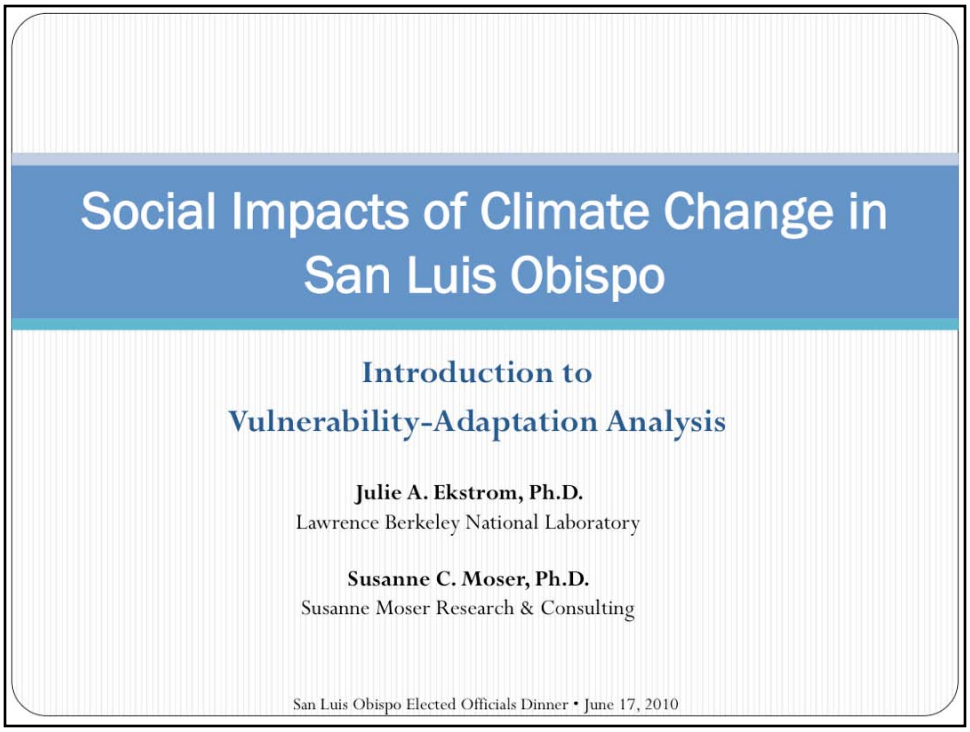


My name is Julie Ekstrom, and I'm a postdoc working for Susanne Moser. She and I wrote the vulnerability and adaptation assessment for the county, which was used as the basis for the social systems workshop last month.

Overview and Goals

- **Overview: What is Vulnerability & Adaptation?**
- **Selected Findings from SLO Report**
  - Vulnerable Populations and Communities
  - Vulnerable Economic Sectors and Activities
  - Vulnerable Services and Infrastructure

Here is what I would like to achieve with my presentation:

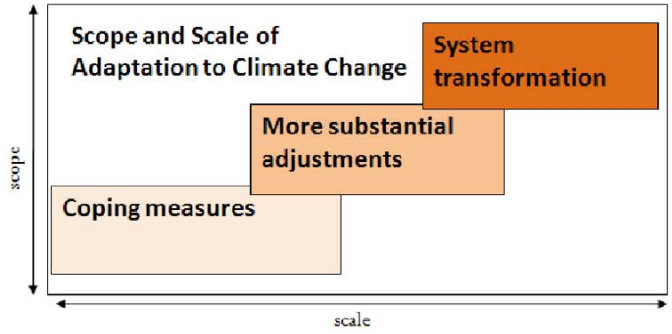
Introduce you to way of thinking about climate change impacts that
goes beyond climate model projections
emphasizes the social aspects of potential impacts
integrates climate threats with existing stresses and vulnerabilities

Apply this perspective by providing you with an overview of how San Luis Obispo County's population, economic sectors, and community services are vulnerable to climate change

Now I'm going to go through some of the key concepts related to adaptation.

Adaptation – What's Involved?

