

# The Ultimate Guide to the NCA5 podcast

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adaptation, national climate assessment, chapter, resilience, people, assessment, ncaa, climate, work, podcast, climate change, impacts, cite, interesting, reduce, ecosystems, extent, manage, benefits, systems

## SPEAKERS

Allison Crimmins, Dr. Eric Tate, Dr. Jesse Keenan, Doug Parsons

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### **D** Doug Parsons 00:00

Hi everyone this is America adapts the climate change podcast Hey adapters welcome back to another exciting episode, I've got something special for you the ultimate guide to the fifth edition of the National Climate Assessment. Remember when we tackled federal agency adaptation action plans Well buckle up because we're doing the same for the National Climate Assessment. Joining me is the director of the NCAA Allison Crimmins who provides a 30,000 foot level view of what's in NCAA five then regular contributor and executive producer of American apps. Dr. Jesse Keenan of Tulane University joins the pod and we take a deep dive on what's in the assessment. Jessie will be your guide through the assessment as he analyzes and provides expert insights into its positive aspects and benefits. Finally, Dr. Eric Tate of Princeton University and co author of the adaptation chapter of NCAA five wraps up the episode all three offer their advice on how you can leverage the NCAA in your adaptation planning and climate communications. In the world of climate adaptation. Finding a common language can be challenging, but embracing the NCAA can be a game changer helping those doing work in ESG sustainability, resilience and adaptation planning find common ground if you've ever felt intimidated by the sheer size of the assessment and wondered how it could be relevant to your work. Well, this episode is tailor made for you this is a doozy of an episode so share it in your networks. So without further ado, let's jump in with Alison Crimmins. Hey, adapters Joining me is Allison Crimmins. Allison is the director for the fifth edition of the National Climate Assessment or more affectionately known as NCAA five. Hi, Allison. Welcome to podcast.

### **A** Allison Crimmins 01:43

All right. Thank you for having me.

### **D** Doug Parsons 01:45

First off, this is a whole episode is gonna be talking about NCAA five, and I have you on as the director, I'm very pleased to have you on you're right there in the thick of it. And so people

generally know what the National Climate Assessment is. But I want you to give your description very quickly. What is it? Sure,

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Allison Crimmins 02:00

I think it's easy to think of an NCA as one of the national climate assessments as a big report, and I suppose it is that it is a comprehensive look at climate impacts risks and responses to the United States. And it is a long report. But I really want to emphasize that it's a lot more than that. We take a lot of efforts to improve how we're talking about the science and make it more accessible and make it something that people everyday people can read. And we take a lot of efforts to make it accessible in terms of graphics and figures and podcasts and interactive atlases and an art and just different ways for people to understand and connect with climate change here in the United States.

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Doug Parsons 02:47

And we'll get into some of those ways that you're communicating it but as the director of the assessment, it's not your day job permanently, you're on loan, I guess one way to look at it, but what do you do there as director?

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Allison Crimmins 02:59

Yeah, that's right. I'm on loan from EPA, to the White House Office of Science and Technology Policy, and then through them US Global Change Research Program. And my job is really to set the direction of the National Climate Assessment and ensure that we actually get it done and out the door and manage all of the people and the processes and the many, many rounds of reviews that the assessment goes through before it's finally published. I joke that I actually do a little less science over the last few years than I would normally do in my regular day job, because so much of my job is about the hundreds and hundreds of people that have to come together to develop an assessment like this.

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Doug Parsons 03:39

Okay, so how is the NCA different from the IPCC process? Yeah,

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Allison Crimmins 03:43

there are some similarities. I think, especially when the National Climate Assessment was first started. We were mandated under the Global Change Research Act of 1990. I think there were a lot of similarities, particularly in the process of development between the Intergovernmental Panel on Climate Change IPCC reports and the national climate assessments, there are some important differences. Probably the most immediate one that comes to mind is that the IPCC is global in nature, and we are looking specifically at the United States. So it's an opportunity for us to provide some downscaled data, some really locally relevant information on how climate change is affecting Americans. The other difference that I would point out is that, you know,

despite efforts at the IPCC to continuously improve their products and make sure that they are accessible and less jargon filled. I will say that the IPCC reports tend to be pretty technical in nature, especially when you're digging into all of the underlying technical support documents. They tend to have a lot of jargon and they're very, very comprehensive in nature. We try to ensure that the National Climate Assessment is something that's accessible to a much to broader audience, so the folks who read the assessment may be policymakers at a national level at a state level at a local level, they may be water utility managers or farmers, they may be educators or students, they may be nurses. So just such a broad audience, we have to make sure that we're developing a product that speaks to all of those people who need climate information to be making decisions. So I think that's kind of a key difference between the IPCC reports, and the National Climate Assessment and gets back to what I was saying earlier about this really being a tool for people to use to make decisions, not just a big, dusty tome of every scientific fact, you've ever want to know that, you know, it sits up on your shelf somewhere,

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Doug Parsons 05:43

this is gonna be hard for you. But I need you to do this really, at the broad level? How is this fifth edition different than previous editions?

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Allison Crimmins 05:51

I think there are several differences. One is there are some advancements in the science that we highlight in this report. So there's things like improved understanding of climate sensitivity, or how much the earth warms when we double CO<sub>2</sub> in the atmosphere. I think there are some topics that are covered in NCAA five, that you didn't see as much of or at all in NCAA four or previous assessments. So we have a chapter on economics, which was covered in NCAA four, but really kind of sprinkled throughout the report, and especially in the mitigation chapter, NCAA five has a whole chapter on economics to itself. And we also have a chapter on social systems and justice. I'm really proud of the fact that NCAA five had more social scientists working on this assessment than we've ever had before. And I think that shows, not just in the social systems and justice chapter, but really, throughout all of the chapters of the assessment. And one of the major themes across the entire report is environmental justice, you know, equity. And I think that has really strengthened the narrative of the report, it helps us understand climate change in a social context. And it also highlights a lot of the research that has been published just in the last few years in the Social Science and Environmental Justice fields. This

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Doug Parsons 07:13

is an adaptation podcast, and my bias is an adaptation. So we're going to dig a little bit into the weeds there in part of the this whole episode, where I'm going to be digging much deeper into the report. And we can't do that with you. But let's talk a bit about adaptation. And when the areas that I found is adaptation investments, and you're actually tracking those things, which I think is really cool. Tell us a little bit about that.

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Allison Crimmins 07:33

Yeah, there is a map in our adaptation chapter in NCA five, that is looking at documented public and private sector adaptation activities across the United States. And actually tallying those up. There's a similar map in the mitigation chapter. And those two maps are kind of combined in a figure in our overview chapter. And that really shows how we've advanced not just in adaptation planning, but some adaptation implementation as well, some action and we found that just since the last national climate assessment, NCA four came out in 2018, there has been a 32% increase in adaptation actions across the United States. Fantastic.

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Doug Parsons 08:17

That's good, I guess progress from what I guess the original NCAA here is, I guess my tough kind of question for you is, I used to be a practitioner, I used to work for the state, I used to work for the National Park Service. And we know about the National Climate Assessment. But as you described before, you don't want it to be this unwieldy report that people don't know how to use. And yet there is still that element of it. And I guess you're an adaptation planner at the city level, or you're an urban planner, working for a private firm. What advice would you give people to approach and use the climate assessment? Because it was a tremendous amount of work? I don't think anyone questions the science. It's more about now what I do with this.

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Allison Crimmins 08:55

Yeah, absolutely. How do I turn all of this good science into decisions and then actions? Yeah, I gonna point you to two different places in the report. The first is that the entire report is really full of case studies, and especially the regional chapters, I think each regional chapter does a great job of highlighting actions that have already been undertaken in those regions. And there's a storytelling element to that as well, that I think makes those case studies really powerful because those case studies are demonstrating what has worked, but also what hasn't worked. And I think that can be really helpful for communities to see what other communities are doing and learn from. The other tool that I would point you to is our NCAA Atlas. It's at Atlas dot global change.gov. This is an interactive online tool that presents maps of our temperature and precipitation variables that you can find in NCAA five itself. But the tool lets us zoom into your state or county of interest, and so allows a user to create a map if that might be most useful for them. So for instance, if you are interested in the number of days that will be hotter than 95 degrees Fahrenheit in the future, you can click that map and then zoom right into your county to see what that will look like under future global warming levels. But maybe you're in a place where 95 degrees is, if you're in Arizona, 95 degrees is not the metric that you're interested in, maybe you're interested in 105 degrees, or maybe you're in the Northwest or the Northeast, and you're interested in extreme precipitation, this tool allows you to select that climate variable of interest, and look at how that will change in the future. And you can create maps and download them and use them for those kinds of decision making. It also allows you to overlay things like the justice 40 layers, so you can see where the disadvantaged communities are within those counties and states. So if you're making decisions, like how do I use the money, I have, effectively to plan for the number of cooling centers I'm going to need in my county, or how much staff I'm going to have to have ready for extreme heat events this summer. This is a tool that allows you to really provide some focused local information to help inform those decisions,

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Doug Parsons 11:17

and encourage my listeners, especially who want to potentially use it, and you just heard some ways, but that you guys have webinars and you have other tools, you know, get your staffers to listen to these webinars and such, and especially the podcast, so I'm gonna get the podcast, too, because I'm obviously very interested in that. But it does take, I think, a little bit of work to truly understand what's in there. And I think there's a lot of folks out there that need to make those efforts. I want to pivot a little bit here. So was there something that report that you learned that really struck you as being a good sign? Where did you find your optimism in this process?

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Allison Crimmins 11:46

Oh, I've got a couple places of optimism. I think for me, the thing that gave me courage right off the beginning of the report, right from the beginning, that I didn't have to start by explaining climate change is real to everyone, which has been a, you know, a significant part of my career, I really appreciated that this report starts off with the fact that people across the United States are taking action. And it's a relief to me to not have to sort of defend the very, very established unequivocal science that shows that humans are causing climate change, I think our conversation in the United States has really advanced. So that piece gave me courage. I would say the other thing that gave me courage is just seeing how much action is taking place. And, you know, we still have a lot more instances where we're planning adaptation than where we're doing adaptation. But you're starting to see that shift, I think you're seeing more and more instances around the country, where people are moving beyond just the planning stage and actually getting to the implementation stage. And eventually the evaluation stage. So learning from each other, and learning what works and what doesn't work, will allow that adaptation progress to keep moving forward. So hopefully, in NCAA six, we see even more of that. Oh,

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Doug Parsons 13:11

nice transition to my next question. So this is obviously a monumental amount of work for you. I'm sure you are wrapping things up. And so David Reed Miller, the previous director, moved to Maine to recover from NCAA for that, or that's what I've been told. And so what advice would you leave for the next director of the National Climate Assessment?

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Allison Crimmins 13:30

My advice would be to not just make NCAA six look like NCAA five, but bigger. You know, we get a lot of comments from many different fields to add new chapters to the next report. So I'm here at the American Geophysical Union Conference, I had a lovely conversation with educators who really want to see an education chapter in NCAA six, I also talked to people who want to see a chapter on soil or finance or international law, or water quality, you know, everyone has an idea for how to make the assessment bigger and bigger and bigger and more and more and more. I think for the NCAA six director, I would recommend not just making the report bigger, but really focusing on how to make this assessment, something that is useful to our audience. So let the user needs drive what's in the report. And that might mean not including topics that

were in NCAA, five or NCAA four, it might mean prioritizing things, particularly in areas like social science and in our response in our adaptation and mitigation chapters, the kinds of things that people really need right now to be making decisions.

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Doug Parsons 14:44

Yeah, I know this is a congressional process and you know, you just kind of start in the hole that you put all this effort and actually takes a bit of time but then you have this delay and people just they're constantly reassessing what their adaptation needs are and these things are coming up on a weekly and monthly basis. And so that makes it a little bit tricky. So what would you say for people that, okay, it has a long shelf life?

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Allison Crimmins 15:04

Yeah, I mean, this is the report of record through at least 2027. Possibly more, if it takes longer to develop NCAA six, I think where we have a gap in terms of adaptation is really tracking, not just the plans, but tracking our progress in terms of evaluation. And having a good understanding of how effective these different adaptation actions are in different situations in different communities. And when our authors come together to develop the assessment, they have to look at, you know, the entire body of information that's out there, whether it's peer reviewed journals, or indigenous knowledge, or grey literature, or, you know, other traditional information sources, and they use that to synthesize the information that's in our chapter. But if they can't find that information, it won't make its way into NCAA six. So between now and NCAA six, you know, I guess this is maybe a call for your listeners, which is to not just do the adaptation, action, and call it a day, but make sure that that gets documented on all its highs and all its lows, because that information is really critical for our authors to be able to include it in the next assessment. Great.

