Integrated Regional Water Management (IRWM)
Climate Change Document Clearinghouse

PUBLIC REVIEW DRAFT - April 2010

Public comments are being accepted on this document until May 10th, 2010.
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On March 4, 2010, the Department of Water Resources (DWR) released draft IRWM planning guidelines, which require the inclusion of climate change considerations in IRWM planning analyses. In an effort to assist IRWM practitioners, DWR has developed a clearinghouse of climate change documents relevant to IRWM planning.

The documents included in this clearinghouse provide:

- Background information on the current and future impacts of climate change,
- Resource planning strategies for adapting to climate change, and
- Considerations for incorporating climate change analysis into California Environmental Quality Act (CEQA) documents.

Each IRWM planning organization will have to consider their specific regional role in addressing climate change; these documents can be used as references to build the necessary understanding of climate change issues and potential impacts. The documents come from a range of sources from international, national, state, and regional entities and therefore provide a wide variety of useful information.
Documents noted with an asterisk (*) may also be useful for developing climate change analyses and mitigation and adaptation strategies.

Background Information on Current and Future Climate Change Impacts - General

Global Climate Change Impacts in the United States

US Global Change Research Program – June 2009
http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts
This report synthesizes information from a wide variety of scientific assessments and recently published research to summarize in plain language what is known about the observed and projected consequences of climate change in the United States. The report was prepared with the goal of informing public and private decision making at all levels. The relationship of climate change to water, energy, agriculture and human health in the US are explored. The importance of

mitigation of climate change is emphasized by comparisons of impacts resulting from higher vs. lower emission scenarios.

The Copenhagen Diagnosis – Updating the World on the Latest Climate Science

Climate Change Research Centre – 2009
http://www.ccrc.unsw.edu.au/Copenhagen/Copenhagen_Diagnosis_LOW.pdf
The Copenhagen Diagnosis is an interim report prepared by the Intergovernmental Panel on Climate Change (IPCC) which evaluates the evolving, policy-relevant, climate science written for a broad audience of policy-makers, stakeholders, the media, and the public. This report presents the most significant climate change findings related to greenhouse gas (GHG) emissions, melting of glaciers and ice-caps, Arctic sea-ice decline, current and projected sea level rise, and risks associated with crossing critical thresholds resulting in irreversible damage. The science used in this report is based on the most credible and significant peer-reviewed literature available at the time of publication and the report addresses some common misconceptions in climate change science.

Climate Change and Water

Intergovernmental Panel on Climate Change Technical Report VI – June 2008
http://www.ipcc.ch/publications_and_data/publications_and_data_technical_papers_climate_change_and_water.htm
Observational records and climate projections provide abundant evidence that freshwater resources are vulnerable and have the potential to be strongly impacted by climate change, with wide-ranging consequences for human societies and ecosystems. This Technical Paper prepared by the IPCC summarizes findings of recent research studies conducted worldwide on the potential impacts of climate change on temperature and precipitation patterns, drought and flood events, water quality and availability, water infrastructure, and all aspects of the freshwater hydrologic cycle that will impact humans and ecological systems in the future. Observed and projected changes in climate as they relate to water are discussed. Mitigation measures and implications for policy and globally sustainable development are explored within this comprehensive document.

Understanding and Responding to Climate Change: Highlights of National Academies Reports

National Academy of Science – 2008
http://dels.nas.edu/dels/rpt_briefs/climate_change_2008_final.pdf
The National Academies prepared this booklet to highlight climate change findings and recommendations from numerous National Academies' reports done in the last decade. The booklet provides an overview of the recent scientific findings, the foundations of climate science, impacts of climate change, and how the science is used to inform management decisions. All the reports referenced in the booklet are available at http://www.nap.edu.

