Water Storage Investment Program
Agenda Item #11 Framework for Quantifying Benefits

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Quantification and Monetization
Context

Potential Benefits of Storage

- Non-Public
  - M&I, Ag Water Supply
  - Hydropower
- Public
  - Ecosystem
  - Water quality
  - Flood control
  - Emergency response
  - Recreation

Why do we Quantify Benefits?

§79750(c)

Projects shall be selected by the commission through a competitive public process that ranks potential projects based on the expected return for public investment as measured by the magnitude of the public benefits provided, pursuant to criteria established under this chapter.

Why do we Monetize Benefits?

§79756

(a) The public benefit cost share of a project funded pursuant to this chapter, other than a project described in subdivision (c) of Section 79751, shall not exceed 50 percent of the total costs of any project funded under this chapter.

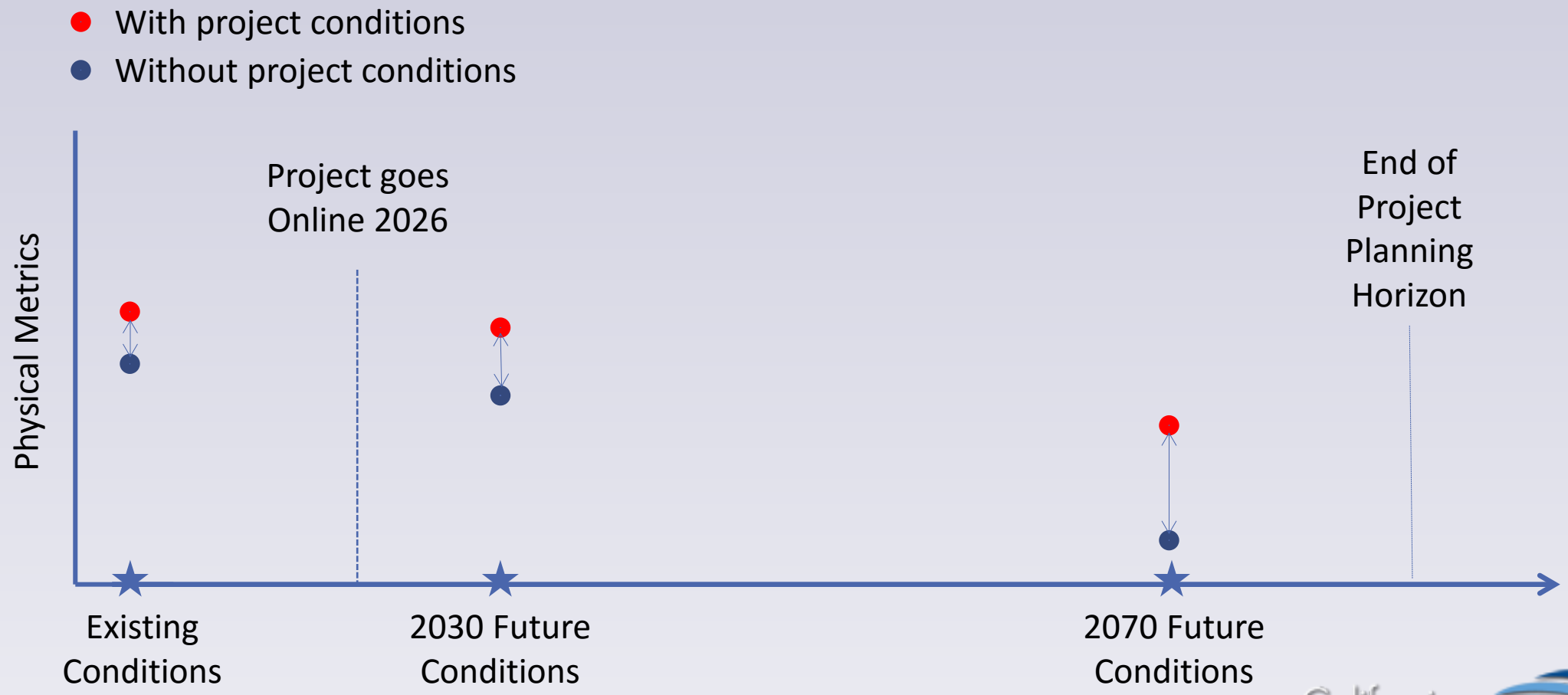
(b) No project may be funded unless it provides ecosystem improvements .... that are at least 50 percent of total public benefits of the project funded under this chapter.

Quantification and Monetization Framework

Benefits Quantification/Cost Allocation Framework

1. Define the without-project future conditions
2. Define the with-project future conditions
3. Calculate physical changes
4. Monetize the value of project benefits
5. Estimate project costs
6. Compare benefits to costs
7. Allocate costs to beneficiaries

