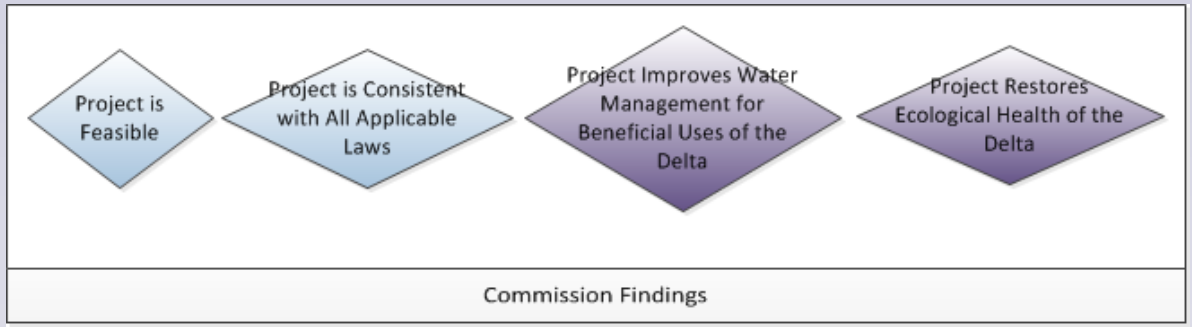
FEBRUARY 2016

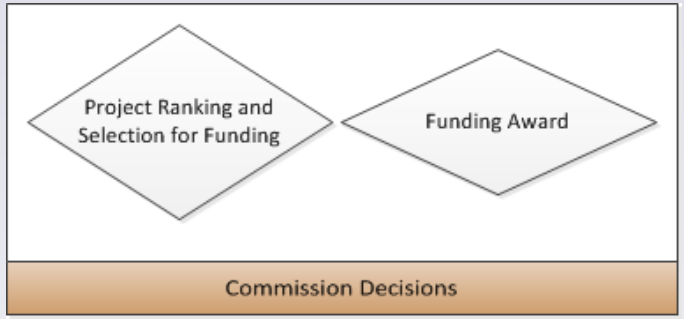
California Water Commission
Water Storage Investment Program
Modeling as a Tool for Water Resources Planning and Decision Making

Commission Findings and Decisions

- Commission Findings (Statute)

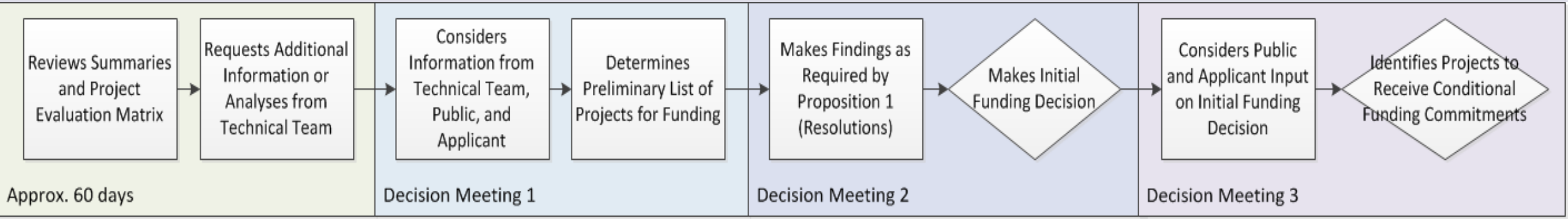


- Commission Decisions (Regulations)

