

Chapter 4: Climate change

Introduction

The California Department of Water Resources, along with other State and federal agencies, has begun to recognize anthropogenic climate change as a significant threat to water resources management and reliability. The Inyo-Mono IRWM Phase I Plan begins to address the impacts of and responses to climate change in the Inyo-Mono region. The Phase II Plan will address climate change in more detail,



including quantitative assessments of energy use and greenhouse gas emissions resulting from water management activities in the region as well as proposed water projects.

Description of expected climate change impacts

California is fortunate to have many climate modelers and climate researchers specifically focusing on expected climate change impacts for the State and specific regions within the State. A discussion of projected changes in temperature and precipitation can be found in the *Descriptive Geography* section of Chapter 3. Because the Sierra Nevada snowpack is a major water reservoir for downstream urban, agricultural, and industrial users, potential changes in snowpack, water content, and streamflow are of particular concern for water managers. While the magnitude of precipitation is not expected to change substantially, changes in seasonality of precipitation and increases in temperature will impact snowpack, snow water content, and streamflow timing and amounts. Such changes in hydrology are important to measure and understand. While modelers have simulated changes in many of the west-flowing Sierran rivers, little work has been done on the waterways in the Inyo-Mono IRWM region. It is necessary to have more specific and quantitative projections of changes in this region to understand potential impacts to water resources. This is especially important for the Inyo-Mono region as water exports are a major use of Eastern Sierra water, and the City of Los Angeles depends upon these exports.

Specific impacts of climate change to water resources management vary throughout the region and may be as diverse as the water systems themselves. In addition to direct impacts on water resources, indirect impacts to water may occur through impacts to terrestrial systems. Examples of this include impacts to vegetation and soil properties. Also of concern is how climate change will impact land use. In the Inyo-Mono region, major land uses include grazing, recreation, agriculture, and conservation. Changes in land use from one type to another may affect water quality and quantity.

A significant issue in understanding climate change-related impacts to water systems is the rural and remote nature of the Inyo-Mono planning region. Much of the information regarding climate change and water resources provided by the State does not filter down to water managers in the region. In general, more region-specific information, along with more effective dissemination techniques, is needed. Phase II of the Inyo-Mono IRWM Plan will include a more detailed description of expected climate change impacts.

Climate change mitigation/GHG reduction

In California, the transportation, delivery, and use of freshwater accounts for 19% of the total electricity used (California Energy Commission, 2005). Recently, more attention has been paid to reducing the amount of energy used in water resources management. In the Inyo-Mono region, little to no accounting of water-related energy use and greenhouse gas emissions has taken place. While techniques to perform such accounting have improved, most water agencies and rural water districts in the region do not have the resources to perform these tasks. Funds were requested in the September, 2010, Planning Grant application to begin quantifying water-related energy use and emissions during the development of the Phase II Plan. At that point, the I-M RWMG will have more information with which to better assess how to reduce energy consumption and GHG emissions both on an aggregate scale and on a project-by-project basis.

The I-M RWMG has recognized, however, that it is necessary to begin thinking about how water projects in the region will be impacted by and will impact climate. In the region-specific ranking criteria for Round 1 Implementation projects, two climate change-related questions were posed to each project proponent: "Will this project result in reduced greenhouse gas emissions? If yes, explain how." and "Will this project contribute to developing or implementing adaptation strategies to respond to climate variability impacts on water resources? If yes, explain how." While it was not expected that project proponents would necessarily be able to fully consider these issues during Round 1, it is expected that project proponents should develop an awareness of how water resources management relates to climate change and to begin to seriously consider this in future rounds of project submittals. The I-M RWMG will draw upon many resources, include in-house expertise, DWR staff, Sierra Nevada Alliance staff, and others, to aid the group in more fully understanding and accounting for climate change in the future.

Climate change adaptation strategies

Climate change adaptation strategies as they relate to water resources management are still fairly new and undeveloped. Researchers and state and federal agencies have put much thought into the subject and have produced a plethora of reports, papers, and guidance. Specific examples of actual adaptation strategies being put into practice, however, are lacking. DWR published a report in 2008 titled “Managing and Uncertain Future: Climate Change Adaptation Strategies for California’s Water”. In this report, DWR proposes 10 adaptation strategies for water resources management:

- Provide sustainable funding for statewide and integrated regional water management
- Fully develop the potential of integrated regional water management
- Aggressively increase water use efficiency
- Practice and promote integrated flood management
- Enhance and sustain ecosystems
- Expand water storage and conjunctive management of surface and groundwater resources
- Fix Delta water supply, quality and ecosystem conditions
- Preserve, upgrade, and increase monitoring, data analysis, and management
- Plan for and adapt to sea level rise
- Identify and fund focused climate change impacts and adaptation research and analysis

While not all of these strategies are relevant for the Inyo-Mono region, many of them are, and using this list as a guide will allow water managers to begin thinking about how to manage their water supplies in response to climate change impacts.

Similar to climate change mitigation and greenhouse gas reduction strategies, climate change adaptation strategies are not well-understood in this remote region. Information produced by DWR and other state and federal agencies regarding climate change rarely filters down to rural water agencies and community water districts. While some of the larger urban water districts are able to commit staff time to considering climate change mitigation and adaptation strategies, smaller water districts simply do not have the resources to do so. A goal of the RWMG is to provide information to its members and the larger community about potential climate change impacts and possible response strategies in the region. This will include topic-specific discussions at RWMG meetings as well as public information sessions on climate change. One resource available for water managers and practitioners in the Inyo-Mono region is a dissertation chapter written by one of the IRWMP staff members (Alpert, 2009). This paper explores potential climate change impacts to the Mammoth Lakes water system and provides an analysis of possible adaptation strategies to respond to these impacts.

Climate change adaptation strategies for the Inyo-Mono region will be more fully explored in Phase II of the Inyo-Mono IRWM Plan.

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