero Mustonen will then talk to us about, what he's doing right now. He mentioned the IPCC, but also the initiative Snowchange challenge here in Finland so that our students will open their eyes to what happens right here in our own country. Good. I'll give the floor to you, Judy. And you should be able to share.

**Judith:** I am going to jump right into sharing stories from my reporting. All right. So these beautiful, beautiful bulls are living in Chihuahua Mexico. And the reason that I was in Chihuahua Mexico is that I learnt about a project going on there that intrigued me. So I dragged my husband, who is a photographer as well as a writer. And we went down there and the project is that bird conservation organisations were working with ranchers in this region of Mexico to create a biological corridor for endangered migratory grassland birds. And the story is that the numbers of the birds, these beautiful migratory birds that you know that that go north and south, according to season, the populations were declining precipitously. And at first, the organisations were focussed on the north on what was happening in the US. Then they realised that the birds spent seven months out of the year in the Chihuahua desert grasslands, and that landscape was declining because of poor grazing habits. Because of industrial agriculture. And because of some of the cultural problems around the ejidos. The land as collective land that wasn't being tended properly so I remember going through this area of Mexico and seeing very, very poor land. However, the people, the ranchers that were working according to holistic planned grazing that were using an approach that where the animals are moved according the way that they would be migrating, moving from place to place, the way that they would be in nature when being chased by predators. This land was vibrant and good for the birds. So we saw beautiful, beautiful work going on. And this helped us see how understanding how nature natural processes support biodiversity allowed us humans to create approaches that work with nature and promote biodiversity.

So this shows this is just a little a little photo to show that the area had tons and tons of grass growing. This was in the dry season so the grass doesn't look that exciting. But I have seen more recent photos where the grasses in the in the growing season are, you know, up to people's waists. And what's really it's really incredible just how much this landscape is rebounding. This is an area that gets something like nine inches of rain a year. It's not much rain, but what people are understanding is that it's not how much rain a landscape receives, but how much rain, how much water that landscape can retain. That insight allows people to manage a court or invites people to manage in a way that holds on to the water. This is a grasshoppers sparrow. You know, you see this tiny, tiny little bird and that is one of the migratory species that this project is enabling to flourish because when the land was bare, these birds had no place to nest, they had no place to hide from predators and they had very little food. I'm going to, you know, these are the seeds that they that they eat and the insects that they eat because the insects also had no place

to make a living. I'm going to share one more photo from Chihuahua. And this doesn't look like much. But this there's a story behind this so that this plant. This is mesquite. And when I was going around Chihuahua, the the desert with a plant, my host Alejandro rancher Alejandro Carrillo, there were a lot of areas where all there was this mesquite. And, you know, it's not a very productive plant. It thrives on bare ground. So what Alejandro said to me is that as the land improves, the mesquite will naturally give way to higher order grass and Forbes species. In the meantime, the plant offered some shade, some fodder and because its pods can feed some animals and also was holding on kind of keeping the soil stable. So you can see here that indeed this plant is bowing out and allowing the grasses to flourish, just as Alejandro said. But what surprised me is how rapidly this happened. I was expecting a couple of decades, and this is about five years.

A few years ago, I began to collect stories like this. One reason is that the news about the environment has been relentlessly negative, and I felt it really important to bring forth stories about what it is possible for us to do when we work with nature. I also collected these stories because. You know, seeing that as we build knowledge about how to work with nature, people are starting to share insights and that in itself can help people move forward more quickly.

Another reason is to show that all of us to invite all of us into the process of restoring nature, and I'm going to get back to this. And I will say right now, just kind of to plant a seed for all of you is that we are now in the UN decade on ecosystem restoration. The U.N. has declared the 20s the decade on ecosystem restoration, and the goal is to bring everybody into this movement wherever we are and whatever our gifts. So I've seen extraordinary changes that I'm going to share with you here.