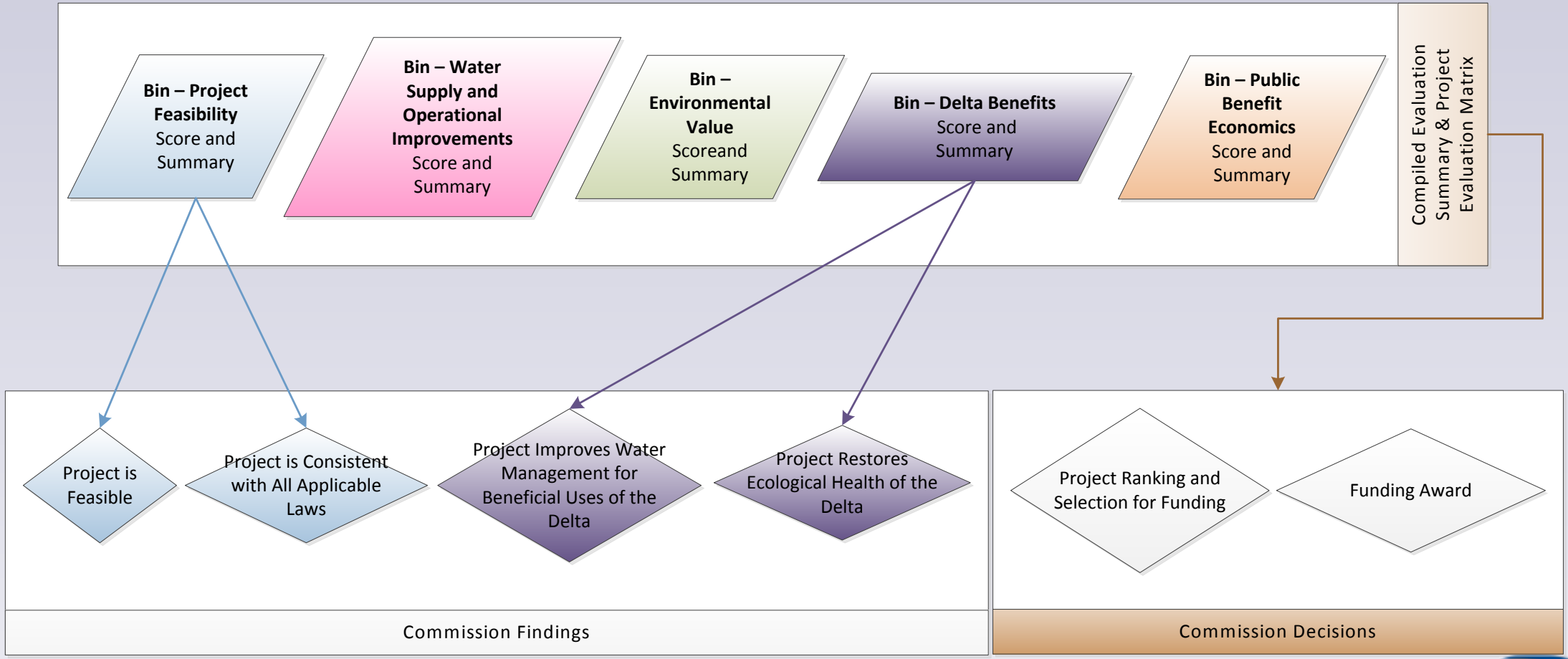


How/When Will Decisions be Made?

- Decisions will be informed by the technical review process and comments made by the public or applicants during Commission meetings
- The Commission:



How Will the Decisions Be Informed?



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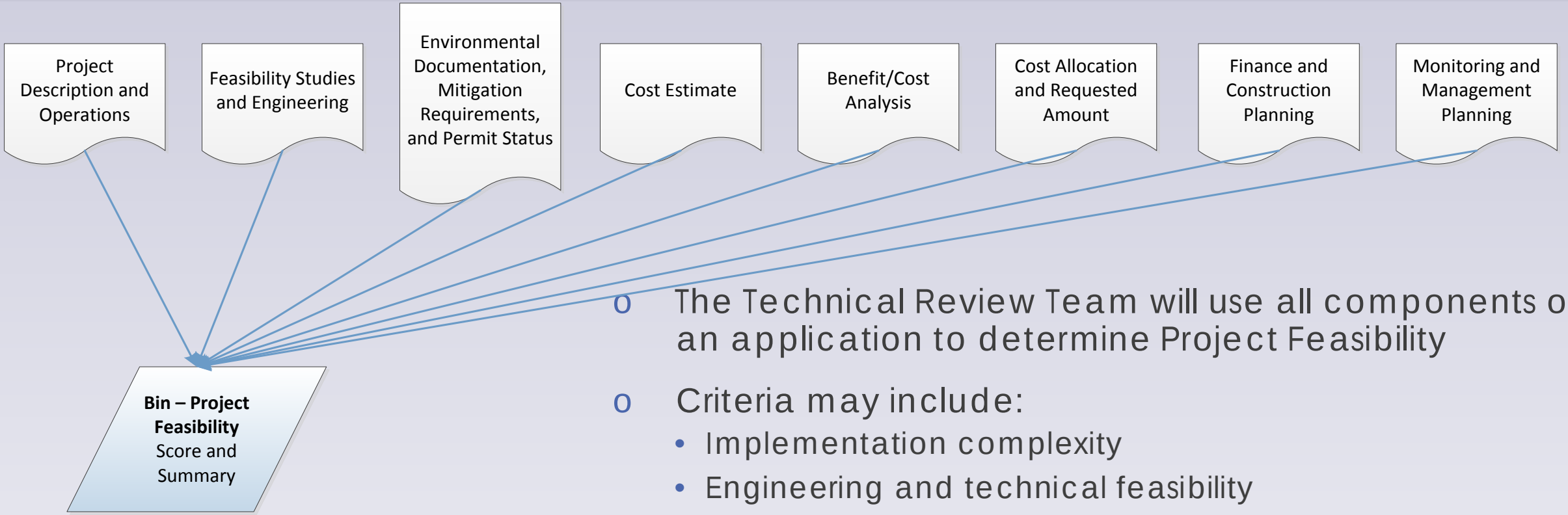
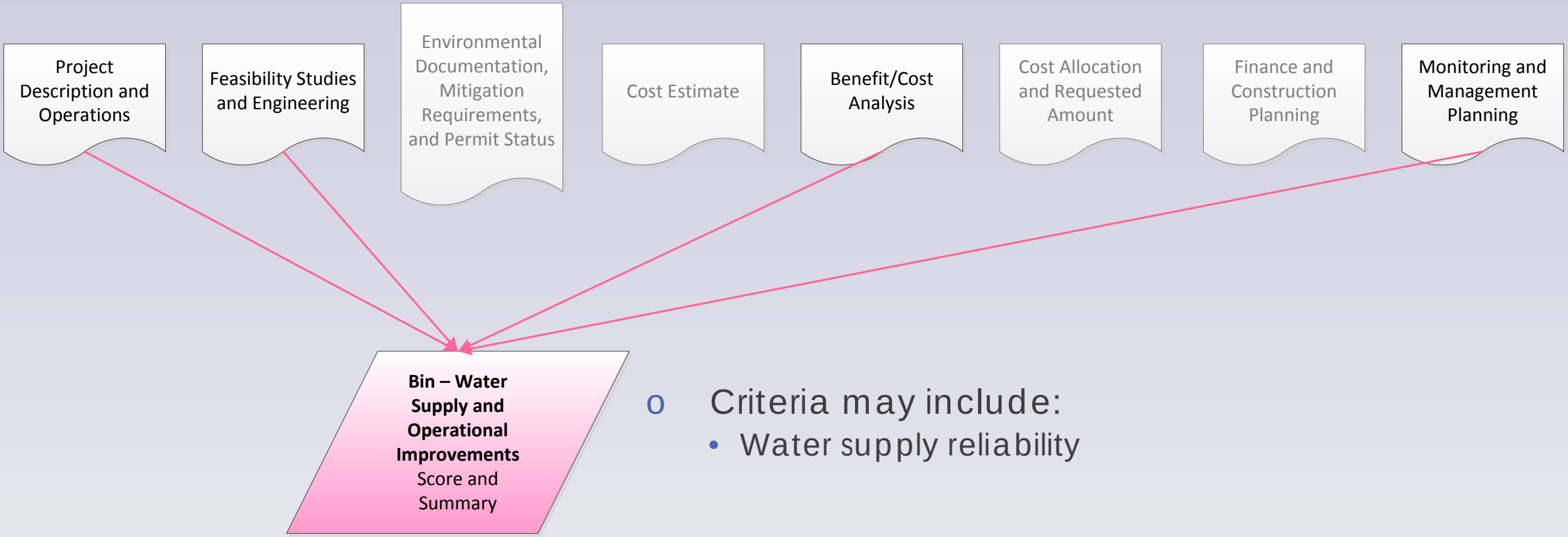
What Informs Project Feasibility?