Graphical Overview of Analysis



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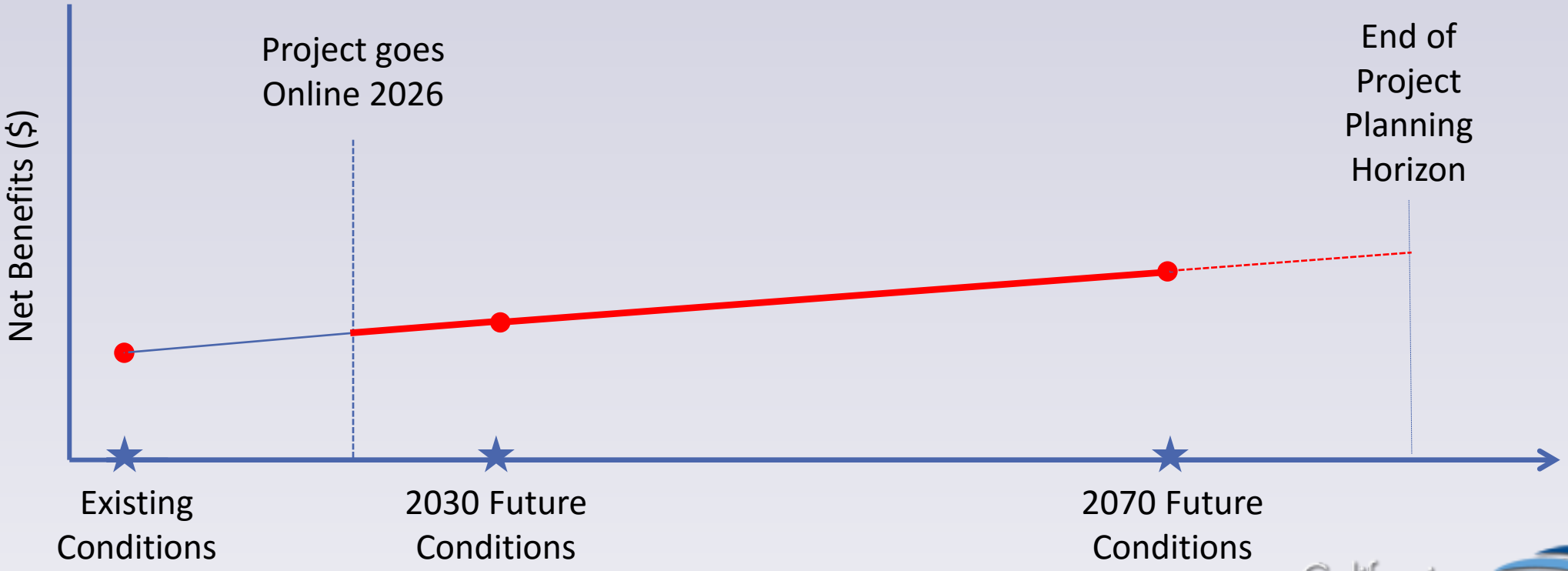
Graphical Overview of Analysis (cont'd)

- With project monetized net benefits



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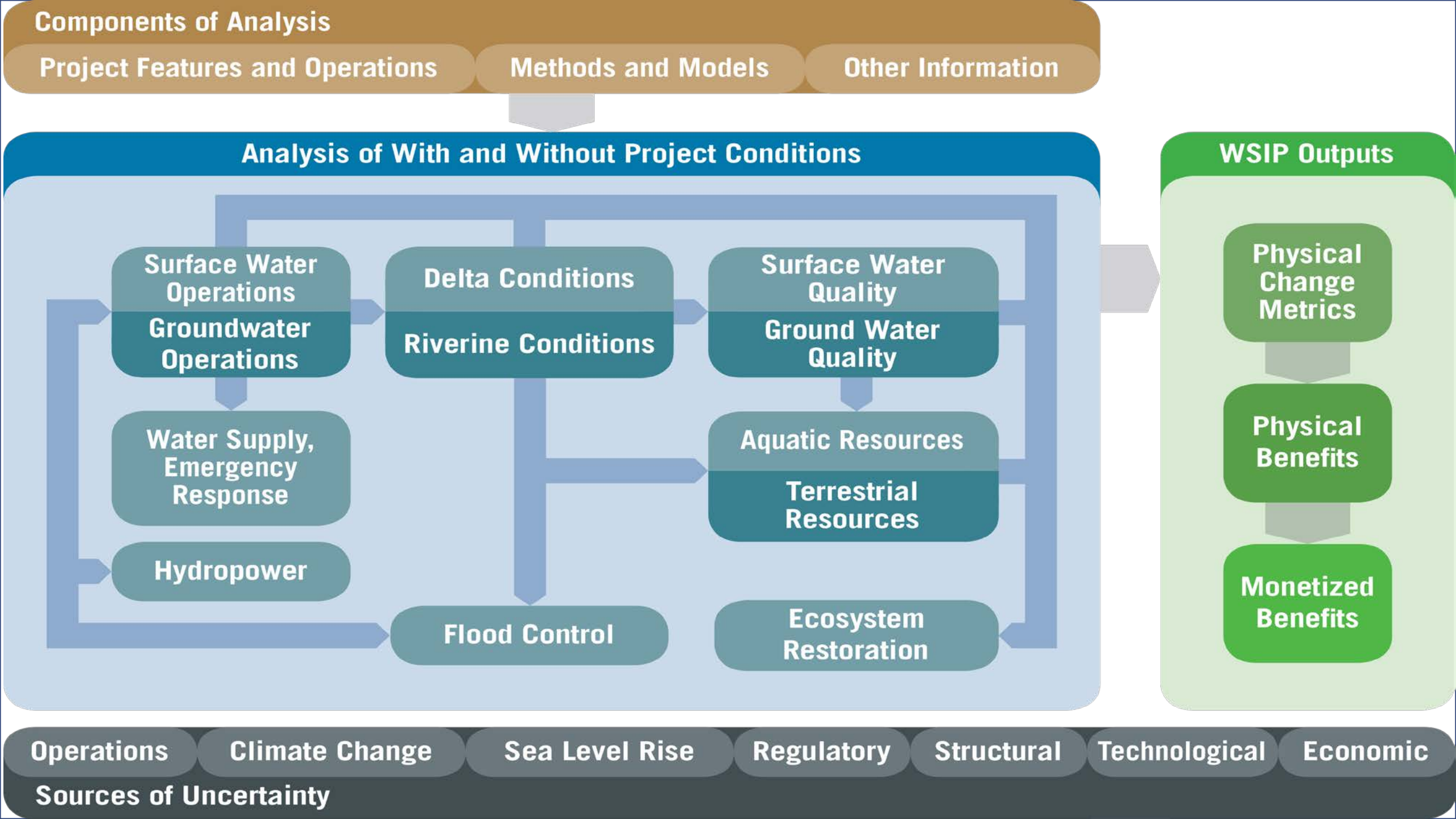

Components of Analysis
Project Features and Operations
Methods and Models
Other Information
Analysis of With and Without Project Conditions
Surface Water Operations
Groundwater Operations
Delta Conditions
Riverine Conditions
Surface Water Quality
Ground Water Quality
Water Supply, Emergency Response
Hydropower
Aquatic Resources
Terrestrial Resources
Flood Control
Ecosystem Restoration
WSIP Outputs
Physical Change Metrics
Physical Benefits
Monetized Benefits
Operations
Climate Change
Sea Level Rise
Regulatory
Structural
Technological
Economic
Sources of Uncertainty

