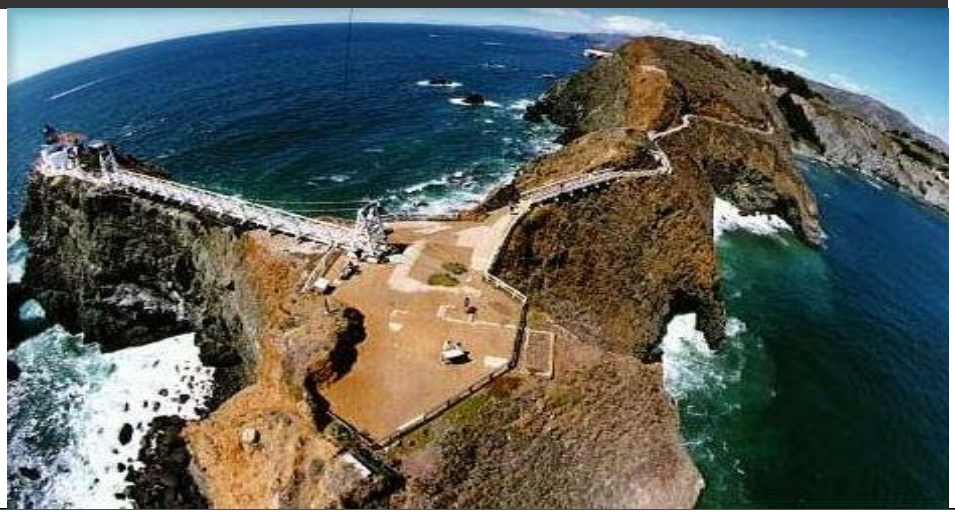
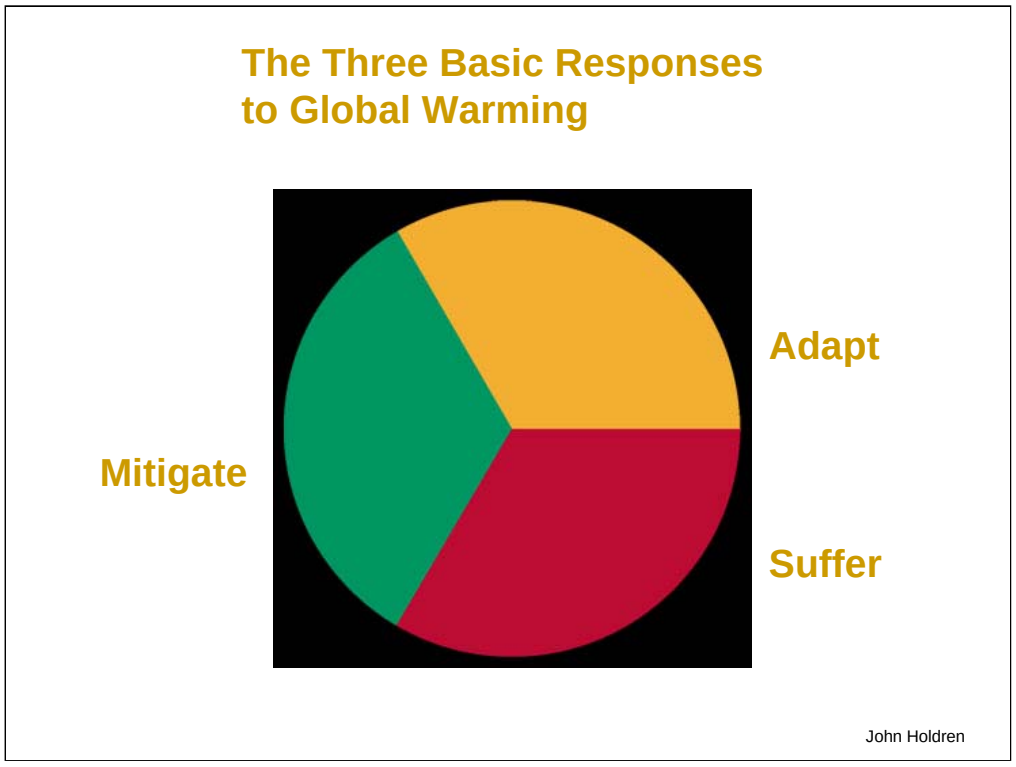
Rising Seas: Preparing for Climate Change