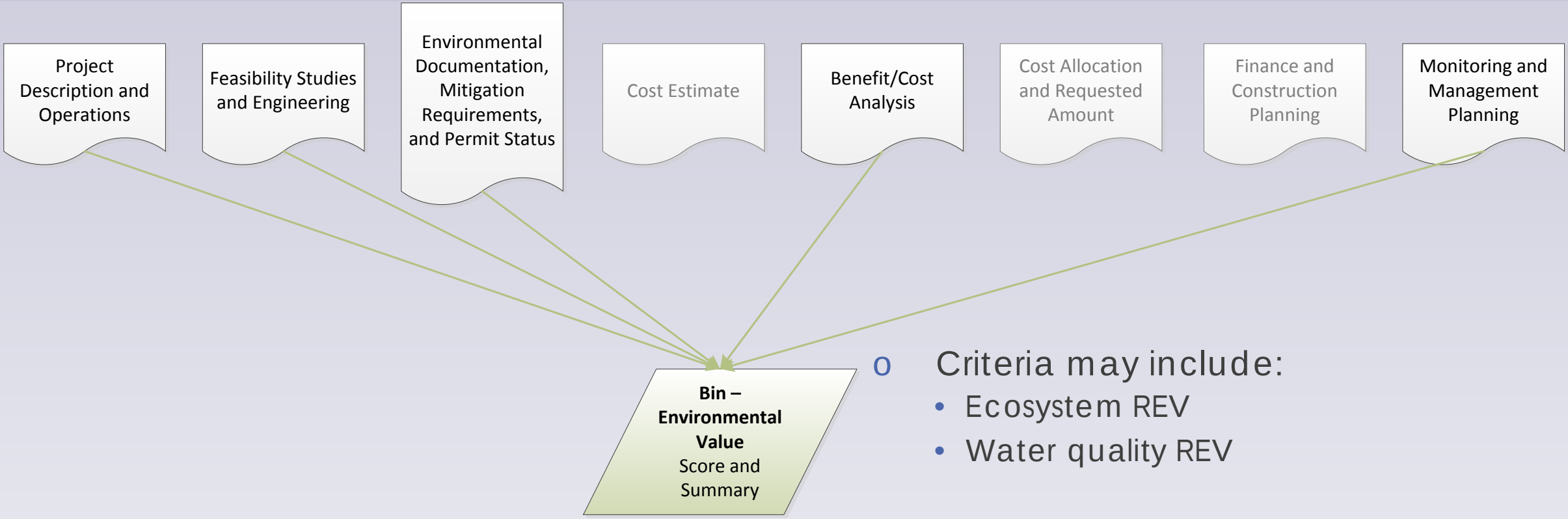
- The Technical Review Team will use all components of an application to determine Project Feasibility
- Criteria may include:
  - Implementation complexity
  - Engineering and technical feasibility
  - Environmental feasibility
  - Economic feasibility
  - Financial feasibility

What Informs Water Supply and Operational Improvements?