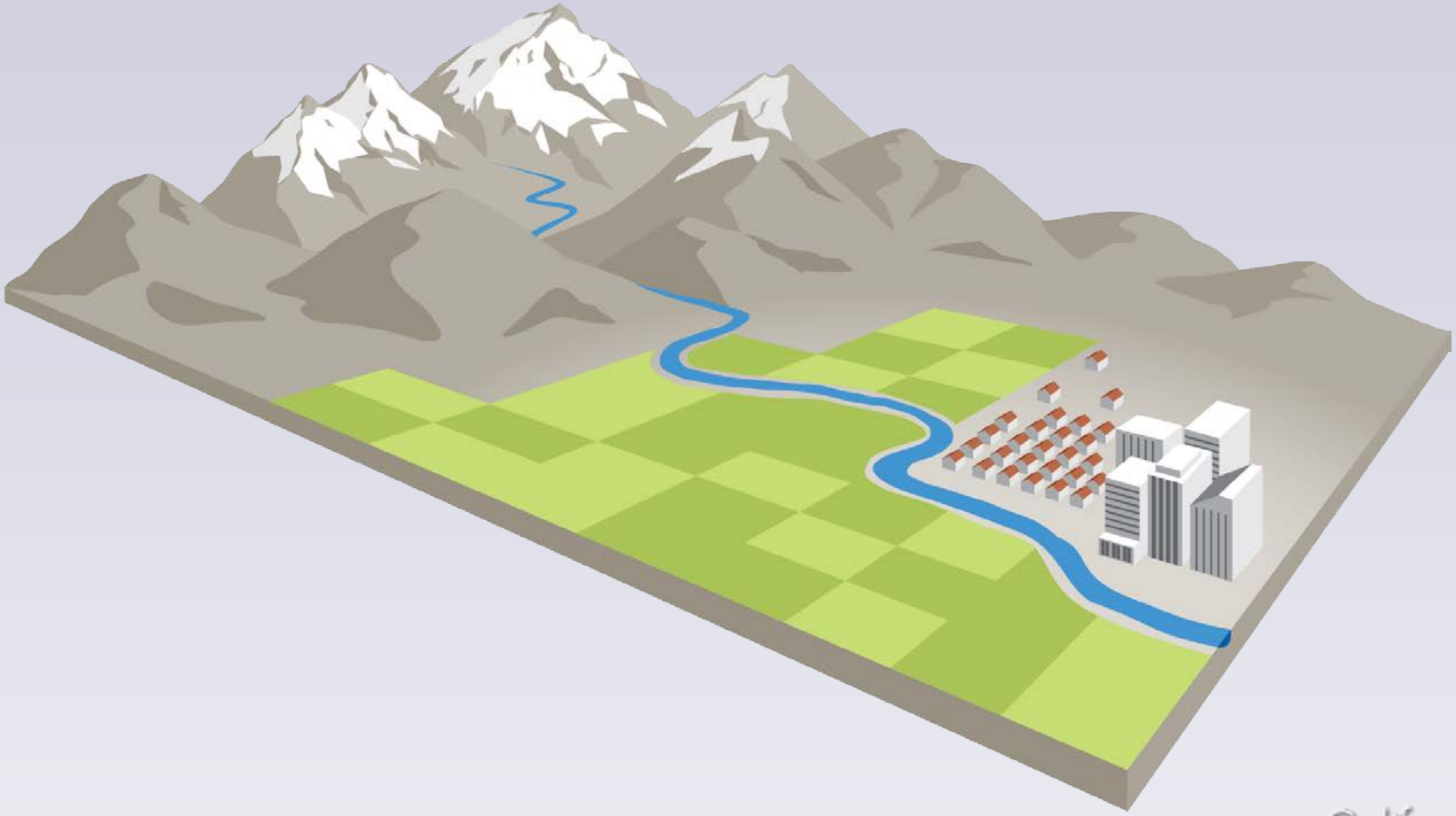
Walkthrough Example Project

- Surface storage project within the Delta watershed
- Formulated for non-public water supply, ecosystem, and recreation benefits (ecosystem benefits include temperature, so also provides improvement to water quality conditions)
- Project projected to go online in 2021

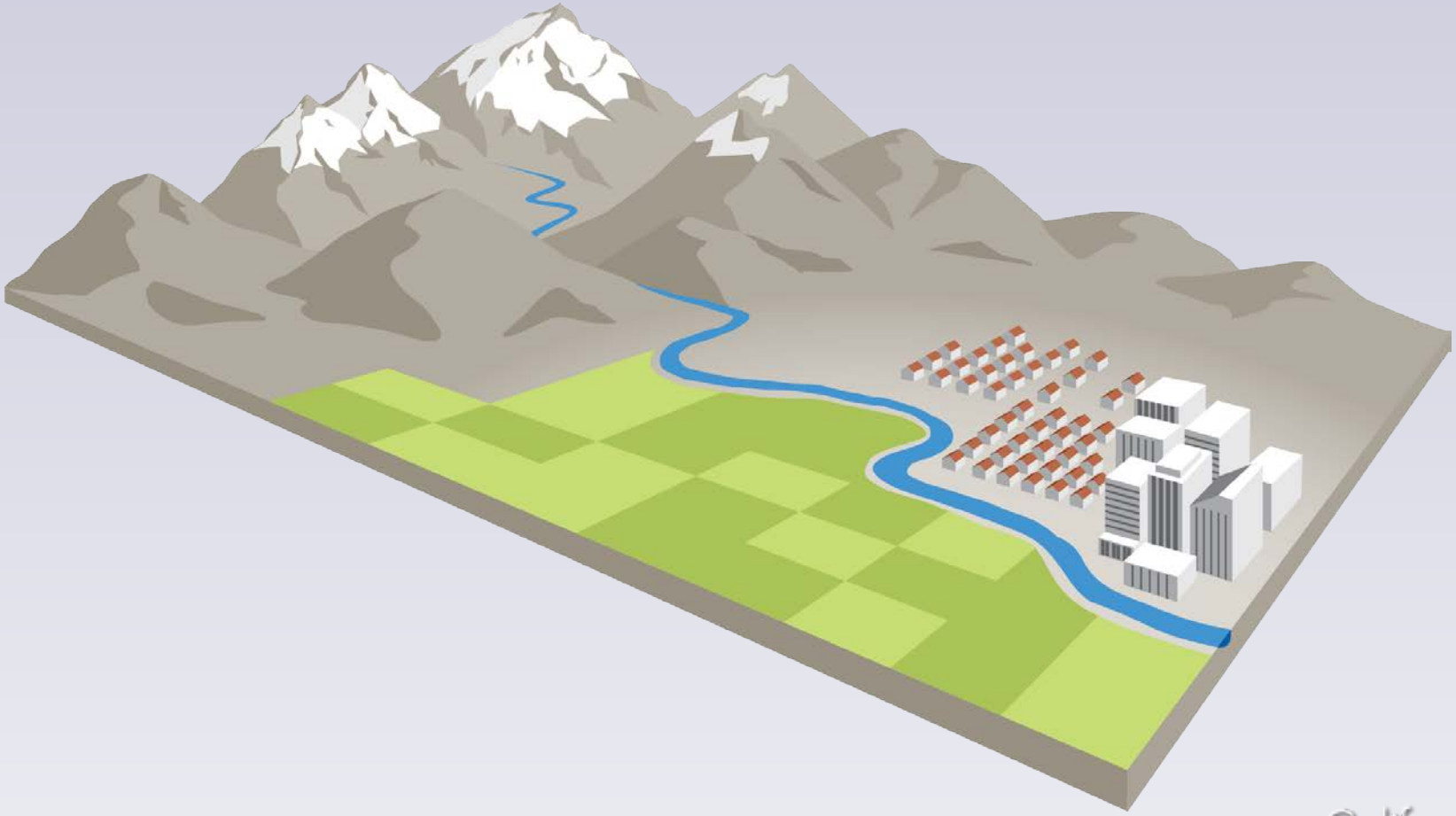
Quantification and Monetization Framework