Vulnerability Assessment

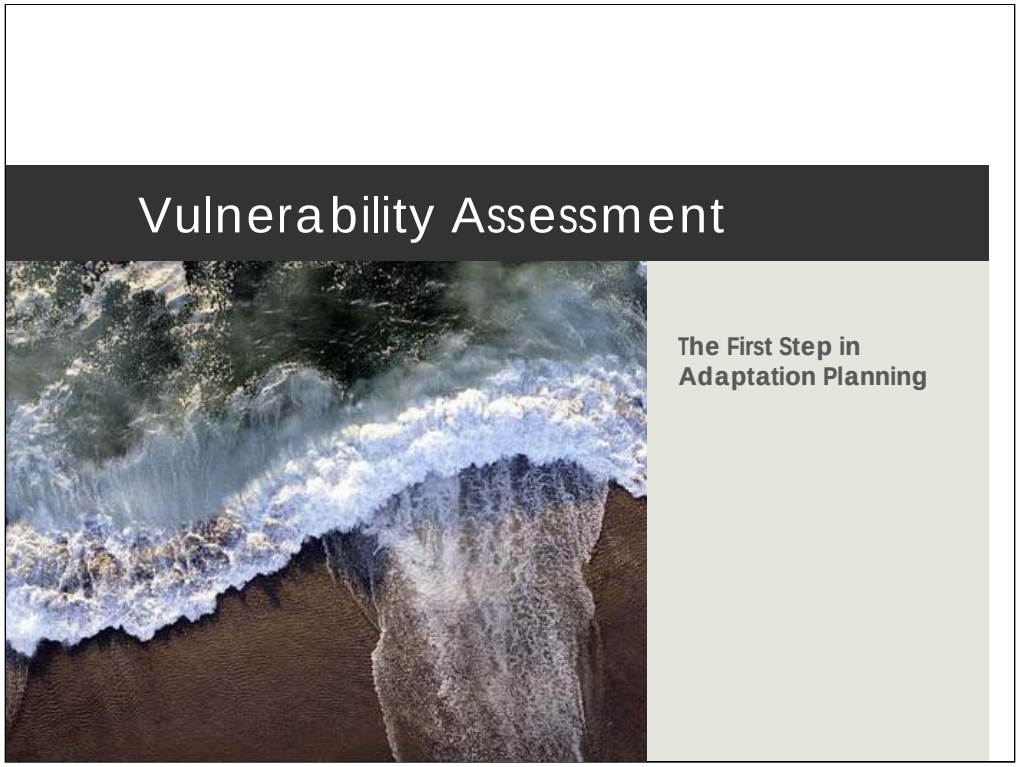


Good Morning, and welcome to our session on adapting to the impacts of climate change. We focused on rising seas because we believe that the Bay Area needs to pay particular attention to preparing for this impact from climate change.

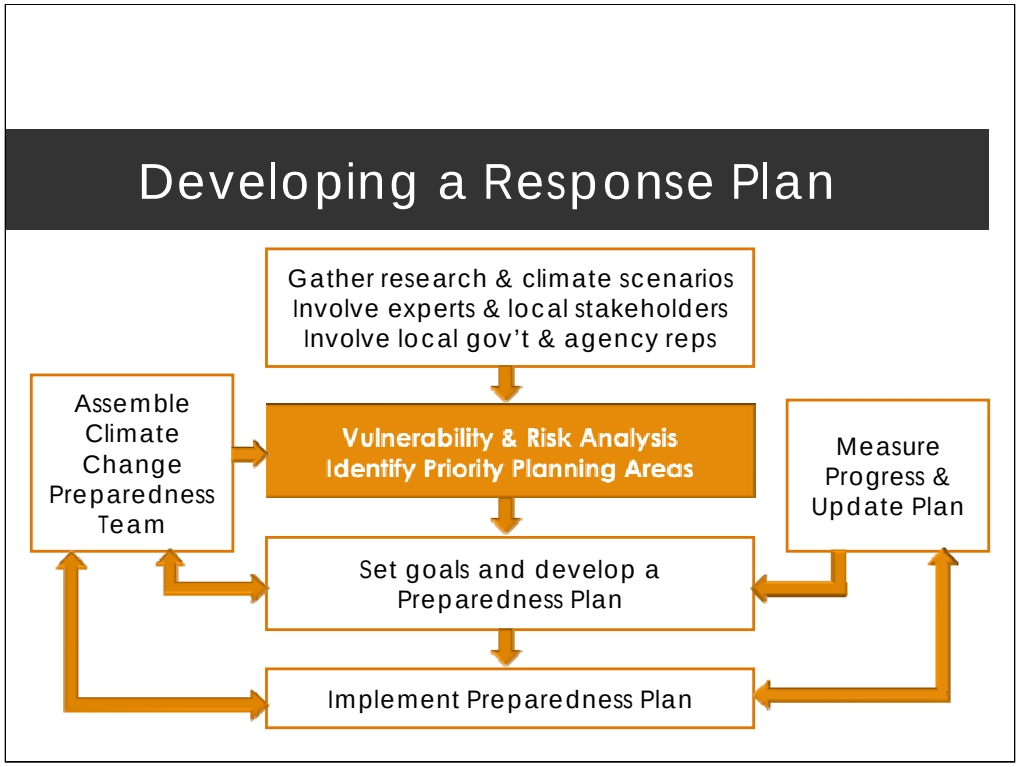


I stole this slide from my colleague Don Weden, who stole the idea from John Holdren, President Obama's science advisor, because I think it sets out our choices for responding to climate change quite clearly. We can mitigate our contributions to global warming by reducing green house gas emissions, we can adapt to the impacts, and to the extent that we do not do these two things, we can and will suffer. Actually it's more likely our children and their children who will do most of the suffering.

It is our generation's responsibility to develop aggressive and effective climate mitigation and adaptation efforts here in the Bay Area.