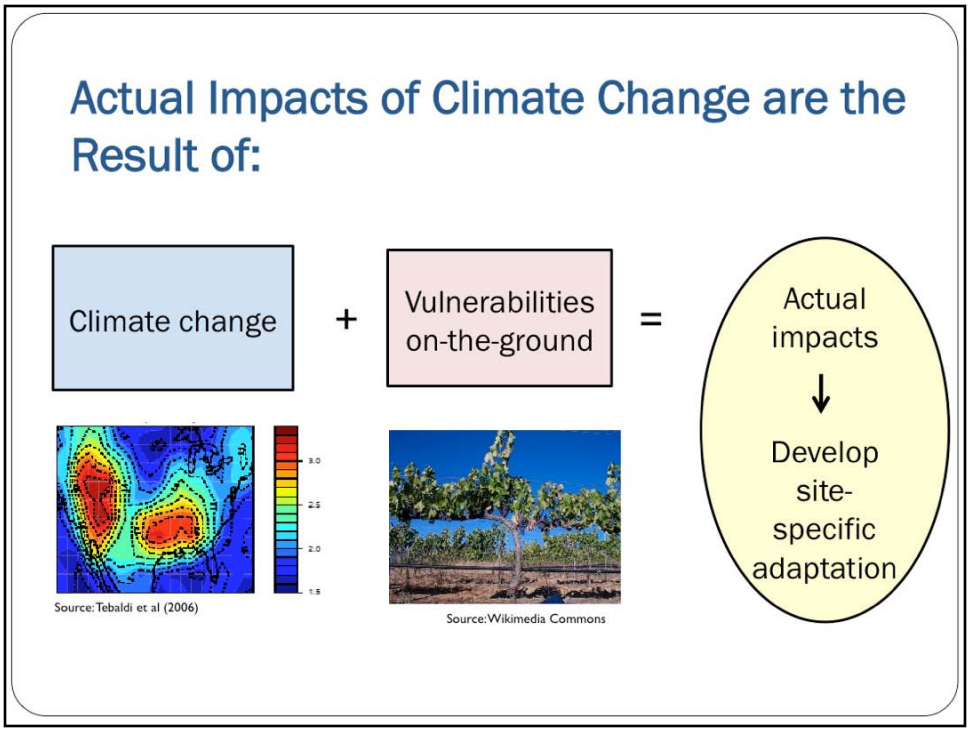
Those adjustments one might make in a system to prepare for and deal with the impacts of climate change.



DEF

The way we use adaptation is consistent with the state and its recent adaptation strategy.

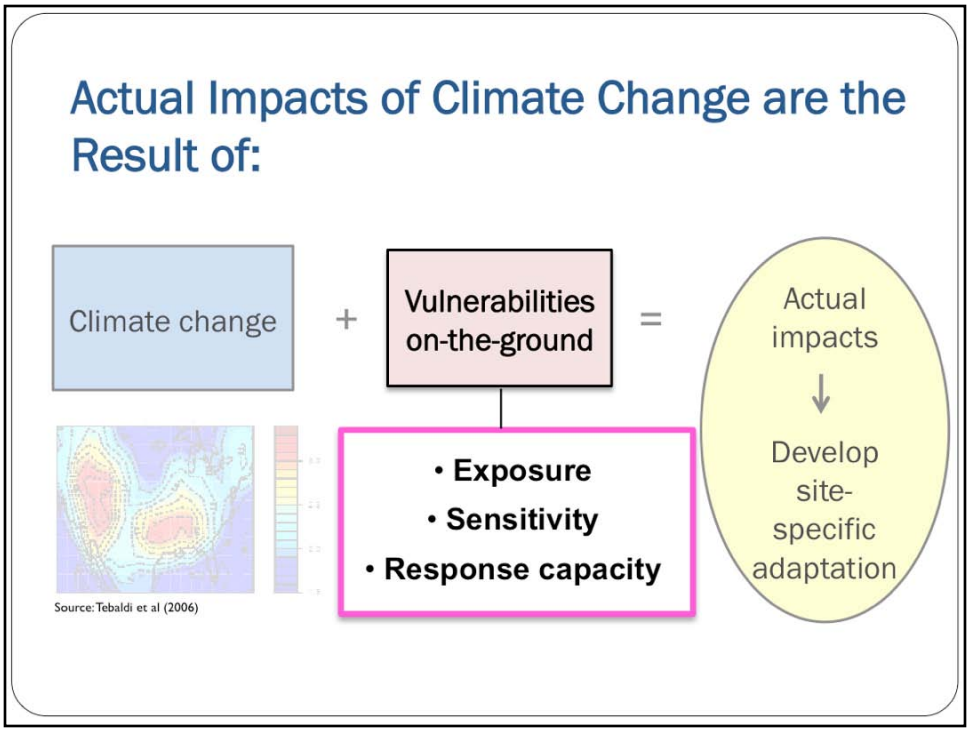
But still adaptation is a broad concept. Encompasses coping in the short term to climate change, all the way to large scale and long term system transformations like complete shifts in economies, policies or decision making systems.



In terms of understanding the **actual** impacts of CC, these are a result of both cc impacts but also social (populations, economies, services and infrastructure) vulnerabilities on the ground.

1. What are the climate change projections?
2. What are our existing troubles (a.k.a. vulnerabilities)

Together from these you can determine the actual impacts from climate change that you should be preparing for and adapting to. Rather than just relying on one type of assessment, we provide both to help SLO County develop site-specific adaptation so you'll develop more effective, no-regrets adaptation strategies



There are three components used for understanding vulnerability are:

One way I think about these is: flu, stress, exposure, sensitive pops, and ability to respond