Climate Literacy: The Essential Principles of Climate Sciences

US Global Change Research Program – March 2009
http://www.globalchange.gov/resources/educators/climate-literacy
The *Climate Literacy* guide resulted from a broad collaboration among science agencies, non-governmental organizations, and individuals through workshops sponsored by the National Oceanic and Atmospheric Administration (NOAA), the American Association for the Advancement of Science, and the National Science Foundation. The guide presents information for individuals and communities to understand about climate and people's influence on climate, and the impacts of climate change to society. Principles in the guide can serve to advance discussion and scientific inquiry.

Background Information on Current and Future Climate Change Impacts – California Specific

Climate Action Team Biennial Report – DRAFT

California Climate Action Team – March 2009
http://www.energy.ca.gov/2009publications/CAT-1000-2009-003/CAT-1000-2009-003-D.PDF
Executive Order S-05-05 mandates the preparation of biennial science assessment reports on climate change impacts and adaptation options for California. This draft report is the second such report and differs from the first 2006 policy-based assessment in that the joint effect of increased urbanization and climate impacts are examined. Six model simulations under two emissions scenarios were run to generate a range of possible future conditions. Impacts of climate change on public health, infrastructure, natural resources, energy, water, transportation, forestry, agriculture and the economy are all explored in depth. State efforts to study and adapt to current and future effects of climate change are described.

The Future is Now: An Update on Climate Change Science Impacts and Response Options for California

California Climate Change Center– May 2009
http://www.energy.ca.gov/2008publications/CEC-500-2008-071/CEC-500-2008-071.PDF
[Long Version-Technical]
http://www.energy.ca.gov/2008publications/CEC-500-2008-077/CEC-500-2008-077.PDF
[Short Version-Layman]
The California Energy Commission Public Interest Energy Research (PIER) Program prepared this interim summary to demonstrate that the effects of climate change are already being felt in California. The report provides recommendations that encompass both mitigation and adaption for decision makers in California. This report, for use by state agencies and the Legislature, is intended to supplement the PIER Program biennial reports that are focused on impacts related to climate change. Therefore it synthesizes the most recent findings, from published literature, outlines a response strategy, and highlights the benefits to California from implementing actions now.

*Preparing California for a Changing Climate

Public Policy Institute of California – November 2008
http://www.ppic.org/content/pubs/report/R_1108LBR.pdf
This paper promotes a comprehensive statewide adaptation strategy in order to reduce California's vulnerability to unavoidable impacts of a warming planet. Adaptation challenges in six particularly susceptible areas-water resources, electricity, coastal resources, air quality, public health, and ecosystem resources-are examined with regard to how well California's institutions are prepared to address them. Many institutions, such as water agencies, electric utilities, public health agencies and the regional bodies responsible for coastal oversight, are already geared toward dealing with climate related challenges. However, funding constraints, conflicting federal policies, and limited availability of adaptation tools still hinder the State's ability to prepare for a changing climate. Recommendations on priority areas for research to address these weaknesses and legal and regulatory changes that would facilitate adaptation are discussed.

*California Climate Risk and Response

UC Berkeley Department of Agricultural and Resource Economics – November 2008
http://www.energy.ca.gov/2008publications/CEC-500-2008-071/CEC-500-2008-071.PDF
This report uses the available science on climate damage to assess the economic implications and examine adaptation strategies in seven sectors: water; energy; transportation; tourism and recreation; real estate and insurance; agriculture, forests, and fisheries; and public health.

Additionally, this report recommends several adaptation policies, supported by more intensive and extensive research, which will help the state transition to a more climate resilient future.