So bringing this back home closer to home. And when I say closer to home, I mean 20 minutes. For me, this is a farm called Studio Hill Farm, and it's in Shaftesbury, Vermont, and I share this because this farm has been able to transform in terms of biodiversity, in terms of water management, in terms of productivity, in terms of soil health, in a very few years. What's happening now, and I know that this is a business class, so I'm sharing some of these examples. What's happening now is that Studio Hill is purchasing 75 more acres that would be about 30 35 hectares of land, so about 30 hectares of land, and they are using a community based funding mechanism. A company called Steward is creating opportunities for people to invest in this in in their land, so they're lending. We, you know, many people I know are involved in this lending money that will allow the farm to expand because they just happen, don't happen to have that amount of cash on hand. And then we are all investors in this enterprise, and that's a really innovative approach.

Another story. All right. So this is someone named Neil Spackman. Here he is in western Saudi Arabia in an extremely, extremely harsh climate. So Neil's story is that he happened to be he's an American, and he knew Arabic. He studied Arabic in school, which brought him into a poverty reduction programme, a project in western Saudi Arabia working with the Bedouin who had been disenfranchised, who were living in poverty rather than doing their living, according to their nomadic traditions. They were housed in cinderblocks, and it wasn't working well for the population. And what Neil did was he wanted to bring in an ecological component to the project. And so he worked with the team. A team of he did a kind of fast track permaculture programme, worked with some experts on desert landscapes, including Jeff Lawton of Australia, who is known for his greeting the Greening the Desert project in Jordan. And Neil consulted with them, and what Neil's focus was was to slow down the rain. You're thinking rain. They only get three inches of rain. Sometimes they don't even get that much. But because the land can't hold on to that rain, because the soil is so is so poor. That the rain doesn't do any good, so what they did was started to do small earthworks to hold on to the rain. And this is what happened. This wasn't about 2010, right after a rain. You can see that they have these earthworks that are starting to hold a little bit of moisture and it must be about 2012. So you're getting a little bit of green now. Look at this. This is in 2019. Now one thing that I find very interesting, Neil went back and this is what he encountered. So the change in the landscape is dramatic.

Another example of how that particular landscape changed is that that part of there, what they did was they would hold on to water, build a kind of bank of water when it rained and use that for irrigation. But they never went beyond their water budget. So another part of the project was planting trees, trees that would have an economic benefit, as well as an ecological benefit. So they planted trees whenever it rained, and then they used their rainwater for irrigation. Then in 2016, the project ran out of funds. So Neil and his team thought, Oh my goodness, we thought, you know, we were doing so well, I guess we just have to see what happens. And ideally in permaculture, you don't need to keep maintaining. You build an ecologically self-sustaining. System. So out of three years I think there were two years without rain. It is very, very poor precipitation. I think he said something like a half centimetre of rain over the course of two years and then another year, perhaps with typical rain. 80 percent of those trees survived. And that's pretty extraordinary. One thing that I think is notable is the way that Neil talks about deserts, that he defines a desert. We think that we know that a certain amount of rainfall above that is not a desert and below that is a desert. But what he says is that a desert is a place where when it rains, it floods. Because once that land is able to hold on to that rain, by definition, it no longer is a desert. Now you look at this landscape and you have to ask, Is this indeed a desert? Whereas here it was several years ago where absolutely you would say that was a desert.

Now I want to share with you what Neil is doing now, and he has, you know, As I said, the project ran out of funds, so he went to Stanford Business School. They're one of their executive fast tracked training programmes, and he has helped to launch a company called Regenerative Resources, which is building value from transforming degraded land and working with local communities. He learnt in Saudi Arabia the importance of engaging with local communities, not coming in and saying, I have the answer for you. Don't worry, your pretty little heads about it will take care of it. But working with communities, I know it's really hard to see here on the website. It actually kind of is morphing into a full, lush mangrove forest along the coast. But they're doing shrimp fisheries with mangroves. This is in Baja California. So it's a little peninsula on the very west coast of Mexico. Beautiful, beautiful land. And that's what they're doing. So it's a really, really exciting, dynamic project with restoring ecosystems at its core. I've learnt a lot. Many of us have been incredibly inspired by this fellow, whose name is John Liu, who documented the restoration of the lowest plateau.