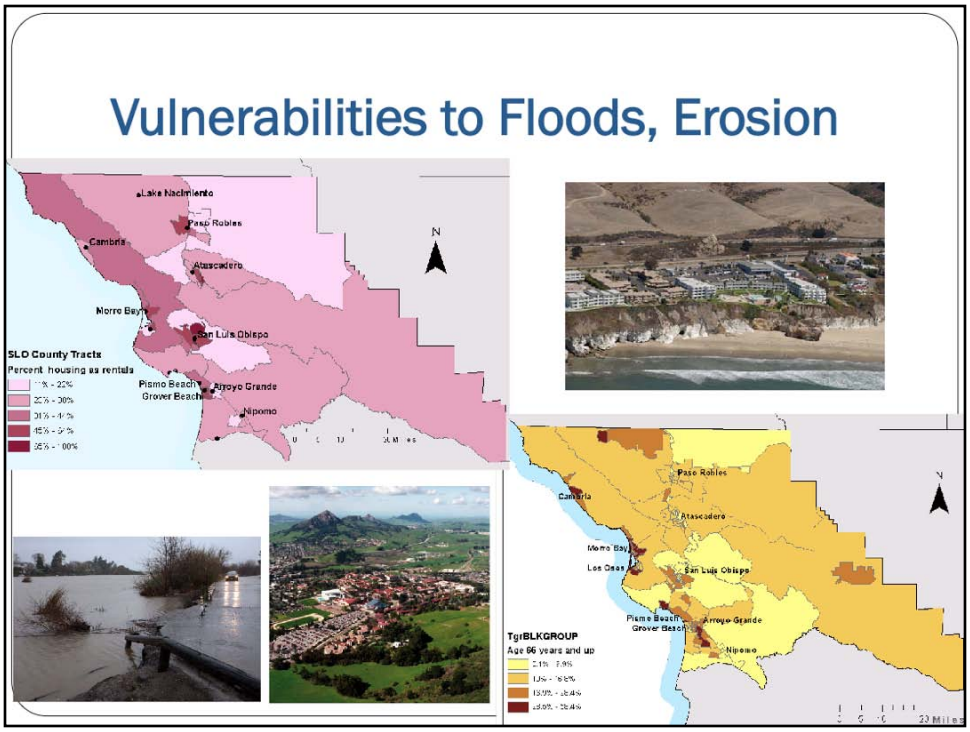
Exposure – who and what is exposed to the current climate variability (floods, fires, heat, SLR)?

Sensitivity – Some populations are more sensitive to climate variability than others. Who are these where do they live and work?

Adaptive capacity refers to ability to cope with extreme events, to make adaptive changes, or to transform more deeply, including the ability to moderate potential damages and to take advantage of opportunities.

So now I'm going to use these concepts to show you some of the findings from the study that Susi and I conducted a study to assess the vulnerability of social systems the County.

In the full report we provide all the details and go into a lot more depth that I can here. I'm just going to go through a selection of our findings from this assessment.



So let's think about SLR and intense rain. Why does it matter in SLO County?

Extreme rain events –flooding

-Exposed: At risk: downstream of Salinas Dam (atascadero) and Lopez Dam (arroyo grande)

- Lower Response Capacity? **Renters** are one group of the population that **don't have control** over making necessary alternations to their homes and might not have flood insurance. When revising the flood risk assessment for the county, while incorporating the risk of more extreme rainfall events, the county might also want to develop incentives for owners of rental homes in higher risk floodplains.

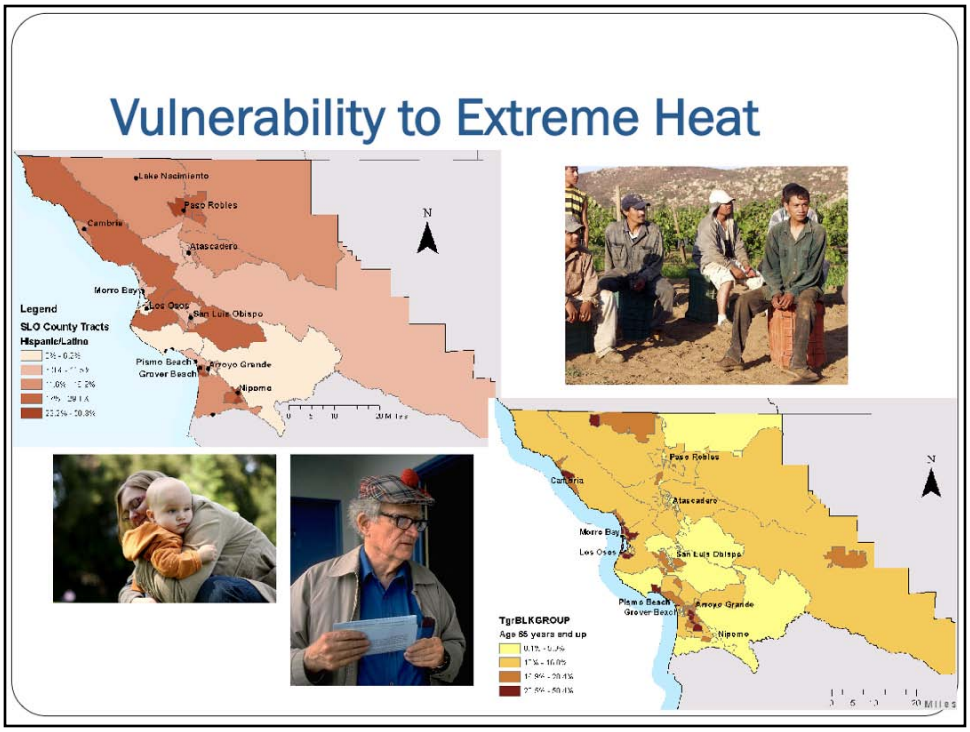
1300 people living in the 100 year coastal flood zone with a 55 inch SLR

-Relative to other CA counties, this is low, and may not be one of priority regions for State to assist

-- in terms of who could be more at risk to the flooding

-Capacity to respond:

-- elderly tend to be less mobile in times of disaster, and you can see there are pockets of more elderly people in some areas than others, esp along the coast. So for evacuation preparation programs need to consider not only the where the elderly are living in current flood risk areas, but where those areas are that will be at greater risk from CC.



