Integrated Climate Adaptation and Resiliency Program

Technical Advisory Council

Resilience Metrics Workgroup Meeting

June 10, 2020

Meeting Minutes

Zoom Video Conference

9:00 AM – 11:30 AM

Item 1 | Welcome and Roll Call

Nuin-Tara Key: Thank you for joining our TAC workgroup meeting. Before we begin, on behalf of our Director Kate Gordon and OPR, we want to take a moment to acknowledge the grief and stress that so many people are experiencing right now following the recent violent deaths of George Floyd, Ahmaud Arbery, Breonna Taylor, Monika Diamond, Tony McDade, and other Black Americans. These deaths and the unrest that has followed come as Californians continue to grapple with the devastating deaths and health impacts caused by COVID-19 as well as economic impacts associated with the pandemic. Impacts which, like violent death, Black Americans and Black Californians experience at far higher rates than other groups due to long-standing structural and institutional racism, which we must continue to expand our efforts to address and eradicate.

We acknowledge the disproportionate pain and burden Black Californians bear and urge all of us to work together every day for an equitable, just society.

ROLL CALL

Present: Jacob Alvarez, Karalee Browne, Jana Ganion, Grieg Asher (Representing Jason Greenspan), Amanda Hansen, Nuin-Tara Key, David Loya, Sona Mohnot, Andrea Ouse, Jonathan Parfrey, Heather Rock, Mark Starr, John Wentworth

Absent: Tom Collishaw, Tina Curry, Grant Davis, Laura Engeman, Dan McDonald, Darwin Moosavi, Michelle Passero, Lauren Sanchez, Brian Strong, Gloria Walton, Wilma Wooten

Item 2 | Overview of Resilience Metrics and Measurable Outcomes

OPR staff provided an overview of background, foundational concepts, and a white paper on resilience metrics, outlining the state of practice and knowledge, importance of setting metrics, and gaps in our understanding.

Jenn Phillips: At the February workgroup meeting in addition to our five workplan priority areas we discussed that the resilience metrics priority of the TAC workplan is key to the TAC's charge and role. At the April Council meeting we heard that this metrics effort will be key for defining terminology and clarifying the purpose of metrics, the meanings of resilience, adaptation, timelines, and more. The key questions ahead for us are: What have we learned from climate change mitigation that should be applied to how we approach tracking progress on climate resilience? What resources do we have on resilience metrics and what is the current state of practice on resilience metrics? What are the major gaps in information and our understanding? How do we best leverage existing discussions and frameworks to advance this metrics and outcomes discussion? Metrics to do what…?

Nuin-Tara Key: When we first launched ICARP and the TAC, it was clear we had a lot of foundational work to do. The first thing was to create a vision for a resilient California. Foundational to this: a resilient California requires investment, policy and action across all different systems within and external to CA. The vision has always been grounded in systems thinking, recognizing people/ social systems, natural systems, built infrastructure.

We explicitly focused in on identifying and defining vulnerable communities in an adaptation context. Want to highlight that within this, is grounded in systems approach, nature, built and human systems. What is critical to this definition is the understanding risk, sensitivity to risk, and capacity (adaptive capacity) as foundational to understanding vulnerability. We provide this context as a framework for how we discuss resilience metrics so that we build off of this

foundation. We want metrics that address all the different systems; we should think about risks, sensitivity, and adaptive capacity.

Brett Cozzolino: To inform this draft white paper I looked at both the California context and lessons from around the world. 2018 Safeguarding: splits metrics into changing climate conditions and resilience outcomes. Conditions refers to physical conditions, while resilience outcomes are split into three systems: built, natural and social systems, covered each by multiple sectors. What we're really talking about for metric, indicator or goal: we can look at other works such as the SDG UN project: a top-level goal would be a resilient system, followed by a number of indicators. Each indicator is measured by metrics. Last 15 pages of the white paper are possible metrics from Safeguarding.