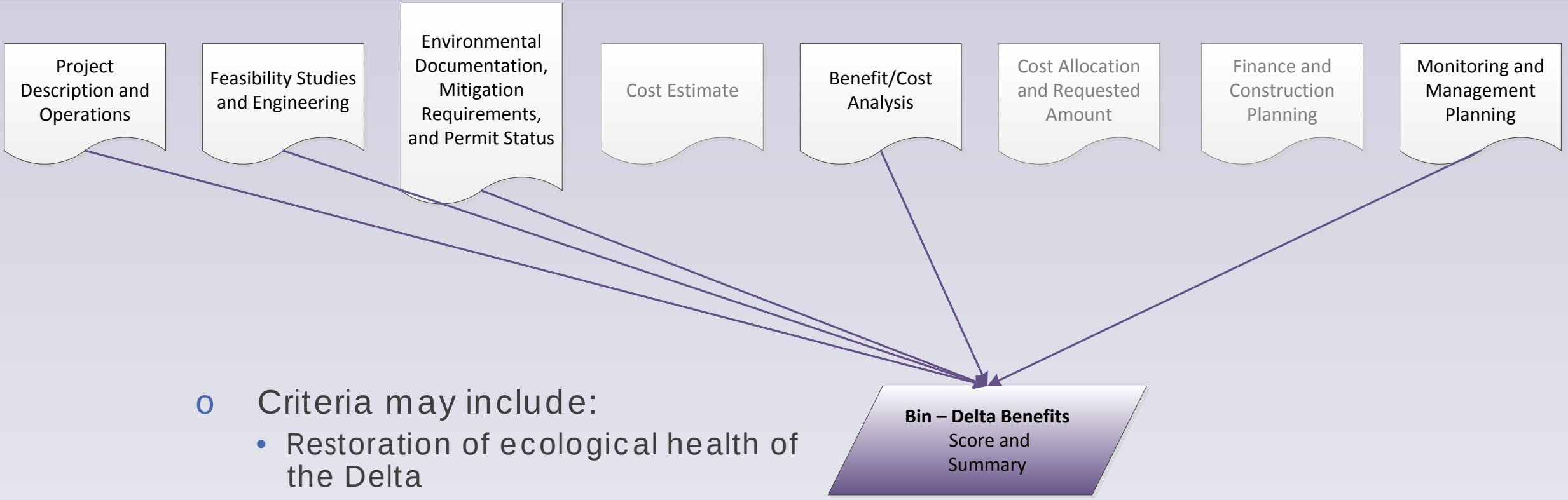
- Criteria may include:
  - Water supply reliability

What Informs Environmental Value?



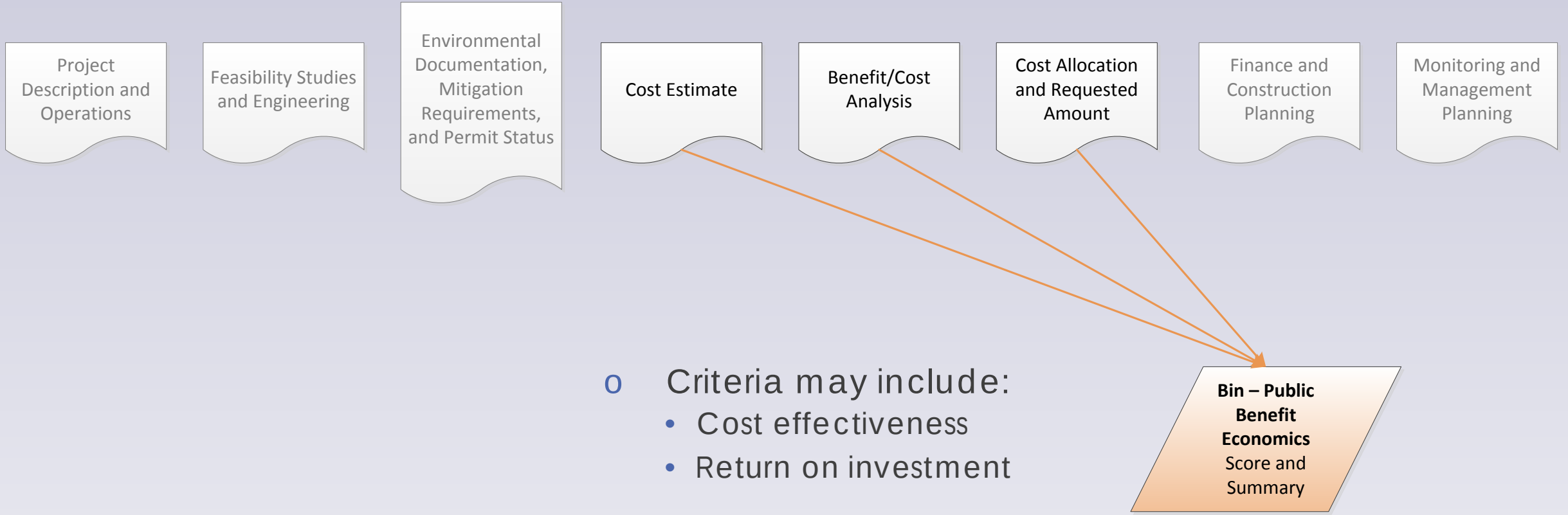
- Criteria may include:
  - Ecosystem REV
  - Water quality REV

What Informs Delta and Delta Tributaries Ecosystem Improvements?



- Criteria may include:
  - Restoration of ecological health of the Delta
  - Water management for beneficial uses of the Delta