Water Resource Planning

*California Water Plan Update 2009

California Department of Water Resources – October 2009
http://www.waterplan.water.ca.gov/cwpu2009/index.cfm
The 2009 California Water Plan Update emphasizes the need to act now to provide integrated, reliable, sustainable, and secure water resources and management systems for the economy, ecosystems, and human health. Aging infrastructure, impaired water bodies, and declining ecosystems are serious problems that must be addressed in the face of climate change and a rapidly growing human population. Update 2009 promotes IRWM as a strategy to maximize water supply security, protect water quality and ecosystems, and adapt to changing conditions. The report contains a thorough discussion of impacts that have already occurred, and additional changes that are expected, which will be useful to IRWM planners as they prepare climate change-related portions of their documents. A sustainable, resilient infrastructure which high levels of regional involvement and coordination is presented as the best way to deal with the challenges to come.

*Managing an Uncertain Future: Climate Change Adaptation Strategies for California's Water

California Department of Water Resources – October 2008
http://www.water.ca.gov/climatechange/docs/ClimateChangeWhitePaper.pdf
This report recommends a series of adaptation strategies for state and local water managers to improve their capacity to handle change. Many of the strategies will also help adapt our water resources to accommodate non-climate demands such as a growing populations, ecosystem restoration and greater flood protection. Strategies discussed include investment in IRWM, aggressively increasing water use efficiency, enhancing and sustaining ecosystems, expanding water storage and conjunctive management of surface and groundwater resources, increasing hydrologic monitoring, data analysis and management and planning for sea level rise.

*Progress on Incorporating Climate Change into Management of California's Resources

California Department of Water Resources – July 2006
http://baydeltaoffice.water.ca.gov/climatechange/DWRClimateChangeJuly06.pdf
In response to Executive Order S-13-08, DWR produced this document to describe progress in incorporating climate change into existing water resources planning and management tools and methodologies. This large report includes eight chapters presenting the progress and future directions on incorporating climate change science into California's water resource management with focus on assessment methodologies and preliminary study results. Some of the analysis done in this report has been revisited and updated in another document included in this clearinghouse titled ***Using Future Climate Projections to Support Water Resources Decision Making in California.*** In combination, these reports provide guidance to the implications and considerations of climate change effects on IRWM.

*Using Future Climate Projections to Support Water Resources Decision Making in California

California Department of Water Resources – May 2009
http://www.energy.ca.gov/2009publications/CEC-500-2009-052/CEC-500-2009-052-F.PDF
This document describes advances climate projection information in California water resource planning since the 2006 climate change assessment by DWR, ***Progress on Incorporating Climate Change into Management of California's Water Resources*.** Advances include a better understanding of how well current models represent historical climate conditions and refined technologies represent streamflows, outdoor urban and agricultural water demands, and sea level rise. Twelve climate projections are used to assess the reliability of Central Valley Project and the State Water Project operations. This information is particularly useful for addressing the implications and considerations of climate change on changing hydrology.

*Adapting California's Water Management to Climate Change

Public Policy Institute of California – November 2008
http://www.ppic.org/content/pubs/report/R_1108JLR.pdf
Significant water management challenges facing California in the coming decades due to climate change include accelerated sea level and increased temperatures. Sierra Nevada snowpack will be reduced and runoff will shift towards winter months. Changes in timing and amount of precipitation will cause significant flood control challenges. Integrated adaptive responses are needed by all entities responsible for water management in California, including federal, state and local agencies, retail water utilities, and agricultural water districts. IRWM proponents will find a useful discussion of water management adaptation options and associated costs. Institutional capacities and constraints to adaptation as well as the dynamic interaction of climate change mitigation and adaptation actions are also explored.

Framework for Implementation of Water Management Planning

California Partnership for the San Joaquin Valley – March 2009
http://www.sjvpartnership.org/uploaded_files/WG_doc/CWIfinalversionExtractCPSJV10222009.pdf
A Water Work Group commissioned by the California Partnership for the San Joaquin Valley has developed a framework for long-term Valley water management. The framework embraces the creation of IRWM plans and identifies information gathering and dissemination tools that outline core information needs for participants at every level. While this document was specifically generated for San Joaquin Valley water users, the information applies to other statewide IRWM planning efforts.

