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[00:00:00] **Kelly Erhart:** Climate change is non-linear now, and I think that means that we need to take a non-linear approach to solving it. There already are, and there will continue to be devastating impacts to humans and ecosystems. And so we need to finance ways to adapt, and we also need to look upstream and be more clear-eyed about the risks that are on the tail end, and be funding research and supporting efforts to better predict those tail end risks so that the most vulnerable people in the world don't have to suffer the consequences of things that are impossible to adapt to.

[00:00:37] **Nate Hagens:** Today I'm pleased to be joined by environmental nonprofit leader Kelly Erhart, to give us an update on the key climate questions that are in most need of further research. Kelly Erhart is the Director of Partnerships at both. Outlier projects as well as Giga Scale capital. Her work focuses on securing funding for key research and development into high impact projects for addressing the global heating crisis.

[00:01:06] Additionally, Kelly is the co-founder and advisor of Project Vesta, a pioneering initiative using Vene weathering to sequester carbon dioxide. In this episode, Kelly gives an overview of the key technologies and leverage points for stabilizing earth's climate system, including geoengineering techniques, glacier stabilization, and reducing highly potent methane emissions.

[00:01:32] Kelly emphasizes the need to continue to fund research and to explore every option and when it comes to preserving our Biosphere's health, a mission that is also at the core of this platform. Before we begin, if you are enjoying this podcast, I invite you to also subscribe to our substack newsletter where you can read more of the system science underpinning the human predicament, and

where my team and I increasingly share written content about The Great Simplification.

[00:02:02] You can find the link to subscribe to that in the show description. With that, please welcome my friend Kelly Erhart. Kelly Erhart, welcome to the program.

[00:02:13] **Kelly Erhart:** Thank you so much for having me.

[00:02:15] **Nate Hagens:** We were together, I don't know, a month ago, at a party with a hundred other people, and you and I talked for like three hours and I was like, I have to have this person on my show.

[00:02:25] So you run, outlier Projects, which is a climate, focused philanthropy. Tell me a little bit about yourself and how you got into this work specifically.

[00:02:38] **Kelly Erhart:** Sure. So I grew up in between two very different places and a suburban strip mall, concrete jungle of central Florida, but then also spending all my summers in rural eastern Montana.

[00:02:50] And I think that from a very young age, I was engendered with this love and awe for the natural world in part. Because of that context shift that I was always in and have been an environmentalist, I think, as long as I could have my own independent conscious thought. and when I was a kid, that was sort of cute.

[00:03:08] Like I started the environmental clubs at my school. I campaigned against palm oil with stickers in grocery stores that said this thing kills orangutans. And it was at out of camp for more efficient light bulbs and electric cars and all the things. But as I got a little older, I would say probably around 18, 19 or so, I kind of woke up to the real urgency of the climate crisis, and that's where I decided I wanna spoke focus.

[00:03:32] The rest of my life was on developing pathways for a more safe and resilient climate future. And so I founded a nonprofit and a couple of different startups in the climate tech space. So my first company was a waterless toilet company. We were developing an. A new way to decompose waste that could turn it into a liquid fertilizer really rapidly with microbes and enzymes.

[00:03:54] And then I moved to the Bay Area and continued being involved in different climate communities and reading a lot of papers independently and started experimenting with and engaging with carbon dioxide removal as an approach to, mediate the effects of climate change. And so started a few nonprofits and, ventures in that space.

[00:04:15] The company that I left more recently, started out of a sort of serendipitous. Kind of funny, kind of terrifying story. It was a moment in San Francisco where, probably many people remember we had these crazy fires and the skies were orange for days. And an IPCC special report came out that week and I was sitting in my apartment in San Francisco, not able to go outside reading the IPCC report and looking into this section around carbon dioxide removal.

[00:04:43] There was this box that showed all of the different ways that we would need to scale carbon dioxide to remove all the different pathways. And I had heard of all of them except for one enhanced rock weathering. And so I got really curious about it and started reading papers and then came into, a certain form of enhanced rock weathering called Coastal Enhanced Weathering, which is now kind of known as ocean alkalinity enhancement.

[00:05:05] And talked to as many people as I could about it. A lot of people said it was insane, but it seemed like an opportunity for really large scale carbon dioxide removal that hadn't moved out of the lab. And so I talked to a lot of scientists and ended up starting a nonprofit, with a friend of mine that then we built and grew, to ultimately deliver the first ever field trials of Ocean Alinity enhancement.

[00:05:28] and it was through that work that I met, the person that I work for now, Mike Sch Shepper. he was an early donor of mine at Vesta. We stayed in touch. And when I left Festa after five years, I got involved with outlier projects and so now I helped to run outlier projects, which as you said is a climate philanthropy that focuses on accelerating research into frontier climate risk areas and ways that we can better understand them, predict them, and prevent them where possible.

[00:05:57] **Nate Hagens:** And how old are you?

[00:05:58] **Kelly Erhart:** I'm 29.

[00:05:59] **Nate Hagens:** When I was 29, I was. Working on Wall Street selling stocks and playing Donkey Kong after hours. So it's, it's impressive.

[00:06:08] **Kelly Erhart:** Sounds fun.

[00:06:09] **Nate Hagens:** Well, I mean, and that's part of the reason I wanted to have you on today is you're young and you're learning about the natural world and the trajectory we're on, and you're doing something about it.

[00:06:22] which I think we need a lot more people of all ages, around the world to do. We're here at Climate Week and sometimes it feels like Groundhog Day that we hear all the same news, which is updated. But you, in our prior conversations, you have your finger on the pulse of many different things, and you mentioned that you've created something that you call a dashboard that's green, red, yellow on the various things.

[00:06:49] So what should our viewers, many of which, who are climate literate? what, is the dashboard saying today? What have you learned? What are the things that they should be aware of?

[00:06:57] **Kelly Erhart:** Yeah. as you said, it's hard to understand climate in this moment. I think there are so many competing headlines. And one day you read a headline that is cheerleading very well, as we should, all of the wind that we've been making in deploying renewable energy sources.

[00:07:11] And then the next day you read a headline about tipping points that are gonna kill us all faster than we ever thought. And so I think this dashboard metaphor is a nice way to kind of think about where we are. So there are lights on the dashboard that are flashing green. There are lights that are flashing yellow, and there are lights that are flashing red.

[00:07:27] so I'll dive into each of those and I'll say that the red lights are really where I've focus. so green lights. Our, the sort of speed and scale at which we're deploying new clean alternatives. we could be moving faster. Absolutely. But if you looked back 10 years ago, where we are today would've seemed like a science fiction.

[00:07:45] And I think that it really can't be understated. The winds that we've had on mitigation and decarbonizing our systems, especially in the global north. And that is huge. I mean, activists went for signals to markets and were getting market signals and mo money is moving. and that's incredible. I mean, more than a trillion dollars went into clean energy last year.

[00:08:07] and that's more than double fossil fuel investment. or rather, that was in, in 2023. and 90% of new energy sources coming into the United States are, renewable, but where things are flashing yellow is that. We are deploying these new clean alternatives, but our actual emissions are not falling.