There are a number of challenges ahead: incomplete data by sector. Matching across regions or sectors is difficult. Signal-noise ("fat-tailed uncertainty"). Down-scaling (or up-scaling)may result in an aggregation 'trap'. Measuring adaptation actions using mitigation actions is challenging depending on whether the adaptation/resilience action fulfills universal applicability and uniform effect. We took a survey of the literature: first, to define a management goal for a region or portion of a sector. Determine what a resilient system looks like, compared to the current system. Determining vulnerability of a system can be accomplished through a vulnerability assessment composed of a suite of indicators supported by metrics for each indicator.

Three key challenges surveyed in the building sector: Limiting or preventing damage to building stock, loss of human life or property, and 'future-proofing' built systems. Duel lens of catastrophic soon vs events in future we have to start planning for - difference in slow onset or sudden impacts. Social systems: Community resilience refers to the ability of a community to respond, recover, and adapt, and do so dynamically. It is directly related to equity. Measuring will be important because tied to equity and environmental justice. Number of tools/indicators to think through this. Natural hazards screening index.

Nuin-Tara Key: I open the floor for questions and discussion.

DISCUSSION

Heather Rock: I want to clarify - We're defining vulnerability when looking at degree of exposure, but by understanding is it's not just exposure but the combination of sensitivity and adaptive capacity. This is important to clarify because there might be a community or built system that is exposed but not vulnerable because of the way it is designed. This might inform how we define

how we think about metrics. The equation used for defining vulnerability and changes in vulnerability could be the same as a metric for determining change in resilience. If you're less vulnerable because you took action to reduce exposure or sensitivity or adaptive capacity could that not then be seen as a measure of your increased resilience?

> Nuin-Tara Key: A great point and something we talked through the TAC previously, in asking, how do we unpack the different dimensions, this is really talking about vulnerable communities: as we're thinking about understanding the factors contributing to vulnerable communities, we need to think about risk, sensitivity and adaptive capacity; there has been some evolution in terms, and unpacking and recognizing that risk and sensitivity are part of exposure.

Jonathan Parfrey: Why are we using the word risk instead of the more accepted IPCC word exposure? Just curious as to thinking behind it.

> Nuin-Tara Key: It was a combination of things; would have to go back to meeting minutes to recall rationale. May have been a point where TAC went with risk because is part of exposure, but maybe more accessible for a general audience.

John Wentworth: I heard in Brett's presentation several mentions of regions. This is top of mind for a number of reasons. Could you speak to the status of Regions Rise Together, your role in coordinating and staffing that, and how you see that playing a role in this? A quick update would be helpful.

> Nuin-Tara Key: Regions Rise Together is joint initiative between OPR and GO Biz. This effort is thinking about economic development strategies at a regional scale, recognizing regional disparities in economic growth. It's trying to focus in on regional economic development and growth across the state. Internally across OPR and SGC, we're thinking about how regional economic opportunities are tied to broader resilience goals and adaptation needs and avoiding siloed thinking around economic development. Don't want to advocate for economic strategies that are undermining resilience.
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> John Wentworth: That was my specific question, I think that's very important to be pursuing all these policies simultaneously, and that also goes for regional efforts.
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> Nuin-Tara Key: Thank you, that's a good flag for us that we need to bring in these efforts in this workgroup to help build out this metrics piece in a holistic and full way. Thanks John.

PUBLIC COMMENT

Alexandra Sokol: Whole system thinking, risk and solutions, while understanding localization and how they dovetail, is definitely important. We are working on a full framework for measuring risk at Enviro-Dynamics as well.

Nuin-Tara Key: Thank you for sharing, we will add to list of resources to review while we think through this, feel free to share additional detail.

Item 3 | Lightning Round Talks on Climate Change Indicators and Resilience Metrics

Series of four brief talks to deepen understanding in this space on tools and resources to track historical and projected changes to California's climate, as well as pathways to measure and track climate resiliency and adaptation.