Now I'm going to try something extremely daring and share this video. You know what? I'm actually going to do it later. I think that's going to throw me off too much and take too much of your time here. I see here I started opening Zoom. No, no, no, no. I'm going to send Maria or after the end of our conversation, I'm going to do that. So anyway,

John witnessed the restoration of a vast, degraded landscape, and he saw, therefore that it is possible to restore even large scale degraded landscapes. I mean basically a an area of land the size of Belgium was returned to ecological function and so he said: Well, now that we know this is possible, how can we not devote all of our energy to restore every corner of the Earth? Certainly in terms of our biodiversity crisis, but also our climate crisis? Because if what has been missing from our discussions about climate is the role that healthy natural systems play in climate regulation, no, we step back and ask, how does the Earth manage heat? Mostly it is through water based processes because the phase changes of water move tremendous amounts of energy. So the transpiration of water, which is the upward movement of more of water through plants consumes energy, and that's happening wherever we have vegetation. I mean, the dynamics are complex, but basically to restore our ecological function is also to restore climate regulation.

So John has really has been promoting ecological restoration in many, many ways. But what came to mean what mobilised him was the notion that everywhere around the world, people can be restoring landscapes. So he helped to launch. Basically, when I say helped a lot, he put up a Facebook post and said “I would like to help, I would love for there to be ecosystem restoration camps all across the world who's in?” Within a several weeks, there were thousands of people who had responded and were part of this online community discussing it now. There are 50 ecosystem restoration camps around the world. So when I and at the end of twenty eighteen, I went to Spain to camp Altiplano. Here they had just they were just finishing their kitchen space and they were so excited about it. So in this area of Spain, they they were doing a lot of experiments and how to restore the water cycle, how to bring back biodiversity, how to heal the soil. All of these different components to ecorestoration, which John Liu…the basic formula that John talks about is to that it's basically three components: increasing soil organic matter, increasing biomass and increasing biodiversity. Anyway, I showed this picture. There were only two camps when I went at the end of 2018. Now there are 50.

 I also wrote about this company called Commonland. And here is also in Spain, where they're doing regenerative almond production, and Commonland is having a large impact not only in the communities where they work, but also in the business community, showing that there is indeed a business case to be made for land restoration.

Here I'm going to show you just I just have a few minutes, so I'm going to show you another place that I went to where I saw extraordinary improvements. So this is in Zimbabwe. So one of my books is called Cows Save the Planet, which raises eyebrows because many people think that cows are bad. But if we go to that formula that I just mentioned increasing soil, organic matter, increasing biomass, increasing biodiversity, how do we jump start those biological processes? In many cases in grasslands. Animals are grazing animals are an integral part of the way that land functions. So here in Zimbabwe, they have been working with cattle to and moving cattle holistically. This indeed is at the Africa Centre for Holistic Management and they have brought back the ecology and there are extraordinary stories about it, and I was privileged to spend a week there. This is the Dimbangombe River, which it took about 15 years, but over that time, working holistically. So when they just had cattle roaming around, the cattle would be on the banks of the river, eating the grasses and then you'd get erosion and then you'd silt up the river. But now that they've been working holistically and moving the cattle so that there was impact in a managed way, so it created the conditions for the river to extend a full kilometre farther into the catchment than it had in living memory. And also, the river now flows throughout the year, and that has meant that, you know that it has become a wetland in terms of the grasses there were first you had sedges and then reeds, and then in reptiles started to thrive and fishy goals and all kinds of species that live along the river.

In terms of human impact, the Africa Centre is working with villages or rural villages, and these are villages like an utter poverty way, you know, off dirt roads. And we spent a lovely day in this village in Yanga, and you can see how Boosie here is smiling. They were so proud of what they've been able to do because livestock are their wealth, but you know, the livestock that each individual had was not sufficient to do this kind of work, so they would pool all of their livestock and then move them from place to place community land and families, growing crops, crop growing fields, their gardens. And what happened was so they this community anyway. So so they did that, and the improvement of the soil meant that they could hold on to more water. There was better water infiltration and that meant that they could grow crops and holding on to the water. They could grow crops for seven months of the year instead of two and a half months of the year around the rainy season. And that for this community meant the difference between dependence on food aid and food self-sufficiency. So that was extraordinary to see last photo in and in Zimbabwe is biodiversity. So this was when we were in at the Africa Centre. We saw many healthy herds of sable antelope with young, which was really wonderful to see. And you could see that this is a species that thrives in when there's a diversity of healthy grasses in the African game parks. They're not doing so well, but we can see here the conditions under which they thrive.