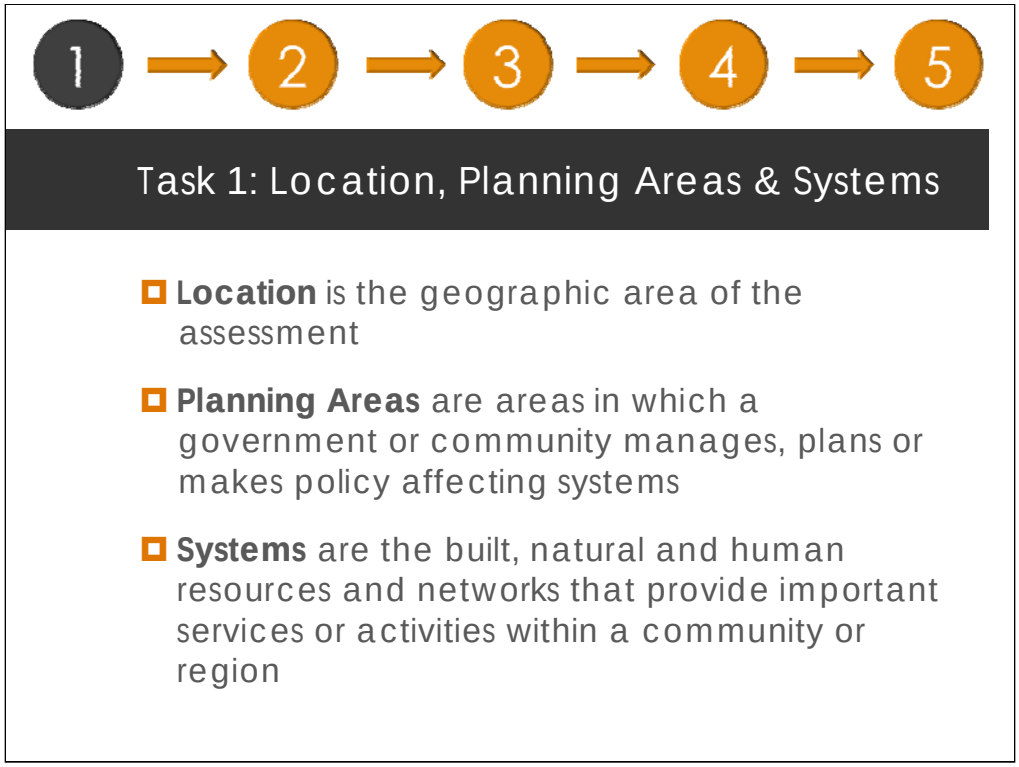
Adapting to climate change requires planning. Conducting a vulnerability assessment is one of the first steps in climate change adaptation planning for a city, a county a region a corporation or even a household. The approach that we are presenting to you today was derived and simplified from a much more complex approach developed by ICLEI a non-profit organization, and King County. Today, we will cover in a very summary fashion the concepts, steps and the resources needed to conduct a vulnerability assessment. The exercise we will conduct represents a very preliminary, qualitative vulnerability assessment. A full blown assessment would be conducted with expert help, with a great deal of information over a period of time with considerable technical, stakeholder and decision maker input.



This diagram shows how a vulnerability assessment fits into an overall strategy for preparing a climate change response plan. A community has to first gather research and data about community conditions, determine which climate change scenarios will be used to determine impacts, and create a stakeholder and technical input process that draws on the expertise and values of your community. You will need a dedicated team to conduct the vulnerability assessment, and then prepare and implement an adaptation plan, and continually monitor progress and changing conditions and update the plan accordingly. So this is an iterative process that will be undertaken by the community on an ongoing basis for the foreseeable future. This approach can be used to address a wide range of climate impacts that may affect your community from public health effects, to flooding from sea level rise to diminished air quality from higher temperatures.

In general, there are five steps to conducting a vulnerability assessment. First, you identify the community or part of your community that you will focus on, and the planning areas and systems you will analyze.

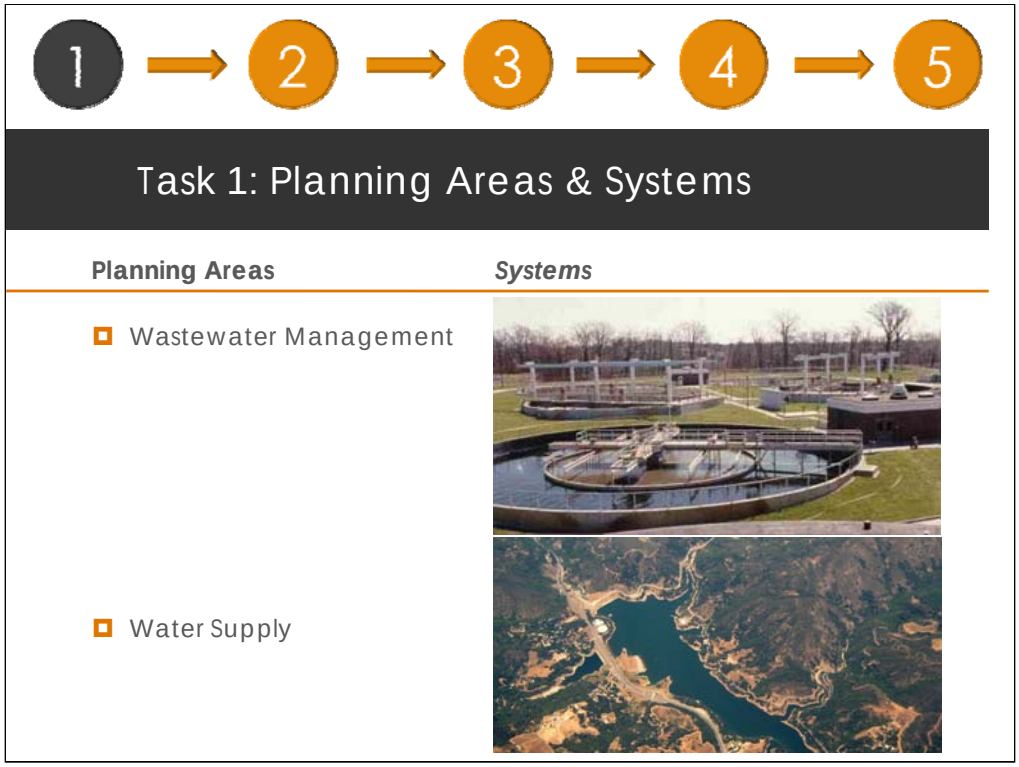
Next, you assess the exposure and sensitivity of these areas and systems to climate change; will they be affected and how. Next, you conduct a vulnerability analysis which assesses what real changes could be expected from climate change to an area or system prior to taking any steps to adapt. Once you understand your vulnerabilities, you assess risk to identify the likelihood of climate impacts and how disruptive these would be to your community. Finally, you set your adaptation response priorities based on the importance of vulnerable resources to your community, and the likelihood of the consequences, which you determine by assessing uncertainties.