Define the Without-Project Future Condition

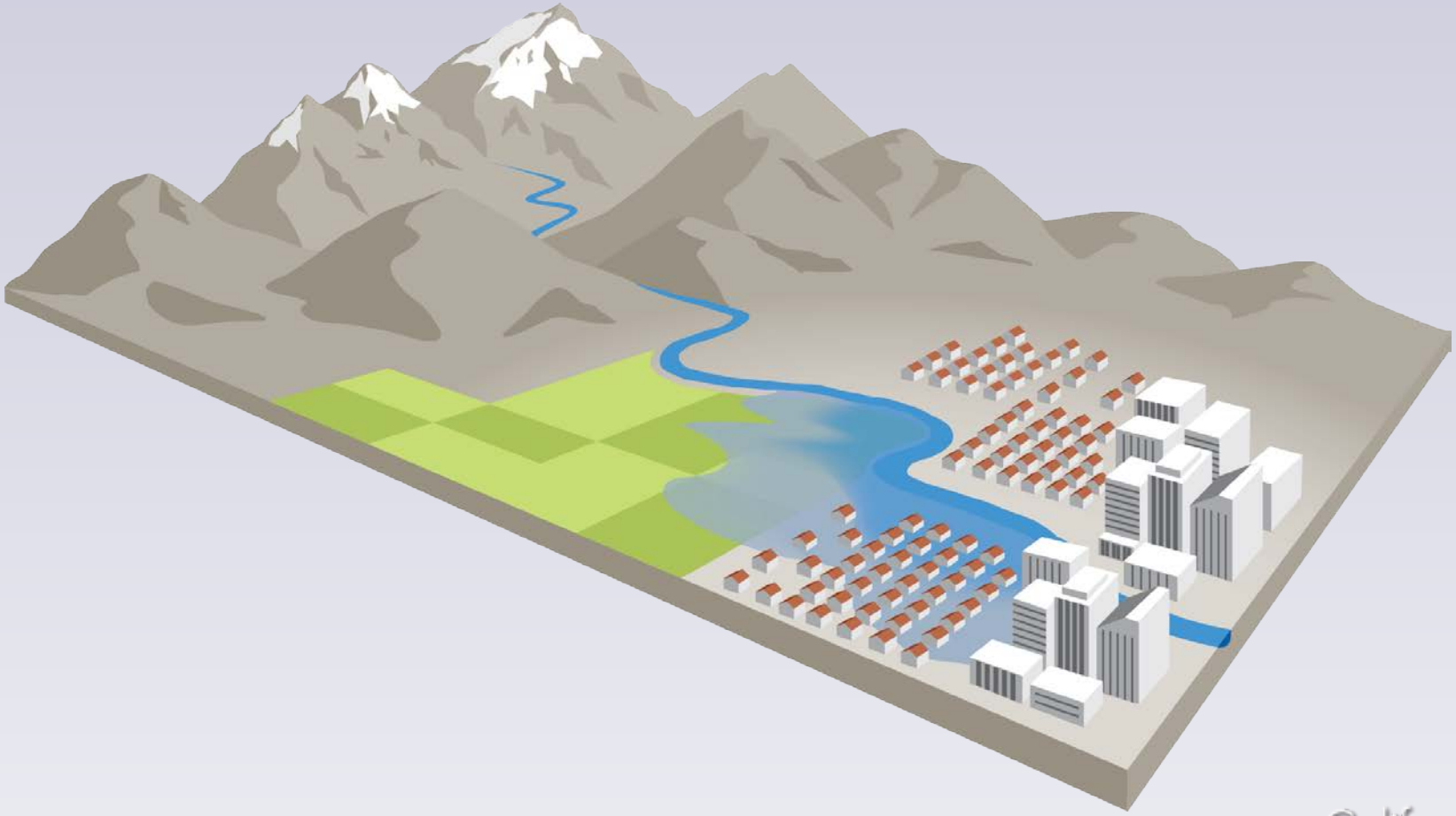
2015 Without Project



2030 Without Project



2070 Without Project



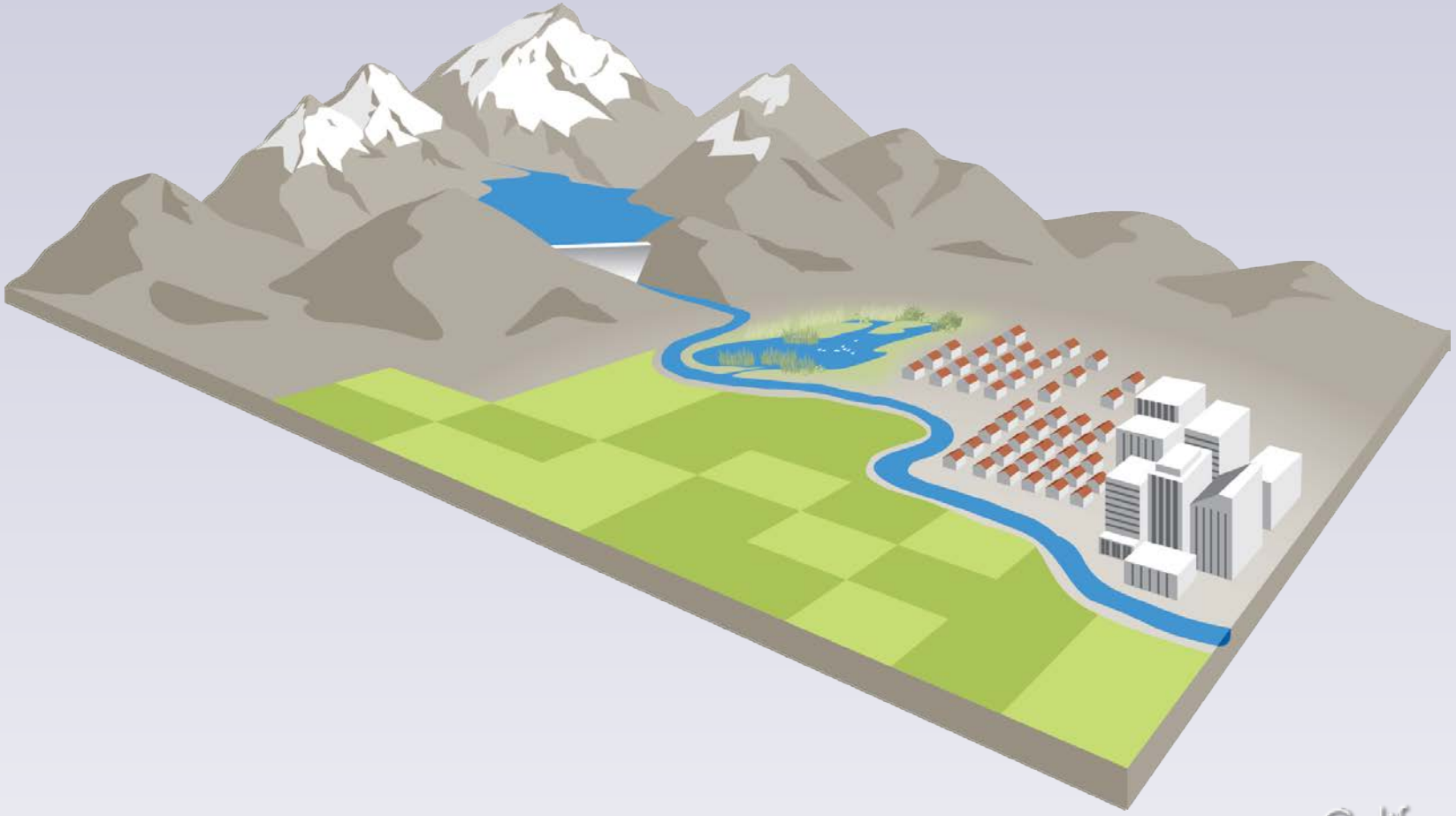
Example Project: Without-Project Targeted Resource Conditions (2030)

Benefit Type	Without Project Condition
Non-public Water Supply	200 TAF
Ecosystem	