*Options for Improving Climate Modeling to Assist Water Utility Planning for Climate Change

Water Utility Climate Alliance – December 2009
http://www.wucaonline.org/assets/pdf/actions_whitepaper_120909.pdf
The Water Utility Climate Alliance prepared this report focusing on how several large water utilities (Denver, New York City, Portland, San Francisco, Seattle, and Southern Nevada) have used global climate models (GCMs) and downscaling techniques to examine climate change impacts and the scientific uncertainties associated with those techniques. The report provides the history behind the science being used and the limitations associated with both the GCMs and the downscaling techniques when they are applied to water utilities planning efforts or other water management planning efforts.

*Decision Support Planning Methods: Incorporating Climate Change Uncertainties into Water Planning

Water Utility Climate Alliance – January 2010
http://www.wucaonline.org/assets/pdf/actions_whitepaper_012110.pdf
This white paper presents multi-outcome planning techniques for water utilities interested in incorporating climate change adaptation into their own planning processes. The document guides those utilities on how to include the large range of climate projections and new information into water utility planning, as well as move forward with the adaptation process. Decision Support Planning Methods (DSPMs) and case studies are presented to help utilities and other water resource management entities characterize and understand the multiple uncertainties associated with climate change. The white paper discusses five DSPMs that provide frameworks to help water resource managers decide on how to direct their planning in order to adapt to climate change.

*Climate Change and Water Resources Management: A Federal Perspective

US Department of Interior, US Geological Survey – 2009
http://pubs.usgs.gov/circ/1331/Circ1331.pdf
This interagency report prepared by the United States Geological Survey, US Army Corps of Engineers, Bureau of Reclamation (Reclamation), and NOAA explores strategies to improve water management by tracking, anticipating, and responding to climate change. The authors acknowledge that climate change is one of many challenges facing water managers, and that a holistic approach to water resources management includes all significant drivers of change such as population, land use, economic development, groundwater development and social values. Adaptation options and approaches for decision-making and long-range planning in the face of uncertainties and multiple dynamic processes are explored.

Literature Synthesis on Climate Change Implications for Reclamation's Water Resources

United States Bureau of Reclamation – September 2009
http://www.usbr.gov/research/docs/climatechangelitsynthesis.pdf
The resources in this literature synthesis document are intended to provide region-specific support for long-term water management planning in the western United States. While the document was prepared specifically for Reclamation staff involved in planning and environmental compliance activities, staff from other governmental agencies and nongovernmental entities associated with Reclamation projects and activities will also find it useful. Emphasis was placed on documents pertaining to climate change as it relates to hydrology and water resources and application of climate change science in the western United States. Historical climate and hydrology, projected future climate and hydrology, studies of impacts on environmental resources, and historical sea level rise and projected sea level rise under climate change are assessed for each of the five western Reclamation regions. Downscaled regional climate change projections and map resources are provided.

Climate Change in Colorado: A Synthesis to Support Water Resources Management and Adaptation

Colorado Water Conservation Board – October 2008
http://cwcb.state.co.us/Home/ClimateChange/ClimateChangeInColoradoReport/
This report is a synthesis of climate change science relevant to Colorado's water supply for use by water managers and planners. The document focuses on observed trends, modeling, and projections of temperature, precipitation, snowmelt, and runoff. It also provides a scientific basis to support further studies of water resources impacts in Colorado. A detailed chapter on climate models, emissions scenarios and downscaling methodology is provided, which is useful information for IRWM planners.