The first task in your vulnerability assessment is to establish the geographic scope of your climate response plan and then to identify the planning areas and systems you will address in the plan, typically, this will be your jurisdictional boundaries. So for a City, you will most likely plan for the entire city, County, same thing, or flood control district, your jurisdiction.

Planning areas are broad topical areas that are akin to the chapters in a general plan, where plans and policies guide the management of systems within a particular planning area.

Systems are built, natural, social and political networks that provide important services to the community.



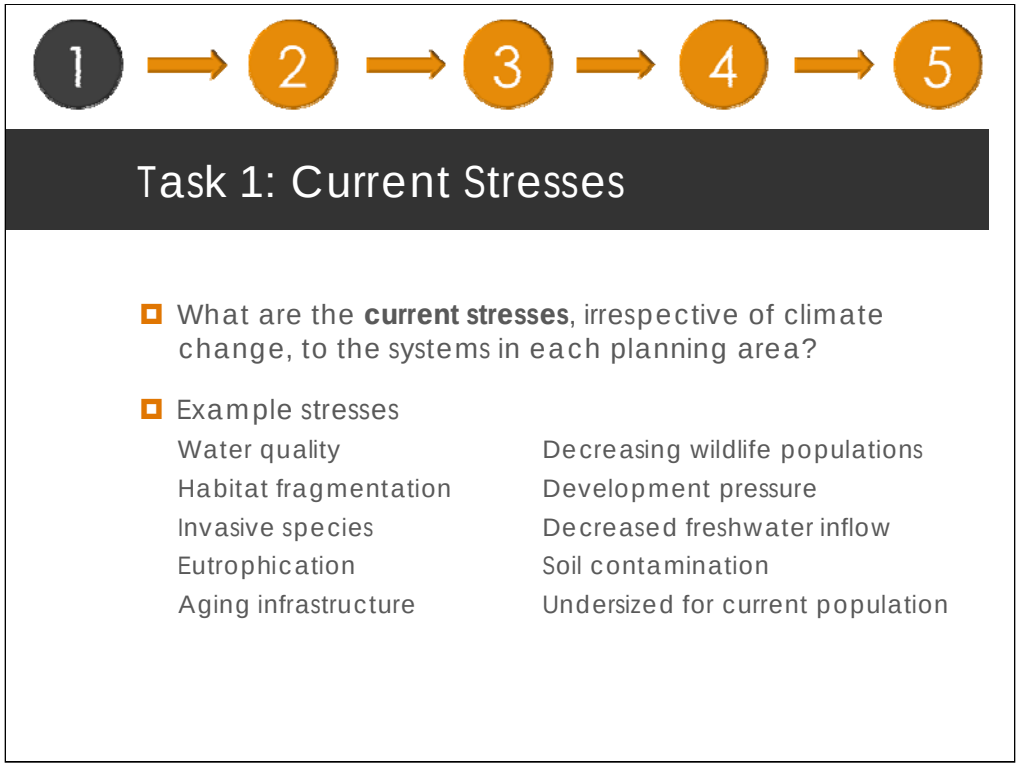
The Planning area of wastewater management is comprised of systems like the wastewater treatment plant and the sewer pipeline network

The Water Supply Planning Area includes systems such as reservoirs and the distribution network

The Natural resource planning area is made up of our important habitats and wildlife and outdoor recreation includes systems like parks, marinas, trails, beaches and other facilities. And some, like these guys in the middle are a little bit of both.

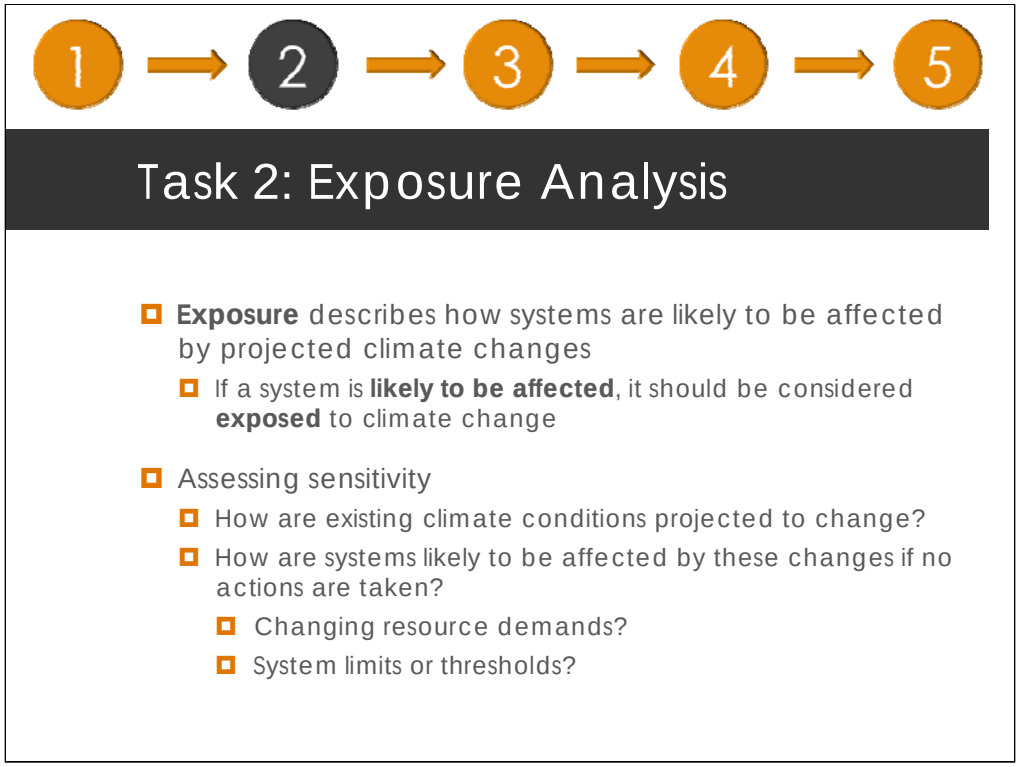
Some final examples of planning areas and systems—Housing, neighborhoods