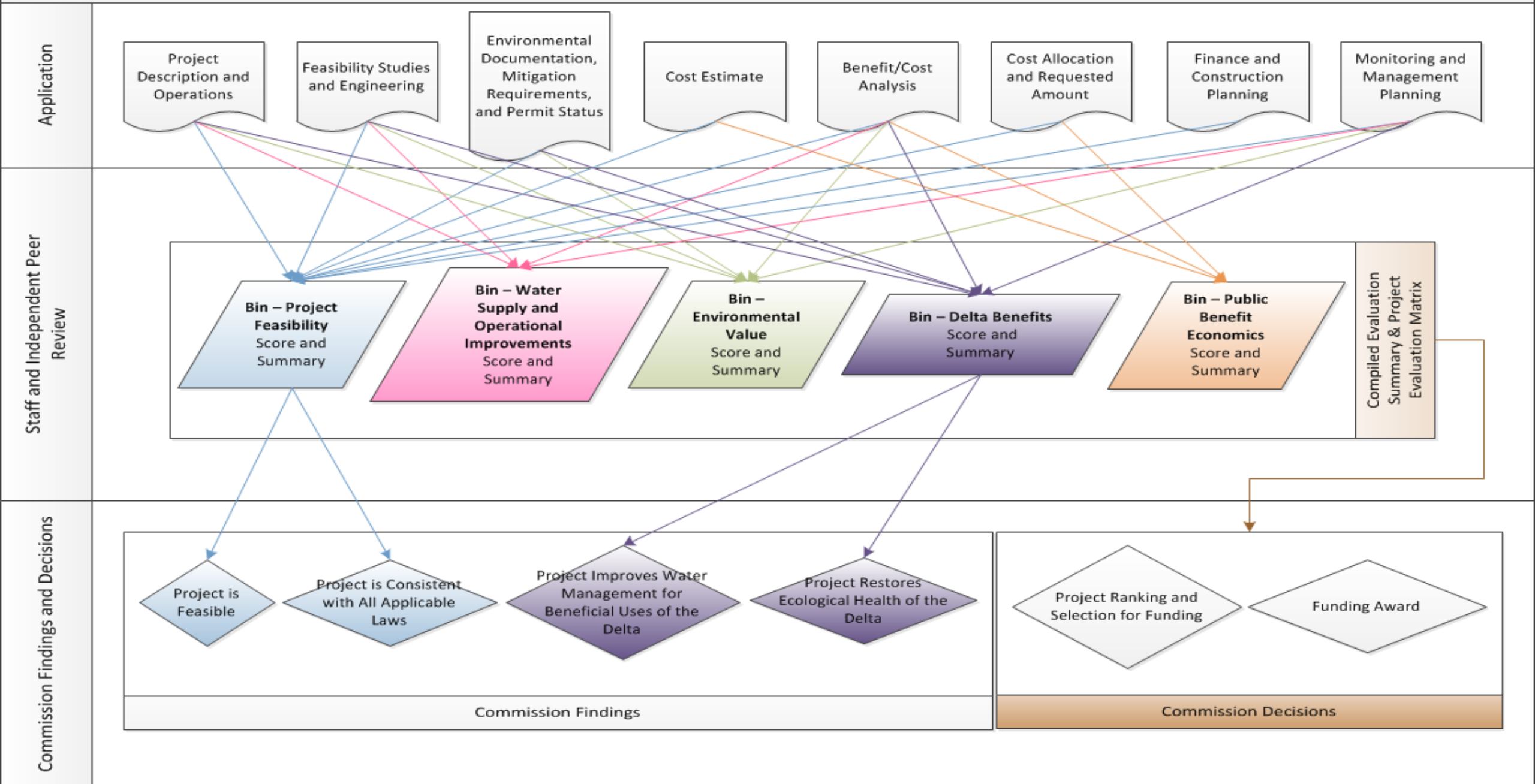
What Informs Public Benefit Economics?



- Criteria may include:
  - Cost effectiveness
  - Return on investment

Water Storage Investment Program Application Review Information Map

SDWA 144



Modeling as a Tool to Support WSIP Decision-making

Modeling as a Tool for Decision-making

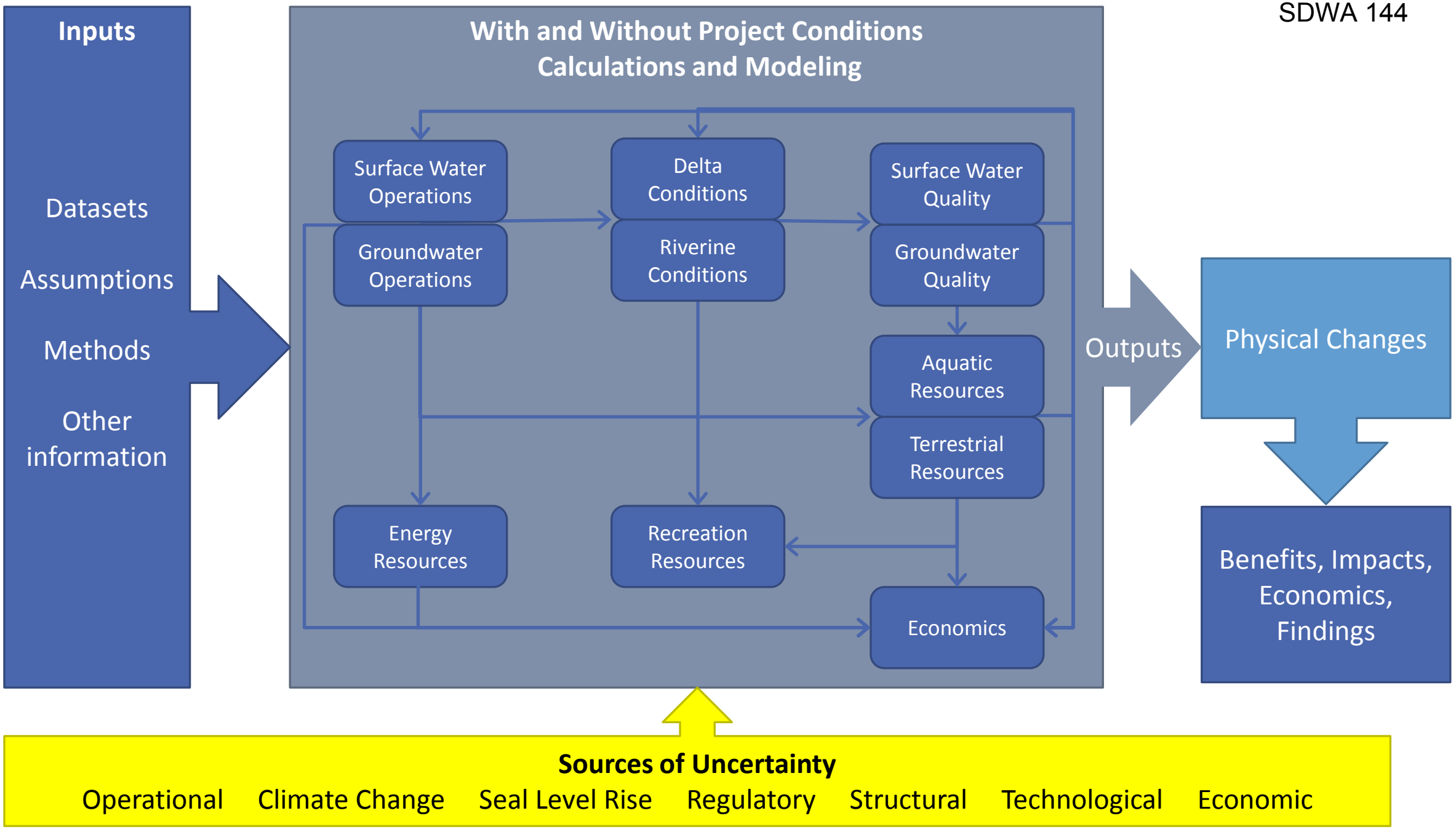
- Disclaimer:
  - I am not a modeler
  - I have not played a modeler on TV
  - I did not sleep at a Holiday Inn Express last night
- But, I have used model results to make water resources planning decisions