Winter-run Chinook	1,600 Fish
Fall-run Chinook	9,000 Fish
Recreation	
Surface Area	0 Acres
Trails	0 Miles
Boat Ramps	0
Facilities	0
Visitor Days	0 People

Quantification and Monetization Framework

Define the With-Project Future Condition

2030 With Project



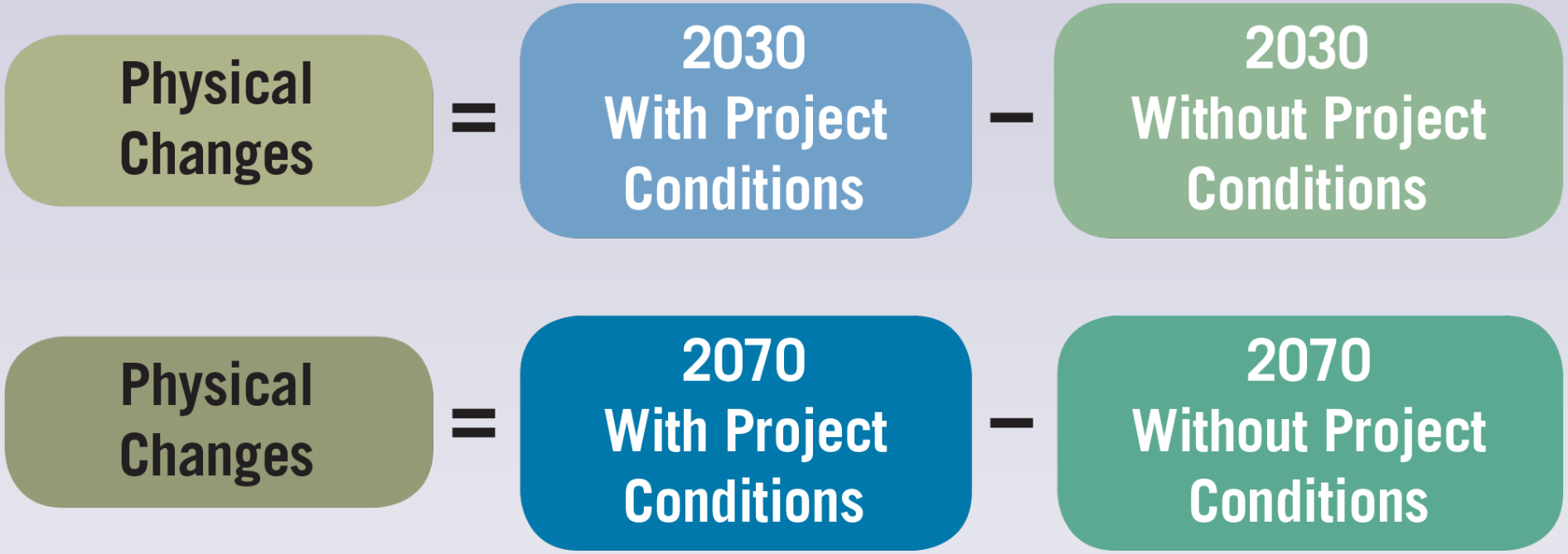
Example Project: With-Project Targeted Resource Conditions (2030)

