

## Integrated Climate Adaptation and Resiliency Program

## Resilience Metrics Work Group Meeting

FEBRUARY 24, 2021 10:00 AM - 12:00 PM (PDT)



- Item 1 | Welcome and Roll Call
- Item 2 | Approval of Meeting Minutes
- Item 3 | Lightning Talks on Resilience Metrics
- Item 4 | Discussion on Social, Natural and Built Resilience
- Item 5 | General Public Comment
- Item 6 | Wrap Up and Meeting Adjourned



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#### Resilient Built Systems

"Infrastructure and built systems withstand changing conditions and shocks, including changes in climate, while continuing to provide essential services.

#### Why do we want to measure resilience in built systems?

Goods movement, roads maintained

Delivery of water to CA homes services. If those systems fail or operate poorly, services become disrupted.

to know that the costs of investments in infrastructure are yielding benefits

To ensure that we are making progress on our resiliency goals/objectives. need and we want to

Indicates emergency response capacity (shelters, energy, evacuation)

Pets and stock animals taken care of statewide goals are met, inform future planning and prioritize investments

Important to understand how infrastructure will function in light of shocks and stressors for resilience planning

## When last we met...

lifespan of built systems is key to resilience

Human (and animal) health and well-being depend on built systems (in our culture/society)

Delivery of electricity to CA Homes and businesses.

to ensure critical infrastructure can perform under times of stress under dynamic scenarios

Identify gaps where /ulnerabilities exist

are live, and emergence to all

To ensure we are allocating resources in an effective manner

built systems enable equitable basic services (clean water. energy, etc)

Water quality and air quality maintained as best as possible.

built systems enable equitable basic services (clean water. energy, etc)

can indicate exposure to la recovery cos

mobility

continuity of services (maybe not 100%, but 80%) during extreme weather events

Understand at what point thresholds in built systems are exceeded and how the systems begin t

Food systems are operating

In order to gauge the level of future investment in infrastructure

continuity of services (maybe not 100% but 80%) during extreme weather events

Medicines and health care available To ensure we are allocating resources in an effective manner

v want to measure resilience to ensure equitable services throughout communities from the built ecosystem, and we want to measure carbon emissions through lifecycle carbon analysis to ensure that measures to improve resilience across built environment do not make the core climate crisis worse (avoid maladaptation through increased GHGs).

Built systems are proven carbon-

emission neutral. Built systems

can serve one purpose in

business as usual situations, and

perhaps serve more critical

purposes in times of shock and

stress. Use of built systems is

equitable (e.g., EV charging,

electrified transport in lower

income areas).

#### How would we know if California has resilient built systems?

The system would be considered resilient if it is ble to provide the same or a similar level of service during or soon after hazards events or rolonged but permanent changes

continuity of face of extreme weather events esitience, and th policies are

continuity of services is held, or only disrupted temporarily

and improved:

(Prior question) Lifeline service restoration timeframes are tracked, trended

systems are climate impacts

> Key infrastructure can withstand climate impacts ncreasingly more

any new

in mind

A system that

enables us to

oth recover and

move forward

after shocks.

Drills, exercises, tests, etc. (e.g. "load testing"

in services occur.

we can provide critical services during shocks to our system; we have built our systems to function reliably and safely amid changing environmental conditions

That part is important (measuring after an event), but it is also important to have a way to measure before any events or changes

Key infrastructure

can withstand

climate impacts

ncreasingly more

intense

during or soon after

changes

intentional

redundancies

to compensate

for failure

points

resilient if it is able to provide the same or a similar level of service during or soon after hazards events or prolonged but permanent changes

The system would be considered

By ensuring that State and local governments have access to adequate resources necessary to plan for, design and construct resilient systems.

#1 is what is current condition of built systems I.e. what does the maintenance or upgrade list look like now and how #2 what are 30-50 year public service goals and how well does built

1. Why do we want to measure resilience in built/natural/socialhuman systems?

2. How would we know if California has resilient built/natural/socialhuman systems?





## Resilience Metrics Survey

- 1. Do you use climate resilience metrics in your work?
  - a. Why do you measure climate resilience?
  - b. Please share your indicators and metrics
- 2. Have you come across climate resilience metrics from other organizations that you think could be useful to your work?
  - a. Please provide examples of climate resilience metrics that you think are worth sharing.
- 3. What do you think the state should measure to demonstrate its progress towards achieving climate resilience?