Martine Schmidt-Poolman (California Energy Commission): Part of Energy Research and Development Division and specifically the Environment team. Three points: sharing data methodologies; development of data and data methodologies; and guidance and training.

Cal-adapt is publicly available, online, and tries to convey the local climate risks. The website offers possibility for everyone to look at some data and enables custom decision support tools. This is the 4th assessment generation of data. Cal-Adapt stages of development were: at first started to show case research, and then moved forward to enable scenarios to be shown, and now we're working on expansion of the data infrastructure.

There have been questions for CEC from IOUs for higher resolution data and new and improved method so that we have a better understanding of climate threats to energy infrastructure, the risks associated with different weather or climate compound events such as things that might lead to mudslides, and also the identification of climate hot spots that pose a risk to infrastructure maintenance and operations.

There are different users with different backgrounds. Some need raw data, some need more help with processing the data. We've heard a need for providing more aids, more insight into data source limitations, parameters, and insights into

when updates will come. Hopefully will soon have a Fifth Assessment to update data. Other data gets updated as research happens.

Regarding use of Cal Adapt for deciding on metrics: data on Cal-Adapt has been used by a lot of different stakeholders, beyond the energy sector as well. It's recognized as key resource in legislation, decisions reference it as a point of access for data, it's a resource for state agencies and many other stakeholders. Pointing at Cal Adapt as a source of data that different organizations could use goes from legislation and CPUC rulemaking, IOUS use it for vulnerability assessments and on the ground resilience efforts.

The future of sharing, development, and guidance: the real big question we've gotten is the need for higher resolution of data and new methods. We have a 4 km grid and daily information but have a broader need of 2 km grid and hourly updating of data. We need more collaborative development so we can gain decision support tools, and there's extra need for training and assistance.

CEC will hopefully decide about development of a high-resolution historical climate dataset, but focused on natural gas sector (where the funding is coming from). Will address some of the higher resolution data, look at passed up until 2019. Will include some of the big events of the last decade, such as mudslides, wildfires, drought and what these mean in a historical dataset. Will feed into future research and 5th assessment as well. Hoping a web-based data assimilation platform will be funded, for access to data such as weather observations, remote sensing and modeling of historical climate data. Finally we have a grant funding opportunity open for next generation of climate projections to enable this data to be delivered. Thank you. Would love to chat more about how this platform can inform these discussions.

Nuin-Tara Key: It's a tremendous asset to have Cal-Adapt and all the work CEC does to help us with this foundational information and future climate projection data. It appears there are no burning questions.

Carmen Milanes (Office of Environmental Health Hazard Assessment):I'll talk about the indicators of Climate Change Report prepared by OEHHA on behalf of EPA. 20 years ago, the CalEPA secretary directed OEHHA to develop a comprehensive set of environmental indicators: metrics describing the status of or trends in the various elements of the environment. Intended as tools to report on trends, such as air and water quality, pesticides, waste, ecological health, environmental exposure and human health;a state of the states' environment report. Another intended use that didn't come to fruition was for tracking achievement of CalEPA's environmental goals.

Conceptual basis is the pressure state response: pressures or stresses from human activities and natural phenomena can alter the state or environmental conditions leading to effects on physical environment and human and ecological health. Response from society or government is only after we're aware there's an adverse effect despite efforts to be proactive, so we mount a response directing at alleviating, repairing, cleaning up or reducing pressure. The environmental indicators for California published in 2002 covered indicators in the first two parts of the conceptual diagram.

Recently focus shifted to indicators of climate change, based on the same conceptual model: climate change drivers are the pressures: they alter the climate state, leading to impacts to physical and biological systems, eliciting adaptation and mitigation responses. We have three dozen indicators that track drivers (changes in climate) and impacts. Indicators are categorized based on conceptual model. Each piece is only possible when data are available, so the picture may not be complete. Each piece is also a narrative looking back. Collectively they provide story and context for mitigation and adaptation. These involve scientific and technical expertise that are outside of OEHHA core expertise. Report is only possible from collaboration and input from more than 70 collaborators across other sectors and agencies and research institutions.