So now let's look at heat impacts from climate change. As Marni showed, SLO will experience more frequent and intense extreme heat waves from climate change. The temperatures will increase more in the inland areas of the county.

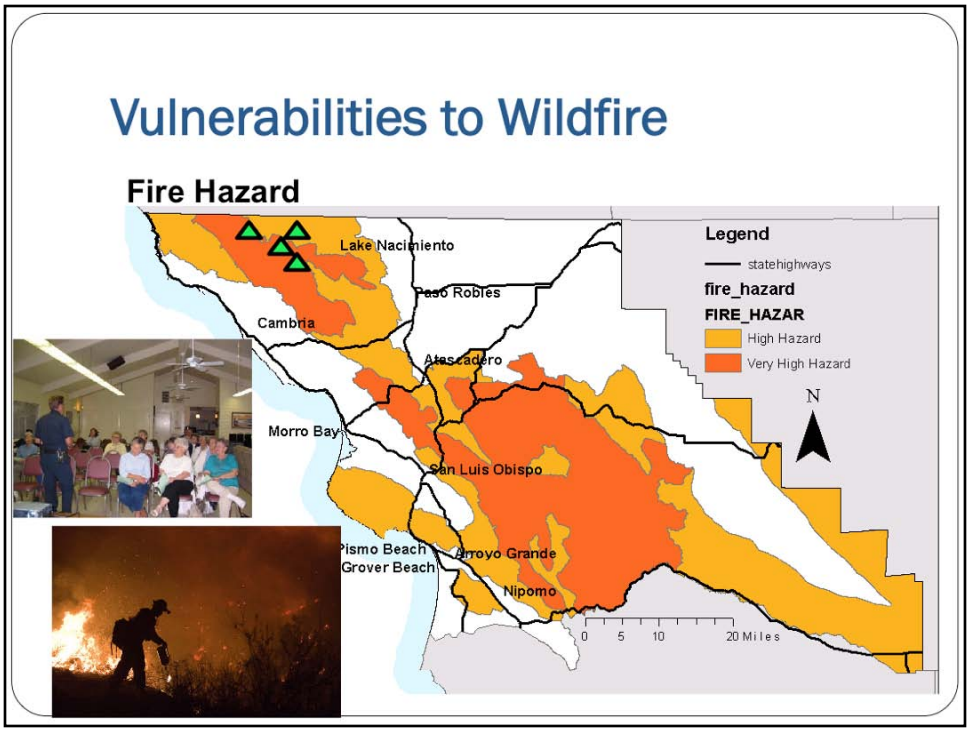
Exposed? People who work outside are directly exposed to outdoor conditions, and they tend to have little choice about it. **Fieldworkers** = exposed

you can see around **P.R.** that there is a high concentration of hispanic/latino and this is an is a higher ag area that has workers in the field. You want to ask whether you've thought about **how to take care of these people that are really important for the county's economy?**

Sensitive?

Elderly tend to be more sensitive to extreme heat, so these groups need close monitoring, effective early warning systems, and educational measures and even buddy systems set up in the community. The county has a relatively high proportion of people over 65 years and the higher proportion of this group is mapped here in brown. They are **especially along the coast, which tends to be cooler, but also not have a/**c. also there are some higher concentrations of elderly up north here and in the east of **california valley.**

Public health planning and monitoring can reduce these vulnerabilities by targeting these populations. E.g. employers might need to take more precautions for the field workers during high temperatures by providing more shade, water, breaks, and even not allowing prolonged work in the hottest parts of the day.



As for fire, we know it's going to get drier and hotter, so climate change result in more wildfires in the county.