- To measure progress, to understand adaptive pathways
- We measured resilience to inform our restoration strategy for Lake Tahoe West, a project designed to take an all-lands approach on the west shore of Lake Tahoe.
- To ensure funds are being invested in projects that can withstand climate change impacts
- To determine and outreach our progress
- To better understand risk
- To assess function and value over time of publicly-funded capital improvements





- To help measure the effectiveness of coastal adaptation or hazard mitigation strategies in preserving coastal ecosystem functions and protecting infrastructure, people
- Health and socioeconomic factors related to health
- To measure degree of challenge, and progress.
- To determine if adaptation actions are working to address climate impacts
- Part of overall monitoring program and region sustainability dashboard
- To see how well the community is responding to different strategies or crises



## Why do you measure climate resilience? (n=15)

"Resilience alone is not something that can be measured in one metric or indicator, but will require a suite of information to be assessed comprehensively to detect changes to a given system, habitat, community, etc. Understanding these trends over time is so important to informing good investments, planning, and policy development."

# What do you think the state should measure to demonstrate its progress towards achieving climate resilience? (n=38)



- \*GW levels, GHG's of course, temp, snow, rain, flood, fire
- Knowledge community has about its climate
- Critical facilities, individual homes, businesses protected from a climate hazard
- Fire return interval, biodiversity, water stress
- Watershed partnerships should define the appropriate metrics for their watersheds.
- \*Reduction in GHG; and critical infrastructure redundancy
- Social/spatial information to understand resilience/adaptation efforts through an environmental justice lens. It would also make visible the areas that still need work/improvements.

#### Resilient Social Systems "All people and communities respond to changing average conditions, shocks, and stresses in a manner that minimizes risks to public health, safety, and economic disruption and maximizes Frame 1 equity and protection of the most vulnerable. Why do we want to measure resilience in social systems? To keep the focus to ensure public on resilience (of safety and Resilience To identify ways to identify health To ensure that which health equity community to support and priorities boil disparities and recovery following is a part) since what resilience in the direct our efforts. down to: a disaster is we measure gets face of climate capacity to to the most equitably Resilience for respond to impacts vulnerable addressed whom? stresses People are the actors who will move us to resilience, if we don't nurture their resilience, we can't get. to prioritize to understand to make sure To foster equity: anywhere. resources to vulnerable prioritizing to better build when social communities are not most resources for those Also we are at the end of the day a human society equity into our systems are who have getting impacted by moving towards a preferred (hopefully) future, if we vulnerable resilience work breaking down climate change to a experienced can't see ourselves and our needs in that future, we're communities greater degree or broken going to leave many out and/or do harm while trying disinvestment to make things better. To prevent and People are the ones To ensure that the social system to avoid the historical to ensure that to identify any to understand the who initiate and doesn't erode with changes due to pattern that the gap mitigation and maladaptation underlying factors operate resilience equity impacts of between the most shocks/stressors, etc. and instead that determine how adaptation and resulting climate change, vulnerable and the strategies, and they well a community people have access to (at minim) strategies actually disproportionate most secure widens need social system can cope and basic needs but preferably to more improve quality of negative impacts communities facing when systems are to do that address those inequities Because in Ag at least, certain we need to understand the To focus on equity and fairness communities suffer directly impacts to social systems and for its own sake and human impacts with the weather, affecting integrate this into planning in addition to government cohension, education, etc. and adaptation- otherwise infrastructure provides benefits equitably and fairly and nature this will be a barrier

## Interagency Resilience Work Group

State partners working on adaptation and resilience

## **Analysis of Discussion Findings**

#### Protection of natural and working lands/environment

#### Adaptation/Resilience

- physical processes are in state of equilibrium
- responses to drought and extreme events
- coastal wetlands and beaches maintain pace with rising sea-levels
- increase in the rate of migration and integrity
- reduction in the rate of natural system disappearance/damage
- rates of beach loss
- continuation ecosystem services
- assess capacity to respond to stressors, visitation