Benefit Type	With Project Condition	Without Project Condition
Non-public Water Supply	400 TAF	200 TAF
Ecosystem		
Winter-run Chinook	2,000 Fish	1,600 Fish
Fall-run Chinook	10,000 Fish	9,000 Fish
Recreation		
Surface Area	200 Acres	0 Acres
Trails	30 Miles	0 Miles
Boat Ramps	15	0
Facilities	4	0
Visitor Days	40,000 People	0 People

Quantification and Monetization Framework

Calculate Physical Changes

Physical Changes



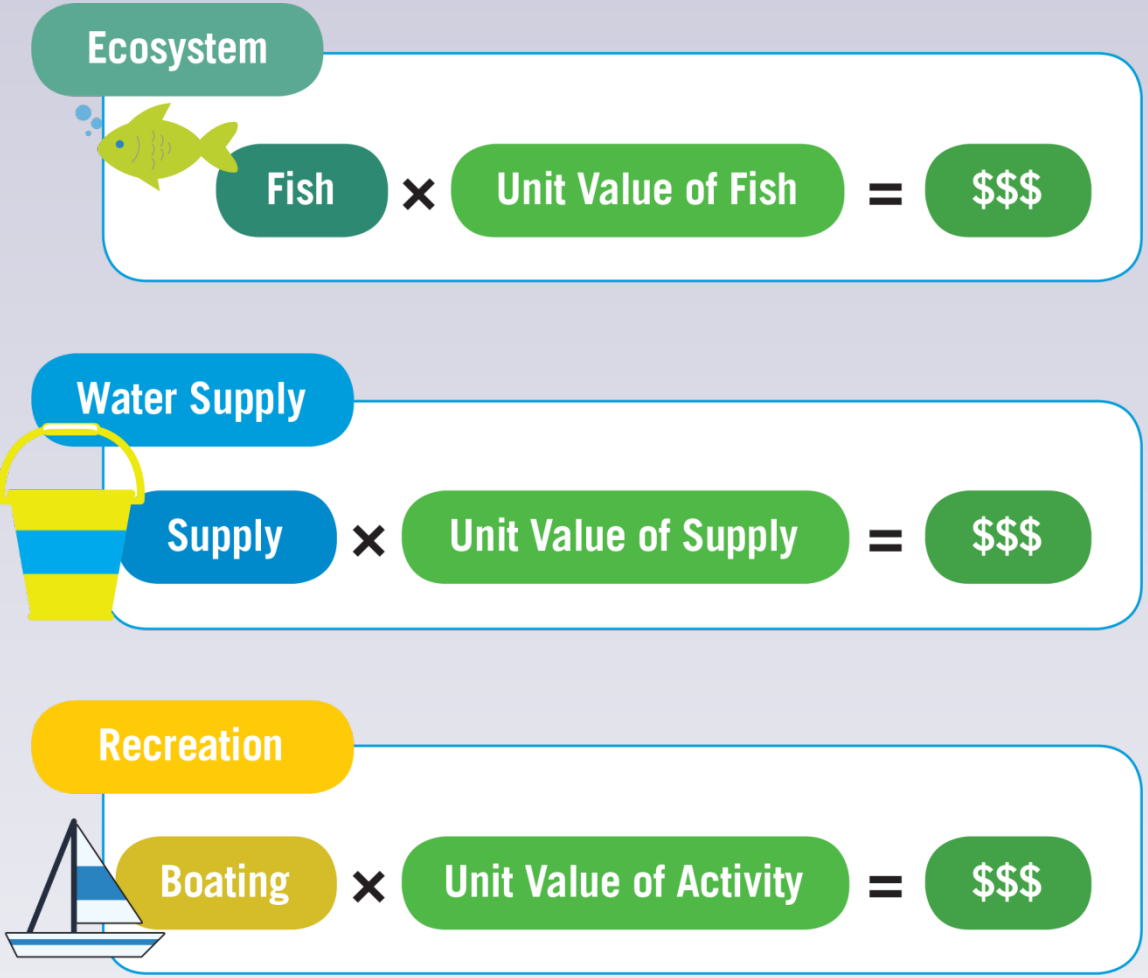
Example Project: Calculate Physical Changes

Benefit Type	With Project Condition (A)	Without Project Condition (B)	Physical Change (C = A – B)
Non-public Water Supply	400 TAF	200 TAF	200 TAF
Ecosystem			
Winter-run Chinook	2,000 Fish	1,600 Fish	400 Fish
Fall-run Chinook	10,000 Fish	9,000 Fish	1,000 Fish
Recreation			
Surface Area	200 Acres	0 Acres	200 Acres
Trails	30 Miles	0 Miles	30 Miles
Boat Ramps	15	0	15
Facilities	4	0	4
Visitor Days	40,000 People	0 People	40,000