[00:08:26] And that's because we're not replacing fossil energy with, renewable energy necessarily. We're building on top of it. And so this is very much the more and more, more, kind of frame of better understanding that the transition that we

think of in the energy transition is not quite a transition. but a, building on top of which creates problems for our real emissions.

[00:08:46] This is where it's yellow, right? directionally we're moving in the right direction, but it's not totally clear where we go here. However, I think it's, there are some optimistic signals in that like. Renewable energy is now a global priority in a way that it never has been. but where things are flashing red is the increasingly grim climate science on the consequences of our emissions trajectory on our natural and human systems, no matter what that emissions trajectory is, whether we're in a 1.5 world or a two degree world, or a four degree world, right?

[00:09:16] This is where kind of the situation becomes incredibly sobering. And so this is why I believe we really need to be exploring additional tools outside of the traditional tool set of mitigation and adaptation. this is kind of a category of risks that all act as accelerants and force multipliers to cascading effects in our systems.

[00:09:35] And so there are a couple of things here that I'll explore one, one driver. To these flashing red lights is that we are becoming more concerned that the climate is more sensitive to greenhouse gases than we originally thought. Meaning that, warming can, may continue to accelerate faster than originally, expected.

[00:09:55] **Nate Hagens:** So it's not just the emissions, it's the feedback from the emissions.

[00:09:58] **Kelly Erhart:** That's right. Yeah. And we'll get into some of the specific feedback loops. another is this really unfortunate, short-term reality, which is that we've done a pretty good job at starting to clean up pollution and that is great for human health.

[00:10:12] It's a big human health win. but unfortunately that has a short-term effect of unmasking the, reflectivity that these aerosols, as a consequence of pollution we're providing. and so. Aerosols from different industrial processes. These are small particles that go into the atmosphere and reflect sunlight and help seed clouds.

[00:10:34] So reducing pollution, short term, bad for warming, good for human health, but it's an element. And then there's this other element, which is natural feedbacks. So everything I've talked about so far is a direct impact from our anthropogenic activities and emissions. But now because we've warmed the planet, we're starting to push our systems into, producing their own emissions.

[00:10:57] And so these are warming induced emissions. Things like methane and carbon dioxide being released at rates that we haven't quite figured out how to track from natural systems like tropical wetlands and peatlands and permafrost, thaw, thaw. And so this is really concerning and we'll get to that I think maybe a little later in the conversation when we talk about methane and super pollutants.

[00:11:17] And then there's this fourth layer, which is tipping points. And I think tipping points are complex and I think it's great that they've gained some mainstream attention. I think scientists are in a bit of disagreement around how to talk about tipping points due to like the technical meaning of what tipping points are.

[00:11:35] But what's important to underscore here is that there are ways that we can tip our natural systems, move our natural systems over a threshold where for whereby the consequence could cause irreversible damage or change on any human relevant timescale. And so this is like collapsing ice sheets, vanishing summer sea ice, potentially turning the Amazon rainforest into a desert.

[00:11:59] You know, these things that then would have cascading effects on all of our systems. And these are things that are relevant to kind of. People who are listening to this podcast and the children that they have or will have because these could happen on that timescale. And so that those red lights are where we focus because there's kind of this tragic irony where there are these cascading impacts that, won't just harm ecosystems, but they'll probably make it a lot harder for all of our best efforts on mitigation and adaptation to continue just due to the type of geopolitical instability they likely would cause.

[00:12:35] **Nate Hagens:** What does your week look like? I mean, you run a climate philanthropy, but how do you stay on top of the science as well as you do? Because when I met with you knew more than I did on a lot of these topics and I read and talk to the actual scientists. So like, walk me through how you stay on top of all the different issues.

[00:12:54] **Kelly Erhart:** So I'm not a scientist myself, right. but I am a big fan of science and I feel really privileged to be able to work with some of the top scientists in the world that are researching these areas. many of them are our grantees. So we take an approach to funding science that is very like people and focused research forward.

[00:13:13] So I have, yeah, the privilege of jumping on calls with these people, going to research conferences, being able to talk directly to the scientists whose names I read on the papers that I read. and I think I, I'm really passionate about this opportunity, because I think that at this juncture where we are in planetary history, responsible stewardship of this planet and the people on it, and the ecosystems on it, demands that we really urgently explore and assess all options.

[00:13:41] And so. I just, I don't know. I dig in.

[00:13:44] **Nate Hagens:** So you mentioned before that we're going to need something in addition to cutting emissions and mitigation. Like, what else is there? what are the technologies or what are you excited about and looking at?

[00:13:57] **Kelly Erhart:** Yeah, I think even under the most ambitious mitigation scenarios, and.

[00:14:02] If we assume we were to deploy all of the adaptation capital that's available today, there are things that we just won't be able to solve for with the existing toolbox. so there are a number of tools that we're looking at, and I think this expansion of the toolbox beyond what we think we need is something that has some precedent.

[00:14:21] So adaptation used to be a very dirty word. For example, in climate. It was thought to be a moral hazard and that it would move the puck away from mitigation as the primary goal. And, I think there's a lot of merit and focus. And I also think that as we've moved farther and farther down this trajectory, now adaptation is considered a necessary thing.

[00:14:41] I think that as we're now in this 1.5 scenario,

[00:14:43] **Nate Hagens:** earlier than many thought

[00:14:45] **Kelly Erhart:** that's right, we're in and, or approaching overshoot, it means that we have to look at other things.

[00:14:51] **Nate Hagens:** Climate overshoot. We've been over, we're in human overshoot for quite a while.

[00:14:54] **Kelly Erhart:** That's right.

[00:14:54] **Nate Hagens:** Yeah.

[00:14:55] **Kelly Erhart:** Yeah. So I think the way that adaptation transformed from a dirty word to a necessary.

[00:15:00] Feature. I think that this expanded tool set, which we can get into the specifics of is the next evolution.

[00:15:07] **Nate Hagens:** So in the climate community, which I'm peripherally aware of, has there been a switch from trying to mitigate what's coming to, it's too late now. We need to adapt. I know David Suzuki, who's long been a famous environmentalist kind of a couple months ago, threw in this house, said, it's too late now.

[00:15:26] We need to just work locally. I is that dynamic happening or what have you experienced?

[00:15:33] **Kelly Erhart:** I don't think anyone, is necessarily driving an argument that it's too late. I think that it's definitely not too late to continue mitigation efforts. We must. Pursue way more ambitious mitigation targets than we ever have.

[00:15:47] And that is gonna require a transformation of economic and political systems, which is gonna be tough. and because it's going to be tough, we are already, we're now understanding that adaptation is necessary as well. there will just be, there already are, and there will continue to be devastating impacts to humans and ecosystems.

[00:16:05] And so we need to finance, ways to adapt. And we also need to look upstream and. Be more clear-eyed about the risks that are on the tail end and be funding research and supporting efforts to better predict those tail end risks so that the most vulnerable people in the world don't have to suffer the consequences of things that are impossible to adapt to.