#### Biodiversity/wildlife

- biodiversity (growth/loss)
- biodiversity is maintained
- thriving species
- gain or declines in species
- wildlife adaptation/resilience
- ecosystems not being overtaken by invasive species

#### Working lands

- soil resistance to erosion
- healthy soils
- pest patterns in crops
- pets and stock animals taken care of
- rangeland animal health

#### Water Resources

- rate of water storage
- water flows
- water levels
- watershed partnerships should define their own metrics
- groundwater levels
- water quality

#### Climate Mitigation/Risk Reduction/Disaster Relief

#### Natural disasters

wildfire habitat



## **Built Resilience**

- Need standardization to institutionalize
- Need method to prioritize which asset to work on first
- Energy generation is changing; don't get locked into existing systems
- Need study and analysis prior to developing a new asset
- Framing: people may already be doing adaptation, just calling it something else
- Learn from earthquakes; building resiliently with the hazard
- Look to other regions (OneNYC, Regional Cities Network, Houston)



## equilibrium continuation watershed outdoor metrics function/deliver<sub>flows</sub> restored/preserved define Working groundwater collective ecosystem processes catastrophic overtaken



## Natural Resilience

- Capture co-benefits
- Capture intrinsic value of nature habitat/biodiversity
- Look to SFEI Adaptation Atlas as way to see how natural systems help protect from climate impacts

## Social Resilience

- Crucial to use environmental justice / frontline community lens to identify where to focus our resources to protect human life
- Equity has to be the priority
- Social resilience is glue to ensuring resilience across natural and social systems
- Look to EPA's update of EJSCREEN, which is currently updating their data and analysis on environmental justice and social systems





## Resilience Presentations

# Dr. Robert Lempert RAND Corporation



## Resilience Presentations

# Kimberly Clark Southern California Association of Governments



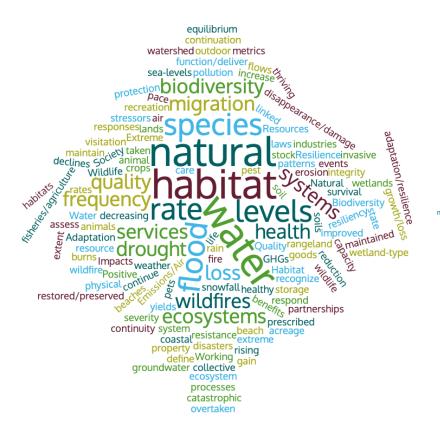
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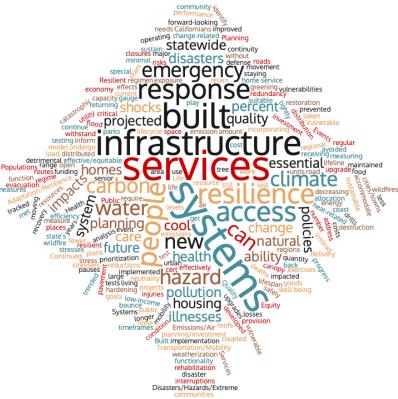
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## Bringing it all together









## When good metrics go bad...

- Money spent isn't everything
- Context specific
- Fair
- Transformational
- Comprehensive
- Robust

- Courtesy Stephane Hallegate, World Bank



## **Metrics Discussion**

How can we strive to get it right?

What should we watch out for?



## Digging into Social Resilience

What social resilience indicators should we develop?



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## Resilience Metrics Timeline

| Winter WG | Identify Purpose & Initial Indicators                                       |  |
|-----------|---|--|
| March TAC | Discuss Purpose & Indicators   Overview of State Adaptation Strategy        |  |
| Spring WG | Refine Indicators & Purpose   Identify Metrics                              |  |
| June TAC  | Approve Purpose, Indicators, and Metrics for Stakeholder Engagement         |  |
| Summer WG | Resilience Metrics Stakeholder Engagement   Finalize Indicators and Metrics |  |
| Sep TAC   | Adopt Resilience Purpose, Indicators and Metrics                            |  |



## Thank you!

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