Transportation infrastructure includes our roadways, bike and pedestrian trails and transit systems.



Any system in existence is subject to some level of internal or external stress. These stresses affect the ability of the system to respond to a new internal or external threat. To assess the vulnerability of a system to climate change, one must first understand the current stresses affecting the health or stability of a given system. Here are some examples of current stresses that might be applicable to a variety of systems. For example degraded water quality, habitat fragmentation and development pressure might be current stresses for an important wetland area. Soil contamination, aging infrastructure and development pressure might be current stresses for a historic neighborhood.

We assess current stresses to establish the context for climate change impact assessment so that we can understand the current health or stability of a system and its ability to accommodate change.



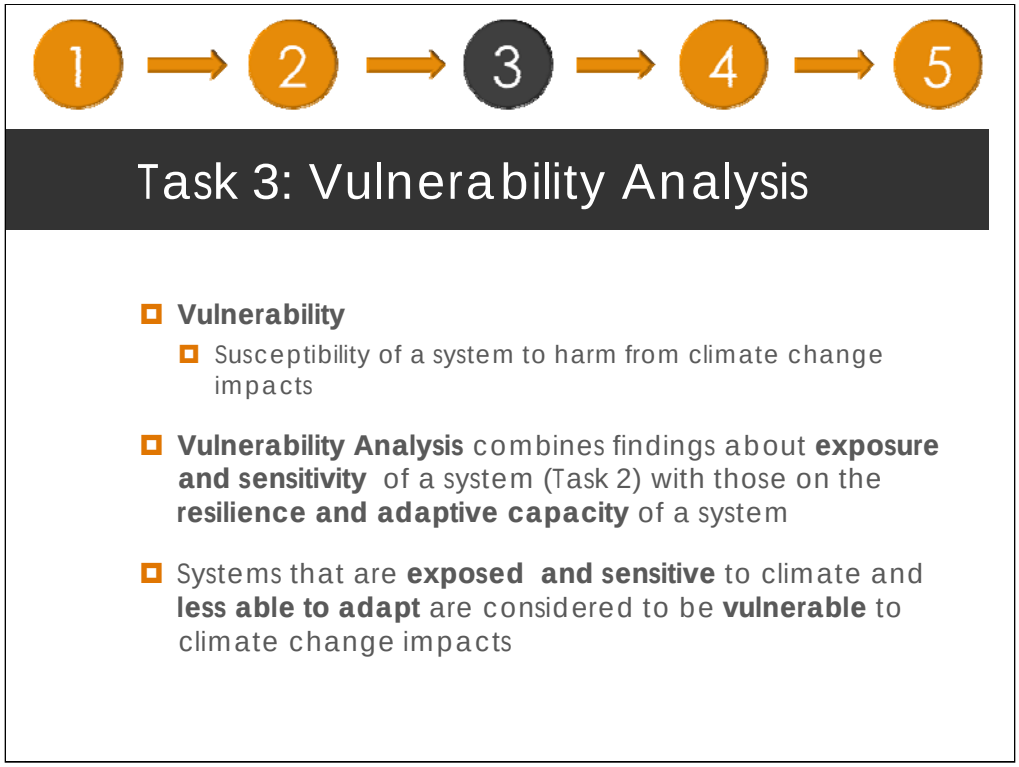
As Susi pointed out earlier, climate conditions can change in a variety of ways. Rising temperatures and seas, storm surge, extreme heat days, changes in precipitation, or increased frequency or intensity of storms are some examples. How will these changes affect the systems we rely upon for our existence?

Exposure describes how systems are likely to be affected by projected climate change impacts. If a system is **likely to be affected**, it should be considered **exposed** to climate change.

To assess the exposure of a system to climate change, one must determine how climate conditions are projected to change and how the system is likely to be affected, absent any actions taken to adapt to changing climate.

Some examples of exposure to climate stress from sea level rise: more frequent salt water intrusion may threaten drinking water supplies by impacting underground aquifers or estuarine fresh water; or shoreline flooding may undermine your shoreline protection system. If these things will occur without corrective action being taken, then your system is exposed to climate change. Other examples of exposure include Increased energy demand to run air conditioners, or decreased air quality as ground level ozone forms more frequently at dangerous levels.