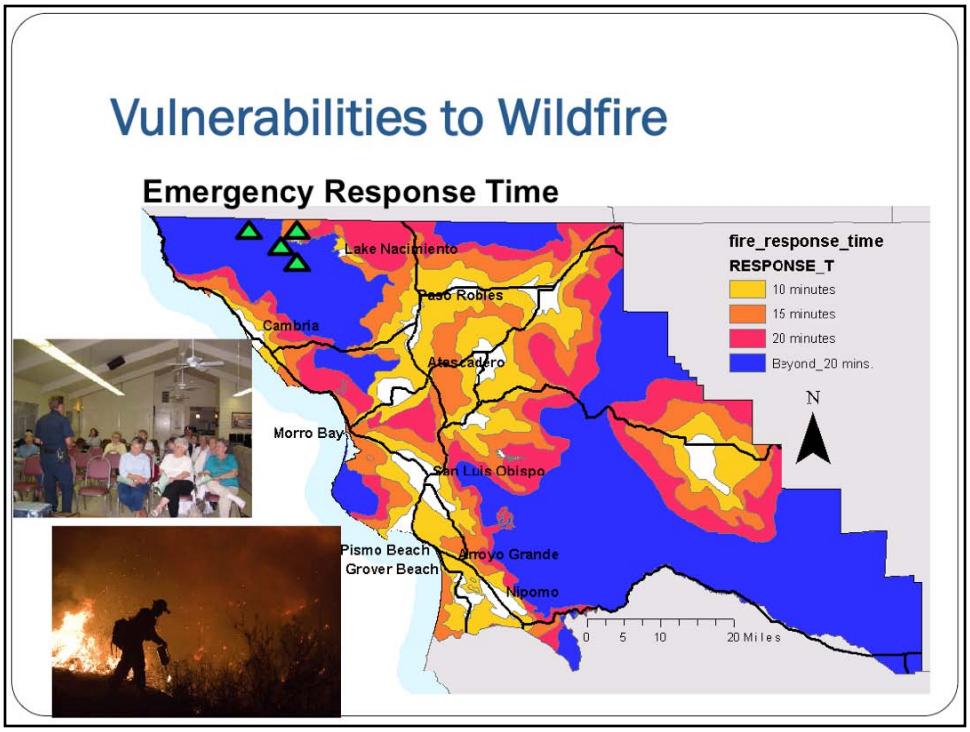
This can affect:

-the demand on emergency services, water supply, air quality and associated public health, native species and habitats,

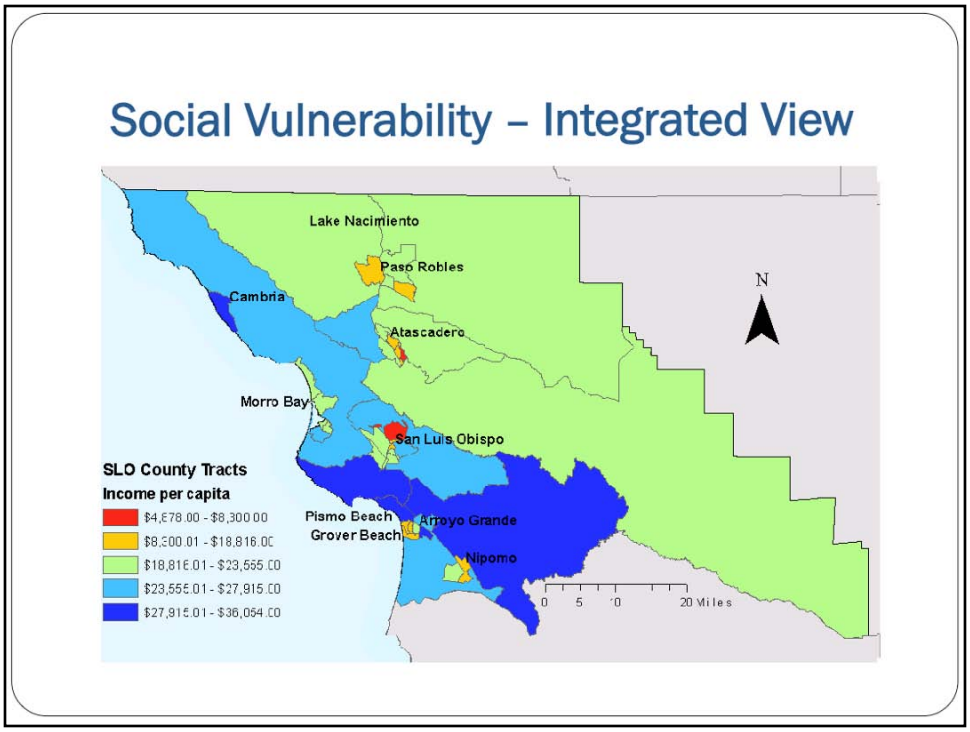
-increased risk for residences esp at the wildland-urban interface.

-Let's look at this map of hazard. DESCRIBE briefly.

-**But also we need to consider the existing emergency response system and how it might be changed in light of climate change. ..**



Here is a map showing how response time varies based on where you are in the county. Orange are the areas of concern because these take at least 20mins to get to for emergency vehicles. Some of these organge areas are where fire risk might be the highest and residents may be less connected than people in the cities to emergency notifications.



I've shown you a bit about how different characteristics of society can indicate greater vulnerability to climate change impacts. Here is a map showing the distribution of income per capita in the county. Lower income often correlates with lower access to necessary resources to prepare for or evacuate in case of a disaster or to invest in actions required to adapt to climate change (insulate house, elevate house above flooding, move away from high fire risk).

But there are a number of other characteristics aside from income that can play a role in how vulnerable communities are on the ground:

age, lower educational attainments, race, linguistic isolation, renters, university students, institutionalized populations, and females as heads of households. These traits are unevenly distributed across the county.