Modeling as a Tool

- **Models may be used at many points** in the water resources planning process to inform decisions
- Models will be very important to project applicants to **quantify the benefits (physical and monetary)** and the Commission for **making go/no-go decisions for projects**
- **All models have limitations** – all models require assumptions and are only as good as the data entered
- Extent and detail of **modeling must be appropriate** to the project, level-of-detail, and the decision to be made

A Variety of Models Could Be Used at Most Steps

1. **Define without-project future conditions**
2. **Define with-project future conditions**
3. **Calculate physical, chemical, and biological changes**
4. **Monetize the value of project benefits**
5. Estimate the project costs
6. Compare benefits and costs
7. Allocate costs to beneficiaries
8. **Evaluate sources of uncertainty**


Inputs
Datasets
Assumptions
Methods
Other information
With and Without Project Conditions
Calculations and Modeling
Surface Water Operations
Groundwater Operations
Delta Conditions
Riverine Conditions
Surface Water Quality
Groundwater Quality
Aquatic Resources
Terrestrial Resources
Energy Resources
Recreation Resources
Economics
Outputs
Physical Changes
Benefits, Impacts, Economics, Findings
Sources of Uncertainty
Operational
Climate Change
Seal Level Rise
Regulatory
Structural
Technological
Economic

Defining Future Conditions

- What are the characteristics of the watershed/water system?
- What are the problems, needs, and opportunities?
- How do conditions change in the future?
  - Regulatory requirements
  - Population
  - Water demands
  - Land use
  - Infrastructure
  - Climate

Defining Future Conditions (cont'd)

- Analyses may include:
  - Hydrologic and hydraulic analysis, including system operations
  - Delta hydraulic/hydrodynamics analysis
  - Climate change and sea level rise analysis
  - Resource-specific analysis (water quality/temperature, species/habitat, energy, etc.)
- Most models used must be ran at least twice
  1. Without-project conditions
  2. With-project condition

  Changes = With-project minus Without-project conditions

Defining Future Conditions (cont'd)

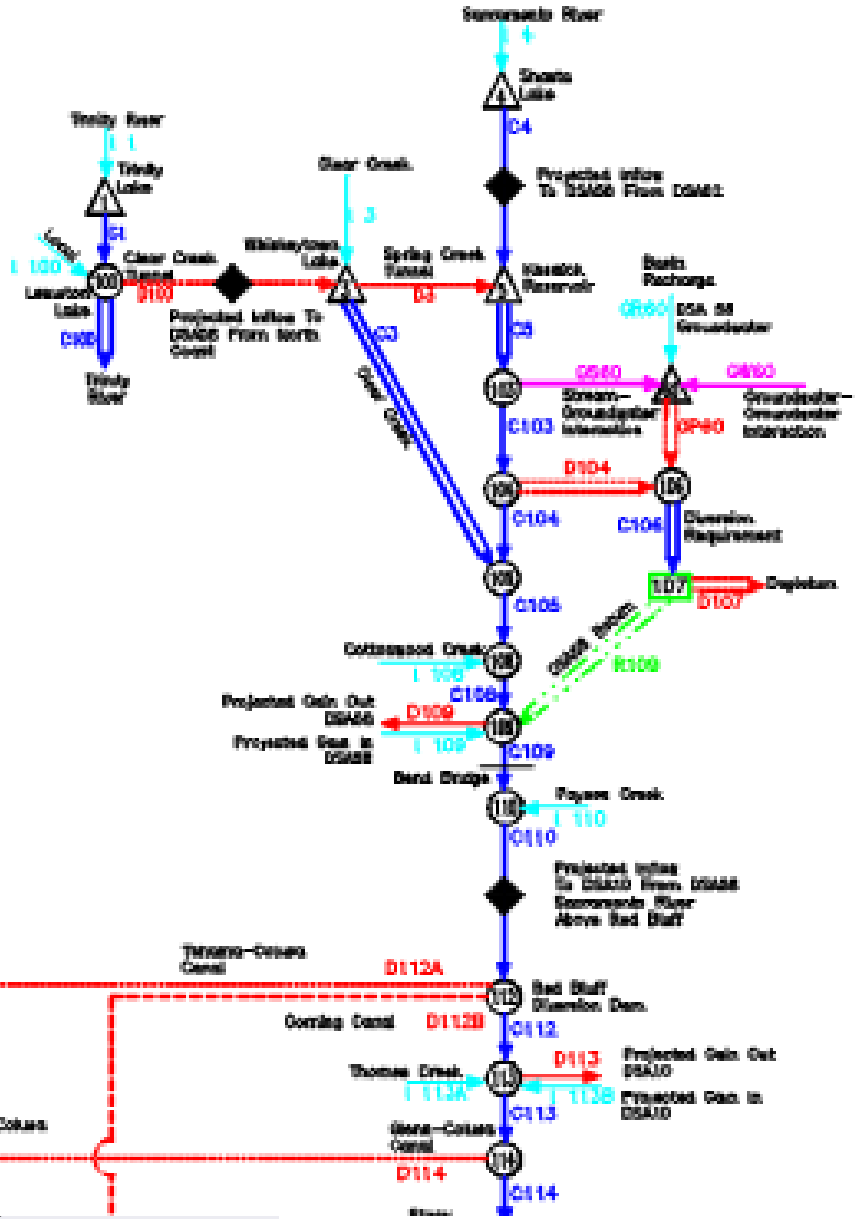
- Models must be appropriate to the project type, size, area of influence, available data, decision, etc.
  - For example, projects that may result in potential changes in SWP and CVP operations would require an applicant to expand the study area for analysis to include these watersheds/regions
  - CalSim II represents the best available planning model for the CVP and SWP system operations