General Resource Planning

*2009 California Climate Adaptation Strategy

California Natural Resources Agency – December 2009
http://www.energy.ca.gov/2009publications/CNRA-1000-2009-027/CNRA-1000-2009-027-F.PDF
Multiple state agencies, led by the California Natural Resources Agency (CNRA), developed the *Climate Adaptation Strategy* in response to Gov. Schwarzenegger's November 2008 Executive Order S-13-08 to identify how these agencies can respond to rising temperatures, changing precipitation patterns, sea level rise, and extreme natural events. The document summarizes climate change impacts in seven specific sectors (i.e., Public Health; Biodiversity and Habitat; Ocean and Coastal Resources; Water Management; Agriculture; Forestry; and Transportation and Energy Infrastructure) and provides recommendations on how to manage against climate change threats. DWR was one of the agencies involved in the development of this document and the water sector strategies closely match the strategies laid out in ***Managing an Uncertain Future: Climate Change Adaptation Strategies for California's Water***. IRWM planners will find the strategies useful for preparation of climate change sections of their IRWM plans and funding proposals.

*Climate Change in California: Scenarios for Adaptation

Public Policy Institute of California – November 2008
http://www.ppic.org/content/pubs/report/R_1108ALR.pdf
This report provides an overview of mid-century climate change scenarios for California and explores how these might be used in state and regional planning efforts in the future. Over the near term (10-30 years), an effective strategy is likely to be identifying and pursuing actions that strengthen the ability to cope with today's climate variability, while also accounting for the most likely climate impacts over that time period. Such an approach will build resilience while new information continues to come in regarding the trajectory of future climate change. Uncertainties inherent to the various trajectories and their relation to emissions scenarios are discussed.

*Climate Change Scoping Plan: A Framework for Change

California Air Resources Board – December 2008
http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm (background for document)
http://www.arb.ca.gov/cc/scopingplan/document/scopingplandocument.htm (home page for document)
http://www.arb.ca.gov/cc/scopingplan/document/adopted_scoping_plan.pdf (actual document)
The California Air Resources Board (ARB), in coordination with the Climate Action Team (including DWR), developed the *Scoping Plan* in response to meeting one of the requirements of Assembly Bill 32 (AB 32), the Global Warming Solutions Act of 2006, which Governor Schwarzenegger signed into law in 2006. This law requires a reduction of GHG emissions to 1990 levels by 2020. ARB is the lead agency for implementing AB 32, and has developed a list of discrete early actions to begin reducing GHG emissions, assembled an inventory of historic emissions, established GHG emission reporting requirements, and set the 2020 emissions limit. The *Scoping Plan* outlines the state's strategy to achieve the 2020 GHG emissions limit and proposes actions designed to reduce overall GHG emissions in California, improve the environment, reduce the state's dependence on oil, diversify energy sources, save energy, create new jobs, and enhance public health. Since all activities within the state will be required to comply with the scoping plan by 2012, all IRWM planning entities should review this plan and evaluate its potential impact on their activities.

*Sierra Climate Change Toolkit: Second Edition

Sierra Nevada Alliance – 2007

http://www.sierranevadaalliance.org/publications/db/pics/1133215571_14593.f_pdf.pdf

This document reviews the science of climate change on the global, national, state, and regional levels. An overview of the effects of GHG emissions and suggested reduction actions by individuals are provided. Climate change adaptation planning strategies for water, watershed management, species protection, forest management, wildfire management, and land use planning are included and make up the bulk of this document. The principles provided in the document are useful tools in the assessment of regional climate change adaptation and actions for addressing GHG emissions.

Preparing for Climate Change: A Guidebook for Local, Regional, and State Governments

University of Washington - Center for Science in the Earth System – September 2007

http://www.cses.washington.edu/db/pdf/snoveretalgb574.pdf

This guidebook emphasizes that waiting until climate change impacts are completely clear entails risk of being poorly equipped to manage the social, economic and ecological consequences, as well as losing the opportunity to take advance of potential benefits. Creating climate resilient communities are the end goal of this process. The guidebook explains how to conduct vulnerability and risk assessments and how to develop and implement a "preparedness plan."