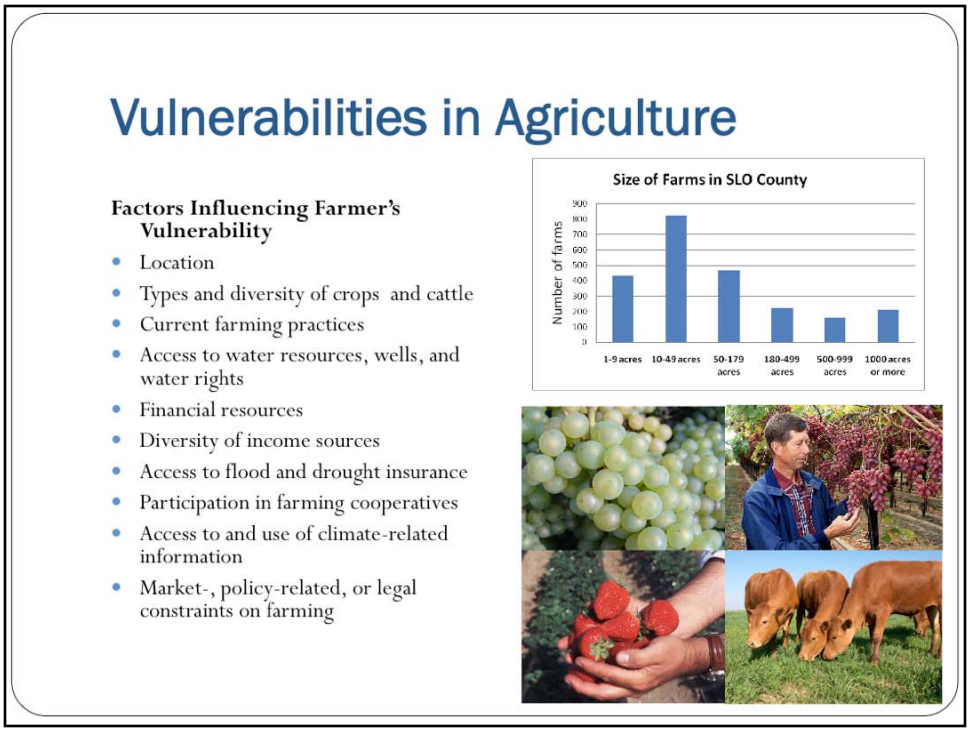
To integrate different variables contributing to exposure, sensitivity, and response capacity, we mapped these together and see a different distribution of potential vulnerability compared to when we just look at income.

POINT out high vulnerabilities on map.

Now we're going to talk about climate change in terms of some of the econ sectors in the county.

SLO obviously relies largely on a service economy. Some sectors within it are sensitive to climate change, such as tourism (SLR, related hazards affecting beaches). agricultural is very sensitive to water availability and temperature. Also, while farming doesn't have a high total employment it is economically impo of the value of the top crops and cattle, and also because its attracts tourism.

SHOW MAPS: the reliance of these sectors isn't evenly distributed throughout the county, but we can see here, that ag is largely in the north portion of the county and down along coast and the in the south coast. Then tourism is high throughout but more so along coast from Morro Bay and north and around Atascadero and Paso Robles. These maps are just to point out that the sensitive economies aren't spatially uniform across the county, as you know. Instead adaptation strategies need to target certain areas based on certain vulnerabilities.



There are a number of climate impacts to agriculture, and the two main sensitivities in SLO are water shortage and higher temperatures, but also saltwater intrusion from SLR.

Full economic impacts in 2007 of the wine industry was estimated at $1.78 billion.

-Some crops are highly sensitive to cc:

-Higher temps and extreme heat waves:

- **Wine grapes** depend on specific temperatures based on certain timing for the sugars to form correctly. If fog decreases along coast as it has in northern california, the chardonnay will be affected. Increases in inland temperatures around Paso Robles may substantially reduce quality of other wines. Temperature changes could have major economic impacts on wine industry