And here I mentioned the UN decade on ecosystem system restoration. There are many opportunities to participate. All of you…more and more there are coalitions building on part of the Eco Restoration Alliance, and we are looking for people to work with us there. We need everybody, we need communicators, we need researchers, we need people on the land and more and more. People are realising this and mobilising. So thank you, I'm happy to answer any of your questions. Once we are in our question and answer time. So thank you so very much.

**Maria:** Thank you so much. And I have added, while you've been talking all the links to the different organisations and your books in the chat, which you cannot see, but I hope that the students now take notice and look at that or download those comments because amazing. All of them are really amazing organisations and have rapid results in what they are doing. Now, really looking forward to hear what Tero has to say.

**Tero:** Well, all right, dear friends and Maria and Judith, actually thank you very much for the first part of this day and clings to all of the students from snowy North Karelia in eastern Finland. Currently, we have about one metre of snow, and it keeps on coming, so if the power should for some reason go out, I will then connect with my mobile and I have sent the PowerPoint to Maria just in case. Let me try to jump right into some of the topics that I want to share with you. If the PowerPoint functions. So. can you see my screen? Yes. All right.

So I have about 18 minutes or 15 minutes of an overview of what we do in small change cooperative, and I'll explain about the scales and work a little bit closer over the next. Twelve slides or something like that. Just as a quick introduction, even though Murray has done that, you know well. Or in a good way before, but just to recap, I'm currently serving as the lead author in the IPCC and for professional work, I'm a rapper in others. Allow me mortars or small change co-operative. Which is 22 year old independent organisation in. In the Arctic, in the Boreal and Australia and New Zealand, as well as, of course, here in front. And much of what we heard from Judy on trying to think of the answers that would fit the shoe in our specific time in history are kind of the the narrative that I want to try to give to you today. And I, of course, look forward to that. Any questions that you might have?

What I'm really talking about is a landscape rewilding programme. That that we launched maybe 2017 and. We have sites mostly in Finland, but we also have partnerships in other countries. So let me go straight into their work.

One of the things that I was trying to position things in the context of economic history of Finland. A simple question why rewilding matters? What's going on What is the concept of restoration, ecology and rewilding in the context of our home country? Much like Judy said, there are big drivers of land use, economic extractive use of lands and natural resources that not all people especially today know about in the historical context. So some of the thoughts of why this matters are positioned here, both in the photos and in the maps. I'll just tell you some of the most important ones.

Over the past 100 years, we have lost about 10 million hectares of our natural peatlands. And of course, this now that we are realising the extent and context for that shift or change, we understand that that implies we have lost 10 million hectares of carbon sinks and storages, which are significant. Why would this matter on the planetary scale has to do with the fact that not all of you may know, but one third of world's soil based carbon, the remaining carbon budget that we have a large portion of that is still located in the Arctic and in the boreal, i.e. in Finland. As well as, of course large countries like Russia, Russian Federation, Sweden, Canada and so on.

The other huge change that Finland has undergone is that over 95 percent of our natural forests have been lost. So if you quickly look at the map starting from about 1000 years ago below the big mining photo that shows you how the peatlands are harvested, you will see, I will not go into details, but I think this map gives you a good sense of how natural a forest cover has been shifting in Finland. Still, 250 years ago, we had about two thirds of the country in natural forests. And by 2010, the last remaining natural forests can be found in scale in the Sámi area in the northern part of the country. And out of those forests that we have in the southern part of Finland, most of the natural forests are in parks or other conservation areas. hirdly, all of this has contributed significantly the Finnish biodiversity and our lakes and rivers.

Here comes a moment of self-reflection in terms of the economic power and economic narratives. At least the Finns in the audience have probably heard the concept that Finland has pure lakes and one hundred eighty eight thousand lakes, which are crystal clear and so on. I don't want to come here as a depressing person, but unfortunately most of the Finnish Lake systems and rivers have been impacted by these significant land use changes by forestry, mining and peatland alteration.