> Jonathan Parfrey: Thank you for the presentation. Regarding the Grinnell resurvey: I've noticed there hasn't been very many updates to this project recently. Does this project continue and is there thought of expanding this work so we can get a sense of plant/animal migration and refugia?
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> Carmen Milanes: Effort does continue and they have some more focused studies on some of the transects that are part of the Grinnell survey. Our ability to generate indicators depends on availability of data. OEHHA does not have funding to fund research and development of data. We monitor scientific literature continuously and check in with collaborators frequently.

Nuin-Tara Key: This is a great example for process, development of the indicators. Thank you.

Dorian Fougeres (California Tahoe Conservancy): Hello, I am Chief of Natural Resources for the CA Tahoe Conservancy within CNRA. I am co-led for resilience team for International Union for Conservation in Nature. This presentation is for framing and ideas for how to approach this kind of work, we've done a lot here in Tahoe as well which will show here as well.

Starting big picture there are three different ways resilience can be used: as a metaphor or synonym for sustainability, colloquially; qualitative approaches; and the quantitative side.

Conceptual approaches to consider: Complex Adaptive Systems (CAS); adaptive cycle approaches; panarchy. Keep in mind that human systems aren't separate from ecological systems: this is social-ecological resilience. Adaptive capacity, as a part of resilience. Finally, transformability.

Setting concepts aside and getting practical: set the orientation by starting first to ask: resilience of what to what? Consider values for whom? Getting specificity on the frame for the whole process. Process: who develops these, who assesses monitors, reports and uses these? Consider both qualitative and quantitative approaches. May be difficult to measure long duration pieces, due to how long it takes and data limitations. You also have to think about ranges of indicators, composites. Consider utility, prioritization criteria and performance measures piece.

Think about seven design principles: diversity and redundancy of different elements in your system; how well connected they; slow variables; leverage points; 5-10 yr. period; participation; poly centric governance.

Some Tahoe Conservancy examples: strategic planning, dedicated funding; mainstreaming, updated science foundation, program assessment and adjustment, investing in our staff; communications and pushing the story of why it's important; efficiencies and agreements with partners such as Federal – Good Neighbor Authority; advocacy for alignment and integration; the practical application of science; finally, planning for transformation.

Nuin-Tara Key: Thank you, questions? Seeing none, we can move on to our last speaker.

Adam Parris (NYC Mayors office): Thanks for having me, I am the Deputy Director for Climate Science and Risk Communication in Mayor's Office of Resiliency in New York City. Just want to hit three lessons learned from our work. We've done lots of work on indicators through NPCC and other efforts but yet to have a unified set for resiliency and adaptation.

The first lesson is figure out and own up to what you're trying to achieve. Avoid the pitfall of trying to find the perfect metric. An indicator is a metric that has meaning in the context of what you're trying to achieve. In between what we want to achieve and how to get there and exactly what outcomes we want there can be a lot of disagreement. Difficult in a static and a rapidly changing world. Hard to be flexible and adaptive in the face of uncertainty and

ambiguity. Adaptation is an opportunity to break from the status quo. In a sustainability context or socioecological resiliency context this may mean facing up to historic injustice.

The second is the ends don't always justify the means: figure out how you're trying to achieve it: process indicators as well as outcome indicators. If a community felt like process wasn't fair or wasn't just or may counteract community long term goals, they may fight to reverse this decision or future decisions, perhaps for good reason. We are woefully short on data for process. Figure out what you want to achieve, but challenge is we don't necessarily know what adaptation looks like, and even if we do it can change rapidly; and then how you achieve it, what makes for a quality process and really good relationships, i.e. with constituents.