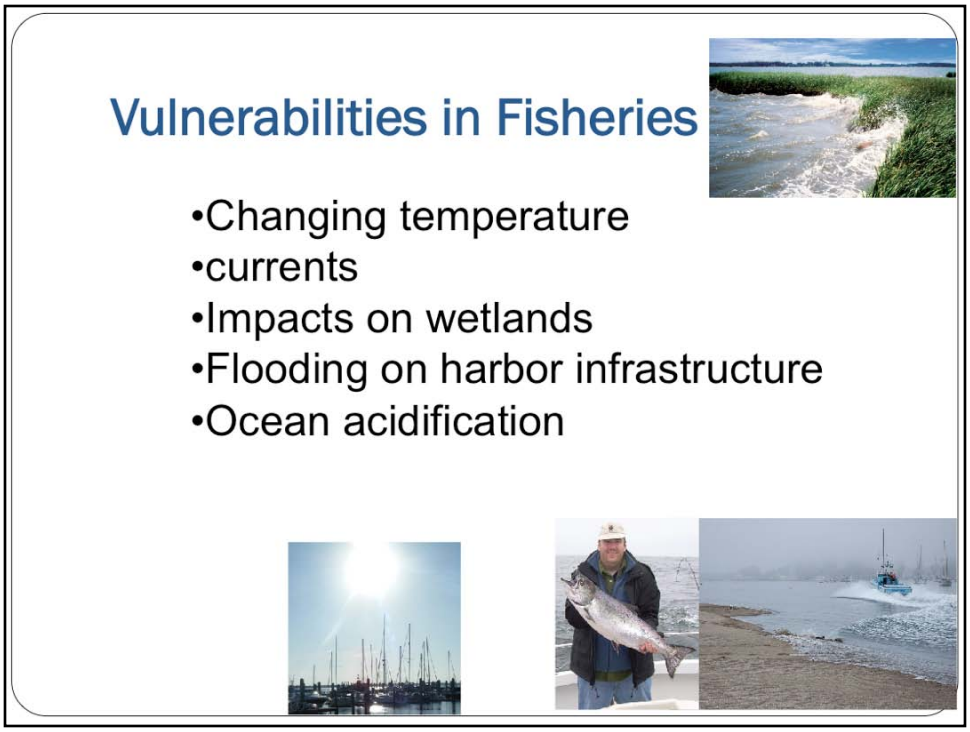
-High temperatures also can affect **cattle** health and reproduction, and during these times the industry requires more water for forage as well as to hose of animals to keep them cool. Statewide modeling shows that by the middle of the century a decline in profit from livestock by $8-62million for the state due to a decline in forage (from droughts)

-- **avocados** production in 2005 decreased by 81% compared to 2004 bc warm weather in April made blossoms drop off the trees.

-- **strawberries and vegetable crops** will experience a longer growing season, with higher temperatures and general drying trend (with less available water). Strawberries are projected to decrease in SLO County by 10-15% by 2030-2050 due to climate change. Broccolli and lettuce are particularly sensitive to increases in temperature esp early in the year. E.g. the June 2008 heat wave here reduced yield of most vegetable crops by 7%, which highlights the existing sensitivities to extreme weather event sthat will likely increase with cc.

Some farmers don't have the ability to adapt as well as other farmers. E.g. small farmers that rely entirely on a single crop for incomes might be more vulnerable to cc than large farmers that have diverse income. This **chart** shows how many of different sized farms there are in SLO.

Factors…



fishing remains an economically and culturally important part of coastal San Luis Obispo and could be significantly impacted by climate change. Climate change will impact fish populations directly by warming ocean waters, changing currents (upwelling), affecting nutrient availability and the oceanic food web, and shifting habitats, and indirectly through impacts on fishing-related coastal infrastructure and inundation of critical nursery habitat (i.e., coastal wetlands).

There is no straight answer for what cc will do to fisheries, but it will certain impact some fish populations and the industry. This is already an industry in dire straits. The gulf oil spill is an ex of how close to the edge that fishermen are at to environmental changes and the dependency on stable ecological and oceanographic conditions … and impacts can be devastating

At this point increasing the resilience of fisheries by continuing to protect the wetlands that serve as nursery grounds and also where these could migrate upland from SLR, and other important habitats, and by supporting sustainable fishing practices.

And now for tourism, one of the most dominant economic industries in the County, attracting visitors for its beautiful natural environments and historical events, its picturesque wine country, and its countless visitor attractions and opportunities for recreation

Go through bullets

SLO County's tourism may suffer if climate change causes large enough sifts in the industry to diminish its importance and impact on the landscape's character. Visitors' perceptions of reduced attractiveness of the region (e.g., eroded beaches, reduced fishing opportunities, lower wine quality, wildfires) combined with broader, more remote socio-economic changes may be as or more important than the direct impacts.

Vulnerable Services: Water

- **Climate change threats**
  - Water supply reduction
  - Saltwater intrusion in coastal areas
  - Water quality changes
  - Flooding and runoff
- **Concurrent stressors**
  - Growing demand due to growth, climate changes
  - Already overpumping
  - Infrastructure
  - Groundwater pumping, banking, desalinization is energy-intensive, costly
  - High water cost
  - Septic systems, wastewater treatment facilities

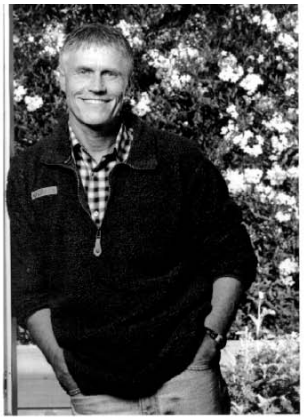
Climate change is projected to impact several important aspects of water in SLO County.

Well functioning emergency planning, preparedness, and services are critical in times of disaster such as floods, fires, or earthquakes.

Transportation, energy, and communication infrastructure, which are critical to emergency response, are susceptible to the impacts of cc. Transportation routes, e.g. in the county are exposed to several climate change impacts, including sea-level rise and related erosion and cliff failures, heat extremes, flooding/inundation, and increased wildfire and associated problems with soil erosion and landslides). past wildfires have led to closures of important evacuation routes and climate change is projected to result in more fires in the region. Post-fire soil erosion and landslides can damage roadways and other infrastructure (e.g., culverts).

Climate change is likely to lead to an increase in the number of climate-related disasters, increasing the demand for emergency services. Over time, this implies a need for increasing budgets and contingency planning to continue to be able to respond effectively.