[00:16:27] **Nate Hagens:** Let me ask you this, I mean, we're here this week, when our president in this city, proclaimed that climate change is a hoax. You and I live in the United States. Is it possible or even likely that the nucleus and the beating heart of the environmental movement on climate is going to move offshore and the rest of the world is already happening?

[00:16:51] and what are your thoughts on that?

[00:16:52] **Kelly Erhart:** It's possible. I think that the rest of the world is definitely furthering a lot of really important work in this moment. certainly on a multilateral front. it's really important I think, that we can preserve multilateral institutions to continue this hard fight.

[00:17:07] but I also think that. Politics are phasic. and I think that Americans are going to continue the fight against climate change no matter who's in office, who's holding the presidency. And while we have seen devastating cuts to science, all environmental science at a federal level and science generally at a federal level, there is still a lot of momentum moving in US-based science.

[00:17:35] I will say though, that I think there is an opportunity for other countries now to step forward and sort of move away from the paternalism of the United States. Being the primary actor on many of these things, I think that could open up some interesting pathways. and I also think it opens up leadership for countries in places that have been less active in climate science due to funding and sort of systemic reasons.

[00:17:59] especially places in the global south to play a more active role in advocating for and, doing regional research on, These risks and the pathways out of them.

[00:18:10] **Nate Hagens:** So gimme some insights into, you said, beyond adaptation medication, there's things that we're going to need to do, like carbon dioxide removal and other things.

[00:18:19] What are the cutting edge things that, that you and your team are looking into that are, most promising or that need more research?

[00:18:25] **Kelly Erhart:** So carbon dioxide removal is something that has been called for at large scale, and it's sort of not really a question anymore. It's in every IPCC report. and carbon dioxide removal is necessary because carbon dioxide is a long live gas.

[00:18:40] so we emit carbon dioxide today, but it stays in the atmosphere for, you know, a hundred years or so, right? So even if we had the magic off button, we would need to, with emissions, there still would be carbon dioxide in the atmosphere, warming our planet. So large scale carbon dioxide removal is necessary.

[00:18:57] and what I might cover is one area where I have a lot of excitement, which is open system carbon removal and in specific ocean alkalinity enhancement. So the planet absorbs and processes carbon in, in many different ways. There's kind of the short term carbon cycle where plants grow and die in the long term carbon cycle, which is regulated by minerals, dissolving and moving carbon out of the atmosphere and into eventually the ocean.

[00:19:22] but I think. For right now, what I'll talk about is, durable carbon removal. so carbon removal that can store carbon for a hundred or a thousand years,

[00:19:32] **Nate Hagens:** like CCS,

[00:19:34] **Kelly Erhart:** not quite. Okay. so there CCS and so CCS, carbon capture and storage, there's also CCUS, carbon capture utilization and storage. that is a way to do closed system carbon removal, just like direct air capture or other reactor based methods of carbon removal work.

[00:19:54] So closed systems are interesting, because you can literally watch the molecule move in and out of the system, so you can measure it very well. But they're tough because they require infrastructure. they're very and lots of energy. Expensive and a lot of energy to run them. Right? Yeah. So open systems are interesting.

[00:20:11] This is. Forests, soils and the ocean. I'm particularly interested in the ocean because it's our largest active carbon sink. and the ocean has become about 30% more acidic since the industrial revolution 'cause it's absorbed about 30% of our carbon emissions. And so ocean alkalinity enhancement is a strategy to, increase the ocean's capacity to absorb carbon, but as bicarbonate not as harmful, carbonic acid.

[00:20:42] so you're sort of increasing the buffer capacity or giving the ocean more breathing room and it has the potential to draw down. Gigatons of carbon dioxide annually. which is great because the scale that's required to meet the goals set forth by the IPCC is somewhere around 10 gigatons or 10 billion tons of carbon dioxide removal annually.

[00:21:01] **Nate Hagens:** So would this, be under the category of geoengineering then?

[00:21:05] **Kelly Erhart:** I think that geoengineering is kind of a tricky term

[00:21:08] **Nate Hagens:** because we've been doing it for two centuries anyways.

[00:21:11] **Kelly Erhart:** Yes. I think that as long as humans have been intervening in our natural systems to make them do what we want, we have been in geoengineering, and you could argue that we've actually been doing the, just the dirtiest, most inequitable form of geoengineering that is possible by releasing fossil carbon dioxide and other gases into the atmosphere in the way that we have.

[00:21:32] So, depends how you wanna define geoengineering, but yes, it is a, A way to do a scientifically informed, intervention in the natural system.

[00:21:43] **Nate Hagens:** And what would that entail? In the oceans,

[00:21:45] **Kelly Erhart:** there are different ways to do ocean alkaline enhancement. it can be mineral based, so you can take alkaline rocks, and add them to the ocean like ine for example, add them to the ocean and then allow the, wave energy to dissolve them.

[00:21:58] So as the rocks dissolve, the more surface area, the more that they can, drive the natural chemical reaction that turns atmospheric carbon dioxide into bicarbonate, eventually bicarbonate ions in the ocean. or you can do it through slight chemical changes. so there are different chemical pathways to just introduce direct alkalinity, but.

[00:22:20] research on this is still ongoing. so there's been a lot of work to understand kind of the safe ecological thresholds, of doing something like this, and that's really promising. I think the next step is continuing to drive down, the true ecological thresholds and what's safe and what's not, and then exactly how we would deploy systems like this.

[00:22:39] but again, to give you a sense, IPCC says we need about 10 gigatons of carbon dioxide removal annually. Right now we're only deploying in the tens of

thousands of tons of durable carbon dioxide removal. And so that's like. Thousand, a few drops in what needs to be a swimming pool.

[00:22:56] **Nate Hagens:** Our economic system runs on quarterly GDP and profits, and if we only have a couple drops and we need a swimming pool, there would have to be a profit objective to do that scale.

[00:23:08] And so it would, it'd almost be like we have to dedicate a meaningful percentage of our GDP to protecting the biosphere and act as apex custodians. So to, to move from drops to swimming pool would almost by definition, require a different economic system or not.

[00:23:26] **Kelly Erhart:** It may, I think what it would require is shifting the incentives in our economic system as well as the incentives in our political system.

[00:23:34] **Nate Hagens:** And maybe

[00:23:35] **Kelly Erhart:** the prices. And the prices.

[00:23:36] **Nate Hagens:** yeah.

[00:23:36] **Kelly Erhart:** That's why I think research is so important in this moment to drive the prices down so that they could conceivably work within some form of a differently incentivized economic system that, that we live in today. but yeah, it will require a lot of capital and a lot of infrastructure.

[00:23:53] **Nate Hagens:** Do you ever find, like we're with our people that understand and many of them are nerds and spend a lot of time reading papers and talking to scientists. This annual gathering in New York City, is where those people convene, but there's tons of other problems in the world. There's ongoing

wars and inequality and biodiversity and poverty and debt and all those things, and I just.

[00:24:22] The thing, the conversation we're having right now. Makes sense. I understand exactly what you're saying and where you're coming. Well, most of it, but other people are not even on the same game board as we are in this discussion. Do you ever feel that as a young person in this world, I mean, I'm sure you have friends outside of this space, do you ever feel like an alien in conversations about the future of humanity and the biosphere?