We must also assess sensitivity. A high level of sensitivity, that is, a low capacity to absorb impacts without suffering significant harm. So will these changes increase the exposure of our system to climate effects? Will they place greater demands on limited community resources, or will these changes push our system beyond sustainable limits or thresholds? This information is necessary to assess vulnerability.

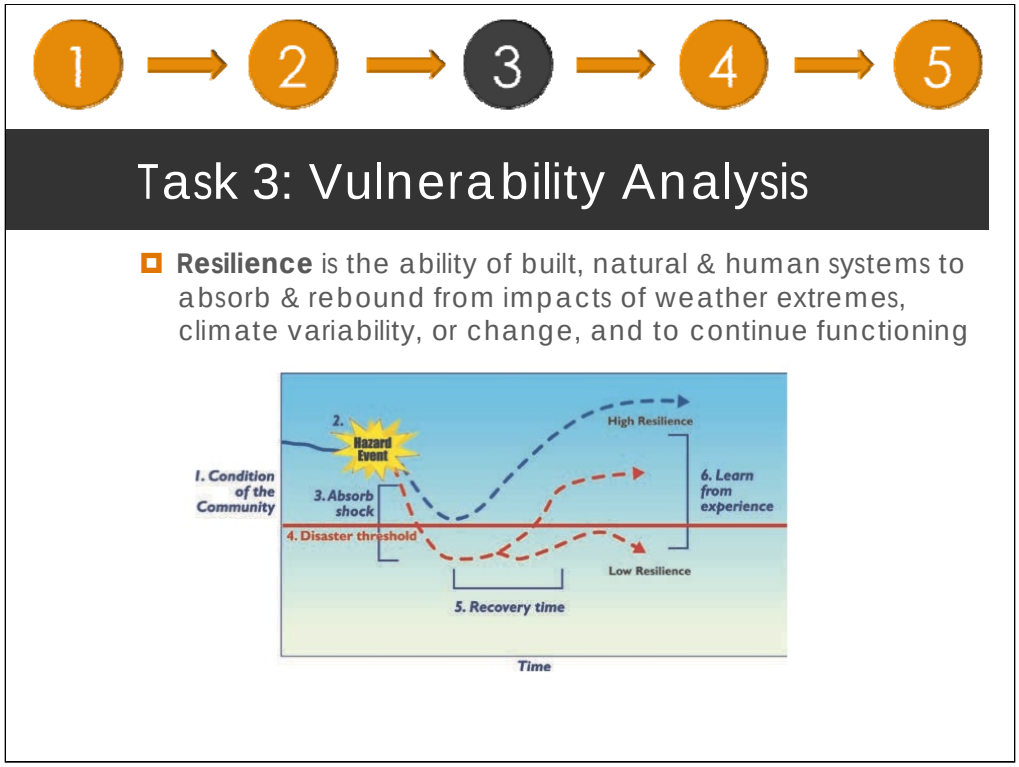


Vulnerability—most broadly defined as a susceptibility to harm or a potential for change or transformation—is constituted of three components: exposure to an impact or stress, sensitivity (or resistance) to the impact or stress, and the capacity to respond or adapt.

A neighborhood is vulnerable to a climate-driven stress, if its exposure to that stress (taking into account existing stresses that can compound exposure), its baseline sensitivity to the stress, exceed its ability to cope with or withstand the impacts of the exposure.

A vulnerability analysis combines the findings from the exposure and sensitivity analysis with an assessment of the system's resilience and adaptive capacity.

If our neighborhood is exposed to (will be affected by) climate change, and if it is not very resilient, or we have limited capability to adapt it to climate change, then our neighborhood is vulnerable to climate change.

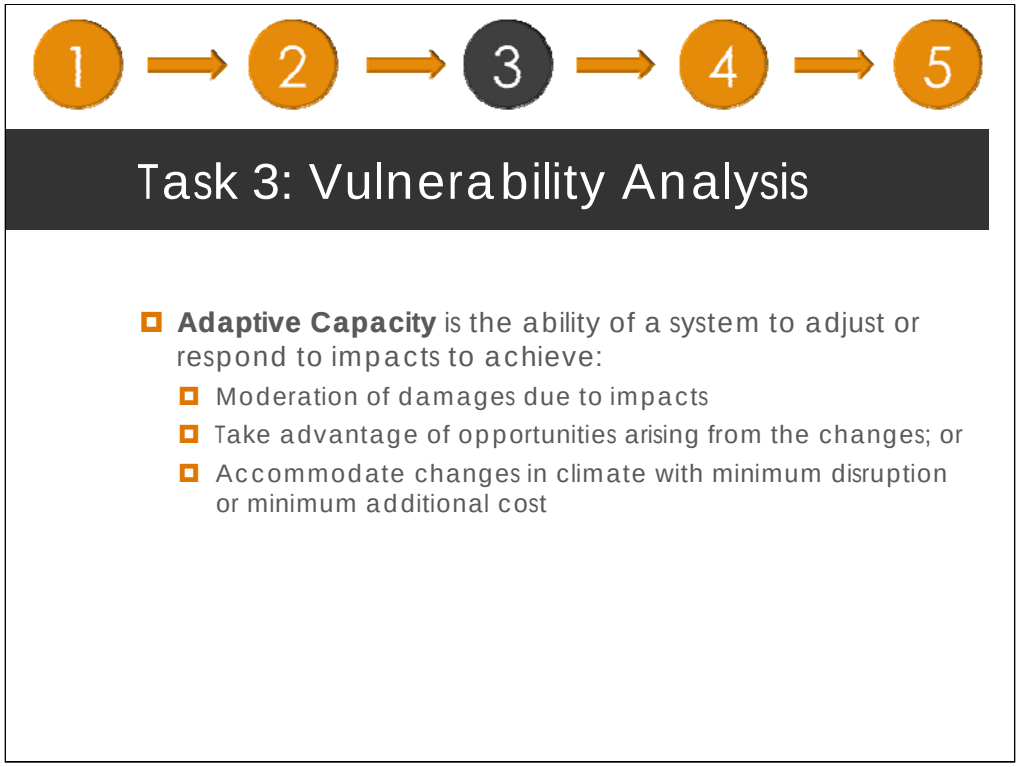


Remember, Susi described resilience earlier. Resilience is the ability of a natural or built system, e.g. a wetland, or a fire station, or a social network like a neighborhood business district to absorb and rebound from impacts of weather extremes, climate variability or change and to continue to function.