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Doug Parsons 16:20

Okay. So the final thing I want to talk about is, and you've mentioned it a bit is the marketing of this, now that you have it actually, the tufts thing happens. And I've I've said this on my podcast multiple times, is that a lot of times we do these reports and these white papers, and there's basically just throw away money to market it and promote it, and I use this example of Hollywood, they'll make \$100 million movie, but then they'll spend \$100 million to market it and get it out there with hopes that it'll do well. So give us some of those strategies that you're doing to get it out there. Because it's you don't want to just have done this all for naught, it needs to actually be shared out there. Yeah,

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Allison Crimmins 16:56

it's only going to be useful if people know about it and know how to use it. I think historically, we've struggled to do a great job of of communicating that. And, you know, you mentioned David Miller, I think he had a particularly tough time getting the communication out during during the previous administration. But we've always kind of struggled. And I think it takes so long to develop these reports, there's almost a little bit of fatigue, when we finally get it out the

door. And we have to remember that the publication of these assessments is not the last step. It's not the last entry on our in our Gantt chart or our timeline, you know, there's so much more beyond just the publication. And so we're thinking about ways to make sure we are reaching broader communities and helping them find the report and helping them navigate the information to find what it is they need. So we did some cool things to our website to help people find the information easier, you can kind of skim across our key messages if you're looking at sort of a high level, but then also drill down deeper into a chapter if you're interested in water, for instance, or ecosystems. And then if you really want the data behind the figures, or the papers that underlie the key messages, you can dig into our traceable accounts or our metadata. And that allows researchers to you know, who really want the in the weeds stuff. To find that information easily. We also put some effort into creating new pathways to find the assessment and interact with the information. So we had our first ever call for art, which was a really big success. We received 800 submissions of artwork from all around the country. And then 92 of those pieces of art have been included in the assessment in a beautiful gallery and in the chapter covers. And you know, that project was to reach out to a community who might never have picked up NCAA before. But also because art has this amazing power to help you understand and move you to action. I think art is a really powerful tool, sometimes more so than 2000 pages of words on a page. Yeah, the art has been a really great way to introduce the National Climate Assessment to new communities. Another thing that we developed our podcasts. So we did six podcast episodes where we interviewed authors from the assessment. And that was really great because it allowed us to kind of hear their perspectives about the findings, but also a little bit about their personal lives as well, whether it's their career journey, or how they've interacted with climate change in their own lives, or how it's affected their own families, which I think gives a little bit more of a personal feel to the assessment itself. And we also recorded the overview chapter as an audio book. So if you don't have time to sit down and read a chapter, but you know, you're doing the dishes or walking the dog. It's an opportunity to listen to the National Climate Assessment as well. Finally, we're doing some more at For it's to make the report accessible in terms of alternative text for our figures so that people using screen readers can access this report. And we're translating the entire assessment into Spanish for the first time ever, and those Spanish translations will be available, probably in the March or April timeframe, you know, 2024,

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Doug Parsons 20:19

Whenever someone's going to option, the audio book for a movie, we'll see. So, you know, it's coming back to me, I actually presented to the community engagement group from the program there. This was when Kathy Jacobs was the head of the National Climate Assessment process and what I was pitching, he really need to do different thing I had this slide where Kathy is being interviewed on The Daily Show, and things like that, and it's occurred is presented to your group A while back, but I think that would probably was NCAA three, it's been so long since I did that. Well, I'm excited to hear that you guys are doing a podcast. And so there's six episodes, they're all out at the same time. So people need to go find those. So there's a professional staff there, you are a director, and you're gonna go back to the EPA, but there's, there's a staff there with a global research program all the time, right? Yeah, we are

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Allison Crimmins 21:05

mostly staffed by what we call our national Coordination Office. And so those are contractors through ICF. Those are the folks who really carry a lot of the institutional knowledge, from



assessment to assessment. And the US Global Change Research Program does more than the National Climate Assessment. Although, you know, sometimes it's hard for me to remember that. But, but USGCRP really coordinates research across the federal government around the topic of global change. And we have had 13 federal agencies as members for decades, but just this year, we added two more agencies. So the Department of Homeland Security joined earlier this year. And just I think two weeks ago or so, the HUD joined USGCRP. And I think that's really indicative of the program, not just being the really foundational physical scientists, we are trying to include more agencies and more offices and more people who work on the ground with people being affected by climate change right now, who have to make these decisions based on climate science. And so some of the users of the assessment themselves are joining USGCRP. And really helping provide a deeper perspective of how our program could be more efficient. So yeah, our staff manages a series of working groups across the federal government. And we also have some programs to help Latin American and Caribbean islands develop their own assessments. So we've got some international aspects to our program as well.

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Doug Parsons 22:38

Here's some advice. Not that you necessarily want it, I think it's fantastic. You got a podcast, and I'd mentioned earlier, hopefully, that podcast is going to lead to things that you can't even predict it's going to have a long shelf life, people are going to find it organically. What I think you're missing out on though, is that you need to keep producing the podcasts like once a month. So if you have some staff there that this is a way to bridge between the assessments, and here is the NCAA podcast, you would have endless stories and imagine you doing a story six months from now from someone who's actually using NCAA five on the ground. So you guys I think are missing out if you don't continue a pocket because it's a pretty low maintenance in some ways. And it's low cost, the idea of keeping the assessment alive between assessments is, I think, really important. Yeah.

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Allison Crimmins 23:23

And that goes back to Kathy Jacobs, who you mentioned, who talks a lot about sustained assessment? I love that idea. And I, you know, I think, well, there is a big push when this first gets published and rolls out the door. But it is the assessment of record for at least the next four years. So there's a lot we can be doing. The podcast is a great idea. I would love to see videos, you know, short videos that provide overviews of the different chapters. And this is, you know, my personal sort of wish list, would it be cool to do a graphic novel version of NCAA, I'm not an artist, so I'm not sure I could ever do that myself. But I think there's a lot of ways that you can slice and dice this assessment because it's so big because it's this authoritative source of climate information. There's different ways that you could be pulling out stories or specific topics that are more relevant to smaller audiences. So some more bespoke, or more tailored to a given audience, whether that's podcasts or infographics or webinar series or videos or, you know, brochures, I don't know, I think there's a lot more that we could be doing over the next few years to help us reach more and more people with this information. Okay,

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Doug Parsons 24:39

I'm gonna push back a little on that I agree the videos would be great graphic novels would be great. But people are not going to do that. No. but people are not going to do that. The



complexity of a video is so much and so unless a funder comes along and just drops a lot of money. The podcast once you get a rhythm to it, and a pattern is much more easily produced and it's sustainable. And so what I did covered to this podcast is sustainability. And so that's my advice is that you need to think about next four years what's sustainable? And so I would push the podcast.

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Allison Crimmins 25:08

I like it. Well, I am a person who likes to listen to experts. So, expert podcaster, I'm happy to take your advice.

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Doug Parsons 25:17

Yeah, well get a go get the team there at ICF that they used to budget that and I can give them some some free advice if they need to have that staff meeting. So Allison, I'm gonna let you go. This is fantastic. I is honored to have the director of the National Climate Assessment is again, congratulations on it's a tremendous accomplishment. And I appreciate you coming on and sharing your story. Thank you so much. Hey, adapters. Joining me is Dr. Jesse Keenan Jesse is a Fabbro, Associate Professor of real estate and urban planning at Tulane School of Architecture. Jesse is a frequent guest on the podcast, and many listeners might not know also the executive producer. Hi, Jesse, welcome back to the podcast.

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Dr. Jesse Keenan 25:57

Oh, thank you so much for making time for me in this this topic topics. Actually. I'm pretty excited. I'm a little worn out in the preparation of it all. But I'm pumped to get into this because I think it's really valuable that we talked about what's going on in Washington and how that impacts all of us. Well,

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Doug Parsons 26:15

Jesse, your episodes are always popular, and the previous episodes where we looked at the adaptation action plans and you dug into those have been some of my most popular over the last few years. I'm sure this one's going to be popular. Okay, so let's start this off with the Fifth National Climate Assessment. What is it Jesse? Well,

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Dr. Jesse Keenan 26:32

the fifth National Climate Assessment, as with all national climate assessment is a congressionally mandated assessment of the scientific literature on what's happening with climate change, climate change, impacts mitigation, and most importantly, for us adaptation. And it is really hundreds of authors, technical contributors, review editors, support staff, graphic designers, reviewers, the National Academy of Sciences, reviews, it is a massive effort. And it's in many ways, it's like the IPCC, intergovernmental panel on climate change. But for the United States, it's a massive effort. And it's the definitive and authoritative source for all

things, climate change in this country. Today, we're going to look at the National Climate Assessment, we're going to go through all the chapters except for the regional chapters, but all the major chapters if you will, and we're gonna look at how adaptation plays out in all these chapters. And, of course, guess what, there is an adaptation chapter, and we're gonna look at that. And then we've got a special guest coming on, who's the author of the adaptation chapter to go even deeper on this. So today, it's looking at the National Climate Assessment and trying to see where adaptation appears through all of these sectors and through all of the science and social science. So I'm super excited. So adapters,

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Doug Parsons 27:53

let's buckle up, we're going to dig into the guts of this assessment. Now we're going to start off with water.

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Dr. Jesse Keenan 27:58

Water is so interesting to me because right, it's still, we need it for to sustain ourselves in life and infrastructure. I mean, it's such a critical component of it. And I think one things I learned about reading this chapter is that yes, things are changing, the water cycle is fundamentally changing. But there's a huge natural variability anyway, right? You know, with or without climate change, there is massive amounts of natural variability in the water cycles, and associated phenomenon driving that. So when we add climate to it, it becomes really complicated. And I think the challenge for adaptation has always been, at least in the academic debates is are we adapting to climate change? Or are we adapting to natural variability? So I think it's a really interesting thing, key message three sites that water managers are adapting, and they've adapted with better data advances in decision making and cooperation. Their key message is like, hey, it's happening. But water allocation and standards and the institutions that are supporting that are slow to adapt. And by the way, frontline communities really lack a lot of resources. So the big picture here is several things. One, rates of precipitation change are outpacing regulatory changes, right? The climates moving faster than these allocation standards and institutions can keep up. And just even the process of updating metrics and codes is a slow process anyway, but it simply can't keep up with the rate of change. Another big picture takeaway from this is that the water supply and the constraints around scarcity of water are driving a lot of litigation. And that doesn't necessarily support cooperative adaptation right at the moment when we need to think about cooperative adaptation, often on a regional scale. We're sort of bogged down in these arcane I mean, particularly out west water rights and allocations great story, by the way, in the New York Times on this paper trail of water rights and allocation permits in the light in California, but just when we need everybody work together, we can't because we bogged down by this legal system. Another big picture takeaway is that for looking water modeling, which is necessary support adaptation is very specialized, and therefore very expensive. And it's not particularly well standardized. So we need more data. And we need more direct observational data. And we've seen this emerging and ag and other sectors where there's more and more observational data and sort of horizontally distributed decentralized networks of data collection, even coming from citizen science, but we need to think about and what they're calling for is more measurement science to support our understanding of the flow of water through the water cycle, and how we can better manage that this is a theme we'll see over and over, which is throughout the National Climate Assessment, or it was called NCAA five, which is that we need more information, right. And we

didn't fully acknowledge that, you know, you're not always gonna have perfect information. But we need to, I think, invest in systems and networks and in the hardware to help us make better informed decisions. And by the way, talking about that New York Times article in California, and how just this paper trail going back over hundreds of several 100 years, really about the allocation of water, water resources, they're getting better and better at holding these farmers and these ranchers to the estimates, because the way it works water allocation is you have to use use it or lose it, basically. And so they tend to overstate how much water they're using. And now California is actually using satellite data to basically keep these folks honest, because sometimes you're either over or under estimating true water demand. So the bottom line is, we got to track water so that we can better manage it as an adaptation functions. Yes, I've

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Doug Parsons 32:03

always followed water issues, but I lived in the east for the longest time. And since I moved out to Arizona, it's a radically different conversation. It's very interesting. Obviously, the assessments relevant to that. Okay, that we're moving on Jesse, let's move over to energy.

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Dr. Jesse Keenan 32:14

Energy demand is changing, particularly as we electrify our economy, right. The electrification of our economy is critically important for decarbonisation. But that has a lot of implications for adaptation, we got to think about better grid design and hardening that grid. And sometimes that just means moving equipment. But at the end of the day, we need better codes, particularly for engineering resilience in grid design, we have to think about vegetation management to reduce wildfire risks. We know that wildfires are ignition sources, rather, are coming at the interface of vegetation and transmission, for instance, as we saw with in California in Northern California, so managing that vegetation is key. There's a fair amount of talk in there in the energy chapter about micro grids, battery storage, solar PV, and the connection that all has to continuity, right, either community resilience or engineering resilience. So that we've got essentially backup power and storing. They also get into stress testing pipelines. And that reduces risk, for instance, from things like subsidence. And you may remember a couple of years ago, we had that hard freeze in Texas and a lot of pipelines were frozen over because they were above ground, they weren't benefited from the installation of being below ground. So that's a simple adaptation to extreme weather events. At the end of the day, like all sectors, it's about vulnerability assessment. And sometimes that means having that vulnerability assessment in real time, particularly as utilized by utilities who can manage the grid manage the power in ways that are directly in response to chronic shocks and stresses to the system. And part of that is a better incorporation of physical modeling and data again, a theme we see throughout and say five, that has implications for heat on transmission lines, stream temperatures, for thermal electric plans for the water availability for hydro when they get into really cool adaptations, like recycling of cooling water for hydro electric power, thermoelectric power. So there's a lot of interesting things in there in the energy chapter. A lot of it really has to do with engineering, resilience, protecting these assets, if you will, but also thinking about how we can you know, recycle water, use better data and manage energy in a way that has a lot of CO benefits between mitigation and adaptations.