[00:24:50] what can you share about that?

[00:24:51] **Kelly Erhart:** I don't necessarily feel like an alien, but I do really enjoy sharing about these things. I, yeah, I think that anything that helps me better understand the world that I live in makes me feel a little bit more alive. And I like sharing that with people. but what you're pointing to is very real.

[00:25:08] And I think it's a, big problem for the human condition, which is that we have near term. Crises that we need to manage. wars, famines, incredible injustice around the world, and these near term problems require us to focus on them and allocate resources to them. Yet at the same time, we live in a complex world that will have that.

[00:25:35] Demands that we also look at what is happening over the medium and long term. and it's hard to figure out how exactly to allocate resources amongst those two things. I think with climate change, is non-linear now, and I think that means that we need to take a non-linear approach to solving it.

[00:25:52] And I think it demands us to, really invest more in the future so that the types of suffering that we see today do not just become even more exacerbated by the systemic. The systemic linchpin that is our natural system.

[00:26:07] **Nate Hagens:** Tell me about methane. I know it's, a potent, greenhouse gas and contributes a lot to warming.

[00:26:14] what should our viewers understand about methane?

[00:26:17] **Kelly Erhart:** Yeah, so I'll explain why methane is a big part of today's warming. kind of some tools that we already have to cut methane, and then some opportunities for advancing research there. So, as you said, methane is responsible for about half, half of, is it half?

[00:26:32] Today's warming is, I didn't know that. Yeah. Methane and other super pollutants are responsible for about half of today's warming. but even

[00:26:38] **Nate Hagens:** though they're much lower in concentration, they're much

[00:26:40] **Kelly Erhart:** lower in concentration. Super pollutants are defined as like, methane, black carbon fluorinated gases.

[00:26:47] they're much lower in concentration, but they have far more warming impact. They also don't last as long in the atmosphere, which is part of why they haven't received as much attention. But we have. One of the fastest lovers at mitigating, warming, and avoiding overshoot is to act on these fast acting, short-lived pollutants in the atmosphere.

[00:27:09] And something that's kind of interesting about methane, it's optimistic in one way or pessimistic in another way, is that, the more methane. So methane is naturally cleaned out of the atmosphere through chemical processes in the atmosphere. there are, I don't know if I should necessarily get into this.

[00:27:28] So there are different hydroxyl radicals and chlorine radicals in the atmosphere that clean methane turn 'em into carbon dioxide. There's only a sort

of a, relatively stable amount of those in the atmosphere. And so if we keep producing more methane, the atmosphere will process that methane more slowly.

[00:27:46] If we produce less methane, if we mitigate methane emissions, the atmosphere will continue to process methane at rates that are reasonable. so I think that's like one important thing to anchor to, Methane is, it's definitely the most, the second most important greenhouse gas, it's probably responsible for about half a degree of current warming.

[00:28:04] And methane comes from a number of sources. the two biggest sources are oil and gas, energy sector and, livestock and agricultural emissions. So oil and gas, you know, is one place where we've actually developed quite a lot of solutions to, capping and trapping methane. I think now it's really just an enforcement and, regulatory problem.

[00:28:26] But, enteric livestock emissions are actually the biggest emission source for methane, and it's one where there's some really promising research, but we're not quite there. So, groups like the Global Methane Hub, and many research groups, working on methane have developed approaches to reduce methane emissions from cows, from cow burps and farts.

[00:28:50] and that's great. but unfortunately right now we only have pathways to mitigate about 10% of livestock emissions. and that's because the majority of ruminants, live in pasture and they are not. We don't use the same animal husbandry practices in the rest of the world as we do in the global north.

[00:29:07] So about 90% of those emissions are still unaccounted for. and so technical pathways are needed for development there. And there's a lot of interesting opportunities, vaccines and feed additives, things like that.

[00:29:19] **Nate Hagens:** My understanding is that the cow farts themselves, aren't as big of a problem if it's raised on a pasture, but then in the last six months when they fatten the cows up, they put 'em on dry distiller grains in these feedlots.

[00:29:35] And then that creates a lot of that, impact. So if we did it differently and or more of us ate less meat, that could, help.

[00:29:44] **Kelly Erhart:** Yeah, I think, so I haven't necessarily seen the studies on, on the difference in feed additives at the end. but what I understand, is that even pasture raised ruminants, Do produce quite a bit of methane. And so that's the majority of the methane, that, that is in the atmosphere today is coming from pasture raised ruminants. which again, there are opportunities to, to mitigate that with different feed. And

[00:30:15] **Nate Hagens:** so this is the methane coming from the cows, but what about the demand for cows creates deforestation in, for instance, Brazil to plant more soybeans and that has a climate impact.

[00:30:28] That's right. That's not methane per se, but it's adding to the whole thing.

[00:30:31] **Kelly Erhart:** Exactly. It's all a part of the same cycle. Yeah, yeah. So that's, one source. I think one other area that really concerns me with methane is what I pointed to in the dashboard metaphor. So this is, that natural feedback loops are now adding to the problem.

[00:30:49] so we are now seeing thawing permafrost that's releasing more methane. tropical wetlands and peatlands are also re releasing a lot of methane. and these sources aren't even factored into climate models right now. So this being, so the

[00:31:04] **Nate Hagens:** IPCC doesn't include those, feedbacks in their projections?

[00:31:09] **Kelly Erhart:** No. And so for, Several years, methane emissions were fairly flat. but around 2010, the amount of methane in the atmosphere was seen to be increasing rapidly, and that's in part a result of these warming induced emissions. So there's a large amount of uncertainty here. We don't know where exactly the hotspots of these emissions are coming from or exactly what is driving them.

[00:31:34] but it's really important that we understand, and it's a little crazy because scientists do know that this is. this is an emission source. but no, it's not currently included in our modeling or planning in part due to the lengths and the timeline of IPC cycles, IPCC cycles, as well as, modeling efforts that are needed and observational, better observational data to inform those models.

[00:31:59] **Nate Hagens:** Let me ask you this, you, you claim to not be a scientist, but you clearly have a scientific mind, and you talked to some of the top scientists on these issues. What is your personal Kelly Erhart distribution of where we are in the year 2100, the midpoint of where you think, undercurrent trends?

[00:32:19] Like where, what sort of warming are we headed for on the default path?

[00:32:23] **Kelly Erhart:** I think it's really hard to say. I, I. I think it's very hard to say. I think it could be anywhere from two degrees to four degrees in some upper estimates. And a lot of that depends on how well we are able to better bound these big uncertainties in the climate system and understand them and then take action.

[00:32:42] So in the case of methane, like there are actually some things we could do about warming induced emissions. There are some natural things we could do like resinating, wetlands, and then there's some other things that we could do that are a little bit more interventionally. so like one area of research is into atmospheric methane removal.

[00:33:00] so as I said, there are these chemical processes, that naturally process methane out of the atmosphere. and I think, and there are ways now that researchers are exploring to accelerate that breakdown of methane in the atmosphere or support the systems that are slowing down.