Quantification and Monetization Framework

Monetize the Value of the Project Benefits

Using Unit Values to Monetize the Project Benefits



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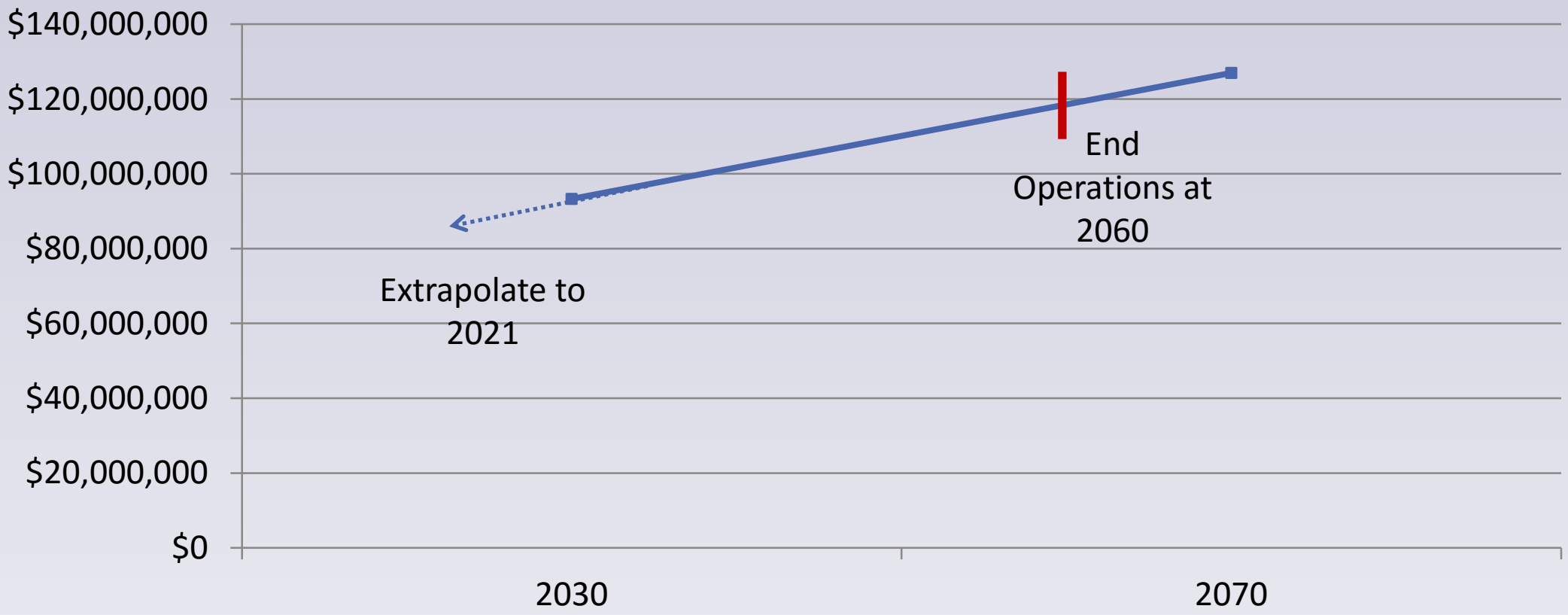
Example Project: Monetize Benefits (2030)

Benefit Type	With Project Condition (A)	Without Project Condition (B)	Physical Change (C = A-B)	Unit Value (D)	Economic Value of Changes (E = C*D)
Non-public Water Supply	400 TAF	200 TAF	200 TAF	$250 per AF	$50,000,000
Ecosystem					
Winter-run Chinook	2,000 Fish	1,600 Fish	400 Fish	$100,000 per Fish	$40,000,000
Fall-run Chinook	10,000 Fish	9,000 Fish	1,000 Fish	$2,500 per Fish	$2,500,000
Recreation					
Surface Area	200 Acres	0 Acres	200 Acres		
Trails	30 Miles	0 Miles	30 Miles		
Boat Ramps	15	0	15		
Facilities	4	0	4		
Visitor Days	40,000 People	0 People	40,000 People	$20 per Visitor	$800,000

Example Project: Benefit Trend



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Example Project: Calculate Present Value from Annual Benefits

Present Value	$884,191,594	$18,907,342	$992,206,762	$1,895,305,698
Year	Ecosystem Benefit	Recreation Benefit	Water Supply Benefit	Total Benefits
2015	$ -	$ -	$ -	$ -
⋮	⋮	⋮	⋮	⋮
2020	$ -	$ -	$ -	$ -
2021	$ 37,437,500	$ 530,000	$ 47,750,000	$ 85,717,500
2022	$ 38,000,000	$ 560,000	$ 48,000,000	$ 86,560,000
⋮	⋮	⋮	⋮	⋮
2030	$ 42,500,000	$ 800,000	$ 50,000,000	$ 93,300,000
2031	$ 43,062,500	$ 830,000	$ 50,250,000	$ 94,142,500
2032	$ 43,625,000	$ 860,000	$ 50,500,000	$ 94,985,000
⋮	⋮	⋮	⋮	⋮
2059	$ 58,812,500	$ 1,670,000	$ 57,250,000	$ 117,732,500
2060	$ 59,375,000	$ 1,700,000	$ 57,500,000	$ 118,575,000

Quantification and Monetization Framework

Estimate the Project Costs

Example Project: Estimate Costs

- The applicant shall estimate and display the capital costs, including construction, initial environmental mitigation or compliance obligations, and land acquisition, for the purpose of establishing eligible capital costs for WSIP funding.
- **Capital costs = $1,000,000,000**
- **Total PV of all costs = $1,145,100,000**

Quantification and Monetization Framework

Compare Benefits to Costs

Compare Benefits to Costs

- Benefit-cost measures are required to document the expected return for public investment. All project benefits, and all public benefits, are compared to project costs to help establish appropriate cost shares, and to help consider and establish the financial feasibility of the project.

Benefit-Cost Ratio

$$\text{BCR} = \frac{\text{Total Project Benefits}}{\text{Total Project Costs}}$$