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Doug Parsons 34:35

Alright, adapters, I actually talked about energy on this podcast. So there you go. Okay, Jesse. Next step, we're talking about land cover and land use. Yeah,

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Dr. Jesse Keenan 34:43

I always think that it's so interesting because simply from my own work, the IPCC and others, just over the years, I've really come to appreciate how little of the surface of this planet isn't managed or touched by human beings. They start off this chapter with his amazing citation that on average between 1985 and 2016, something like 1600 square miles a year are developed in this country and just they really makes you think like, wow, our footprint here is just enormous. They orient in the context of adaptation, they orient a lot of their work to ecosystem resilience. And they define that quote, defined here as the capacity of a land system to respond to disturbance by resisting damage and or recovering quickly maintaining an essential structure and function and quote, and I want to say that's really important, because, by the way, conflict of interest here, I was an author, and then that in the National Climate Assessment also worked on the glossary. And one of the things that I think we're able to really accomplish through consensus and the process of these NCA five was acknowledge that there's different types of resilience. Resilience is not one thing. There's ecological resilience or ecosystem resilience, there's engineering, resilience, there's community resilience, they all mean slightly different things are sometimes really big, a different really important ways. But they have their own conceptual and empirical knowledge and practice. And it's time to kind of move away from resilience. So resilience that get into the specifics. And this chapter is jumping right in saying, Hey, this is what ecosystem resilience is. And it's about maintaining those essential structures and functions that can change shape and form. But it's about the essence of that system. And that's what we've seen in the development of ecological ecosystem resilience now for for many decades. So that's important definitions fundamentally matter. We've been talking about this for years. Let's get into it. So management of land determines the persistence of services or ecosystem services. And if we get it right, you know, that's a great thing. But it can, more or less increased or decreased resilience performance. So they talked about thinning of some Western forests that are experiencing droughts, and the extent to which that may actually help the forests in the long term in terms of warming and drying. By the way, for those of you who study resilience, and can harken back to hauling, and Hollings early work on resilience and environmental management, you know, that he was citing in there, this idea of forest fires and resilience and high degrees of rates of change associated with forests that are regularly burning, also have high degrees of resilience. This we now know and empirical terms and forestry science in the light in ecology more precisely as cited here is a really important thing. So also land based carbon storage drives a forestation conservation, crop management, and that's going to increase the resilience of these underlying ecosystems and their performance. There is, again, these co benefits that arise between mitigation and adaptation. Of course, they site green space and the urban heat island, and we're going to see that come up over and over as urban, really just extreme heat comes into play throughout the NCA five, it also opens. And I think this is super interesting, opens the door to climate change, climate, change driven crop migration. And I think that's really fascinating because it's about species selection, thinking that species are on the move, that the ranges are shifting, flora and fauna, the range of shifting and so we have to think in terms of land and ultimately agriculture in a way and we'll talk about this in the ACT chapter that these species are migrating to. And it also brings up this sort of perennial challenge of like, what is species migration versus an invasive species? Like, where do you draw that one, particularly in terms of conservation, biology, and restoration ecology, and at the end of the day, they bring up one of my favorite topics, which is land use man

relocation, or managed retreat, as we'll see, as referenced in elsewhere in the ministry locations, man, this brought up elsewhere in NCAA five, but also, by the way, in the glossary, it brings that into play as like this huge challenge. And I always bring this up that we can talk about codes and building an infrastructure, and the kind of material things that at the end of the day land use is a really fundamentally important part of adaptation. And they opened that door here, and I was glad to see it. This

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Doug Parsons 39:14

next section I'm really interested in, we're gonna be talking about forest and obviously, there's so much forest in private hands. And I'm curious, do you have a sense that these private landowners are actually looking at the National Climate Assessment when it comes to management? And when I dealt with forest when I was doing conservation work, the idea of carbon sequestration was sort of a joke, because there was such a turnover in forestry practices and such and I know I'm gonna go in the weeds, but I have a strong opinion about that. So let's just jump into forest.

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Dr. Jesse Keenan 39:40

Well, I just want to answer that question, which is, you know, I don't know to the extent to which these private landowners or even trusts or a variety of different stakeholders who are involved in forestry. What I do know though, is that USDA has a very active adaptation units they've been able to through a couple of different regions All initiatives have a lot of well grounded and participated in stakeholder, multi stakeholder led initiatives and adaptation they have for many years now. And when I was looking through the citations in this chapter, I saw some of that coming to the forefront. I do think that there's a lot of incentives actually for cooperative behavior, and forestry, forestry management and silviculture. So I feel like, I don't really know the answer to that question. But I feel those practices are sort of finding their way. And let's talk about maybe what those are. So they do list a lot of assessments, frameworks and tools for proactive adaptation. But one of the things that they cite from the gecko is kind of favoring or selecting rather, genotypes and species that are considered to be more tolerant. This is a huge issue, not necessarily in forestry, but in landscape architecture, for instance. And they highlight all of these silvicultural techniques, having age diversity, within planting species diversity, things that are coming from sustainable for instance, urban forestry, like using local dirt, not bringing outside dirt, which can bring in pathogens, really interesting adaptation reference to managing vegetative debris after a storm that has the CO benefits of sequestering carbon, but also helping an ecosystem adapt. I thought that was really super fascinating. So I'd say big picture from this, you know, the, quote, the general principles for adaptation, hold across geographies, and ownerships and are consistent with the principles of sustainable forest management and quote, so a lot of what we see an adaptation is being drawn from years now, decade's worth of sustainable forestry management practice where ecological resilience and adaptive management are actually long part of the Sustainable forestry culture and practices in again, I can't stress this enough about the idea of promoting biological diversity. And let me read a passage from this chapter, quote, increasing the diversity of functional traits such as shade tolerance, seed size, specific leaf areas, ability to re sprout and bark thickness may give force a better chance to adapt to climate related disturbances. And I think that's super interesting. I mean, just seed size and like the flows of water and floods. I mean, there's so much there that I think is really interesting. And the

processes from which these different considerations of biological diversity play out in the management of force, I'd say I learned a lot going through this, also thinking about assisted migration, as they call it and reforest stations when reforestation efforts and the extent to which good things happening there, but they're constrained by, let's say, for instance, the availability of a climate adaptive seedling stop, right? So they want to promote all this diversity in biological diversity, but their ceiling stock is limited in many ways. They also get into the adaptation economics of forestry. And they acknowledge that, you know, there are opportunities here at the, let's say, in a regulatory economic cost, we need regulations to require adaptation. They argue, I mean, listen, you can't be policy prescriptive. And you can't basically say that we have to have this policy or that but if you read through the lines are basically saying we need to require regulatory action for adaptation, we should be subsidizing to reduce costs where there are public benefits, right. So if there are public benefits, benefits and forestry management that we know we're going to help people, then we should subsidize that. And conversely, and this is really important, they cite literature on the idea of taxing for inaction that reduces resilience. And I think that's a really important thing. They also cite the value of market based incentives. And this isn't, this is an example that's not in the National Climate Assessment. But it's a very apt one, which is Blue Force conservation. I think we've talked about them probably on this podcast before, but they're the ones that created the force resilience bonds were essentially an outside investors invest in managing a forest through sustainable means developing some ecological resilience, functionality. And then basically, literally downstream beneficiaries of that pay a return on that investment. It's a market based incentive structure. And they just closed just during COP it was announced that they closed one of their first funds on this, and it has been deemed quite successful. And there was a return that was paid back to the investors. So market based incentives for adaptation are part of that matrix. And I think that matrix of adaptation options, and I think that's really pretty darn exciting. Okay,

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Doug Parsons 44:29

so let's pivot to the broader areas of ecosystems. And I'm looking forward to this because you're gonna talk about some nature based solutions to right. Yeah,

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Dr. Jesse Keenan 44:36

I mean, so one of their key messages that climate change is driving ecosystem transformation, which in this context of, you know, complex adaptive systems, then we can, I think we're gonna come back to this idea of transformation later on, but the big picture is this, you know, building preserving and restoring ecosystems is challenging, right. And particularly in the car context of restoration ecology where there are thresholds or tipping points, things are in motion range shifting is happening. So this idea of building preserving and restoring ecosystems is really in flux. And one of the frameworks that they apply here in the context of adaptive management, it's something that I had never read this before. But to me, it made all the sense in the world, because I've seen it represented other sort of frameworks and applications and practices elsewhere in the world. And they call this framework resist except direct wrath. And I guess this is widely applied in ecosystems. And it's this idea that you try to resist some measure of change, but at some point in time, you're going to cross a threshold, and you just have to accept it. And then you can try to just do your best to direct it right. And it's a full acknowledgement that adaptation, I this is my interpretation, but it's a full acknowledgement

that adaptation is a process, not an outcome, and that there are limitations, thresholds and frontiers from which adaptation is going to work in both incremental systemic and in transformative terms. And that at some point in time, you're going to have to accept things beyond from which resistance can operate in your favorite right. And this is kind of the distinction in many ways between resilience and adaptation, like resilience for the most part, and their multi equilibrium ideas of resilience. But most of the time, we're talking about this fairly single equilibrium conservation principles of resilience. At some point in time, you know, resilience is about resisting, and then there's a threshold, there's a limit to that, we have to accept the fundamental notions of change whether we can control it or not. And then we try to do our best to direct that in what we think is a beneficial way. So beneficial ways. Let's talk about this. So they get into ecosystem based adaptation and nature based solutions. They talk about what you think that they would talk about, which is wetland restoration, oyster restoration, cover crops, stormwater management practices, urban agriculture, and they really do their best to draw the linkage here between mitigation and adaptation co benefits, I found it to be really particularly interesting. And it sets again, we're going to come back to this notion of transformation as a component of adaptation. But it sets this language in this desire to hone in on the tension of this resist except direct framework that they put forward, which I think is really quite apt, both within ecosystems, but outside of ecosystems to,

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Doug Parsons 47:27

for transitioning here to my personal favorite is as a former Florida person, we're gonna talk about coastlines. And you did mention a little bit earlier about managed retreat. And I'm just curious, because it can be a controversial subject, how the NCAA approach that and I think you'll get into that.

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Dr. Jesse Keenan 47:42

Yeah, I mean, manage retreat, manage relocation, you know, it does come up a good bit, I think, to the credit of the coast chapter team, they're really the first to be explicit about the tension between growth and adaptation. And more formally, the adaptation growth paradox, because what we see in observe, for instance, in cities and communities that are along the coasts, is that they need growth, for all the other things that you think we need growth for housing affordability, and the societal goals, right? And more formally, they need that growth to be able to maintain or grow a tax base in order to pay for the adaptation. Right? And it's a paradox because here you are trying to grow in the face of huge impacts and burdens and costs, but you're doing so as a means to tax that growth, to be able to pay for adaptations elsewhere. I don't think it necessarily forecloses the idea of sustainable growth, or sustainable urban development or anything like that. But it is a paradoxical challenge in many ways, and they're the first to bring this up. And I think, to their credit, that's what we're gonna talk about this over and over again, it's all about trade offs, everything about nothing. No adaptation or resilience intervention is ever, you know, advanced is a pure good or a pure distributional good it there's always going to be winners and losers and things that you gain lose along the way. So I think I really appreciate them just, hey, here's the tension, growth and adaptation. So they get into all kinds of different adaptations, including updating land use planning, thank you very much. It's one of my favorite topics. They get into community infrastructure and nature based solutions. They highlight the Ohio Creek watershed project, which actually originated from the national disaster resilience competition, which was a bunch of money that came actually after



Hurricane Sandy in the years thereafter to spend money on Resilience Project federal money on resilience projects all around the country is kind of demonstration projects. And this was one of the kind of early room for the river type ideas where you make room becomes a part important project that they cite. What's interesting to see that after all these years, the national disaster resilience competition is yielding and giving us more things to learn from and about, like you also gets into wetlands on In oyster restoration, and the idea of living shorelines, they talk about planned relocation, one of the things components of that is like, okay, they're sending zones and receiving zones. But it's not just so easy to just move people from A to B, like, one of the things they talk about is like recreating these loss relationships of the coasts and cultural dimensions. And my own research with others in the past on this is that that's really, really important to the effectiveness of what you leave behind and how you manage what you leave behind. So they get into the kind of good, bad and ugly of the due process, and procedural justice aspects of planned relocation like, you know, benefiting property owners, to the detriment of renters and the institutional mechanisms that challenge the distribution of resources and inequitable terms as they define it. So that's important, we need to know the extent to which plan relocation has institutional barriers and inequities and inequalities in those outcomes, because we don't want to leave anybody behind. Right, that should be a societal and policy goal. They also note and highlight the interaction of various adaptations. And one of the things they talk about is that, again, we're seeing this language of transformational adaptation and the idea that we can direct that change through systems values, and processes. And I think that's a really interesting framing, because some people would argue that transformation is not something that we can really manifestly control. It's not a deterministic phenomenon, right? That the world is to exogenous ly complex. It's, in fact, not chaotic is fairly random bliss as a function of social behavior, or social environmental interactions. And therefore, transformation, which is really about breaking things and rebuilding something from that carnage, if anything at all, but a tirely new identity to a system and associated processes, is something that we can control. Maybe it goes back to that idea of resist and accept and direct, you know, like, we just follow it right? It's very hard for us to control it, we just follow it. And so I think there's this very interesting tension that keeps coming up in these chapters about like, we want this radical change in a way. And transformation, by the way, is a fairly radical change, because it's a radical departure from the status quo. But there's some debates, I think, and to what extent we can have agency over that. And I think that's a really important intellectual debate. But it's also a very important one, because in many ways, even though the National Climate Assessment, it's not supposed to be a political exercise, it is a call for action to say that we can have agency over transformation. And I think that's a political rhetoric, you can read through the lines that may or may not be consistent with the scientific literature. And that's what I'd love for people to give us some feedback on that and tell us what they think about that. But it's it's not an academic exercise. It's a truly important one. Because in saying that incremental adaptation is failing us in a way, in in some cases, that is, in some cases, not, but that we must drive transformation. I'm not sure we should be so eager to break the system. Because there are huge consequences to that. And I think, if our goal is to think about social justice and equity trade offs, and like we should be move with all regard for the full distributional implications, and procedural implications associated with what it means to break something and put it back together. So I'll leave it at that. I know, it sounds kind of academic, but I think it's a really important thing that we need to debate. And maybe we can come back to that in more concrete terms.