Thirdly every indicator represents a network of partners. If you create an indicator with bearing on investments, you need to be able to track it to build a story about progress and make due in accountability to public good. Need to track over time, need publicly available data or a commitment to generate that data and track that indicator continuously as long as is needed. Don't take partnership lightly from an institutional standpoint, and why we need institutional arrangements. We don't have an unlimited amount of attention. Setting up the right numbering scale of indicators and the right number and scale of networks of partnerships to continue to look at those indicators over time is crucial.

Nuin-Tara Key: Thank you. Let's break now and then discuss.

DISCUSSION

John Wentworth: These are critically important and germane points.

Jonathan Parfrey: Would be fruitful exercise to take Dorian's systems analysis and try to populate it, given some of the concerns we have. This could be helpful for moving us to the next stage.

> Nuin-Tara Key: Do you mean expanding statewide, using it as a model?
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> Jonathan Parfrey: You touch on an important point. There are different regional, statewide and sector analyses. May need to analyze through these lenses too.

PUBLIC COMMENT

Alexandra Sokol: Are you working with anthropology groups on the human factor side of this as at all?

> Nuin-Tara Key: We have not yet but since we are in early stages, that is a great suggestion.
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> Alexandra Sokol: I wanted to thank you all also for the inclusion here; great speakers, great presentations. A lot of the work that we've been doing as well with both the Millennium Group, the American Anthropology Society's take on disaster and risk; this really dovetails a lot with the work that we're doing trying to map risk and resilience on a neighborhood by neighborhood basis.
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> Nuin-Tara Key: Thank you, we will add to list of resources and engage with anthropologists as well through this process.

BREAK

Item 4 | Draft Scope of Work and Goals for Resilience Metrics Work Group, and Roles of Work Group Members

OPR staff led discussion on draft scope of work and timeline for the metrics work group, as well as expectations of work group members and OPR staff.

DISCUSSION:

John Wentworth: We have arrived at an inflection point. Bullets and buckets and some general observations: there is a critical role for OPR and the TAC going forward to firstly provide the appropriate framework for the larger efforts going forward. In terms of geography we've seen two different representations of geography which gets us to Regions Rise Together. The gentlemen from New York touched me in several ways. I've been watching Governor Cuomo's Covid updates and he never fails to speak of New York in terms of its regions: it is a critical organizing and framework tool. The gentleman from New York also cautioned us about not drowning in data. Need to play long game, set altitudes, regions, 20-30-year horizons. We do not have unlimited amounts of attention. Need to be judicious and smart about when we say something that it's actionable, meaningful, we can do something with it. Great efforts to align with include the USDA Forest Service recently published documents around the Sierra Nevada Recreation Infrastructure Vulnerability Assessment and

Adaptation Strategy Partnership. Shareable data, landscape scale. Opportunity to marry that Federal work with State work so it's the full complete geography of the state.

Nuin-Tara Key: Thank you and now Jenn I'll turn it over to you.

Jenn Phillips: We'll talk about scope of work and timeline now and the framing. Goals include to identify needs for adaptation, track implementation of actions at varying scales, guide allocation of our resources, assess our achieved results in the state planning areas. Still working on an achievable scope and timeline. We've heard many approaches Does it make sense to structure this work around these systems and what are the intersectional issues that come up across these systems and how do we think about sectors and things that cross these systems of natural, built and social? The next is do members have input into these working definitions and systems we propose today for metric and indicators? How are we talking about and defining what a metric is and what an indicator is? Other gaps we should be tackling? Who are the experts? Which particular systems we should dig into We will talk to individual TAC members after as well who couldn't be here.

John Wentworth: Important to have standardized metrics across the geographies of State, Federal levels so we don't have too many different systems.

> Nuin-Tara Key: Standardizing approach: 100% agree with having consistency about how data is collected and presented. Need to explore and recognize that not all indicators will have the same meaning or value or relevance in a specific location or region. So yes, to standardizing but also make sure we're not oversimplifying, there's no one perfect thing. What are the indicators that don't make sense to bring up to the state level, versus ones we do?
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> John Wentworth: As long as we're looking at the full geography, then we should be able to tease that out.

