Anticipating California Delta Futures

A proposed joint activity of the Delta Independent Science Board and the Delta Science Program.
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Summary

The proposed effort will draw on the interdisciplinary sciences concerned with future thinking in pursuing a suite of activities including a survey of current scenario planning efforts in the Delta, discussions with members of the Delta scientific and management communities, and public seminars. Insights gained through these activities will be summarized in a report with recommendations to improve the use of scenario analysis in the Delta to prepare for alternative plausible futures under conditions of deep uncertainty. The goal is to foster dialogue about and inform development of scientific, social and policy responses that would be robust to a range of future conditions, including conditions characterized by rapid change and extreme events. This effort is responsive to multiple recommendations produced by the Delta Independent Science Board (Delta ISB) and the Delta Science Program (DSP) that have noted the need for anticipatory management (Delta ISB 2022; Norgaard et al. 2021).

Background

The California Delta is undergoing continual and often rapid change. Predicting and preparing for those changes is becoming more challenging, as the past is an inadequate model of future variability. Anticipating change is critical for effective management in the Delta. Science can be applied to make reasonable predictions of some future conditions, and much scientific effort aims to improve accuracy and the time and space scales of those predictions (e.g., climate change). However, many changes cannot be scientifically forecasted. Others may be forecasted but largely ignored due to their perceived low probability of occurrence.

Ignoring uncertainty can lead to inefficient investments since the solution that is optimal under a "best guess" future is not necessarily the one that performs best under diverse plausible future conditions (Wainger et al. 2021, Groves et al. 2019). As recent events have helped us realize, preparing for low probability events with potential high consequences for water supplies, ecosystems or human well-being is needed for effectively managing risks. Anticipating unlikely, but still plausible, future conditions has been demonstrated to speed

up responses during crises, improve resilience, and can create new insights about effective preparation for change.

One tool commonly used to support such forward-looking, future-oriented thinking is scenario analysis, in which future scenarios are collaboratively developed and used to evaluate how well alternative policies, scientific capabilities, or projects perform under various conditions. Scenario analysis is uniquely valuable among decision support tools in that it can be used to probe uncertainties beyond those that have been estimated using existing data and models to include *deep uncertainty*, which is system variability that cannot be well characterized with existing data, models and understanding. The exercise of developing and comparing alternative future scenarios reveals research gaps and management or policy needs, improving decisions by increasing capacity to prepare for, respond and adapt to rapid change.

The use of scenarios to plan in the face of deep uncertainty can be challenged by basic facets of psychology. Human behavior is conditioned by numerous *cognitive biases*, i.e., patterned psychological responses that developed in the evolutionary environment, and continue to influence, among other things, the ways we process and respond to information. Social scientists have produced an extensive literature on cognitive biases and there is a growing literature highlighting how they impact – and often impede – effective environmental policy and action, especially in a climate change context. Examples include cognitive biases that lead us to discount future impacts; biases that lead us to selectively accept or reject information to protect pre-existing beliefs and values; and biases that lead us to resist change in favor of the status quo. These and other cognitive biases may inhibit the development and use of scenarios that meaningfully account for low-probability events, or deep uncertainty more generally.

Scenario planning is already being used by many government agencies in the Delta. The proposed Delta ISB-DSP effort will survey and critically evaluate these efforts (Activities 1 and 2), using social scientific methods to explore whether there are patterns in scenario design that suggest the influence of certain cognitive biases, especially in the treatment of uncertainty. A qualitative analysis of scenarios will characterize properties of scenarios and will be structured to detect potential gaps, omissions, and other recurring limitations in current scenario planning efforts. Discussions with Delta scenario planning stakeholders, and other interested or affected parties, will complement this formal analysis.

With awareness and intention, cognitive biases can be counteracted to advance more creative, anticipatory approaches to environmental planning and management. The fields of decision science, psychology, and futurism have developed techniques that can be applied to generate scenarios that represent uncorrelated drivers and extreme changes. These approaches differ from scenarios that explore sensitivity to known variability in that they are often used to stress-test policies in terms of potential performance for outcomes

where probabilities are lacking (e.g., Lempert et al. 2004). The public seminar series (Activity 3) will introduce concepts and tools from these scientific fields. The science that has been developed to structure future thinking can be applied to inform the range of future possibilities that we consider in scenario analysis and assist us in avoiding typical mental traps such as a focus on incremental, rather than rapid, change.

Results and insights gained through these three activities will be summarized in a report along with recommendations to help the Delta science and management enterprise better characterize, prepare for, and adapt to uncertainty for a range of management needs such as salinity management, water supply, and ecosystem goals. Recommendations could inform new analyses, simulations, and strategic scientific plans by agencies and other activities to anticipate and prepare for the future.

Proposed Activities

1. Survey and qualitative analysis systematically characterizing and critically evaluating existing Delta scenario planning exercises through an interdisciplinary futurism lens.
2. Discussions with parties who are interested or involved in developing and/or using scenarios (e.g., scientists, managers, policymakers, planners, Tribes, community activists/organizers, etc.).
3. Public seminar series to:
    a. Introduce concepts of future thinking
    b. Explore/identify deep uncertainties in the Delta
    c. Identify some signals of future change
    d. Provide other useful background information
4. Joint Delta ISB-DSP report synthesizing findings of activities 1-3 above, with recommendations to improve use of scenario analysis to inform decision-making under deep uncertainty in the Delta.
5. Interactive workshop to engage interested or affected parties in understanding/exploring applications of recommendations.

References

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