What's the societal or shall we say, policy mapping and positioning? One way of trying to capture is that local communities in the rural areas, but especially the indigenous Sámi people who are in the Arctic or have been for the past 25 years, the object of top-down decision making. In other words, the rights and the dialogue with the traditional owners or people that have been living in inside and with these natural resources have faced a very complex history. Of course, then we can turn to the other side of the coin, which is that finished welfare state, the economic power, wealth and so on and so on. The industries, especially after the Second World War, when utilising these natural resources and they have provided gain in our society, they have brought free education or nearly free education, for example, to all of you that are studying there today. So the headline statement here would be something along the lines that the use of natural resources that we have taken has come with a price. And that price is ecological and climate impacts from the past about especially 75 years of intensive land use.

So what's going on, why rewilding and what are we doing to try to address some of those points?

I won't tell you all of these things, you can then go back to the recording. The main point here is that as I said before, we were founded at Millennium in the year 2000, so we had 22 years to the mission and especially in 2017, the European Investment Bank, Snowchange and a foundation in the Netherlands called Rewilding Europe came together to think under the auspices of the European Union's commission what can be done fast to alleviate these three points: biodiversity losses, climate action and impact the water and local communities?

I'm happy to answer on questions of indigenous knowledge and traditional knowledge in the questions, I'll just point here that in our work we are combining science with indigenous knowledge with the Sámi and local knowledge, traditional knowledge with the Finnish villages. So let's go to the start. Where are we and what's going on? What happened in the early days? This is a sequence of photos taken over about 10 years. And I'll try to explain this in the context of economic use of the land transitioning then into a rewilding site.

Geographically, this area is about 180 hectares, so in in terms of distance, what you see in the photo in the forefront is about 1.6 kilometres across. Between 1980 and 2010, this site called Linnunsuo in eastern Finland was utilised for economic peat mining.

Most of these peat mining was used and continues in a lesser way to be used for energy production, and it has been then led by state company called Vapo, nowadays known as Neova. Without going into the details in 2012 or 2011 there was an ecological disaster on this site and all the fish were killed in the downstream river. That was the time when we thought we started to participate and work on the site to try to seek the benefits and options of what can be done on a very like a moonscape environmental landscape. So you will see that in the first year 2012, three large wetland units were created. That's the amount of water that's reflected in the clouds. The purpose of this was to alleviate the pollution that was coming from the site and also start to establish the functioning ecosystem on the site. About eight years later, in the winter photo that you can see we have nine different wetland units and the site is fully restored and now it can stay and nature can fully come back. What are some of the biodiversity successes that happened, which were also quite surprising. When this site was under industrial use? It was the home of two bird species, mostly forest, grouse and raven. And today it's one of the most significant bird habitats in Finland, with over 195 bird species, including extremely rare birds like Long-billed Do-witcher, Terek Sandpiper.

This was the ninth time in Finland that these birds which ever appears here so we could detect that the place is a safe haven for rare species. But on the other hand. We are tracking the success of Wood Sandopiper and Northern Pintail because these are the more common but in troubled species. In Finnish these are liro and mostly we look at liro and jouhi sorsa, northern pintail…

So this is where we started. This was the very first site where the programme started testing and implementing the work we do. And I'll try to be fast and to that point, so that. We have time for questions. So what's going on after five years? Snowchange owns about 3000 hectares of core areas. We have purchased them out of the markets because they were threatened by industrial land use and or are degraded, and then we have 35000 hectares through land concessions in terms of geographical scope. We have our highest in latitude, highest sites in Lapland or in the summit area, in the high Arctic and then stretching all the way to work on mine western Finland. Some of our sites are on the same scope and special coverage as smaller national parks in Finland and in terms of the economy out of the economic options look like in the post industrial and both extractive Finland in the rural areas. We are looking and contributing to non-timber product economies, for example, handicrafts, traditional house building from wooden timber materials, tourism hunting, employment by contracting caterpillars and so on. So I can also talk about the economic things a little bit later.