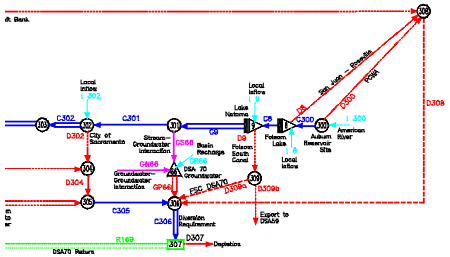
CalSim II Primer

- CalSim II is a reservoir-river basin planning model developed by DWR and Reclamation to **simulate the operation of the CVP and SWP** over a range of different hydrologic conditions
- CalSim II model geographic areas include Sacramento Valley, San Joaquin Valley, Delta, Upper Trinity , and delivery locations for SWP and CVP contractors

CalSi

Sacramento





Water Storage Invest

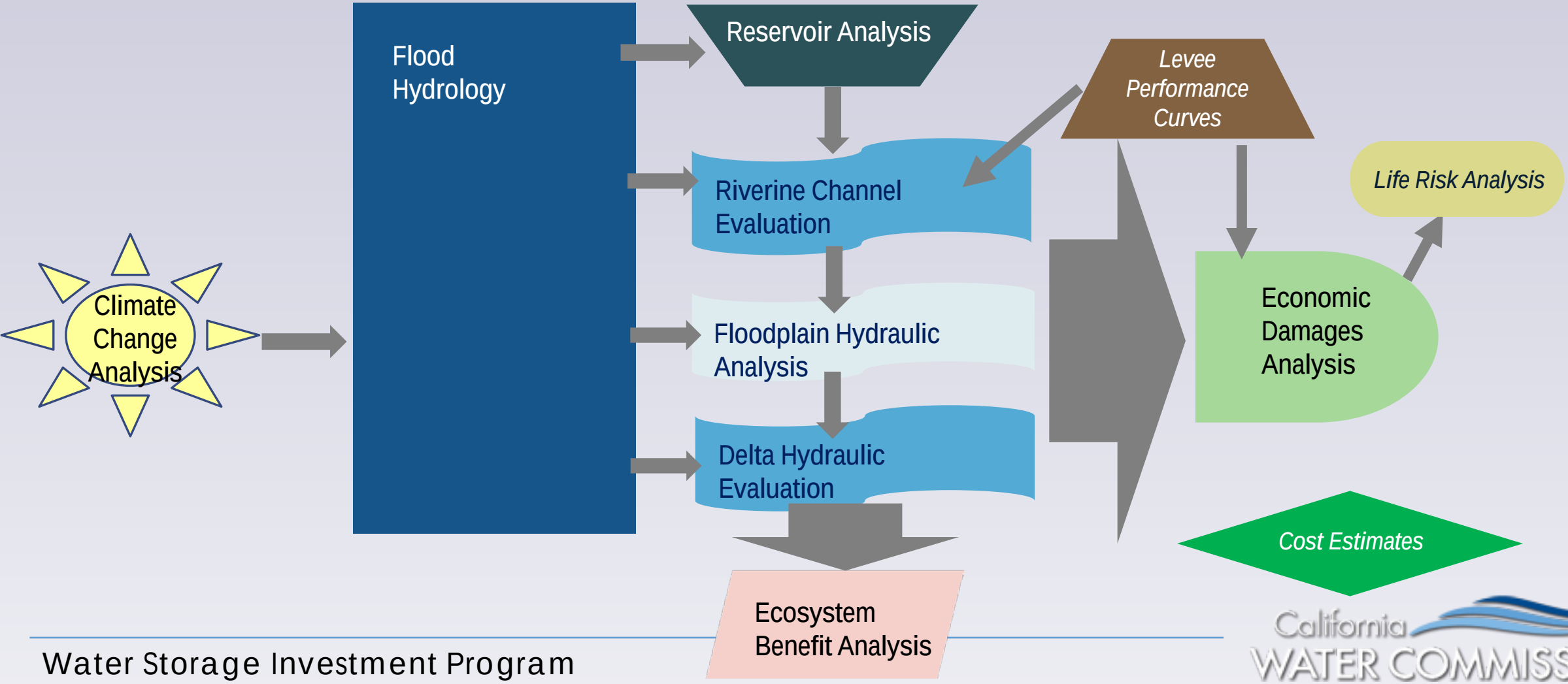
CalSim II Primer (cont'd)