[00:33:16] **Nate Hagens:** You follow my podcast?

[00:33:18] Yeah. And you've seen some of my presentations. One of the slides I have is trying to argue, Change our climate trajectory with facts is like arguing with a forest fire because we have this metabolism as a species accessing an energy gradient with all of the stored carbon that powers our economic systems.

[00:33:41] Do you ever feel that way, or, not?

[00:33:44] **Kelly Erhart:** I do feel that way sometimes. Yeah. I do. I mean, you asked me what I think our trajectory is, and part of why I keep going back to the research is because I believe that there is. So much opportunity and so much white space for us to act in. and so I don't wanna say we're gonna move towards a four degree world because I believe it's possible for us to produce a different outcome.

[00:34:06] But yeah, there is a lot of inertia in the system and I think that among my peers, like there are. Many different ways to approach the reality of where we are. And I think generally there's sort of two trends. Like you can be naively optimistic, you can be optimistic because you believe in some I identic fallacy

that will just, you know, all go back to just eating beans and living on grass and not having houses or something like that.

[00:34:33] And that it was better then and we weren't doing anything bad then. Or you can be a techno optimist and think that we're just gonna solve it all with technology or you can just not look at the whole system.

[00:34:42] **Nate Hagens:** What about my view, which is that emissions are peaking now or soon because, of the affordability and availability of fossil carbon, if we were to peak this decade, because oil will decline, and that will change the economic system and we still emit, continue to emit, but at a lower amount, every year into the future.

[00:35:04] How does that, how would such a scenario fit into your two to four degree range? I, mean yeah. Pure of speculation

[00:35:12] **Kelly Erhart:** in that,

[00:35:12] scenario, that would, that would bring us into a, more hopeful world for sure. but one of the things I think a lot about are the cascading and compounding effects of the natural feedback loops that we've se set off the fuses that we've lit by having a warm planet for as long as we have had.

[00:35:31] And there are just some funky things that start happening when you're in a very warm world for a long enough time that can throw the whole system off. Right. Give

[00:35:38] **Nate Hagens:** us a couple examples.

[00:35:39] **Kelly Erhart:** So glaciers are one of the biggest wildcards in the climate system. and they're the single largest driver in what we can expect in terms of sea level rise.

[00:35:50] and so it's an area that we've worked on a lot of research, supporting a lot of research on,

[00:35:55] **Nate Hagens:** and also glacier collapse in continents like Asia that then affect the water supply and everything else. I mean, continental glaciers, well, continental

[00:36:04] **Kelly Erhart:** glaciers as well.

[00:36:05] **Nate Hagens:** Yeah.

[00:36:05] **Kelly Erhart:** Yeah. so. Sea ice loss is a problem for albedo and for many reasons, but glaciers in specific.

[00:36:14] So these ice sheets, especially those that are land bound, are, these big uncertainties. So we focus a lot of the research on that. We fund on the western arctic ice sheet. So the waits glacier, it's also known as the doomsday glacier. It is the single biggest uncertainty in how we think about sea level rise over the next century or two because if rates collapses, it could cause up to two meters of sea level rise globally in a short period, in a short period.

[00:36:43] It has in other, in, in sort of like we can look back at paleo climate records and we've seen that it has collapsed quickly. And

[00:36:50] **Nate Hagens:** what percentage of the world's ports would be completely useless if six feet, two meters happen? Many. Yeah, many. I mean,

[00:36:58] **Kelly Erhart:** we're talking about. Goodbye Bangladesh. Goodbye Jakarta, many coastal cities.

[00:37:03] A th about a third of people live, with within New York City. New York City. Yeah. About a third of people live within low lying coastal areas. Yeah. And

so I think with sea level rise, at that scale, that's, we can't adapt to that. Right? And so, when I started learning about this, glacier in particular, what freaked me out is that when you talk to Glaciologists today, they say, unfortunately, it's no longer a matter of if Dwight's collapses.

[00:37:31] It's a matter of when. And that's because Dwight's collapse is now kind of decoupled from temperature. So we've started a feedback loop of water coming underneath this previously land bound glacier, that is accelerating the glacier, into a collapse scenario. And when you ask Glaciologist, okay, well that sounds scary.

[00:37:52] You said up to two meters of sea level rise. Is it gonna happen this century or next century or in 500 years? They say, we don't know. It could happen this century, and we don't know with any confidence between, it could happen anywhere from 1% chance or 99% chance, but we can't tell you because we really don't yet understand the underlying dynamics that are causing this glacier to collapse.

[00:38:15] And so, again, this is another thing that is not currently factored into IPCC models.

[00:38:20] **Nate Hagens:** And if it were to happen, then that additional water would cause other things to happen.

[00:38:27] **Kelly Erhart:** That's right. That amount of fresh water could be the amount of water that would disrupt the salinity and of the ocean enough that, it could significantly slow down.

[00:38:36] The amoc a really important current that drives, deep convection and circulation, that also drives weather patterns on, on planet earth and is important for ecosystem health as well.

[00:38:47] **Nate Hagens:** is the barrier that I don't think the barrier is facts anymore. So is it cognitive dissonance that. We lack agency as individuals.

[00:38:57] And so hearing about this is like, no, I don't want to hear anymore. Even though we have to hear more. Some of us, the funders, the scientists, the politicians, the activists have to understand where we're at. But we've known about this for a long time. It's unfolding in many ways faster than was predicted, and yet.

[00:39:19] In our country. And the second most, least likely country to talk about these things is Australia. It's still like a dirty word. climate change is a socialist hoax or whatever. what, do you think the barrier is? Is it, facts or science? I don't think so. Is it misinformation? Is it, protecting my own psychology from learning about these scary things?

[00:39:48] Or what are your thoughts?

[00:39:49] **Kelly Erhart:** Yeah. I don't think it's an information deficit, although I will say that we are learning more and more about, about these systems and that is informing, I think, better research. I think that there's certainly a cultural thing. I think it's terrifying. I think that there is something primal about believing that the world that you're building and living in is not gonna be safe for your children.

[00:40:13] And that, that certainly could inspire a lot of cognitive dissonance to, you know, you don't wanna, that the primal safety net is the next generation, right? it's not just me. It doesn't just end with me. There will be a next generation. It will continue. And the idea that we're threatening that. Is, I think a very threatening idea, and confronting.

[00:40:33] And so it's not easy to confront these issues, but again, I think that it's the responsible thing to do. And I don't think turning away from them in despair is

the right way to go about it either. I think we need to be realistic about the harms that we've already caused and the harms that we will cause.

[00:40:50] And the canvas that we have is not the canvas that we wanted or the canvas that we hoped for. but it is a canvas and there are things we can do. And the only way we can start painting on that canvas is by looking at what's actually happening in the system.

[00:41:05] **Nate Hagens:** Do you know Bill Plotkin?

[00:41:07] **Kelly Erhart:** Yeah.

[00:41:08] **Nate Hagens:** Bill was on my show and he talked, he said that only 5% of humans ever reach adulthood ecological adulthood.