So a resilient wetland is one that has sufficient sediment supply or sufficient room to migrate upland in the face of rising seas.

A low-income neighborhood that has inadequate shade trees, or insufficient insulation or energy resources to power air conditioning to keep the neighborhood sufficiently cool on extreme heat days would not be resilient to increasing temperatures.

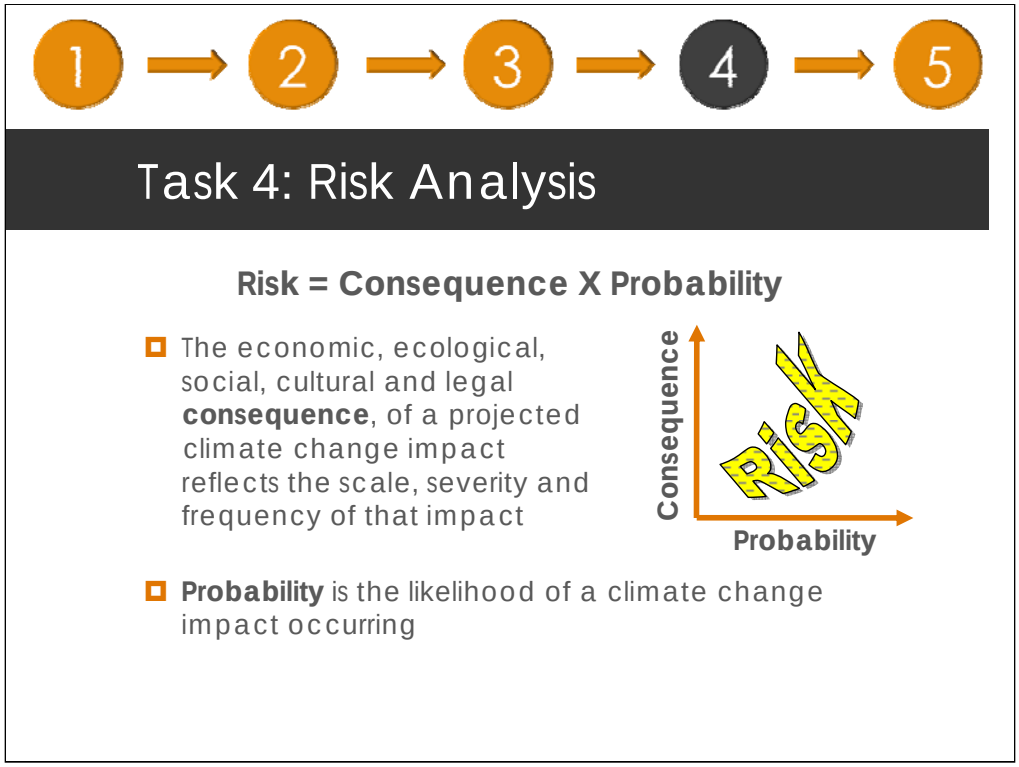
Determining resilience requires assessing all of the likely impacts and whether a system can absorb them and continue functioning, without lots of outside help.



A water supply system has adaptive capacity if it can adjust or respond to climate change impacts to reduce effects, if the system capacity can be increased using reclaimed water.

Adaptive capacity can be low if a system is already managed for multiple uses. The Sacramento Delta is developed for housing and farming, is a hotspot for biodiversity as a mixing place for salt and freshwater and home to many unique species, and is a source of about drinking water to about 2/3s of the State's population. These existing demands, limit flexibility to accommodate climate change for one use, as other uses will be affected by the change.