- Inputs to CalSim II include hydrology, facilities, regulatory requirements, and operations criteria.
- CalSim II produces outputs for river flows and diversions, reservoir storage and releases, Delta flows and exports, Delta inflow and outflow, deliveries to project and non-project users, and controls on project operations

CalSim II is only part of the equation, and only for some applicants

- CalSim II output provides the basis for multiple other hydrologic, hydrodynamic, biological, and economic models and analyses. **CalSim II results feed into other models.**
- The CalSim II simulates the operations on a **monthly time-step.** Results are:
  - Intended to be used for **comparative analysis** (without-project vs. with-project)
  - **Not intended to provide absolute predictions**
  - Indicative of real-time operations, but do not match specific real-time observations.
  - Other analyses require more specific daily time-step information (i.e., flood analysis)
- **CalSim II does not provide specific results for public benefits**

Flood Control Example – Each step requires "modeling"



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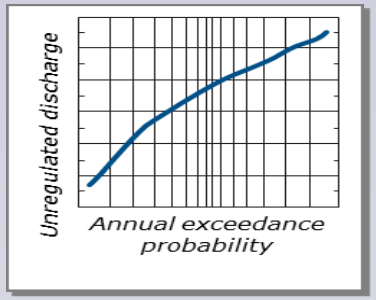
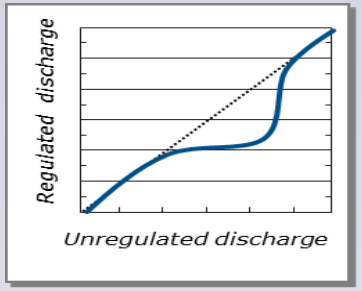
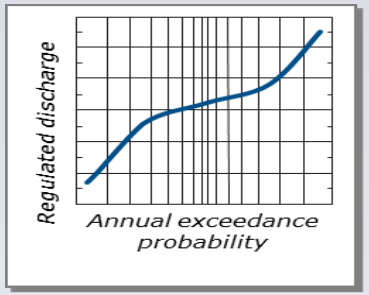
Flood Control Example – Types of Tools and Models

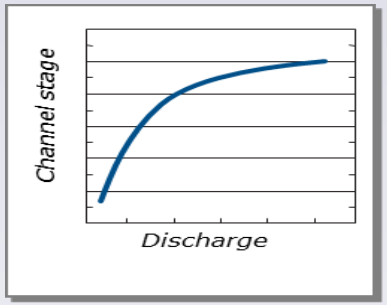


Unregulated flow frequency curve - *PeakFQ, HMS, RAS*

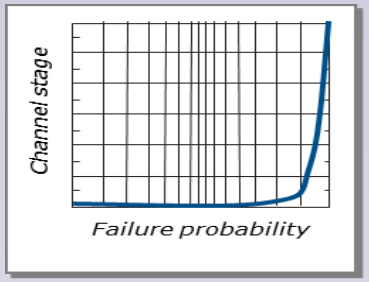


Unregulated-Regulated transform, Regulated flow frequency curve - *ResSIM, RAS, IPAST*



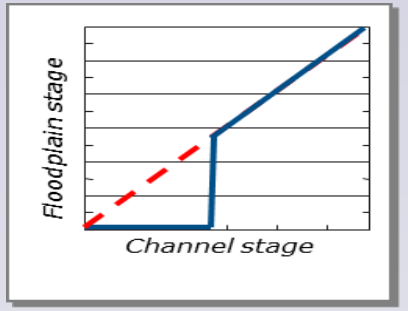


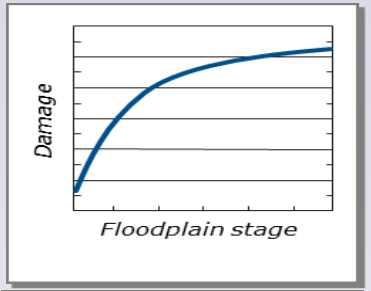
Flow-Stage relationship - *RAS*

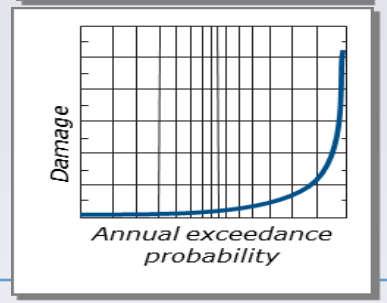


Levee performance curves - *NULE/ULE*

Interior-Exterior relationships - *FLO-2D*







Stage-damage curves & Flood damage frequency curve - *FDA*

Summary

- Models are tools for use by decision-makers, unfortunately they are not crystal balls
- There are models for all types of analyses and for a variety of purposes
- **There is not “one model to rule them all”**

This Variety and Complexity Requires…

- The ability of the applicant to choose tools appropriate to their analysis (e.g., specific to their project type, location, benefit portfolio, available data, etc.)
- Significant documentation and justification to be provided by the applicant
- A large enough review team with knowledge in the affected resource areas
- Dashboard information for Commission decision-making

Questions?