[00:41:17] And you are one of those humans, clearly, and we need more of them. So please finish on glaciers. what else do we need to know about that?

[00:41:25] **Kelly Erhart:** So I think there are two really critical tracks. One is better forecasting. so we need to better understand these glaciers. We need to observe them.

[00:41:33] We need to build new models and actually forecast the risks of catastrophic sea level rise. and from that research we could inform intervention strategies. So as I said, that level of sea level rise. Impossible to adapt to with seawalls. Right. However, there are some natural analogs that we can look to in, in studying glaciers where glaciers have refrozen themselves to their bed.

[00:41:56] So where there have been big ice streams that stop, and then the glac, the glacier refreezes. so there are interventions that we can look at as well. If anyone read ministry for the future, there's the, guy Slavic, who, is pumping water

out. that is one way pumping water out from underneath the glacier to reduce the basal, the basal lubrication and slip.

[00:42:19] There are also these things called thermo siphons, which are passive heat pumps essentially, which can remove heat from the bottom and then site, in a, in a passive way, be able to actually refreeze the glacier because you're removing the heat from the bottom and then using the cold air at the top and cycling that through.

[00:42:37] so that would require drilling like. You know, 10,000 holes or so in Western arct, but it's possible there could be some targeted interventions there. So there are a few organizations that are working on research on this that I think, are opening up the action space in a way that's really important, and providing some opportunity to actually work upstream of, that risk.

[00:42:59] **Nate Hagens:** So yesterday I interviewed, Ted Parson on, solar and, geoengineering, and it all sounded sci-fi craziness to me. I don't think we're gonna go that way, except if you look at the default path of what we face, we're gonna have to do something was his point. so what is your take on. Solar geo engineering and some of these seemingly fantastic tech responses to the climate crisis.

[00:43:31] Gimme your take on the state of solar geoengineering. What are we doing? What's exciting? What might be necessary? Yeah. What should we avoid all that?

[00:43:39] **Kelly Erhart:** Sure. So I think when we think about runaway warming, there's really only one emergency global break that's been contemplated or researched and that is solar geoengineering.

[00:43:49] so the one that has been looked at most is SAI, stratospheric aerosol injection. there are lots of ways to refer to it. In this podcast, I'll refer to it as sunlight reflection. It's a pathway that explores whether we could cool the planet by reflecting more sunlight off of the planet. and so that's something that the earth naturally does already.

[00:44:07] The earth reflects sunlight. and before I dive into the specifics here, I'll say like. SRM Sunlight reflection is not a solution in and of itself. There's a lot that it doesn't solve for, and there are a lot of uncertainties associated with it, and so it really requires careful research and governance.

[00:44:26] but I'll dive into a little bit on kind of how it works. So when we talk about climate change, I think that most people think of warming in terms of greenhouse gases, which is reasonable. but there's another piece of warming that's less frequently spoken about, which is the albedo or the reflectivity of the earth.

[00:44:44] so the earth naturally reflects about 30% of sunlight. and studies suggest that if we increased reflectivity by about 1%, we could drop temperatures by about one degree Celsius.

[00:44:56] **Nate Hagens:** Just

[00:44:57] **Kelly Erhart:** 1%. Just 1%. Yeah. And so that's kind of the motivation I think, behind this research that's important to anchor in that reflectivity, that albedo is important to anchor in.

[00:45:06] Because what we are beginning to understand is that, the earth's albedo has actually dropped pretty significantly as a consequence of climate change. So we're reflecting less, we are reflecting less. We are making the planet

darker, if you will. So over the past 25 years, studies have shown that the Earth's albedo has dropped by something like half a percent.

[00:45:26] Essentially means that half a percent drop in albedo is equivalent to an additional 138 parts per million of carbon dioxide in the atmosphere in terms of the warming impact of that loss in albedo.

[00:45:40] **Nate Hagens:** So it's one of the positive feedbacks.

[00:45:42] **Kelly Erhart:** It's one of the positive feedbacks. Yeah. So for context, right now we're at about 420 parts per million.

[00:45:47] So 138 equivalent edition is insane. Right? And I think what's scary about that is that this drop in reflectivity is this like hidden second layer, second pulse of warming, that is on top of the greenhouse gases we already talk about and potentiates more warming. So it's this feedback at least less reflectivity, more warming, less reflectivity.

[00:46:08] **Nate Hagens:** So we've got all the emissions from land use, change from fossil fuels, but also the earth is less reflective. So what does that mean,

[00:46:17] **Kelly Erhart:** right? So I think there's this. This feedback loop that we've just been talking about, I think it's a really dangerous erosion of one of earth's natural cooling systems of one of the most important natural cooling systems that the earth has.

[00:46:31] and so I think that's part of why researchers are exploring things like stratospheric aerosol injection, right? So where we would in, we would introduce. Aerosols, primarily sulfate is the one that's looked at into the stratosphere that would reflect more sunlight. The idea has been around since 1965.

[00:46:49] It was actually first mentioned in a report to President Lyndon Johnson. And then research really picked up in the nineties. but there's a lot more research that needs to be done, especially in better understanding and bounding the regional impacts. Some of those sort of complex things could, that could happen between our natural systems.

[00:47:05] There are natural analogs, right? So volcanic eruptions, they mimic this process. They mimic what SAI might be

[00:47:12] **Nate Hagens:** Mount Pinatubo. Mount Pinatubo is a

[00:47:13] **Kelly Erhart:** great example. actually phytoplankton, they exhaust sulfates. they do what? Marine phytoplankton. They release sulfates naturally. And those sulfates actually seed clouds.

[00:47:26] So aerosols are important for cloud nucleation. they're, they, so the phytoplankton in the ocean are in part seeding the clouds in the deep ocean. But then. Also reflecting, real

[00:47:38] **Nate Hagens:** briefly, do you, what's the deal with phytoplankton? I mean, I know they're very important, but I haven't heard any updates on that.

[00:47:44] Have you followed the state of that situation?

[00:47:47] **Kelly Erhart:** Which part of the state of that situation?

[00:47:49] **Nate Hagens:** Well, that they're being influenced by endocrine disrupting tiny particles. And the amount of phytoplankton is being reduced, the amount slash health. And that changes the, both the sink capacity for absorption of carbon, but also the creation of oxygen that we breathe.

[00:48:09] do you have any updates on that? I mean, I'm, I haven't followed it.

[00:48:11] **Kelly Erhart:** You summarized it well. Okay. you summarized it well, it's a, that's another example of a dangerous feedback loop. We overlook these teeny tiny creatures that actually regulate incredibly important processes on planet earth.

[00:48:23] **Nate Hagens:** How do we, like, how does a human brain, like how do you keep all this together?

[00:48:30] And this is just climate and oceans. Like, do we have the ability to even any group of us, can AI help with this?

[00:48:40] **Kelly Erhart:** I think there are some things that AI can help with. I think there's a bit of hype around how much AI will unlock, how much AI will unlock climate stability. because ultimately that's always going to rest on our political will.

