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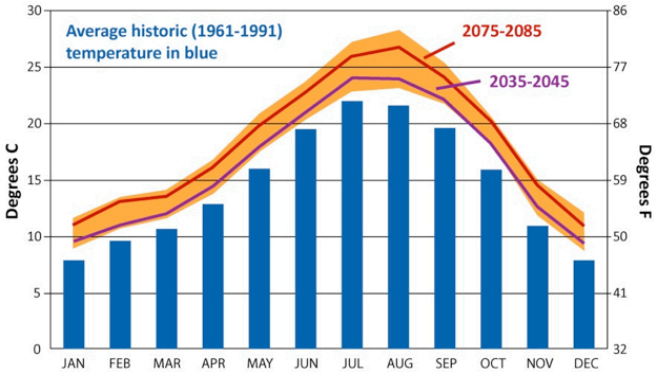
How can the Geos Institute help you with your IRWMP?

The Geos Institute helps communities predict, reduce, and plan for climate change. We have found that the most effective way of planning for climate change is to incorporate climate change science and understanding into all ongoing planning and decision-making processes, including Integrated Regional Water Management Planning (IRWMP). In short, we encourage people to wear a "climate change lens" as they go about their normal duties. While most decision-making processes are not greatly altered by the climate change lens, the final outcome may be drastically different. This is because, rather than making decisions based on patterns and trajectories of the past, new decisions will be made based on expected patterns and trajectories of the future.

There is much debate about what the "climate change lens" should look like. Is it purely science-based? Which models should be used? Which emissions trajectories? How do we account for uncertainty? Who should be involved in assessing impacts? How do we make sure the lens is used consistently? How do we account for variable values and needs of local communities?

The Geos Institute takes a science-based approach that is also locally specific and highly collaborative. It fits well with the IRWM planning process because both processes are intended to be collaborative, open, and accessible. Both processes look for new synergies and opportunities for integrating across different interests and sectors. And both processes involve a variety of stakeholders with diverse interests. We have the following products and services to offer through our non-profit consulting firm ClimateWise®:

1. **Global climate model projections at locally relevant scales** – We provide maps and graphs that are easy to read and show a range of climate change projections specific to the local area of interest. We use the A2 emissions scenario because, of the outputs available to us, it most closely resembles current emissions trajectories. We have in-house data from three global models, but also consult other models through



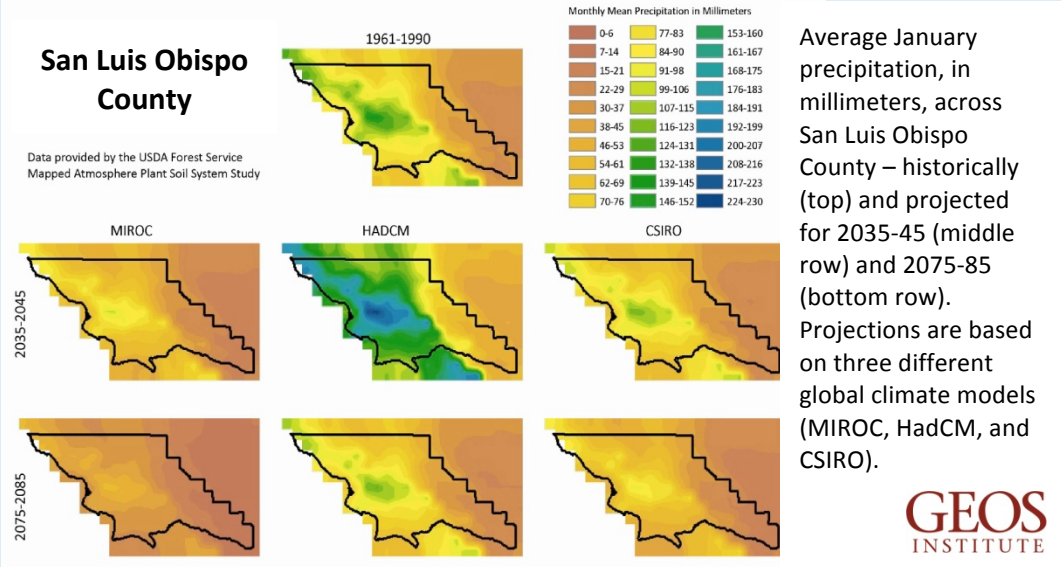
CalAdapt, the scientific literature, or directly from the modelers. Variables that are mapped and graphed include annual and monthly average temperature and precipitation.

We also do a literature search to bring information on snowpack, extreme heat days, water temperature, sea level rise and coastal inundation, and other regionally important variables to the decision making process.