The Washington Climate Change Impacts Assessment

University of Washington - The Climate Impacts Group – June 2009

http://cses.washington.edu/cig/res/ia/waccia.shtml

This assessment of the future ecological and economic impacts of climate change in the state of Washington presents a complete and up to date picture of the future climate of the Pacific Northwest. Global climate model projections from the IPCC Fourth Assessment are used to develop regionally-specific climate change scenarios which are then examined in relation to the consequences for eight important sectors: urban stormwater infrastructure, hydrology and water management, energy, agriculture and economics, salmon and ecosystems, forests, human health, and coasts. IRWM planners will find much information useful for local planning efforts.

Water-Energy Nexus

California's Water-Energy Relationship

California Energy Commission – November 2005

http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

This report examines how energy is used - and how it can be saved - in the water use cycle. The strategies and goals for a comprehensive statewide water-energy program would achieve incremental energy benefits for water and energy utilities. The report proposes to provide stakeholders with incentives to continuously identify and implement strategies optimizing the state's water and energy resources and assets on an integrated, coordinated, and collaborative basis. The report evaluates actions and methods that can boost the synergistic efficiencies of both the energy and water sectors. These and many other recommendations in the report are useful for IRWM planners.

Refining Estimates of Water-Related Energy Use in California

Prepared for California Energy Commission By Navigant Consulting, Inc. – December 2006

http://www.energy.ca.gov/pier/project_reports/CEC-500-2006-118.html

The 2006 report was a continuation study of the 2005 report titled ***California's Water-Energy Relationship***. It reviews and updates estimates for the magnitude and intensity of water-related energy consumption by segment of the water-use cycle. It further provides adjusted water-energy proxies that are sufficient for informing policy and prioritization of research and development investments. A phased approach is recommended to continually refine water-related energy intensity estimates on an ongoing basis.

Methodology for Analysis of the Energy Intensity of California's Water Systems, and an Assessment of Multiple Potential Benefits through Integrated Water-Energy Efficiency Measures

UC Santa Barbara – January 2000

http://www.es.ucsb.edu/faculty/wilkinson.pdfs/Wilkinson_EWRPT01%20DOC.pdf

This exploratory study for the California Institute for Energy Efficiency examines the energy intensity of water use in specific geographic areas of the state, and it estimates the potential energy benefits of efficiency improvements of water use. The analysis indicates that significant potential *energy* efficiency gains are possible through implementation of cost-effective *water* efficiency improvements. This exploratory study identifies significant potential cost-effective energy efficiency benefits from integrated energy, water, and wastewater efficiency programs.

Sea Level Rise

A Report on Sea Level Rise Preparedness

California State Lands Commission – December 2009

http://www.slc.ca.gov/Reports/SEA_LEVEL_Report.pdf

Sea level rise presents a very serious threat to coastal communities and infrastructure, including transportation facilities, electric utility systems and power plants; storm water systems and wastewater treatment plants and outfalls; coastal wetlands; and other human and natural systems. This report discusses the role of the State Lands Commission (Commission) in addressing the threat of sea level rise through oversight of development on coastal lands managed by the Commission. The report also summarizes the results of a survey conducted by Commission staff to assess the extent to which major grantees and sublessees have considered the potential impacts of sea level rise on facilities located on sovereign lands. Recommendations to better assess the impacts are provided. Efforts by California, federal agencies, and other coastal states to address the issue are well summarized.

The Impacts of Sea-Level Rise on the California Coast

California Climate Change Center – May 2009

http://www.pacinst.org/reports/sea_level_rise/report.pdf

Flooding and erosion already pose a threat to communities along the California coast and there is compelling evidence that these risks will increase in the future. Under medium to medium-high GHG emission scenarios, mean sea level along the California coast will rise from 1.0 to 1.4 meters by the year 2100. A wide range of critical infrastructure will be at increased risk of inundation in a 100-year flood event, and accelerated erosion could result in a loss of 41 square miles of California's coastline. National studies on the economic cost of sea-level rise suggest that while adapting to climate change will be expensive, so are the costs of doing nothing, as substantial investments are already at risk and vulnerable. This report updates and expands a

1990 comprehensive regional assessment of sea level rise using more comprehensive data, new climate scenarios and modern computerized analytical tools.