[00:48:54] However, there is, I was at an event this week about AI for climate and someone mentioned Move 37, which I think you've had various AI. Researchers and folks on this podcast. So people are probably familiar with Move 37 and the Go game where an AI was able to outperform a human for the first time.

[00:49:14] And I think what's interesting about that metaphor, someone was trying to say a move 37 for nature. You can talk about mo move 37 in terms of creativity, but actually move 37 was not just about creativity, it was about the fact that the AI saw a way to control just a little bit more of the board.

[00:49:32] Because to win game you have to control the majority of the board. To win the go game, you have to control the majority of the board. And so humans, based on our primal instincts, always go to completely annihilate the opponent. And so the move 37 was a move that seemed unintuitive, but it was one that was not driven by a desire to completely annihilate.

[00:49:52] It just needed half a percent more of the board than its opponent. And I think that is an interesting way to think about. how do we move outside of our biases in ways that maybe could be mediated by technology that could help us see things about our biases that we don't currently? I think there are some limits to what AI can do, but I think it can be helpful

[00:50:11] **Nate Hagens:** continue with solar geoengineering.

[00:50:13] Do you think this is important to research and that, Ted Parson believes that there's a 90% chance that we will eventually be sending planes up in the sky on mass? Probably a consortium of nations or something like that. Not because hey, it's a cool thing to do, but because we'll be forced to.

[00:50:33] **Kelly Erhart:** Yeah.

[00:50:33] So I mean, first let me be clear. I think the, primary objective is we need to reduce emissions, right? And, do large scale carbon dioxide removal and scale adaptation. But because of the rate at which earth is losing its reflectivity and because of all of the cascading compounding effects of warming that we've been talking about, I think it is important to understand whether sunlight reflection could be a safe and effective tool, to essentially give us some time.

[00:51:01] and if not, just not to give us some time to just be an insurance policy, a contingency plan for these catastrophic scenarios. where. Humanity might not be able to make our way through it, right? And so I think there's a lot that we know about how SAI might work, but there's a lot that we don't know.

[00:51:16] So research is, really important here. And I think it's very important because governance is a big question. so you said Ted thinks it's 90% likely? I don't know that I would say that, but I do think it's more likely than ever that governments would consider deploying this technology. But with the current

political sentiment, especially in the United States around scientific research, I think it's more likely than ever that it would be done in a dangerous and uninformed way.

[00:51:43] so. Funding research into programs that are trying to understand how this tool would work and how it would impact our systems is so critical. I think that one thing that people worry about as it relates to SAI, is that a billionaire could wake up one day and decide that they wanna go pump sulfates into the atmosphere.

[00:52:00] I think that is a convenient but incorrect, narrative. You wouldn't

[00:52:04] **Nate Hagens:** have to stay up for a long time to have any real impact, and you'd

[00:52:07] **Kelly Erhart:** need a lot of aerosols to actually call the planet. So it's really only something that I think a nation state could do. Right? And it's gonna require governance that would, you know, rival our very best multilateral diplomatic efforts that we've ever done as a species.

[00:52:23] **Nate Hagens:** The more I talk to experts like yourself, on all these issues, I've concluded that governance. Is the core thing that underpins all these risks. And is there any hope? Have you seen signs of different, better governance on the horizon, either locally, nationally, or internationally?

[00:52:46] **Kelly Erhart:** I think there's a lot of conversation around governance, especially as it relates to sunlight reflection right now.

[00:52:51] And, that's important. 'cause equity is really central here. It's like who decides who bears the consequences? There will be different consequences in

different regions. and so there are some really good efforts. I'll name one organization called, the Alliance for Just Liberation on Solar Geoengineering.

[00:53:10] Very long name DSG is the acronym. they work on engaging civil society in the global south to, Unlock their abilities, civil society's ability in the global south to engage with conversations around SRM informed in informed ways. There's also the Degrees initiative, which capacitates researchers in the global south to actually do regional research on what the impacts of SRM would be.

[00:53:33] And I say this in my answer around governance because I think it's very hard to know how to govern something if you don't know what it'll do. it's not impossible, but it's hard. and so I think where we are right now is we need to better understand what this tool would do, before we can really contemplate effective governance.

[00:53:54] **Nate Hagens:** So yesterday, I had a fascinating interview with a guy, a scientist named Sheldon Solomon on terror management theory, and he unpacked that for evolutionary reasons. Most of our past, we were hunting, gathering, telling stories, and then there were periodically crises. But you and I at least, and our peers, we get these crises and reminders of mortality, salience from climate, from all the things we read and work on.

[00:54:23] And it affects our physiology, our behavior, our politics as a young person, like how do you take this all on board and enjoy your life with equanimity and have friends and enjoy the normal human things in life when this is your full-time job? Like how do you manage that at 29?

[00:54:44] **Kelly Erhart:** It's not always easy.

[00:54:46] I'll say sometimes I get back from research conferences and it requires a very concerted effort. something that feels very true for me is that I can't move through this work by just dis dissociating and. Treating the facts as facts. there, there are facts that are directly tied to millions and millions of people's lives and immeasurable species and ecosystems, and that affects me emotionally.

[00:55:15] and so I'm sure many listeners follow, the, work of late Joanna Macy. I think that her work on the great turning, and being able to move through the processes that she offers has been something that's. Brought me a lot of nourishment and been able to settle me into the grief of this moment, but also the potential.

[00:55:40] And then I would also say, you know, you mentioned community and that's a big part of, I think communities in endlessly regenerative resource and being able to be with people that I love and that are looking at these things and enjoy life together and, celebrate the life that we do have in order to inform the life that we wanna fight for is like such a big part of what motivates me.

[00:56:02] **Nate Hagens:** And I know firsthand that you have a great community.

[00:56:06] **Kelly Erhart:** Yeah. They're the best.

[00:56:08] **Nate Hagens:** I don't wanna put you on the spot, Kelly, but you're a young woman who deeply understands climate. You don't have to share this if it's too personal, but do you have a view on having children yourself in the future, knowing what you know?

[00:56:22] **Kelly Erhart:** I definitely wanna have children. Yeah. It's not a question for me. I think that. A lot of people my age consider not having children, and I respect that decision, and I understand it. to bring children into a world that is

going to be more and more uncertain is a scary thing. But I also think that it is a radical act and an investment in the future.

[00:56:49] And, to me, again, it's not blind hope. It's not, I don't say that thinking, well, my children will just be fine because they'll be my kids and it'll be fine. Like, no, they will live in an incredibly disrupted world. And at the same time, there are ripple effects and there are realities that we can't possibly imagine.

[00:57:10] Octavia Butler has this short piece, seven Lessons for Predicting the Future. And the punchline is basically don't like directionally orient, but she has this example of growing up as a kid in the Cold War and going for doing bomb drills every single day. And at that time, not a single human could imagine how we would unlock the relative peace and stability that we've been able to over.

[00:57:34] The last many decades. And I think that's kind of the way that I think about where we're heading. which is, again, not naive hope, but being real about where we are and choosing to step forward into it.

[00:57:47] **Nate Hagens:** That's why we're friends.