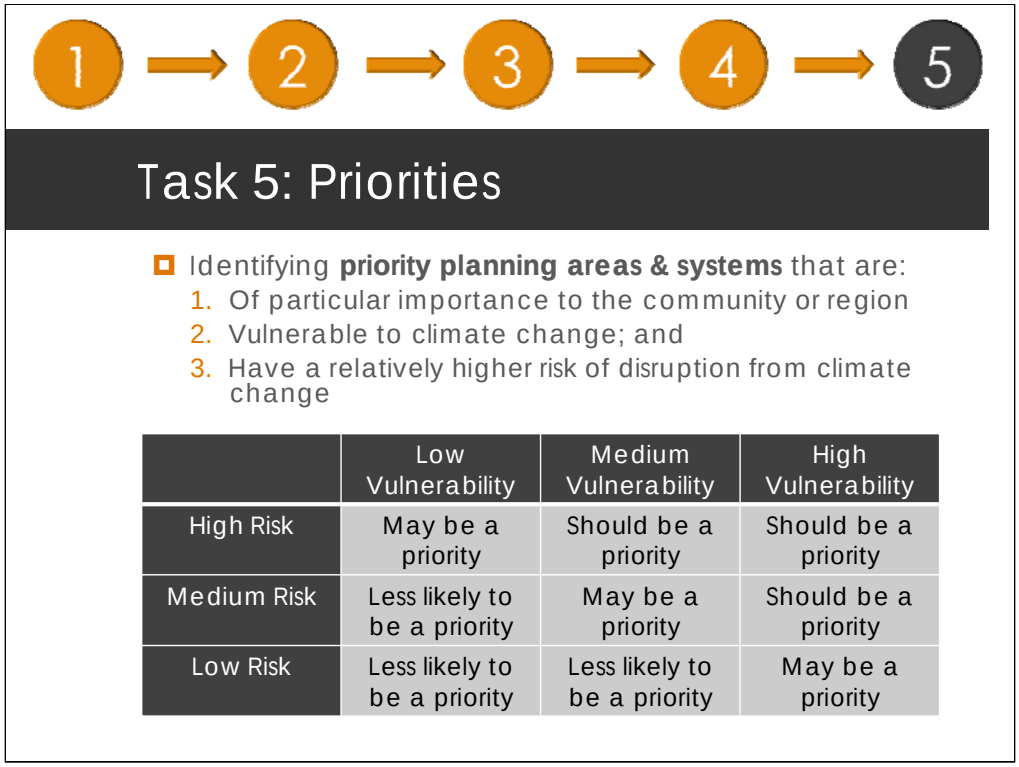
Some plants may migrate upslope to address rising temperatures, but those adapted to living at the highest land elevations have limited options for places to migrate.



Using the information developed in the vulnerability assessment we can characterize the consequences and assess the risk to determine how to prioritize scarce community resources in mustering an adaptation response. In this approach, risk is subjective measure based on your community's physical, economic and social conditions and perceptions, the consequences of the impacts, and the probability that these impacts will be experienced.

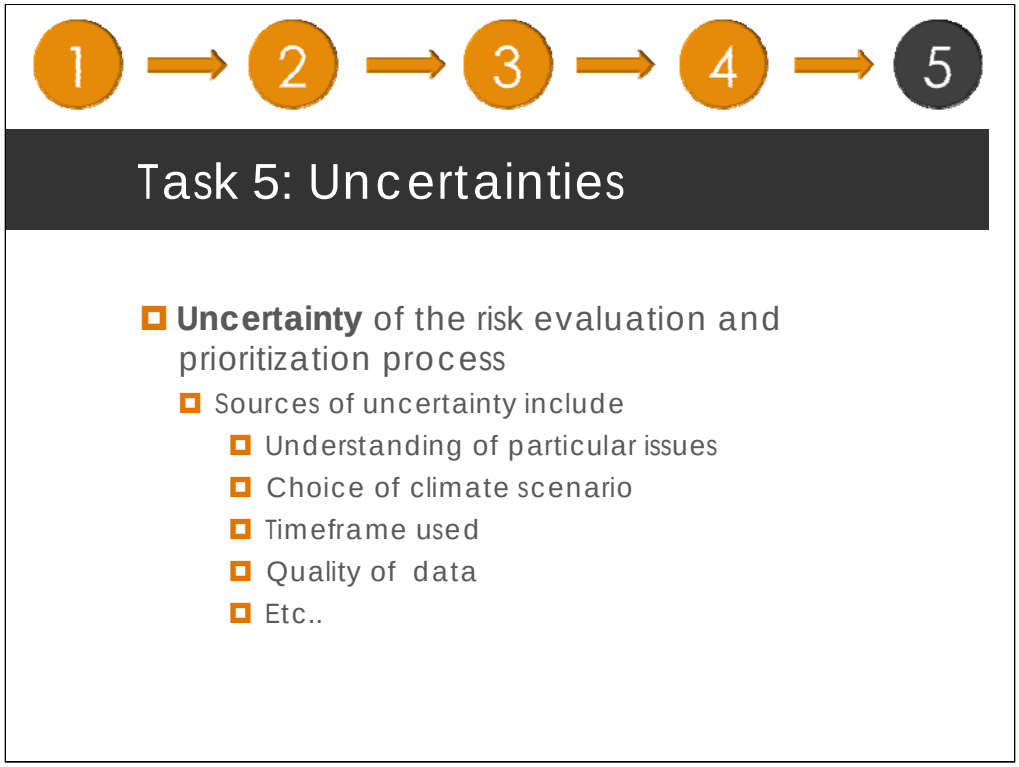
The consequences of climate impacts could be economic, ecological, social, cultural or legal. How damaging would a large decrease in the annual Sierra snow pack be for the Bay Area economy or specific cities? What would happen if climate change wiped out an important fishery, like salmon or Dungeness crab?

What is the probability or likelihood of an impact? Increased temperatures and sea level are quite likely impacts, but your community needs to agree to what the risks are, based on the consequences before committing resources to a response.



After you have completed your vulnerability assessment, you have to establish priority systems, based on your assessment of risk and and vulnerability. These are the economic, ecologic or social resources that are very important to the community, that are vulnerable to climate change and have a relatively high risk from disruption from climate change.

Obviously those that are high risk and high vulnerability are those that would be most important to address because of their importance to the community and the high likelihood of impact.



The Community must also articulate the uncertainties regarding the analysis as a way of identifying research priorities to reduce uncertainty in the future.

To characterize the uncertainties in your analysis, you can look at whether there is comprehensive understanding of the issues, such as whether your community, your region, your state, your country and your world will limit climate change causing emissions and the impacts that flow from them. If we do not, our adaptation strategies may be inadequate to meet the coming changes. Thank you.