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Doug Parsons 53:43

We haven't really talked about things that are too alarming right now. But let's talk about

ocean ecosystems and marine sources. What what's going on there? That's alarming.

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Dr. Jesse Keenan 53:51

I mean, I feel like I've been teaching climate change for a long time or what feels like a long time. I feel like I'm in the know, I knew I would go into this and learn tons of new things, which I totally did. But the extent to which I read the ocean ecosystems and marine resources chapter, the extent to which I came away, just like, totally alarm and like, can't believe I didn't fully appreciate the range of how precarious things really are. But they set up this story and has that story. They set up the science about that, you know, marine ecosystems and ocean ecosystems are on the brink of system collapse. And it's just phenomenal, read really good, where all these chapters are phenomenal work. I mean, there's really good work and all these things. But for me, I learned a ton about this. So in key message to quote, a range of approaches can facilitate adaptation. And by the way, when I say key messages, like one of the nice things about the client National Climate Assessment is that the head of every chapter, the start of every chapter, there's a bunch of key messages, usually three to five, sometimes six key messages, and they basically are the outline of what's in the chapter. So if there's something you're interested in, just read See The key message. And then you can jump pretty quickly into navigating what you want to read. So it saves everybody a lot of time. So when I say key message to that's, that's what I'm talking about. So going back to this, quote, a range of approaches can facilitate our rotation to some degree of climate change. But higher levels of climate change will limit the success of adaptation measures and markedly increased the climate risk to marine related economic activities. Like there's only so much we can do, right, and we can adapt. But really, there's these higher order pressures that really limit us. So big picture, I think it's worth recognizing, we've known this for a long time, this is well represented several national climate assessments now, as that fisheries are moving, at least in our context, in our northern hemisphere, they're moving north, the fisheries, many species are swimming deeper. And that means we need different fleets, we need different nets, equipment, we need to fish in different locations, we need to manage Matt, and we need a governance of the species and fisheries management, that is basically keeping up with the rate and degree of adaptation that's happening, essentially phenotype ik adaptation, and maybe even genotype we'll see, I'm sure that exists somewhere in literature, of what these species are doing to stay alive and to not roast to death in the warming oceans. And so one of the things they highlight are all the barriers, adaptation, I mean, think about it, your family owned business, and you have a boat, and you have a certain amount of nets that you use. And those nets are governed by what, when and where to manage overfishing, stuff like that. And as the fish adapt, and you're trying to adapt to that, like, it's expensive, you know, you maybe have to go further out and you're using more gas money to get further out, or whatever it is, these are real costs. So one things they highlight that I think is kind of unique is the barriers to adaptation, right? Access to find the cost of the equipment in the infrastructure, the access to fishing permits, again permits in the government system, we're trying to keep up in many ways. And in many cases, the fish are just moving from one governance body to another. And it's hard for these units to keep up. But they also highlight some adaptations in response, the idea that you can have permit banks, where people can collect these different permits and essentially trade them seafood cooperatives and expanding into aquaculture as a means of diversity. And by the way, to the credit of the ocean ecosystems and marine resources chapter in their authors. They have one of the best graphics on adaptation is titled ocean related climate adaptation strategies. And they break it down at several scales, individuals, communities, sectors and cross sector governance. And they highlight incremental adaptation and systemic adaptation and truly transformative adaptation in this graphic is really well organized, super accessible. I'll give you

an example. So individuals, they talk about diversifying livelihoods maybe moving into aquaculture, for instance, at a community scale, they talk about climate resilient shoreline or shoreside infrastructure and supply chains. They talk about a sector scale moving into tourism opportunities, for instance. So it's well done. There's a lot of adaptations are happening. The question is, who pays for it? How fast is it moving? And then we'll talk about the the economic chapter. And that sort of comes up in this chapter is like, it's all about the speed of adaptation. So if the industry and the economic sectors behind fisheries, for instance, among other things are, can they keep up with the rate of change? Because the faster the rate of change, the more expensive it really is? And I think that's the theme we'll come back to in the economics chapter. That is

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Doug Parsons 58:40

pretty disturbing. But we're gonna make another transition here. And we're gonna talk about agriculture, which I don't actually talk much on the podcast about, I'm not quite sure why. But what's the NCAA five say about this?

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Dr. Jesse Keenan 58:50

Well, actually, you know that we have this resilience conversation with Monsanto, if I remember what it wasn't. Yeah, it has been wild. But if you go back and you study adaptation, in adaptation, science and the kind of interdisciplinary context, a lot of it comes back to agriculture and tourism, oddly enough, but really agriculture is it was at the forefront. So because you could quickly turn over a crop, you could figure out one, you had to do it to feed people right out of necessity. But two, you can do things that were short term adaptations, and you could figure out what whether they were working or not, I mean, it's not like the long run capital allocation is associated with massive infrastructure. And you don't really know if it's going to work for 20 years or something like you could you could go from growing season to growing season, knowing whether your adaptations are working. Of course, you didn't know if you were adapting to natural variability or to climate change. But anyway, there's a long history of adaptation here. So most chapters and National Climate Assessment there the key messages usually start in order from the climate connection like this is how climate shaping things. Then they talk about vulnerability and then then you get to add up to Acia here key message one is about adaptation. So right off the bat agriculture chapter, let's give them an applause. They jump right into adaptation. So a couple things come up. One is that there's conservation management, agro ecological practices, like diversifying crops and landscapes that are improving what they call agricultural resilience. But that's really a composite of engineering resilience and ecological resilience. They get into things like organic matter, nutrient cycling, natural pest controls, to remember the pest, their ranges are changing, too, right, we've got pests moving into areas they couldn't previously live in. For instance, because it's warming, it talks about reducing reliance on petrochemicals, which, by the way, is a clear co benefit between both adaptation and mitigation. Because of the carbon intensive nature and fossil fuel components of these petrochemical, they also get into this idea of big picture terms of matching species to the environment. They talk about, much as they did in forestry chapter they talk about plant hardiness zones have shifted and will continue to shift and crops are basically going to have to follow along. And here's a good quote, quote, matching unique regional combinations of plant and animal genetics, with regionally relevant management practices can optimize soil carbon sequestration, reduced G emissions and enhance

adaptability to a changing climate. So they're thinking about this, that the interaction of plants and animals, right, and so that's, I think, a quite sophisticated way to look at it. Of course, they're asking for better instrumentation and technology. And in fact, we know that that instrumentation technology has helped in terms of adaptive management, climate Corps, I mean, there's a lot of things that have been happening in the private sector, whether it's insurance, or just the technology side of this, from which AG has benefited tremendously from better measurement science. And in many ways, I think it's a benchmark for other sectors, they also have this really, by the way, this has kind of like nothing to do with adaptations. But they have this unbelievable tax on terrestrial and aquaculture and food production. And the idea of high feed conversion efficiency, which is more or less a unit of protein produced per unit of feed, they also get into like the netting out the energy side of infrastructure for protein production as well. It's just super duper interesting, I learned a whole bunch about feed to conversion efficiency. And I think at the end of the day, that has everything to do with, obviously, energy and the mitigation side. And I'm sure somewhere along the way, that's going to have a lot to do with adaptation, because essentially, we are seeing more aquaculture as a form of adaptation. And so these feed conversion efficiency rates and how we just frame that, in general are critically important for feeding the world and doing so in a resource efficient way and effectively managing ecosystems, they also take on rural communities, right. And there's always so much talk about cities and urbanism and infrastructure and things like that, but real careers, I think often get left aside, and they spend a lot of time talking about vulnerabilities, they do have a frame for community resilience. And they talk about the values and principles behind me resilience in terms of sense of community self reliance, a tacit knowledge of the natural environment. And then they get into the community resilience index, and basically, you know, high measures in the environmental category and low measures in the institutional category. They talk about economic diversification is key for community resilience. And then, of course, they talk about renewable energy and rural America and the extent to which there's a lot of benefits there for engineering, resilience, community resilience, and ultimately mitigation. So I mean, that's kind of par for the course, right, in terms of fully acknowledging that, particularly when it comes to adaptation, there's the haves and have nots. And a lot of rural communities don't have the institutional capacity. And there's with a wave of renewable energy development in this country, there's many rural communities that are going to have that as an opportunity to advance community resilience and economic diversification. And those are good things. And those are things that we should really take to heart. But currently, that lack of institutional capacity is a real constraint on advancing community resilience and adaptation.

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Doug Parsons 1:04:14

Let's move on to the built environment. A lot of my listeners are in that space. Yeah.

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Dr. Jesse Keenan 1:04:20

So this is the built environment, urban systems and cities chapter and full conflict of interest as an author on this chapter. And just all these chapters are really fantastic people who are super dedicated to this, they spent years working on this, there's many drafts and lots of feedback and commentary. And there's a lot out there and a lot has changed from NC 40 and se five and essentially, that's what we were challenged to take on all chapters are challenged to take on it's an assessment at the end of the day, and I think it's really important just to kind of double

down on this. This is not the opinions of the authors. This is not the editorial prerogative of the authors to drive independent research. This is truly an assessment of others have said and done, and really citing only the best and most qualifiable peer reviewed literature, but big picture cities and jurisdictions are adapting, including, you know, incorporation into codes, standards, policies, plans, like I just said, tend to be concentrated in wealthier, more populous jurisdictions. As we've seen, in other chapters, there's an argument to be made that the pace is not sufficient to keep up with the growing vulnerability and risk. We cite in here. 25,000 local governments and 246 tribal governments have a hazard mitigation resilience plans, think about 34 states have a combined state hazard mitigation and climate adaptation plan. This is my own commentary. This wasn't in the report. But just to give you some more color on this, but there's several 100 climate action plans in the United States, and only a few dozen of these have what I would consider to be good and sort of comprehensive adaptation plan. And maybe a dozen are actively investing. That is they're moving into that implementation stage. So there's a huge gap between you know, 10s, of 1000s, of jurisdictions just starting to get into this. And at the end of the day, there may be a dozen basically cities with a lot of high institutional incapacity to plan and implement these particular adaptations and mitigation investment. So there's a big gap. So we're doing things but we're not doing it fast enough. In this chapter, we take on a bunch of different adaptations, integrating climate, with disasters, housing, public health, environmental quality into conventional planning. And that's, you know, that mainstreaming effort is active. But we talked about the funding side of this and the extent to which adaptation of markets is shaping municipal bonds, credit rating agencies, and it even impacts the social safety net on loans, grants in a post disaster context. All of these things are shaped in our shaping various adaptations. We talked about decision support, and the need for better analytics and intelligence. And that's a conversation that seems to come up in every chapter. But we talked about networks that support community resilience. We talked about energy performance, increases community resilience, having redundancy of backup power, and things like that, again, that's come up in other chapters, we take on codes and standards, things like that is codes and standards and buildings and infrastructure versus building ventilation, cooling, evaporative roofs, vegetated roofs, high albedo surfaces, reflecting that energy back into the space, resilient construction materials. And in many ways, the challenge, and we're not moving nearly as fast as we should, is that for looking designs, right? It's designed not for today's climate friendly weather, but tomorrow. And we also provide moving outside of codes and standards. We also talked about gray infrastructure and floodwalls and things like that. But we also talked about green and blue infrastructure. We talked about the value of urban forestry to reduce reduce heat, distributive stormwater management systems. And of course, you know, last but not least, we do take on mandatory location and what that means for the housing market for public finance and for a variety of other implications. And at the end of the day, I think I would, well, I hope we did a good job talking about trade offs, right? Because there's always going to be trade offs. And we even cite in the literature, amenities like risk reduction. So when you reduce risks around environmental exposure, or environmental risks, that becomes an amenity. And that can drive up property values. And that can lead to rent seeking and displacement. So here you are trying to reduce risk in an area through a seawall or flood wall or some kind of intervention. And it has this kind of distributional effect of rent seeking and displacement. So we always have to ask ourselves, and I think we raise this in the court chapter because it's a reflection of the questions that are asked in practice and in the scholarship of who bears the costs and the benefits of adaptations in mitigation investments. Right. And that's a really fundamental question. At the end of the day,

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Doug Parsons 1:08:57

we're gonna talk about transportation. I also maybe you could touch upon that, you know, we had the big infrastructure bill that came out, is it already too late for people out there that are applying for grants to take advantage of what is in the assessment? Because hopefully, it's going to inform because there's billions of dollars there, and it's gonna take years for them to spend it? Yeah,