Flood Protection in the Netherlands: Framing Long-Term Challenges and Options for a Climate-Resilient Delta

Netherlands Environmental Assessment Agency – December 2009
http://www.rivm.nl/bibliotheek/rapporten/500078004.pdf
Sea level rise and flooding vulnerabilities in the Netherlands are analyzed in this report, which indicates that the country has a good capacity to cope with both potential impacts of a warming climate. Three scenarios for adapting to anticipated changes are examined. Increased flood resilience in areas surrounding major rivers is promoted as a means to reduce risk of economic damage and casualties and provide flexibility for water management changes. This document is relevant for local IRWM planning efforts since similar risks of increased flooding and sea level rise are faced by IRWM stakeholders in California.

Biological Resource Impacts

The Impact of Climate Change on California's Ecosystem Services

California Climate Change Center – March 2009
http://www.energy.ca.gov/2009publications/CEC-500-2009-025/CEC-500-2009-025-D.PDF
This report projects the impact of future climate change on California's biodiversity and the natural provision of four key ecosystem services in California – carbon sequestration, forage production, water for instream flows for salmon, and snow recreation. The provision of all four ecosystem services will decline under most climate change scenarios, leading to a decline in economic output and well-being for the state. Continued development of our understanding of the links between climate, ecosystems and economic value through a comprehensive research program is urged. Consideration of potential regional changes to ecosystem services would enhance IRWM grant proposals and IRWM plans.

Ecological Impacts of Climate Change

National Academy of Sciences/National Research Council - 2008
http://dels.nas.edu/climatechange/ecological-impacts.shtml
Adequate planning for climate change in IRWM documents entails a necessary understanding of the magnitude and implications of potential changes on local and regional ecosystems. This document presents a series of examples of ecological impacts of climate change that have already been observed across the United States. The lives of all animals, plants and microorganisms are strongly attuned to changes in climate. If the changes in climate are modest and slow, the majority of species will likely adapt successfully. If the changes in climate are rapid or large, more and more species will face ecological changes to which they may not be able to adapt. Given that ecosystems provide imperative ecosystem services such as food, fiber, fuel, medicine, environmental regulation, and more, humans should attempt to minimize the magnitude of ecological impacts from climate change.

CEQA and Climate Change Considerations

NEW CEQA Guideline Amendments

http://ceres.ca.gov/ceqa/guidelines/
On December 30, 2009 the CNRA adopted amendments to the CEQA guidelines for GHG emissions, as directed by Senate Bill 97 (SB 97). The amendments became effective March 18, 2010. The new guidelines state that lead agencies should quantify GHG emissions where quantification is possible, or perform qualitative analysis, or both as appropriate in the context of

the particular project, in order to determine the amount, types, and sources of GHG emissions resulting from the project. The guidelines preserve the discretion of lead agencies in making determinations of significance but recommend that lead agencies consider the adoption of broad programmatic approaches for reducing GHG emissions from their activities. All IRWM activities which require CEQA analyses must comply with these new guidelines.

CEQA and Climate Change

CAPCOA – January 2008
http://www.capcoa.org/CEQA/CAPCOA%20White%20Paper.pdf
The California Air Pollution Control Officer Association prepared this white paper for public agencies to use as they develop procedures for reviewing GHG emissions from projects. The paper reviews policy choices, analytical tools, mitigation strategies, mitigation measures, and provides examples from guidance documents developed in Massachusetts, Washington, and California. It also presents methodologies for residential, commercial, specific and general plan scenarios and information on estimating emissions from solid waste facilities, wastewater treatment plants, and construction. This document may be particularly helpful for developing strategies for determining the significance of environmental impacts for GHG emissions.