Here you can witness Kivisuo. You may recall that our programme is called landscape rewilding. So one of the aims of the European Commission and EIB when we started together was to try to seek out and think ecologically and climate theologically or in climate terms big enough ecosystems that matter and give is always our largest intact or, shall we say, landscape white site. And it became the largest protected area in Finland in 2020, with the government of Finland, one of the keystone species that benefits from this action is the peregrine falcon that's doing very poorly in Finland. Well, here you can see the practical work, how does it look like in terms of rebuilding carbon sinks, for example, on the left hand side, like we heard from the Spanish example with Judy?

So adding gravel, creating spawning locations and or then creating decaying timber on the forest floor or on the lower bottom? Or then sometimes if the landscape or the site is heavily altered by human use, then we have to use machines like on the upper right hand corner to recreate wetlands, restore natural flow and alleviate the past land use.

On my last slide, I want to give you a little bit of a sense of scale. How does rewilding look like in Finland and if we started from Kivisuo which is a massive Arctic site both kilometres wide and hundreds and hundreds of hectares, how do then scales look like. Here we are working on a small wetland that has become the home of teal and Goldeneye, telkkä, and tavi, as well as a water protection unit. And this land is all owned by a local forest owner that worked with us to alleviate pollution to the downstream river. I will not do on hydrological ecology, but this is some of the ways that we can try to also rebuild the landscape elements into a very monoculture environment. Usually, if we work on signal sites, our bare minimum is has to be about 30 hectares. This is a case of Hautaneva in Pyhäjärvi Kärsämäki where European Golden Plover started to enjoy these habitats. And the reason why I say about the 30 hectares, this would be the second scale is that if we use the bare minimum like the one we saw just now with only four hectares, it has to be connected with larger collection of rewilding actions because otherwise too small sites will not do anything more than being a hobby or some kind of a nice activity.

Finally, this is the highest level of our work in basin wide, our catchment- wide restoration. This is an example from western Finland around Lake Kuivasjärvi. You can see it here on the centre of the PowerPoint slide, but then the purple line will show you the and maybe this is a new concept of some of you, a basin or catchment area means the area from where the lake collects its waters. And in order to improve the water quality and bring back a lot of critically important biodiversity and other benefits, you need to work with multiple ecosystems. And of course, hopefully in a single system like a basin, and this one is sixteen thousand dollars.

I'm almost done. I'll just tell you some of the success of Lake Kuivasjärvi restoration and rewilding. We have taken another peat mining site called Salojenneva, about 30 hectares and turned it into a wetland and carbon action with the southernmost population of Willow Ptarmigan, riekko, in Finland. And this is highly endangered species in southern Finland, and it can find success, for example, in a strategically placed rewilding.

How do our sites look like in terms of climate change. This could be a huge topic, I'll just give you one minute or ten seconds summary. This is one of the fastest ways to alleviate climate pollution or climate impacts from the soil, especially on peatlands. Rewilding may alleviate soil based emissions immediately. For example, on Linnunsuo we have calculated that that is per year about 400 tons of CO2 and slowly rewilding starts natural carbon sinks. And of course, in further Arctic we go, it helps to keep carbon on the ground, like on Kivisuo, which is hundreds of millions of CO2 that we are able to save.

I'll skip this part. This is an ecological corridor in Ähtäri but the we can come back to this if somebody is really interested, but I'll go to the end.

What are we doing internationally as we heard from Judy's examples? Rewilding restoration community led work on biodiversity and climate has now become rather, I wouldn't say common, but there are no more sustained examples and solutions where the communities are addressing the colonial and other top-down choices from the past decades into a Renaissance or a large proliferation of these methodologies.

We work in all of the Arctic countries Siberia, Canada, Alaska, Greenland, Iceland, Sweden, Norway and of course, in Finland. But specifically on rewilding, we have concentrated on on the Pono river system in Arctic Russia. That's why that that's where the pictures are from. And then we also this year expanding on Koitajoki here in North Karelia in the Republic of Russian Karelia, two other pilot sites both of my park in New Zealand is helping at alleviating Kiwi bird it trouble. You may have heard of this iconic bird, together with the Maori indigenous peoples and science in southwest part of the North Island. And finally, we are working with Indigenous Australians organisation called Fire Sticks to reinvestigate traditional burns and land management in North Eastern part of Australia.

And that's it. You're going to wake up now. Thank you. I'll stop sharing.