Karalee Browne: Might be better to begin with what indicators to not consider, easier to whittle down. We came across similar situation in mitigation in figuring out metrics, where all cities and regions are not the same, indicators don't have equal value.

> Nuin-Tara Key: We're interested in recognizing this question of where do you start? Could we have focused conversations on a specific system if we do take this three-part systems approach if we go this route and consider them together? Another option to consider.

Jonathan Parfrey: One indicator that might be asking how universal public understanding of those climate risks is. Could work with PPIC on environmental poll. Public health has to be front and center as one of the key indicators. These two things might be universal throughout the state.

Heather Rock: Thinking at higher level about framing this, what we can control and what we can't. We do have a good structure for how to do a vulnerability assessment looking at exposure, sensitivity, and then adaptive capacity to get a measure of vulnerability. It seems that if we want to become more resilient isn't it best to reduce that vulnerability? It seems like there is an opportunity where we when we reduce our exposure by building differently, or how we control our sensitivity by changing design standards, or adaptive capacity by educating the public about climate or changing our ways – by doing these things aren't we decreasing our vulnerability and moving towards resilience? Are there then indicators we can measure to track our progress. If we do our vulnerability assessment and then put our adaptation plans in place, we increase our resilience but then we need to keep doing them again and again as our exposure changes over time. Can we track this over different sectors and communities and regions and think about it through broader framework that can be applied across different buckets, regions, communities, instead of throwing in indicators that may or may not be relevant 20 years from now?

> Nuin-Tara Key: I'm with you, both Dorian and Adam said similar things: understand why, what the purpose is, and what the use is. From state perspective, I see a need to understand how to make progress in reducing exposure and risk and building capacity. We have a better understanding of our risks and how to track that, recognizing that it's evolving. But there's a gap in understanding how we know we are making the right investments to buy down that risk.

David Loya: I agree with John's point to capture regional indicators, and also indicators that crossover with other collection schemes. An indicator is a metric with a meaning to what your trying to achieve. Tendency to jump into picking indicators that are readily available and starting to track them, whereas we need to figure out how we're using them before we select them. Discussion around definitions: we should consider those and dig a little more deeply. Both the definitions we're using now for indicators and metrics and how we're using those. Would be interested in revisiting the definitions used in this framework. Before launching into picking experts to consult, maybe have more full council and working group discussions to hone in on purpose and how to achieve.

Andrea Ouse: I think that having the regional approach makes a lot of sense but also it needs to be scalable to roll up to state and to local level. We're walking a

knife edge between easily translatable and simple things. We expect these metrics to mean something and the reportability has to be in a framework that can be widely understood. I love the idea Jonathan had to bring in public health. In the planning world we are really pushing that intersection to get that public health and environmental justice and sustainability at the table at all levels of policy at local level. Public health at the table is really critical for knitting systems together. Love the regional aspect, public health aspect, and love not drowning in data.

Mark Starr: I'm with the California Department of Public Health. Appreciate the recent comments about public health. The three seems appropriate, natural, built and infrastructure systems heavily impact human health and is important from public health perspective. We're heavily focused on social systems aspect. In the white paper there's an emphasis on the importance of human vulnerability and equity indicators in the narrative, but not many indicators and metrics in the appendices in the table of example indicators and metrics. We can help with that, Linda Hellend is on this call and Meredith Mallette. We have our Climate Change and Health Vulnerability Indicators and a visualization platform, which includes things about adaptive capacity and identifying people at highest risk of harms from climate change. We have other tools available, indicators about neighborhood stability and social cohesion, all these would be important additions to really look at the human impact of this and have metrics and indicators that address that. We and others have used these tools for grant and policy guidelines and for local health departments. Would be a great place to have this demonstrated at a state level.

> Nuin-Tara Key: Thanks for flagging that. A quick note, what's in the draft white paper is a start. If there are other existing resources, datasets, tools, information, perspectives on indicators that we should bring into the white paper, let us know what we need to add for review.