Thank you for what you do!



Paul Hawken, 2009

When asked if I am pessimistic or optimistic about the future, my answer is always the same:

If you look at the science about what is happening on earth and aren't pessimistic, you don't understand data.

But if you meet the people who are working to restore this earth and [their communities], and you aren't optimistic, you haven't got a pulse.

Clearly the county faces many challenges albeit surmountable ones if you begin planning and preparing sooner than later. Local gov’ts are in advantageous position of beginning your adaptation efforts early.

I hope this information didn’t come across as pessimistic for the glimpse on how you could be affected by climate change. Instead, you have a great opportunity right now to use this information and the recommendations developed by the stakeholder workshops to move the county forward toward a more sustainable future that is more resilient to climate change.

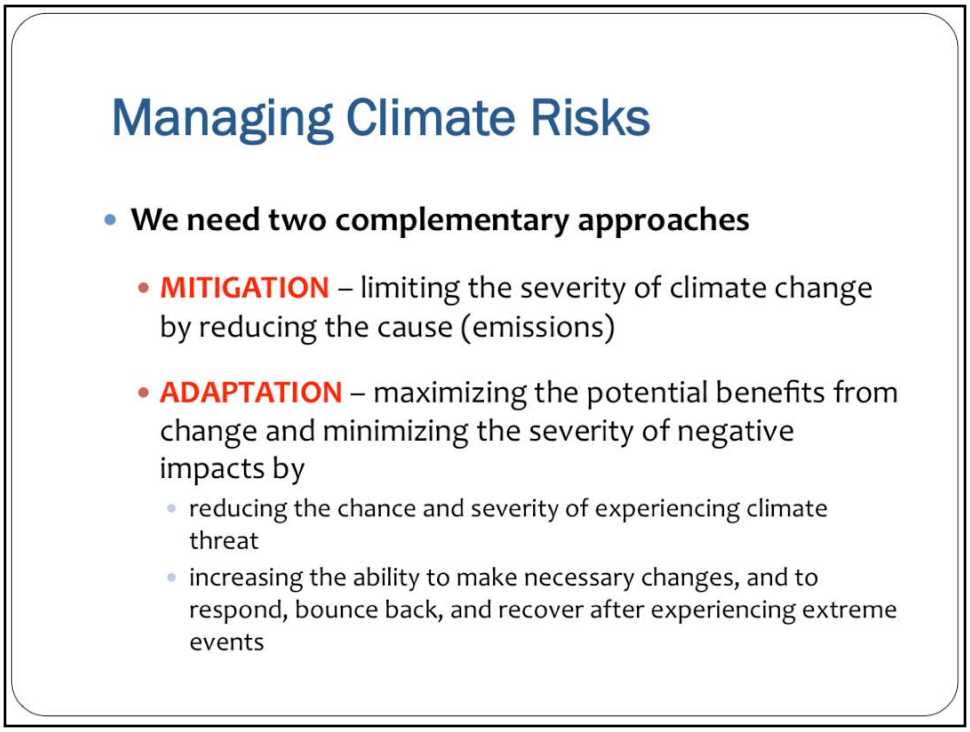
Thank you!

Summary reports are available at:
http://www.lgc.org/adaptation/slo/

Our Contacts:

Susanne Moser, Ph.D.
Susanne Moser Research & Consulting
Santa Cruz, CA 95060
Email: promundi@susannemoser.com

Julie Ekstrom, Ph.D.
Berkeley, CA
Email: jaekstrom@gmail.com



To provide some context, there are two complementary approaches for managing climate change risks: mitigation and adaptation

Mitigation is DEF. The approach seeks to reduce future climate change.

Adaptation is on the other side of managing climate risks. *Those adjustments one might make in a system to prepare for and deal with the impacts of climate change.*

It seeks to maximize the potential benefits from change and minimize the severity of negative impacts. There are two ways it can help do this: READ

–While these are separate sets of actions, both mitigation and adaptation are equally necessary to manage climate risks and it's important that these be developed in a complementary way. While developing adaptation strategies, you'll want to avoid those options that would contradict the goals of the mitigation work. One common strategy for adapting/coping with extreme heat events is for residents to rely on air conditioners. However, as climate change brings more heat events, continuing this reliance increases the energy use (which is likely to increase the burning of fossil fuels). Foresight to plant trees that shade houses at the hottest time of day, e.g. can help reduce pepole's reliance on AC.

Similarly, for mitigation planning, you want to at least be considering how your strategies could reduce your community's ability to adapt to climate change.

Actually, We Have 3 Choices

"We basically have three choices: mitigation, adaptation, and suffering. We're going to do some of each. The question is what the mix is going to be. The more mitigation we do, the less adaptation will be required and the less suffering there will be."

John Holdren

Past President of the American Association for the Advancement of Science; Harvard University, Science Advisor to the President

(cited in *The New York Times*, 01-30-07)

Just to underline the importance of using both mitigation and adaptation – and not just one or the other, the science advisor to the President, John Holdren provides a useful perspective about our choices for dealing with climate change "quote"