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Dr. Jesse Keenan 1:09:14

it's not too late. And in fact, I think what you will see is in variety of government, the federal government policies, but also incidentally, state and local, you know, the NCAA becomes an authoritative source. So when they take action, sometimes they simply reference and see in terms of legislative intent, or policy intent behind why we're going to invest in resilience or adaptation, adaptive capacity and the design of something but in other ways, it becomes a real a true motivation, right? Because not only is it something we simply just reference it actually opens doors to new ways of doing things and thinking about things and this is the catalytic component of IRA and big ol inflation Reduction Act, and the bipartisan infrastructure law is that there are a bunch of new programs out there. Some of these are many of these things are kind of one off thing. But they truly have the opportunity to be catalytic. So transportation is a good example, because transportation has a bunch of different programs, if you will. So big picture in the transportation chapter is that they're the first to take on lifecycle assessment, right, thinking about the planning and management, design, construction operations means all the way from cradle to grave. And that you have to think about the costs of the impacts. And of course, the lifecycle implications with emissions and all that. But thinking about the total costs of adaptation and resilience investments, and what happens when you don't make those investments, and the impact that has on CapEx and OpEx. That's capital expenses, operating expenses over time. So this is really important, right? Now we're beginning to price things. And that kind of gets to your question, which is like, we've got a bunch of money to spend. But now, it's not so easy. There may be a price tag today. But we also have to look at that price tag tomorrow. And this chapter does a really good job of saying, hey, it's actually a lifecycle analysis that we need to undertake here. Big picture. They're also the first to take on the labor challenges as part of adaptation. I mean, again, we think about cases like we're going to spend money on assets, and we're going to spend money on stuff, or programs Navy, but we're spending it on everything, but maybe the people that have to do the work, right. So they bring up quote, here's a quote from the chapter, aging, high retirement rates, retention issues in industry, right shortages of special or specific, rather essential jobs, so that what they're really talking about here is like, hey, we can design engineering resilience. But we also have to think about people who are in the workforce. And as people age out, they're taking their knowledge with them. And we really need to think about this, the labor component of this. They also provide a lot of really interesting frameworks for assessing risk. There's the Federal Highway Administration's vulnerability assessment adaptation framework. I just want to give the Federal Highway Administration some credit here, if all my work in yours on adaptation in the federal government, they're always at the table, they always send somebody, they're always working on this. You can't go to an adaptation meeting somewhere along the way. Federal Highway Administration is their long, committed group of folks, but they have their own vulnerability assessment and adaptation framework. There's also the US Department transportations vulnerability assessment scoring tool, and TRB, which is the Transportation Research Board, which is like all things transportation, it's a unit of the National Academy of Sciences, Engineering, Medicine, they have a quantitative tool for measuring resilience benefits. And again, that goes back to that question talking about, you know, we're spending money, how should we spend the money, there are ways to calculate these benefits within by the way,



lifecycle analysis, right. So they cite some really alarming things in here along the way as they cite these various scoring assessments and things like that. Houston went through this exercise, for instance, found out that 13% of its highways and 12% of its major roads were highly vulnerable to flooding, surge and sea level rise, California found that 20% of its bridges were at very high risk. So we're beginning to triage understand and prioritize the allocation of resources in line with where some of these physical vulnerabilities and exposure elements really are. Again, they're calling for in the chapter computer processing sensor cyber technology. And they talk about the extent to which sensors can help guide people and they can have even real time events can help guide mobility. And they talk about you know, evacuating people and sending people in the right you know, show drivers in real time where hazards are, for instance, that's really important. That's important from fuel economy point of view, but also getting people out of harm's way. So there's been a lot of work in that. And of course, they also acknowledged there's benefits and disadvantages, because as you become more connected and cyber technology terms or network terms, you open up to a new set of vulnerabilities. But whether that's cyber warfare or just errors in the system, they also talk about electric vehicles. And of course, they acknowledge that there's challenges with evacuating people but there's also opportunities for backup power. We've even talked about that on this podcast, the extent to which and by the way, I've seen it in the car advertising that you know, you plug the f150 in, lights up the house or whatever. I don't know the science and engineering about how enduring that really is. But I do know that car companies having talked to some of them in the past year to really do our thinking about that the interface between the House and the electric vehicles is working in dual direction. At the end of the day, they also take on these trade offs, right, and they talk about like simply moving a road out of sea level rise zones is has all kinds of collateral impacts on people who can't necessarily shift their modes or their trips so easily. So you know, whenever we move on a road or highway out of a sea level rise zone, it's going to have impacts on people I could think about those. In fact, they also brought up this really interesting example, I'd never thought of all this stuff in there thought about four. But this one in particular is like, as we begin to move more ports inland, and the intermodal components of those ports inland, we're going to bring our pollution and our traffic with us as well. Right. So where there's an adaptation, there's going to be some maladaptive implications for people along the way. And, and the port's sea level rise analysis and work that's been going on in this country is well documented, I did a book a couple of years ago, where we have a chapter in there about this. I mean, people are really thinking about this. And as we think about long term investments in these capital infrastructure, forests are on the front line. And if we start moving more of these port facilities inland, there are collateral impacts. So again, it's all about trade offs. And those trade offs are critically important.

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Doug Parsons 1:15:48

A lot of people are going to be interested in this. And we're talking about air quality and human health and my sense, over the years to natural resources have been given such a focus on the assessment, but human health just keeps coming up in the adaptation space. Yeah,

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Dr. Jesse Keenan 1:16:02

it's interesting. I mean, if you go back and you look at sustainability, and the extent to which economic or behavioral motivations behind sustainability have become more enduring over time, it actually has more to do with human health than any kind of altruistic or environmental



benefits that people perceive to be coming from their sustainable actions. So this is both a reflection of need demand and also doing something for ourselves, right. This is why these things are important. Because they're real. They're here, they're now so there's two different chapters. Let's start with the air quality chapter. So they get away and they start from the get go. They talk about the CO benefits and health benefits of switching away from fossil fuels, right. And that's really important to understand that there's a really interesting conversation about the difference in mortality and more morbidity impacts, which, again, in my lay interpretation, I found very interesting. But let's talk about adaptation. So they talk about how building energy efficiency potentially, but not always improves indoor air quality, and allows us to accommodate different or at least changing temperature. Sometimes when we have energy efficiency, we seal up buildings and can actually have lower levels of indoor air quality. But in general, there's an opportunity there. And by the way, when is more energy efficiency, we can in theory, spend more on air conditioning. And again, there's consumer level trade offs that are happening. They talked about using portable air filters and masks for wildfire, smoke allergens, mold, so like these product level adaptations to smoke allergens and mold, they talked about the extent to which prescribed fire emissions are lower than major fires. So prescribed fires are going to have emissions. That's not great for people. But at the end of the day, it's a net lower impact. They talk about advances in remote sensing for smoke protection systems and how valuable that is. They talked about the increase in allergens and the extent to which people are staying indoors wearing masks to reduce exposure. That's an adaptation. But we need more early warning systems to help support that adaptation, right. So understanding when those allergens are going to come more severe. Over in the human health chapter. To me, I love human health and health systems and adaptation because there's been so much great work on this over the years. So big picture here is impacts are vast on human health, but they're also, you know, there's impacts to healthcare systems, hospitals, nursing home pharmacies, Doug, I don't know about you, but if our CVs got flooded, like it'd be chaotic wherever you live, Walgreens, CVS, I mean, these are places of healthcare, their places of core retail, they're important, as are all health care facilities. And they cite something like 9% of hospitals are at risk for flooding. I've seen some even higher numbers for coastal states for health care facilities. So the numbers are quite alarming in terms of just they cite the US Department of Health and Human Services sustainable and climate resilience health care facilities initiative. That's a mouthful. It's on the US climate resilience toolkit. They don't really get into it. So actually took the time to go back and pull it up because this was something we worked on during the Obama administration. I just wanted to see where it landed. And the checklist is fantastic. If you're in healthcare and you're listening to this go look this up is the US Department Health and Human Services, sustainable climate resilience health care facilities initiative, easy to access with a quick Google search. It has a vulnerability assessment, it talks about land use siting of facilities, even plants on landscapes to mitigate things, it talks about transportation in or I should say engineering resilience for transportation. So for instance, it is like this whole category for can the pavement handle extreme temperatures that is the payment for the loading and offloading of ambulances, right. Do you have alternative evacuation routes? Do you have cooperation with public transit during extreme events like really interesting about this systematically, they talk about the hardening of or what they call refuge standards for key parts of facilities or hospitals, from everything from when two extreme snow loads. I mean, just think about that, like we have to have a certain does Are are a component of our health of our hospital, let's say that can handle super large amounts of weight from extreme snow, vertical transportation, right. So just hospitals are usually, and they're usually tall, and you need a lot of elevators. So in the machine rooms do we have dry flood proofing? For elevators, there's a lot of things you can actually do to manage flooding in elevators, and to keep the cap out of the water because there's a big problem, the cap comes down. And once it hits the water and soaks it all up it's a huge loss to the system. It also talks

about passive survivability for both cold and heat, which is really interesting. So another thing that they get into in this chapter is implementing surveillance systems for climate sensitive infectious disease and non infectious health outcomes. So these are all very important adaptation measures and indicators, you know, infectious disease, the disease themselves is shifting right. And it's shifting, it's adapting in a complex adaptive system. It's adapting maybe maladaptive to us, but diseases spreading in many cases and contexts. They also get into extreme heat is Doug's, you know that this is a real problems and real challenge in terms of public health, ensuring equitable access to cool spaces, reducing social isolation, augmenting heat warning systems, improving green infrastructure, which can lower ambient temperatures, will reduce energy costs for the demand for air conditioning. So you can have efficient heat pumps and fans weatherization, again, a form of energy efficiency investment. And of course, as we know, and that will take this is cited in there, but I just want to bring it up, like there are maladaptive implications for air conditioning, we may actually even cite this in our own chapter. Air conditioners are more or less taking heat from inside the building and pushing it outside. Right. So the heats got to go somewhere. And actually, they do talk about that in this chapter. But there's also maladaptive inflation just because you're consuming more energy. And I remember reading an article a couple of years ago about, you know, estimates for future electricity demand from air conditioning as a form of adaptation, the extent to which that was going to kill X number of people based on current generation distribution for those loads. So more air conditioning, you'll save some lives, it'll kill others along the way, gets into passive survivability of buildings. So that insulation, night flushing of air moving that hot air out cool air, and so

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Doug Parsons 1:22:19

extreme heat was all over the news this summer, it seems like every summer, it gets even more tension. And it is the number one climate killer at the moment. Yeah. So does the assessment, treat it with that sort of urgency? Because they want it out there? They want people using it public health, obviously. But I mean, extreme heat get its do, I would

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Dr. Jesse Keenan 1:22:38

argue that it does, it appears over, it's probably cited and half the chat was in some form or fashion, maybe not the oceans chapter, but it appears everywhere. There's a lot of citations in terms of the techniques that you can do to minimize it from public health point of view, from a landscape point of view from a built environment point of view from an institutional governance point of view. So it appears in a lot of different forums. But I'm glad you brought that up, Doug, because you know, as you say, I mean, it's a huge public health implication. And there are a lot of people do die from extreme heat. And I can tell you live in in New Orleans, this past summer, when it was 90 plus degrees, or 90 plus percent humidity, over 100 degrees, I think, almost every single day, except for a few days, people were dying left and right and talking to physicians in the emergency room about how they die, how they management, how they treat it. There's not a lot you can do. And unfortunately, a lot of people succumb to this of all ages and backgrounds. I mean, people it's roofers, that children is the elderly. I mean, it's, it's non discriminating anyways. But there are also just a ton of people who have disproportionate vulnerability, particularly for people who can't afford air conditioning, they have to make trade offs between food and medicine, and air conditioning. So huge challenges, but it kind of makes you wonder, the extent to which maybe the sixth national climate assessment can be organized

around impacts, in addition to the sector organization, because you could really almost have a whole chapter just on extreme heat, right? And look at it through a bunch of different lenses. But to your question, I think it's, it's pretty well captured throughout the chapter. And in many ways, that's what the regional chapters that we're not going to get into the National Climate Assessment in many ways, they take on these local sort of vernacular of climate impacts. So getting back to the health chapters, there's a ton of stuff here, they talked about wildfires, the advantages to prescribe burns and fuel management. They talked about the need, again, for early warning systems for smoke, particularly as that smoke moves across the country. We saw that this past summer with not great weather forecasting of where the smoke was going to go. The Mid Atlantic in particular, got kind of got caught off guard, vector borne disease, they talked about insecticides becoming less effective, which is very true. So there's all kinds of adaptations for vector borne disease. A number of years ago, I worked with a colleague on non basically how you design when Zika was burning through the Caribbean And how would you design the landscape and infrastructure to manage mosquitoes without using insecticides. And it turned out there had been all this knowledge about how to do that, that went back centuries that's largely been lost because the insecticides, so there's a lot of knowledge out there on how to manage vector borne disease skaters in particular. So they get into adaptations of vector borne disease that are super cool. So vaccines, spatial repellents, genetically modified mosquitoes, yes, that is an adaptation, they talk about something I thought that found was totally cool. I hope I'm pronouncing this correctly, while Baqia it's basically a harmless bacteria, at least harmless to people that blocks viruses like Dengue fever, and Zika, and others from growing and the bodies of certain mosquitoes. And they basically pass this on, and it reduces the transmission of diseases. So really interesting adaptation, the town's chapter also gets into mental health. And they talk about climate anxiety and eco anxiety, which I think is the formal diagnosis now, in you know, I was just at the University of Pennsylvania today and talking with a few people. But one of the students I was talking about was in therapy for eco anxiety, which you will see cited in the National Climate Assessment, as you know, from I think it's, I forget what Medical Association's Americans psychiatry or some sort of psychological, social APA or something like that, whatever. It's an official diagnosis now, right? People have it. It's something that is diagnosed, it's treated, it's real, having talking to this woman about chronic fear of environmental Doom, that that's a real thing. And so I think it's important to acknowledge that there's physical and mental health implications here. They also get into community level resilience. And they talk about the maladaptive implications of higher order adaptations that may be overlooking, let's say, community defined, driven and led adaptation efforts. So again, another important conversation about distributional equity and procedural justice and the trade offs that come along with that.