2. **Ecological model projections at locally relevant scales** – We create maps of the local area showing where the dominant type of vegetation is likely to remain stable and where it is likely to change. This information is based on inputs from three different climate models into the MC1 functional vegetation model. We also provide model projections for expected changes in wildfire and forest carbon storage, specific to the local area.

3. **Hydrological model projections** – The Geos Institute is working with the USGS to provide hydrological projections at local scales based on two global climate models. Projections are mapped across the local area and values graphed to show future trends and variability. Maps and graphs of monthly or annual runoff, recharge, stream discharge, and water deficit are available, as are custom analyses.

4. **Assessment of uncertainty** – The Geos Institute takes two primary approaches to the issue of uncertainty. First, we put the level of uncertainty associated with climate change into perspective based on other areas of uncertainty in which people are used to making decisions (such as earthquakes, population growth, or forest growth). Second, we consider where there is high agreement among models (low uncertainty) and where the models disagree (high uncertainty) to help make sound decisions across a range of future scenarios. For example, the models usually show very high agreement for warming, but less agreement for local precipitation patterns. Yet sometimes the models agree on precipitation changes for a certain season or local area (higher winter precipitation at higher elevations, for example). Agreement among models is often higher for mid-century projections, with less agreement towards the end of the century.



Average January precipitation, in millimeters, across San Luis Obispo County – historically (top) and projected for 2035-45 (middle row) and 2075-85 (bottom row). Projections are based on three different global climate models (MIROC, HadCM, and CSIRO).

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5. **Local experts and leaders drive the process** – We bring together leading regional scientists, local experts and leaders to discuss climate change and its likely impacts. Together, based on shared scientific information, the group identifies likely changes across the local landscape and communities. We bring together people working in different sectors of the community (agriculture, emergency response, land use planning, human health, natural resources, Tribes, etc.) so that they can form a common understanding of climate change and share ideas about ways to work together.

6. **Assessment of vulnerabilities** – Because we provide spatially explicit climate change projections for the local region or watershed, as well as an assessment of associated ecological impacts (such as wildfire or invasive species), groups involved in IRWM planning are able to identify the areas and resources that are most vulnerable to climate change. We walk participants through a process that helps them identify the sensitivity, exposure, and adaptive capacity of a range of areas and important resources. Risks to resources and populations are ranked by their potential impacts.

7. **Local values and needs must be considered** – Each community or region has unique values and needs that affect how climate change impacts should be managed in their region. We conduct workshops and meetings that are highly collaborative across sectors and interests. We bring diverse groups together to develop a common understanding and approach to potentially divisive issues, such as water resources.

   Climate change is expected to have far reaching impacts across the community. When diverse groups come together, they begin to better understand how actions taken in their sector or interest can have serious impacts to others. They realize that a coordinated response to climate change is needed if we are to maintain our core values and quality of life.
   Our workshops are highly structured to move the community through a series of steps that is most effective at developing a common understanding of the issue and the need for collaboration, developing new partnerships and synergies, and identifying opportunities for positive solutions. We challenge participants to think more holistically about the issue and to develop solutions that are co-beneficial across different groups. Rather than just thinking about capturing more water for storage, for example, we encourage the group to think about how to slow down the movement of water through the entire system, starting at the highest elevations. The collaborative process is intended to reduce future competition for increasingly scarce and uncertain resources.

8. **Developing co-beneficial adaptation strategies at the watershed level** – Once vulnerabilities are assessed and impacts prioritized, we work collaboratively with

the planning group to develop strategies that best prepare local communities for climate change. Strategies are focused on reducing exposure and sensitivity to climate change impacts, increasing adaptive capacity to climate change impacts, and reducing the overall magnitude of climate change impacts. Interdisciplinary groups are especially important during the development of strategies because strategies proposed by some groups or interests often conflict with strategies proposed by other groups or interests. The development of collaborative and cross-sector strategies leads to a whole suite of synergies – cost savings, new partnerships, complementary efforts, and less conflict.

9. **Integrating climate change adaptation and mitigation** – While adaptation strategies aim to prepare people and natural resources for the impacts associated with climate change, mitigation strategies aim to reduce the magnitude of climate change. There are two primary avenues for reducing the magnitude of climate change: (1) reducing greenhouse gas emissions and (2) increasing carbon storage or sequestration. Cities and counties around the nation are working to reduce their emissions, but little has been done at the watershed level to increase carbon storage. Managing lands, including forest, grasslands, and farmlands to increase carbon storage in soils and biomass is a highly promising approach to climate change mitigation and is complementary to many adaptation efforts.

Let us know how we can help.

We are interested in your needs and challenges and would be glad to assist you with your IRWM planning. You can read more about ClimateWise services and completed projects at www.climatewise.org.

Please call or email with your comments or questions to Marni Koopman (lead scientist) or Keith Henty (project developer).

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