[00:57:49] **Kelly Erhart:** That's why we're friends.

[00:57:50] **Nate Hagens:** I, agree with that, entirely. So if you could leave one invitation or challenge to the viewers of this program, who are quite erudite and aware of these issues, but on climate specifically for taking action, on climate and the broader ecological predicament we face, what would that be?

[00:58:11] **Kelly Erhart:** First of all, I would say curious and open. The climate movement. If you're in the climate movement, there are a lot of biases that any of us have as humans. We have a lot of biases, and I think the healthiest thing we can do as humans is to be always checking those biases and moving outside of

our echo chambers and looking for new information to better understand the world through.

[00:58:34] So I would say that's one thing. Stay curious if these things that we've talked about are interesting to you. Read about them. Try and understand other systems that are complex and think about the non-linearity of this moment and how we could respond. I think if you're a researcher, you should definitely think about whether there are ways that your research can flow into these fields.

[00:58:53] I think if you're in government, we need to see a lot more government leadership on, research, on climate and environmental science. if you're someone with access to philanthropic resources of some kind, we're gonna need to see hundreds of millions of more philanthropic dollars go into this research before it's likely that governments pick up the.

[00:59:13] Pick up the weight. And in just general, I think spread the word like that, that we need these tools, that we need to explore these tools, that we need to think more with a wide lens on the tail end risks so that they don't come up and bite us in the way that we're seeing these compounding effects right now.

[00:59:30] **Nate Hagens:** And to broaden that question to just general advice for people, who are aware of the metris and what we face, what, kind of advice do you have for, people watching this today?

[00:59:43] **Kelly Erhart:** Take deep breaths. Enjoy your morning coffee or your tea. Slowly, like connect with your friends. Love the people you love.

[00:59:51] Nourish yourself in the ways that you can so that when you show up to the work, you're not coming to it in a depleted way. I think that the best thing we can do is to give our full selves to the things that we commit ourselves to,

whether that's climate or human trafficking, or, you know, the. Gender justice or whatever it is, whatever area you work on.

[01:00:12] Or even if you're just, even if you're developing a technology product, like whatever you do, bring your full self to it. And I think nourishing yourself so that you can be resilient to the reality of this moment is critical.

[01:00:24] **Nate Hagens:** So, before we begin this interview off camera, you shared with me what you did last night in your hotel room.

[01:00:30] Would you mind, repeating that, yeah. As your own little coping routine or?

[01:00:35] **Kelly Erhart:** Absolutely. I recently started learning how to play piano maybe six or eight months ago, and I've been really enjoying it. And so I'm traveling for a few weeks for work and I bought a travel piano. It's very small, but it works.

[01:00:49] And so last night, which was actually day seven of my climate week, I started. Last Thursday, I was exhausted and I got into bed and I played myself. A few songs, sang and played myself a few songs from bed, which for me is just a lovely way to switch the brain into a different state of being and a really nice way to kind of give myself a sweet hug at the end of the night.

[01:01:14] **Nate Hagens:** So do you have any specific recommendations for young people your age or younger who, might be watching this in addition to what you've already suggested?

[01:01:25] **Kelly Erhart:** I think the curiosity piece is big. I, often talk to young people who wanna get involved in climate and they're really activated around renewable energy and I think that's so awesome and we so need that.

[01:01:38] And we also need people who are looking at complex systems and thinking about more creative ways to participate with this climate reality that are beyond just the clear markets of renewable energy. and I think I would encourage young people to not bucket yourself into needing to be a scientist or needing to be an entrepreneur or needing to be this or that thing.

[01:02:03] I think we live in this world that is so quickly evolving in terms of what you can do, what work is interesting, what work is meaning, what work is. Going to compensate you that the best thing you can do right now is be adaptive and be curious and stay engaged with the world, so that you can find the right role to play in it.

[01:02:23] **Nate Hagens:** What do you care most about in the world, Kelly?

[01:02:25] **Kelly Erhart:** I care most about this living planet. I think it's so incredible the ways that the teeniest tiniest bits of life exist as far down into the earth's crust as we've ever gone. And as, high up into the atmosphere, there are these bits of life that are making everything work.

[01:02:43] And then there are these beautiful outcomes of these teeny, tiny processes that happen over billions and billions of years. That mean that I get to sit here with you and talk, and that it all kind of works. Like I care about life and the sustaining and thriving resilience of life. yeah.

[01:03:02] **Nate Hagens:** If you could do one thing, and had a magic wand that had no personal recourse to your decision, what would you do to help, humanity in the biosphere?

[01:03:11] **Kelly Erhart:** If I could do one thing, I would implant into everyone's consciousness a understanding of an ability to integrate and act from the knowledge that we are a part of, a complex, interconnected system. Because I

think if we actually could appreciate that in a way that wasn't abstract, but was grounded, then we would be making much different choices.

[01:03:41] A question of how we design our political economies would be moot. we would do it because we would understand that without doing so. There's no place for us. Right. So I think that's what I would do.

[01:03:54] **Nate Hagens:** That's one of my favorite answers because it's not a magic wand per se, but that's what we're attempting to do with these conversations.

[01:04:01] That's right. Yeah. Thank you so much for your time, and your important work. if you were to come back, a year from now, and I know you're have a big job, at your organization in climate philanthropy, but you're also kind of a nerd, what's like one topic that you would be willing to take a deep dive on that you're personally passionate about that's relevant to human and planetary futures?

[01:04:28] **Kelly Erhart:** I'd be happy to come back on any of these specific topics. I think that there is likely to be a lot of research on all of them over the next little while. and so there could be some great updates. but I think that. There could be something interesting to explore the ways in which natural systems and human systems intersect as just a, topic area, and dive a little bit more into what we're learning around different derailment risks, different risks that cascade into each other, and also the positive tipping points that might be possible because of those interconnections between natural and human systems.

[01:05:05] **Nate Hagens:** That's an interesting topic.

[01:05:07] **Kelly Erhart:** Yeah.

[01:05:07] **Nate Hagens:** Do you have any closing words for our viewers and listeners today? Kelly?

[01:05:11] **Kelly Erhart:** Just thank you. Thank you for listening. Thank you. I probably should have thanked you at the beginning, but thank you, at the end for staying open and curious. I know that a lot of these topics are controversial and they're hard to wrap our minds around, and there's a lot of uncertainty around whether any of these approaches will work.

[01:05:29] but there's also a lot of uncertainty around where we're going, and so I think being willing to be brave and ask these questions and listen to alternative ideas is an incredible thing. And thank you, Nate, for bringing these conversations to the fore on this podcast

[01:05:43] **Nate Hagens:** to be continued, my friend. Thanks.

[01:05:45] If you enjoyed or learned from this episode of The Great Simplification, please follow us on your favorite podcast platform. You can also visit The Great Simplification dot com for references and show notes from today's conversation. And to connect with fellow listeners of this podcast, check out our Discord channel.

[01:06:06] This show is hosted by me, Nate Hagens, edited by No Troublemakers Media, and produced by Misty Stinnett, Leslie Balu, Brady Hyen, and Lizzie Ciani.

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