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Doug Parsons 1:27:11

We're now we're going to talk about tribal and indigenous people. And I'm curious, have you heard anything, were they able to work with indigenous voices as they came up with this part of the chapter because I've done some of that recently on the podcast. And there's actually a lot of interesting adaptation work going on in tribal communities. I

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Dr. Jesse Keenan 1:27:26

mean, if you've been in the adaptation space for any amount of time, you met people, and learn something about the tremendous work was happening among among tribes, tribal communities, indigenous people from all around the world. And in many ways, some of the

most experimental, innovative things have been coming out of these communities of practice for some time, and there's a lot to be learned there. And I think this chapter, and in the whole process engages a huge diversity of people and perspectives and disciplines. And I think, you know, you couldn't do this chapter without having some of the leading voices from these tribal communities participating in it. So there's a bunch of things that come up and key message to highlights the idea of self determination of indigenous peoples to guide their own climate resilience, right. And they bring up this wonderful example of how one tribe made a commitment to tie renewable energy generation to the households of elders to reduce their energy costs, again, clear mitigation, adaptation, convergence, but for them, that was what they prioritized. And that's important. And so one of the things they highlight is the need of support and the opportunity for CO management of state and federal assets, because many tribal communities. And we know we've seen this sort of over and over again, this idea of cooperation and regional and multi stakeholder cooperation, and a lot of times there's divergent resources and assets, where that need to be co managed, and state and federal government have always been so they've been reluctant in many ways or worse, in trying to think about how co management could work. One major problem they cite is that in the context of adaptations, that funding, you know, often requires matching funds reimbursements reporting requirements, quote, degrees of shovel readiness. And this can be a huge burden for many indigenous administrative units and quote, that's right out of the report. So and this is a challenge for tribal communities is a challenge for Dougherty, County, Georgia, small counties all around the country. So in the small jurisdictions, so, you know, how do we operate in this world of getting federal resources when we have very little mechanisms to support the administration of it all. Again, there's a call as we see in other chapters for better data to work within the system, and not just data for data's sake, but also an adherence to understanding place based indigenous knowledge as a either principal primary or secondary or whatever it may be for form of critical indication to understand the impact and benefits of investments. Sometimes we standardized and have uniform ideas of what is positive or good impact when there's different ways to view these things. They call for something called the care principles, collective benefit authority to control Responsibility and Ethics for indigenous data and governance of that data. Very interesting framework for how indigenous data or data from indigenous communities should be managed, governed, shared, collected, and the like. So I think from a research point of view, clear enough, but I think from a public administration point of view, a lot of opportunity there. And this, by the way, is a big opportunity all across the country where there's this big tension between public and private data in justifying all kinds of investments, a bunch of really interesting adaptation examples in the chapter they talked about the College of Menominee think I'm hoping I'm pronouncing that the nation developed community gauged phenology, quote, phenology research project to understand changes in plants on the reservation and also develop the culturally grounded Menominee theoretical models sustainability, we're making investments and understanding those changes to phenology over time, they talk about blue carbon ecosystem restoration and Long Island and Alaska, they talk about building clam garden with a climate adaptation strategy to combat sea level rise. They talk about Native Hawaiians and restoring their agricultural systems. And, you know, that really came to light this year with the fires in Maui. And we began to understand the nature of those grasses that were maladapted to the changing precipitation and aridity standards in Hawaiian Islands. And the extent to which that represented a fuel risk of forest fire or wildfire risk for those communities that there's huge opportunities for indigenous applications and ecosystems management. This is, in many ways, highlighting a lot of these very interesting challenges, but also the huge opportunities and practices for these communities. That I think many of these lessons extend well beyond the borders of tribal communities to many of us who are in the field. So very interesting chapter. Yeah,

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Doug Parsons 1:32:08

that was fantastic explanation. That was fascinating. This is the National Climate Assessment, but it does factor in international interests to a certain extent, right? Yeah, I

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Dr. Jesse Keenan 1:32:16

really enjoyed this chapter just because I, you know, many of these other chapters, I've followed this for many years in different ways. And here on America data, we've had a lot of national security and security people, it's actually been a pretty robust conversation. But this chapter was really interesting. This chapter is titled climate effects on international interest. And the big picture here, one big picture we can start with is that there's a kind of systemic dependency and interdependency across national borders, right? We are dependent for trade, national security, sustainable development, we are deeply connected and tied in really fundamental ways. So from one perspective, national security, they make the argument, quote, declines in state capacity or legitimacy, including potential corruption, where governments cannot effectively respond to extreme weather events, or long term chronic climate connected impacted. So what they're saying is like governments can be taken down right state capacity and legitimacy of governments can be undermined if they can't get their act together and respond to extreme weather. That's a huge problem, right? That's a national security issue. They also cite that if a host country, and we've got military bases all around the country and in embassies and everything else, if these host countries can't adapt or make investments and adaptation measures that is undermining our capacity to deliver services and to readiness, military readiness, whatever it may be, they talk about mitigation and adaptation efforts can unintentionally exacerbate new and existing conflicts, particularly among inequalities among marginalized populations. I mean, we see this all around the world as people are moved being moved and forced migration and it creates a lot of conflict in and as a huge challenge. They also talk about mobility, both planned and forced is a common adaptation. And they cite ongoing international engagement associated with climate migration. I don't know what that is where that's going. But that's something they cite is again, quote, ongoing international engagement about how to manage that. And that's a that's a huge conversation that is ongoing. They talk also about competition, right? So the competition we know around rare earth minerals, for instance, has huge implications for mitigation, but also complicates adaptation, as well. I've got a paper actually coming out about that in the next hopefully next couple of months. So you know, the war in Russia and in Ukraine is limiting us and it's changing markets for rare earth minerals and minerals and disrupting supply chains. And that, by the way, can be traced all the way down to delays and infrastructure here in the United States. So super interesting. They also talk about countries may also leverage climate change mitigation adaptation policies to gain influence and FOSS For new coalition's, I mean, they don't say this but we know China has been engaged in port development, rail development, a lot of infrastructural development that has both mitigation and adaptation ends associated with it. And that's a way to gain foreign influence and create debt burdens and a long standing form of international hegemony. Incorporation of scenario planning is something that they are taking very seriously as part of international relations and global order of managing people and flow of goods and etc, etc. And they talk about the need for policy coherence. And that's a really interesting chapter. And I encourage people to take her to read it through one of the things that really stood out to me and this, this not really about adaptation, but something that kind of I

read this and I was like, Man, I can't believe this made it in here. They talk about solar radiation modification. And they are concerned, as cited in the chapter about unilateral action for solar radiation modification, Doug pop quiz, what is solar radiation modification?

D Doug Parsons 1:36:10

That's just trying to control the amount of solar radiation coming into the atmosphere. Yeah, that's right. That's right.

D Dr. Jesse Keenan 1:36:16

It reminds me of Ministry of the future by Kim Stanley Robinson, were in that book, India flies like hundreds of sorties into the sky, to basically block out some portion of the sun for a period of time to reduce, you know, the watts per meter square of energy reaching that lower part of the atmosphere in the Earth's surface. It sounds like science fiction in a way people worked on it. There's not a lot of research because it's hard to ethically test it. And there's a lot of debates about the ethics of even have running experiments on solar radiation modification. But no doubt, unilateral action by one state untested could have global consequences. And that's a concern for international relations in this country. To me, that's a freakin bombshell. And I don't know why someone hasn't written an article about that, because it's not Kim Stanley Robinson, Ministry of the future, it's a real concern for today. Okay, so this some of the sections of the assessment that might be a bit complicated for people to dive into. So hopefully you can help walk walk through. And so like this issue of multiple stressors, what

D Doug Parsons 1:37:17

are they trying to say there? Oh,

D Dr. Jesse Keenan 1:37:19

man, it's complicated for everybody, including myself. So the next chapter is sector interactions, multiple stressors in complex systems, nor known generally as the complex systems chapter. It's a really fascinating chapter, because it forces us to think about ways of knowing and how climate and non climate factors sort of intersect with each other. And there's really great citations to complex adaptive human natural systems and things that I think are really interesting, but it gets into my favorite subject, which is trade offs, right, quote, trade offs, Link benefits and dependencies among energy transition adaptation actions and sustainability goals that's at the heart of this. And there's a bunch of problems and challenges they bring up. One is that many capital investments, or long run investments that are well beyond current modeling capacities, there's huge amounts of deep uncertainty. And best we can use scenarios. But how do we make these long term investments and stuff and then people and programs and Sustainable Development Goals whenever it is, in the face of these deep uncertainties? So models often struggle to account for the diversity of lived experience? There's kind of ontological problem diversity of lived experience, and therefore they argue the decisions they support are perhaps less than optimal for the standards of procedural justice. Like, who's making decisions about what and what are the thresholds and considerations of



concern and action? There's the standards we kind of hold ourselves to in democratic processes. But if we're not fully accounting for lived experience, and maybe this raises the question, to what extent can we even fully account for lived experience? Are we setting up some huge distributional equity problems, right. And they talk about in the context of distributional equity, the distribution of not just the benefits, but the risks, path dependencies. And really, at the end of the day, the most fundamental aspect of this is, which is the costs and burdens across communities. And I think this, again, really important to bring this up. They also get into the governance initiatives and things like chief resilience officers, which by the way, they fully acknowledge that the evidence is pretty weak as to their effectiveness, like, Chief resilience offers big to do. There's been a lot of challenges to the design, utility, some are natural leaders, some get things done. They've been designed and implemented in public policy and public administration terms of very different ways to differing degrees of effect and impact. And they acknowledge that and in fact, the kind of wonder the extent to which this chapter is really a chapter of political science or political ecology, and maybe in the future, we actually have a chapter on political science because they take on some really fascinating things. And let me just end this notation about this. Chapter with this fantastic quote, because it sums up why I think, you know, political science is underrepresented in appreciating these things. And here's the quote just me read it twice, because I think it's so good. Existing governance structures largely predate contemporary public climate responses and extend histories of us federalism, Home Rule, privatization, and ad hoc regional collaborations or special districts created in response to temporal needs or crises. These structures have generally not been recognized in the face of complex climate changes. So basically, we're relying on institutions that were designed for some shock to the system or some challenge, which largely predates a logic and a convention that drives the immediacy of the challenge and the crisis that we have with climate change. Right. We're relying on outdated institutions and jurisdictions and associated operations legally, to that were based on a different set of logics than what exists today. And that's a fundamental conflict, which many ways feel it feels irresolvable. And it's a conflict that we see over and over throughout the National Climate Assessment, the extent to which the rate of change is moving faster than the governance, whether it's forestry management, or, you know, fisheries management or whatever. The rate of change is moving faster than institutions and regulations can keep up.

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Doug Parsons 1:41:33

Okay, so this next section, let's go back, James Carville. It's the economy stupid, how does this fit into the overall economy? And I know I have listeners like it places like the Federal Reserve, and you've made those introductions. How are the economics of all this playing out? What's it saying to that? Well,

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Dr. Jesse Keenan 1:41:47

let's acknowledge this is the first time economics and economics chapter has made its way into the National Climate Assessment. So this is a huge deal. If you know anything about economists, they're really slow. They take their time. They're very discipline, but change new things, including climate change economics is it's a long time coming, perhaps. But it's as an institution of academics, it's very difficult for this aging and slow institution to creep forward. Well, it crept forward, and it made its way into the National Climate Assessment. Key message one, quote, adaptation can attenuate some impacts by reducing vulnerability, climate change,



but adaptation strategies vary in their effectiveness and cost, right? Reality check, we can adapt to some things, but you know, it's gonna cost you and we don't know how much it's gonna cost you. They talk about economic adaptation and but essentially, the technologies and the opportunities that we're going to do it when essentially, it's cheaper to adapt than it would be to do nothing like so they set up a kind of economic rationalization to this all, they haven't really interesting citation in here, which they estimate or some research that they cite, estimates that about 1% of US capital stock is is adaptation capital, which is kind of amazing. So, again, I mentioned this earlier, gradual warming is much preferred in economic terms of rapid warming, right, or gradual change is going to be much cheaper than very rapid change, because novel adaptations and technologies are often very expensive and out of reach relative to rapid degrees of change. And they have potential, let's acknowledge this, first and foremost, strategic investments have the potential to create very large social and private returns. And that's it, people are going to make lots of money from adaptation, right? We have to fully acknowledge that key message to says that market adaptations are well underway. Right markets are quote, markets are responding to current and anticipated climate changes. And starker market responses are expected as climate change progresses. So they go through a whole bunch of literature on how markets are pricing climate change, either climate impacts today, or the people's perception of climate impacts tomorrow that you know, from housing to food, you name it, there's a lot of observable signals that we now see in the economy. Climate key message three is really interesting. They get into the risks and opportunities for businesses. They get into these ideas, design deployment of adaptation technologies, they talk about a bunch of different challenges to location, the availability of labor and adapting, right, we're gonna have less work outside on extreme heat days. Extreme heat waves will reduce local productivity. There's going to be costs of relocation and retrofitting homes, consumption patterns are going to change regional adaptation efforts may be funded by corporate taxes or a higher rate of return on investment. I mean, think about that, like in areas. I mean, you got to think that through in areas where we're going to have sealed Have arise and movement of people and floods and just things are getting worse and worse and worse. But you got to pay for that, right. And that means you're gonna have to pay through that through taxes and a higher rate of return, I was talking to an Investment Analyst on Wall Street recently. And they were kind of speculating on the extent to which there was a literally a higher internal rate of return, essentially a climate risk premium applied to the cash flows of some investors on a cash flow income basis. We haven't really seen this in the literature yet, but talking to people and serving and looking through the balance sheets, and what's not really in the balance sheet. But looking through it sort of reverse engineering it, there is a climate premium that's being applied to internal rates of return on capital. I mean, we certainly know this in the insurance market. But it's definitely playing out in businesses like climate change is going to cost you in so many different ways, whether it's tax or just, they're going to charge you more for things because they need a higher return on capital. So uncertainty as to the effectiveness of adaptation is also a huge problem, because it can delay investments, we don't know if adaptation is necessarily going to work. And they end the chapter with a really important kind of lesson that economists love to preach all the time, which is that, you know, the government indeed plays a role here. But quote, public insurance support or provisions, quote, unquote, public support can decrease incentives for private adaptation, right. So there's only so much we can do to subsidize people protect and shield people ie National Flood Insurance Program, we can only socialize so much of the economy in the favor of subsidization and stabilization and preservation, because at some point in time, we're going to be creating disincentives, or otherwise decreasing incentives for private adaptation. And over and over again, you see very clear signals from Washington, that they're not going to pay for adaptation, they're going to internally shift the structures of government and the policies to the extent that they can, but really, a vast majority of adaptation, most of all of that information is in the hands of individuals, companies, institutions.