Jenn Phillips: We will continue working on this white paper throughout the course of this workgroup. We welcome comments and this will help us map scope and timeline. I am leaving OPR and moving on to the US Climate Alliance. Because of this we have some capacity challenges. We need time to create a more realistic scope and timeline with this in mind, and think through how much capacity you all have to engage in this effort.

Nuin-Tara Key: We are sad to see Jenn go but excited to work with her in a new capacity. Just to recap: this has been a tremendous amount of information and insight from TAC that we need to synthesize, and strive for an update at the next full June meeting. Need to think about frequency of work group meetings, how to stage moving forward, were initially thinking though having focused discussions on the systems but I like David's suggestion to have workgroup

conversations to focus on goals, purpose, definitions. We will bring back a proposed approach and sequencing moving forward.

John Wentworth: I am involved in a parallel effort that is happening with state funding. What is appropriate for sharing the draft document with Placeworks, USDA Forest Service, economic consultants out of DC, and others? Is it appropriate to share? Then we could learn from each other's efforts.

> Nuin-Tara Key: Yes please, feel free to share through networks and help us get input. All materials shared with council are also public, link is shared. Any final questions from councilmembers?

Jonathan Parfrey: What is the timing of TAC meeting on 26th?

> Jenn Phillips: Haven't solidified, don't expect it to be a full day, will be truncated, but there's a lot to cover. We will circle back.

Item 5 | General Public Comment

Brian Shobe with the California Climate and Agriculture Network (CalCAN):Who should I contact to suggest experts and what expectations do you have for consulting those folks so that I can communicate that with them?

> Nuin-Tara Key: Send suggestions to Jenn and me. I can't give specific expectations but at a minimum it would be joining a work group conversation or sharing resources. We're not thinking of pulling together an advisory or science technical group. They could present or help us think through specific questions.

Brian Shobe: Other question: how to handle sectors that cross systems – I think of food security and agriculture as crossing multiple systems such as ecosystems, but distribution is dependent on built and social systems. Not critiquing the three-system approach but if you can share any preliminary thoughts you have.

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> Nuin-Tara Key: That's a great example of the type of things we need to think through. From my personal perspective I think the systems are helpful to organize and bucket, but recognizing that people don't live in systems or sectors, they live in integrated communities and dependent on all of these pieces. How we reflect that integration is something that we still need to think through. Don't want to think about agriculture as only living in one system. That's a question we have so getting some expert insight from folks will be helpful for thinking through.

Brian Shobe: Last question, about metrics in the appendices: urging this workgroup to focus on outcomes over outputs. For example, there was a metric around healthy soils program projects; from our perspective the goal of that program is to catalyze adoption of healthy soils, resilient adaptive practices, across agriculture beyond the specific projects, which is why we included demonstration and outreach projects in the program. And there's not currently a system to survey farmers about use of those practices (there's a state level federal survey though). That's a need we've talked about and it would be helpful for OPR or this workgroup identify those needs for meaningful data. Which is about the use of those practices, not just the number of projects.

Carolyn Yvellez with Harris and Associates: We don't need to develop resilience metrics in the same risk assessment framework, it won't necessarily fit. Are we trying to reduce exposure or are we trying to reduce dollars spent on lost infrastructure? Are we trying to reduce sensitivity, or are we trying to reduce rates of morbidity and mortality? The Notre Dame Global Adaptation Initiative did an indicator based approach to assessing risk and readiness and tried to do modeling based off of dollars, determining how much risk a city faces based on dollars lost historically from storm/extreme weather events, and didn't find correlations between these indicator based approaches and dollars lost and lives lost. The challenge remains modeling it even if it's a goal.

Item 6 | Wrap Up and Meeting Adjourned

Nuin-Tara Key: Thank you and please provide links. We will now wrap this meeting. Thanks to presenters, to councilmembers, and to everyone from the public who joined. Thank you all, see you on the 26th.