Office of the Attorney General Information on CEQA and Climate Change

http://ag.ca.gov/globalwarming/ceqa.php
This website, maintained by the Office of the Attorney General, contains information about CEQA and ways that climate change can be analyzed by as part of the process of evaluating and disclosing the significant environmental impacts of proposed projects. Project level mitigation measures are proposed in a document titled ***Addressing Climate Change at the Project Level***, a link to which can be found on this webpage. Extensive background information on global warming is also available.

CEQA and Climate Change: Technical Advisory

Office of Planning and Research – June 2008
http://opr.ca.gov/index.php?a=ceqa/index.html (home page for document)
http://opr.ca.gov/ceqa/pdfs/june08-ceqa.pdf (actual document)
The Governor's Office of Planning and Research (OPR), in collaboration with the CNRA, the California Environmental Protection Agency and the ARB, published this *Technical Advisory* containing informal guidance for public agencies as they address the issue of climate change and GHG emissions in their CEQA documents. Since the passage of AB 32 (Global Warming Solutions Act of 2006), this *Technical Advisory* provides OPR's perspective on the issue and precedes the climate change and GHG regulations for CEQA. Technical resources, modeling tools to estimate GHG emissions, and examples of GHG reduction measures are included in the *Technical Advisory*.

DWR CEQA Guidance Documents

California Department of Water Resources – January 2010
http://www.water.ca.gov/climatechange/
DWR as the responsible agency for most IRWM grant making activities will be responsible for reviewing and approving CEQA documents prepared for projects funded through DWR's grant making process. As such, DWR expects that all DWR funded IRWM implementation projects will meet the requirements for climate change analysis in CEQA documents outlined in the CEQA Guideline Amendments approved by the CNRA on December 30, 2009. These DWR guidance documents are being provided to IRWM planning agencies as references to help them document the GHG emissions associated with their proposed projects and analyze the significance of these emissions for CEQA purposes.

Internet Sites with Additional Information on Climate Change

Links preceded by asterisks [**] contain GHG calculation tools

California Air Resources Board
http://www.arb.ca.gov/cc/cc.htm

**California Climate Action Registry
http://www.climateregistry.org/

California Climate Change Portal
http://www.climatechange.ca.gov/

California Climate Change Research Center
http://www.climatechange.ca.gov/research/index.html

California Department of Water Resources Climate Change Home Page
http://www.water.ca.gov/climatechange/

California Natural Resources Agency
http://www.resources.ca.gov/

California Office of the Attorney General
http://ag.ca.gov/globalwarming/index.php

Center for Climate Action
http://www.centerforclimateaction.org/cop15/

**Cool California
http://www.coolcalifornia.org/

**I.C.L.E.I. – Local Governments for Sustainability
http://www.icleiusa.org/programs/climate

Intergovernmental Panel on Climate Change
http://www.ipcc.ch/

NASA Goddard Institute for Space Studies
http://data.giss.nasa.gov/gistemp/

National Climatic Data Center
http://www.ncdc.noaa.gov/climate-monitoring/

National Oceanic and Atmospheric Administration Climate Services
http://www.climate.gov/#climateWatch

Pew Center on Global Climate Change
http://www.pewclimate.org/

**The Climate Registry
http://www.theclimateregistry.org/#

**The Greenhouse Gas Protocol Initiative
http://www.ghgprotocol.org/calculation-tools/all-tools

Union of Concerned Scientists - Climate Choices
http://www.climatechoices.org/

US Climate Change Science Program
http://www.climatescience.gov/default.php

**US Department of Energy Carbon Dioxide Information Analysis Center
http://cdiac.esd.ornl.gov/

US Environmental Protection Agency - Watershed Academy Web
http://www.epa.gov/watertrain/climate_water/

US Forest Service Climate Change Resources Center
http://www.fs.fed.us/ccrc/

US Global Change Research Program
http://www.globalchange.gov/