I mean, it's not part of the government's provision, the economy's too large, is too complicated, that it's really private adaptation. And that many ways, what we need to do is to create incentives and remove disincentives so that we can have more cooperative behavior, more behavior that results in higher social welfare and environmental welfare and quality. So it's a really good chapter. It's very interesting. It's also written in a way that anybody can understand. So if I'll say one thing about the economics chapter, it's concise, it's easy to read, and it's super accessible, which is, I don't think anybody's ever said that about an economist writing anything. Right.

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Doug Parsons 1:47:52

Okay. So the end is in his side here, Jesse, we're almost done. And we're going to talk about social systems here. And I'm curious, as you've talked about this adaptation planning, occurring in just random places around the United States? And are we really set up well to kind of integrate adaptation planning into our social systems? Yeah.

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Dr. Jesse Keenan 1:48:09

So key message one, governance is key for providing access to adaptation. You know, governance is important key message too, though, is that, quote, people's histories, education, cultures, ethics, and, quote, shape how that approach should or could happen, or maybe even does happen. So the problem here is that the key challenge for adaptation is that we've said over and over again, that the rates of change are faster institutions and governance can keep up. And why is that governments find it hard to innovate, to experiment. And it's hard for governments in many ways to build coalitions, and they highlight the extent to which public, private and civic coalition's form around particular issues and can actually manifest transformative adaptation, as they say, or drive adaptation. They give a really good example in Tulsa and flooding and Tulsa, how a bunch of people came together, and actually drove this issue home and worked across these political boundaries. So kind of highlights the limitations of governance, but then shows that there are examples of cooperative behavior in a way they also talk about human migration as an adaptation. This picks up when technological and material interventions fail, or at least that's their argument. I'd say. Big picture though, one of the things they highlight is our reference point for the problems and the causes of those problems are subjectively shaped by history, lived experience, etc, etc. And so they call for the co production of knowledge that drives community based resilience. And that's leading toward this idea of climate justice, which is formally linking development, human rights and climate change. I think that you can't be policy prescriptive in the National Climate Assessment. And I think they're incorporating what we've seen domestically United States but literature and experience and practice all around the world, which is that part of mobilization of people politically, is to not just reduce GHG, and to adapt to climate change, but to have all of these other allied advances of Policy and Social Policy and Social Welfare, etc, etc. and sustainable development, for instance. So, you know, it's hard to sometimes approach an issue. For instance, when you're thinking about trade offs without also having to think about the people behind it, right, and linking the opportunity for human rights and for social justice. And these other things, at least, that's part of the political rhetoric and the political mobilization behind it. So that's the goal, climate justice, how you define that, how we agree upon that. And procedurally, how we get to a principle notion of climate justice is in a way lacking, but maybe it's lacking because it's context dependent. And that's something we can talk about. So at the

end of the day, they talk about what I love to talk about, which is that adaptation to one group may be maladaptive to another. And again, that's a really, really important part of understanding how we analyze the social conventions associated with adaptation, we

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Doug Parsons 1:51:09

have covered a lot of ground or more precisely, you have covered a lot of ground, you'd mentioned earlier that there are these regional chapters, I encourage my listeners to dig into those those where you could stay downscaled in ways that are hopefully going to be more relevant to you where you're at. We're not going to cover those in this podcast, we are now going to finish this out and talk about the adaptation chapter, which is exciting. There's a whole chapter dedicated to adaptation. And we're gonna have the one of the co authors Eric Tate on afterwards to fill in some holes there on top of the things that you discuss. So let's talk about that. Oh, yeah. So

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Dr. Jesse Keenan 1:51:40

I'm super excited to have Eric, come on. He's a professor at Princeton, super nice guy, really knowledgeable, geospatial scientists. I mean, just I'm so excited. We have someone from the adaptation chapter that can help kind of guide us here. I wasn't on the outpatient chapter, I was in a different chapter. I know a bunch of these people. Let me say, if you read anything in this, read this chapter, right? I think in a way, because it's in very concise terms, helps summarize a lot of what we've covered today. But I think just helps us understand adaptation and the complexities adaptation. So let's jump in and key message one, because guess what all the key messages on this chapter are going to be important for us key message one, adaptation is moving from awareness and assessment towards planning and implementation. That's good, right? Compared to the fourth National Climate Assessment. We're making progress. We're moving into the realm of implementation, but monitoring and evaluation of limited, there's still lots of barriers. We've talked about those barriers, and that, in fact, in this chapter, they talk about financial barriers, in particular, there's insufficient efforts and unlikely to keep pace with the rate of change. And I mean, that's a kind of in curious statement, in a way, because adaptation is a process, it's not an outcome. So me, so you kind of have to ask yourself, well, like what does it mean to keep up? Like, how do we benchmark what it means to keep up but nonetheless, I get that idea. We've seen that in so many different chapters, the misalignment, their key message to is, quote, how people and institutions adapt depends on social factors, including individual and community preferences, capacity, and we haven't spent a lot of time talking about adaptive capacity that that comes out in this chapter and others, as well as in it's defined formally in the glossary, and access to resources and quote, the contextual nature of adaptation is really, really important. There's another quote that I think comes out of this passage, that fourth reading, quote, adaptation processes, decisions and actions that do not explicitly address the uneven distribution of climate, arms and social processes and justice underlying these disparities can exacerbate social inequalities and increase exposure to harms, I think there's kind of two things you can take away from this statement. One is that we've got to challenge higher order vulnerability, and that are institutions rather, that are defining higher order availability, like on some level, like resilience at an individual level, or local levels, fine. There's an equilibrium is about preservation stability on some level, but we know there's many, many examples of unsustainable resilience, right? And many ways, as we perpetuate existing systems through resilience, we're also perpetuating

existing disparities in existing systems that trap people into those disparities, or define those disparities in a way however, however you want to think about it, we've got to be able to move across scales and think about, okay, what are the institutions, some people say systems, but I think it's more institutional orientation. There's my own kind of ad lib to it, that define that higher order mobility. The other component of it again, is we have to analyze the trade offs and understand that it's never so easy and ever so complex that it's always so complex to simply say that this is the right thing to do. This is the you know what we think of an adaptation today that produces a well distributed good and bad benefit today may not necessarily be the same within its useful life or, or in the future. So it's a challenge. Let's move on. Key message three, we have incremental adaptation. And that's kind of business as usual in many ways. But we likely need transformative adaptation to, quote, shift in systems values and practices. And then we need of course, monitoring and evaluation along the way. Again, this is a really challenging statement in a way because how do we implicitly benchmark to history? I mean, transformation is about breaking things. It's about things being broken, and then being repeated back together. As we started off in this conversation this today in this episode, like, what's our agency over transformation, that's a really debatable points in application science, key message for going to require public, private and civic stakeholders that makes all the sense in the world rhetorically, but it's really about balancing competing goals, right at the end of the day, and we have to address uncertainties and deep uncertainties along the way as we get there. Key message five effective adaptation relies on decision relevant information, right? Adaptation, stakeholders have to improve their adaptive capacity and incorporate relevant information that's value based culture based. And that's really challenging in many ways, but not an impossibility key message six investments in adaptation are not always evenly distributed, coordinated, tracked and reported. And there's a lot to be said for this. We don't know where money is always going. There's not a national database that says this is what adaptation resources are and where the money is going. You really have to piece this together. I will say this chapter was a wonderful review of the funding and financing mechanisms and the kind of barriers along the way they call for incentives, and I'm sorry, investments in disadvantage investments. And they talked about the incentives and the disincentives, and but at the end of the day, we need transparency. And at some level, we need regulation that begins to help us get there. And there's a number of things we'll talk about with the National that are highlighted the national resilience framework that I think are helping us get there in terms of the economics cost benefit analysis, cost effective analysis, ways of internalizing everything from ecosystem services to non monetary benefits in the economics, that support decision making, and the allocation of funding and financing for adaptation. But there's a lot of let's say, standardization and transparency that needs to come along. So those six key messages are all things we've talked about actually in other chapters, but I think are worth going back and kind of thinking through and looking at the citations, because this isn't just their opinion, this is based on a lot of other people's experience and research that is trying to memorialize some of these conflicts and some of these challenges in the show, it's not always so easy to have, you know, top down and bottom up convergence of adaptation, scalable adaptation investments and interventions. It's infinitely more complex than that.

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Doug Parsons 1:58:00

Okay, Jesse, that was amazing. You did a deep dive, like I thought you would just as we wrap this up, I want to talk about what's missing. And first off, not too many people can appreciate National Climate Assessment and really make that as summit what's missing, because it's such a huge beast. Not everyone has that expertise. But you have a couple things that you want to do. And I just also want to throw out I, I've focused on climate modeling and climate data a bit

in the last year, and those have been popular episodes. And there's always this need for it the federal government getting involved with sort of ground truthing these climate models and data? And is the assessment even the place to have that conversation? But yeah, what's missing from the assessment?

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Dr. Jesse Keenan 1:58:37

Cause, like, I didn't even think about the role of the assessment to be an arbiter of models and proprietary ideas in a way. It's kind of interesting. I'm not sure that in a way, a lot of the challenges that we have with the applications of different analytical tools are not sufficiently found in the peer reviewed literature or scientific literature for the assessment to truly be an assessment those terms, right. But it is interesting, and it is a huge challenge, because we do need an assessment of these. And I do know that there are some nonprofits and some groups out there that are actually aggregating a lot of the climate services and climate service technologies out there that are trying to trying to do just that to try to figure out like, who's got the best, you know, model for flood are the best model for wildfires and you're trying to compare apples to apples or apples and oranges is difficult, but it's there are people who are out there working on this. I don't think the NASSCOM assessment could do that. But it's an interesting thought you put in my head. There's two things that are not gaps. They're not missing pieces. That's not my place to position or spring. But there are issues that I want to read the National Climate Assessment from beginning to end which I've done Now kind of leaves me like hanging like I want more, you know? So if there are questions, so the National Climate Assessment, so let's talk about one is equity and the other is transformations, this National Climate Assessment specific any national climate assessment, you can't get into prescriptive policy, right? These are assessments. And they have done a wonderful job highlighting inequality and inequity in distributional equity, procedural justice, and even recognition of justice appears in the National Climate Assessment. And it's insightful. It's very important. And they highlight the extent trade off as we talked about the highlight maladaptation I mean, I don't ever remember climate assessment, maybe I haven't read it close enough, really getting into the level now adaptation that we've seen in citation here. But I film sometimes think it's hard for readers. And this isn't an indictment, I think it's just a challenge. I think it's hard for readers in a positivist sense to understand how you translate the call for equity, because you can't have this kind of prescriptive policy conventions. And we have a lot of calls for the references to the principles of equity. And in some cases, we've seen very explicit citation like with indigenous and tribal knowledge. But in general, there aren't really generalizable principles, policies or frameworks that help us say, Yep, okay, put equity first and foremost and politically or whatever it may be. But how do you really translate that or operationalize that into particular practices? And maybe you can write maybe one argument is that people experience live experience, context matters, there is no generalizable set of principles and cross learning that can happen, where equity can translate from Seattle domain and from Miami to Los Angeles, right? Maybe it's just contextually debatable, or qualifiable. Whether that's a good idea, and I get that, but I think it also leaves us hanging. Because what is it mean to have large scale top downs, adaptation actions that may truly be transformational? How do we scale up bottom up incremental adaptation? If we can't institutionalize the principles of equity, right, because you see, I'm saying like, there's always going to be incremental adaptation, there may be some measure of localized transformational adaptation. But there's a lot of adaptation investments we're going to need. Ultimately, we're we're going to need cooperative, regional and maybe even national investment. And when we get to that stage, it's going to be super difficult to just say, okay, locally dependent context is going to drive principled equity allocations. And we see this today with renewable energy,

right? Like, there's all kinds of people that don't want renewable energy in their backyard or one community wants to know what can be done. People have different principle notions through their own democratic processes about what they want to support. Yeah, there's all kinds of disinformation, greenwashing and steering by fossil fuels. And we know that and that's a problem. But it runs into the same fundamental problem once you've got top down investments and top down scaling, that's running into this contextual ground up subjectivity about what is the principally right and fair and equitable thing to do. And I don't think anywhere in here, or any of the conversation that is cited in here is really helping us have that conversation. And I worry that that's a concern. And again, maybe I'm missing the point, maybe it can only ever be localized, but there will have to be some scaled orientation, to some types of adaptation. And I wonder where we draw inspiration from and maybe that's just my own ignorance, but I think it's a debate we need to have. The other thing and I'll end with this, Doug, is transformation. I've mentioned a few times, you know, adaptation science in the scholarship for many years is debated about what transformation really is and how, to what extent we can even observe it right. And there's an outdated debate that kind of revolves around whether there are limits to adaptation, or whether those limits or thresholds are really just the boundary from which incremental adaptation passes into something that truly transformational. Right. So are we looking at the frontiers of the limits of adaptation? Or are we just looking at the limits of incremental adaptation from which transformation extends beyond that, and that's a huge debate, and it's not one that's ever been particularly well settled, in my opinion. It's a huge debate in the IPCC. So the question is, given the adaptation very likely to have some maladaptive implications, there's always going to be trade offs. Right. And the recent history suggests that The true societal and technological transformations leave a lot of people behind, ie globalization, social media, for instance, those are true transformations. And they've left a lot of people behind. And they have not always universally driven advances and social environmental welfare. The question is, how far one do we have agency over transformation? And how are we going to mediate these trade offs from one transformation happens? Right? How will democratic institutions? And will democratic institutions even be the form for putting the pieces back together? So I know that's a philosophical question in a way. But I worry sometimes that in the call for transformation, if we're not really just inversely calling out the extent to which there's a misalignment between the rates of change and adaptation, which is well done, and we'll capture their support, or if we're actually taking a political stance, and actively drawing for a fundamental shift in terms that we may not be able to either control or appreciate. And that's what I worry about, that if we push for a radical solution to something, there are going to be unintended consequences. And I understand that there's urgency, there's crisis, there's anxiety, there's a lot of things that dictate the realm from which the landscape of adaptation, but I want to get deeper into transformation to understand it, because again, it could be my own ignorance. But what is transformation? Fundamentally mean? That's what I'm leaving you with?

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Doug Parsons 2:06:36

Okay, I'm gonna No, I want to put you on the spot. And I want to do this quick. We are wrapping this up. This was an epic journey of an episode. But this was all fantastic information. But I brought this up with Allison, and she'll have been on before you. And what would you say to people out there that are practitioners that are that engineers? are educators? And should they be using this National Climate Assessment? How is it relevant to them, I want you to kind of give a rallying cry of why this is an important process and assessment and why it should be out there.



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Dr. Jesse Keenan 2:07:05

Okay, so the National Climate Assessment, a National Climate Assessment, it's as good as as possible kind of get, these are the people who are the care the most that do the most work, the most knowledgeable, if they're not the most knowledgeable, they at least try real hard to talk to those and engage those who are the most knowledgeable. It's really a massive collective effort. And it's authoritative, in that sense, right. And it highlights the good, bad and the ugly, right. It's not a political document. It's not a document that's published by the White House to highlight policies and plans and goals and things like that. It is like this is what's happening. And I think for that sense, there's a legitimacy to it right? And not only is it authoritative, but it legitimizes the challenges and the opportunities ahead of us and the National Climate Assessment in this context, and the fifth one in particular, it's highlighting Yeah, things are bad people are vulnerable, things are unequal. But hey, there's a ton of opportunities here, right? The adaptation is not just about managing risks, it's about capturing those opportunities. That's literally in the definition of the IPCC of adaptation. So I think, if you look at this, how can it be useful? One isn't authoritative source two is providing a lot of good ideas. And those good ideas are realistically outlined in the good, bad and the ugly. And three, there's a wide variety of ways to communicate this and engage with people. And I think that one major challenge that we have is how do we get this information in the hands of people that's useful, whether that's climate modeling, or integrated assessment, modeling or the artwork, right? How do we not shape and support people's decision making in a positive way? But how do we inspire people? And I think the National Climate Assessment is kind of a weird thing in the sense that it helps people make better decisions if you take it seriously, and you take the time to engage with it. But I think it also should inspire you because it inspired me. And I inspired me not for anything that I did, but like I learned so much. And I saw that there, there's hope. Right? And that there's a certain ambition and a social, let's say there's a certain trajectory that we're on that looks and feels very dire. But I have hope that like we can get it together and that people are already doing really good thing. So it's the inspirational part, Doug, that I think is resident here. Fantastic.

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Doug Parsons 2:09:30

And message Jesse, thank you so much. These are always popular episodes are such learning episodes. And thanks for coming on.

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Dr. Jesse Keenan 2:09:37

Thanks for having me.

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Doug Parsons 2:09:41

Hey, adapters. Joining me is Dr. Eric Tate. Eric is a Professor of Public Affairs in the School of Public and International Affairs at Princeton University and co author of the adaptation chapter of the Fifth National Climate Assessment. Hi, Eric, welcome to the podcast.





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Dr. Eric Tate 2:09:54

Thanks for having me, Doug.

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Doug Parsons 2:09:56

We're gonna be talking about the adaptation chapter that you co authored, but first just give us a little bit of background. What do you do there at Princeton?

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Dr. Eric Tate 2:10:02

Right? So I'm a hazards geographer. And I study floods, the vulnerability of people, to floods and of things to floods. So I do flood risk modeling to look at economic impacts to buildings. And most of my work is focused on modeling social vulnerability to hazards. So I use spatial indicators like census data to build these models of social vulnerability. And I also just wanted to mention that everything that I'm saying here is my opinion, and not necessarily representative of the other authors on the chapter, or the US Global Change Research Program.

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Doug Parsons 2:10:44

You were there at Princeton, we had Allison Crimmins on earlier in this episode, she's the director of the the assessment, how did you get recruited to be a co author for it? For this chapter,

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Dr. Eric Tate 2:10:54

I was just actually contacted, the adaptation chapter had a different lead in the beginning has been Preston. And he's at RAND. And I think like a month into the process, after we were working as a group, he was recruited to go work for the White House. And so that was a conflict of interest. So he went off the chapter. And Emily Wasley became the sort of the lead of the chapter after that. So Ben had contacted me a couple years ago, somehow I got on his radar, and invited me to be on the chapter, we

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Doug Parsons 2:11:29

have dug into this adaptation chapter I Jesse Keenan had come on earlier. But having you on, I just want to get your 30,000 foot view of the chapter, you're kind of just that elevator pitch of what this chapter is about if people want to know what your perspective is of it.

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Dr. Eric Tate 2:11:42

Right? If you actually came together quite nicely at beginning, I think is, you know, maybe some discrete themes. But in the end, some of the main messages are that adaptation is the scale that we're pursuing it at, is insufficient to meet the problem. So the scale and the number

of things that we're doing. And so we need to make some changes. And so some of this includes a centering equity into adaptation processes, thinking about incremental versus transformative adaptation, how we conceive of adaptation, is it just about the science? Or is it beyond that, and then some aspects of changing the ways that climate adaptation, governance and financing occur. So there are some of these themes are peppered throughout the the key messages in the sections within the chapter. I think it's a nice collection of ideas that are cohesive, in the end,

**D** Doug Parsons 2:12:43

you just talked a little bit about how you organize the chapter. But let's dig into that a little bit more. And I'm thinking that people that you recruited to help with this chapter, adaptation actually still is this emerging issue. And so not everyone really has all the answers? How did you kind of figure out who you're going to recruit to help write this chapter.

**D** Dr. Eric Tate 2:13:00

So I wasn't part of the recruiting process at all other than being recruited. In the end, we had a mix of some adaptation practitioners and academics from across the fields planning and geography, and we had some people that aren't government. And so I think in the end was a really nice cross section and also different stages of careers. I feel like we had a pretty good subset of experience and perspective that was brought to bear in the end, as

**D** Doug Parsons 2:13:32

the co author and you get to see all these things being put together. Did you learn anything in the process? What really stood up for you? Well,

**D** Dr. Eric Tate 2:13:39

I certainly did. I'm not someone who lives and breathes in the climate adaptation space, most of the time. My primary work is in vulnerability to hazards, mostly climate related hazards, land, water, and lack thereof. Some of the ideas, the core ideas around sort of who's bearing the impacts, and how that it's uneven, are common to studying hazards studying climate adaptation. So I believe that perspective and my experience and writing over the years on these topics of sort of differential impacts and differential exposure, and differential participation and how we should be thinking about that was the place that I was a little bit different than everyone else. We all had our talents.

**D** Doug Parsons 2:14:25

I put Allison on the spot and put Jessi on the spot. So a lot of people don't know how to approach the National Climate Assessment. It's this big giant report. And there are a lot of adaptation practitioners out there who are my listeners, and I asked Jesse and Allison, how

would you recommend to those people to use this report? Because we want it to be used we want there's all this great science in it. But how do you recommend you're an urban planner out there? You're working at various levels of government, how can they tap into this? I

**D** Dr. Eric Tate 2:14:52

like starting with chapter that's aligned with what I'm doing and go through that and what you'll see what they did really nice. See The report is they have all these links of, you know, when you come upon a theme that's discussed in another chapter, it'll tell you where in that chapter to look, the way that I've been going through the report is sort of been in a bit of a snowball fashion, where I'm looking for specific information. So a couple of weeks ago, I was looking around something around cumulative impacts, and drew me to something in the Northeast chapter. And then it had some cross links to another chapter. And so I was able to learn about this topic in sort of an organized form, but in the end got the information I needed for that work at that time. And so that's the way that I've like to go through the chapter. But others may find them, they prefer a more systematic approach.

**D** Doug Parsons 2:15:44

So what do you think is the main point from you in regards to this chapter?

**D** Dr. Eric Tate 2:15:49

Yeah, so I can answer this mainly from my perspective, and not from the perspective of all the chapters author's. But I spent a lot of my time and focus on the centering equity key message number two. And really, it's talking about creating a paradigm shift in the way that we go about adaptation. There have been some people that have said, well, you would have been nice if the chapter had some more specific recommendations for how to go about it. But I think it's the first step is just making a commitment that equity is a key organizing principle of what we do. And just doing that is part of a paradigm shift. And it also links nicely to some of the other key messages around transformational adaptation. Centering equity is a key aspect of that, of governance of Inclusion and Engagement with other groups with the, you know, the scale that's needed to for adaptation. And so I think that the centering equity message key message number two is really important on its own, but also very strongly linked to some of the other main ideas in the chapter.

**D** Doug Parsons 2:16:54

Okay, great. Any words of advice or recommendations to the next lead author of the adaptation chapter of NCAA six. I

**D** Dr. Eric Tate 2:17:02

don't know how you do this in advance, but it's both the expertise of the authors, but also their collegiality. Our group was just fantastic. We got along really well, very respectful of each other's ideas, people jumped in to help when needed. And in the end, it was really a

other's ideas, people jumped in to help when needed. And in the end, it was really a pleasurable enterprise. And that's not always the case when you have sort of a shotgun marriage of different authors to work on a project. So this one worked out really nicely. And, you know, when I go to conferences, and I see some of my fellow co authors, it's some new people that I've met. And, you know, I think it's worked out really well in terms of the writing.

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Doug Parsons 2:17:43

Okay, Dr. Tate, it was a pleasure having you on the podcast and thanks for your efforts with this chapter. Critically important. Thank

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Dr. Eric Tate 2:17:51

you so much for having me on.

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Doug Parsons 2:18:01

Hey, adapters, that is a wrap. Whoo, what an episode thanks to Alison Crimmins and Dr. Tate for joining the podcast and sharing their experiences working on NCAA five and special thanks to Jesse for that monumental dive into the assessment. He has done us all a tremendous service by providing his expert insight on the merits of NCAA five. And there are plenty I've been critical of the NCAA in the past on the podcasts, not the science. That's not my role to criticize that but more on how it's shared with the public and how it can be a useful tool to adaptation planners. I think Allison, Jessie, and Eric all demonstrated ways in which this version can be useful to your work. Hopefully, this was a primer for you to take your own dive into the assessment and align it with the work you're doing. And educators use his podcast and other tools in the assessment to get the word out on this important resource. I want to reiterate that point for adaptation practitioners, please share this episode with colleagues who you think could benefit from learning more about NCA five and how it could benefit the adaptation work they are doing. And if you're a professor, do your students a huge favor and assign this episode so they can be granted early on in their burgeoning careers to understand the importance and applications of the assessment process. I assure you they'll appreciate it over reading journal articles about it. Thanks again to my guests for coming on and sharing the purpose and role of NCAA five. Okay, adapters, that's your cue to make great things happen out there. Okay, before I leave you what is your adaptation story? Do people that you engage with understand what is climate adaptation? Are you finding that webinars and white papers really aren't resonating ways that promote your work? Well consider telling your story in a podcast. If you're interested in highlighting your adaptation story, consider sponsoring a whole episode of American apps sponsoring a podcast allows you to focus on the work you're doing and sharing with climate professionals from around the world. I sometimes go on location to record the sponsored podcast which allows you a wider diversity of guests to participate. You will work with me to identify experts that represent the amazing work that you're doing. Some of my partners in this process have been the Natural Resources Defense Council, Harvard University University of Pennsylvania Wharton, the Department of Defense, World Wildlife Fund, UCLA and various corporate clients is It's a chance to share your story with all my listeners who represent the most influential people in the adaptation space. Most projects have communications read into them consider budgeting in a podcast podcast have a long shelf life much more so than a white paper or a conference presentation. Many groups work into their communication

strategies. If you work in a foundation, maybe you want to highlight the adaptation and resilience work of your foundation or the grantees your funding. There is no better platform than this podcast to get the word out on adaptation to some of the most influential inactive adaptation professionals in the world. Also, if you're interested in having me keynote speak at your conference or corporate event reach out more and more sectors are realizing they need to start thinking about climate adaptation. And for many of those fields, they have very little exposure and resilience and adaptation planning. I can speak to this issue from my own experiences and help you create awareness in your sector. I will talk about adaptation in ways that will motivate and inspire your conference attendees you can contact me via the website [American apps.org](http://Americanapps.org) Also I say this every episode reach out send me an email tell me your favorite episode recommended guests tell me how you work in the adaptation universe that's really important to me. And it also helps me plan future episodes. It is the highlight of my week when I hear from you and it leads to potential partnerships. I'm in America [daps@gmail.com](mailto:daps@gmail.com) Send me an email. Okay, adaptors Keep up the great work. I'll see you next time.