Example Project: Compare Benefits to Costs

Overall Project BCR = $1,895,300,000 / $1,145,100,000

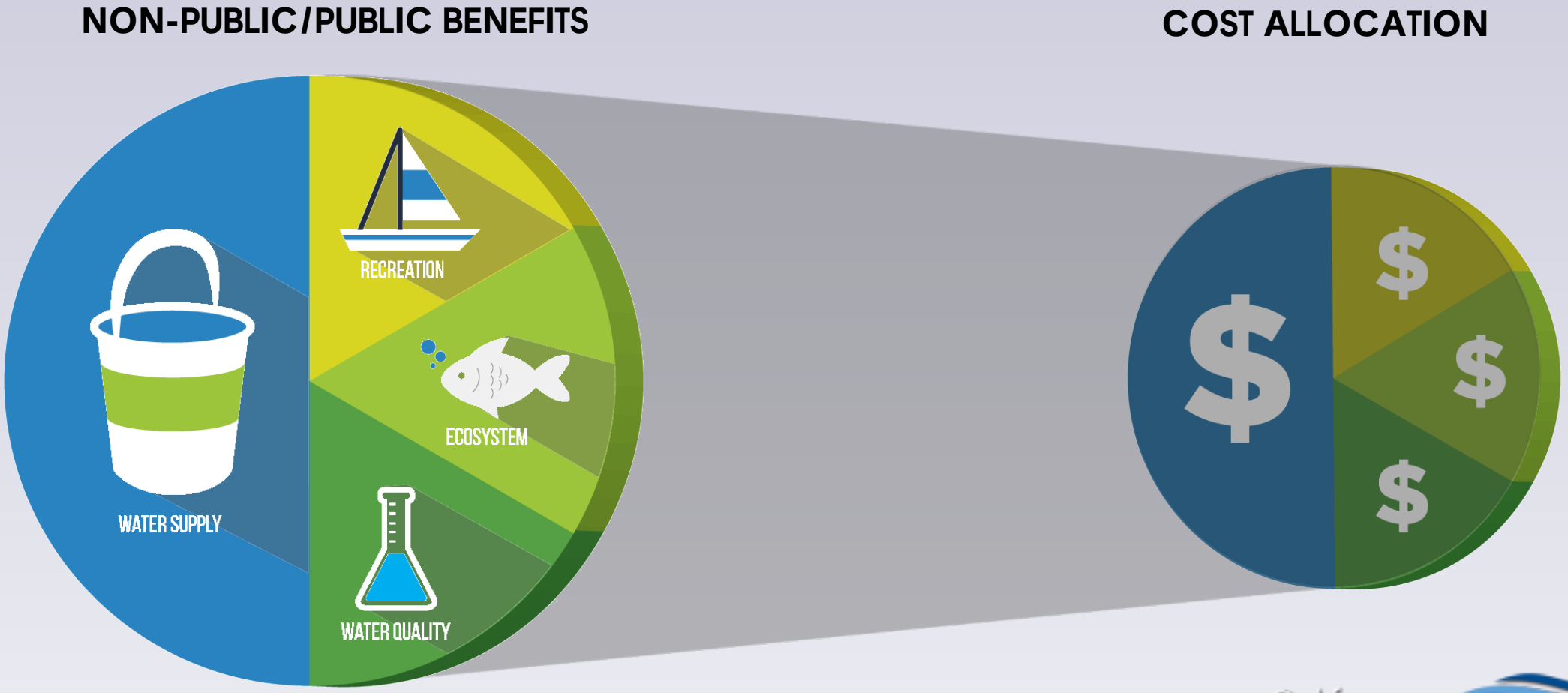
= **1.65**

BCR > 1?

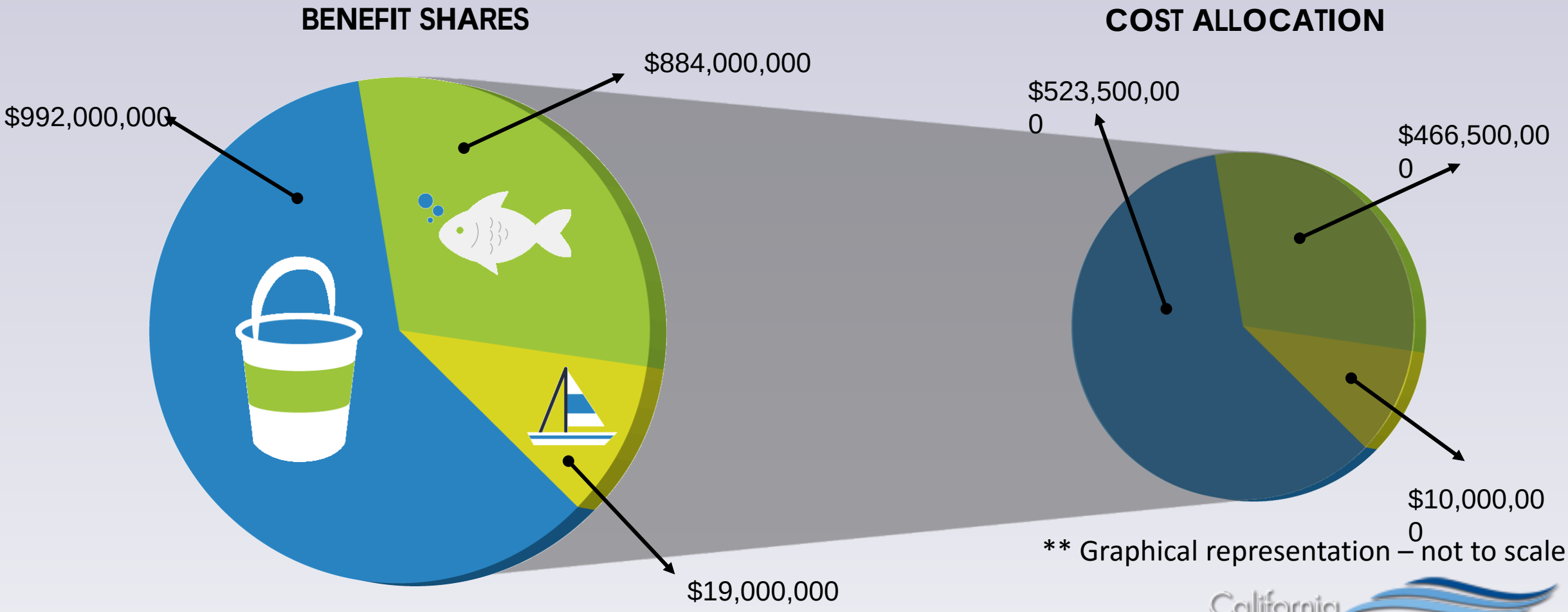
Quantification and Monetization Framework

Allocate Costs to Beneficiaries

Cost Allocation



Example Project: Allocate Costs to Beneficiaries



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Apply Rules from Statute

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Return on Investment

$$\text{ROI} = \frac{\text{Public Benefits}}{\text{Funding Request}}$$

Example Project: Compare Benefits to Costs

ROI = $903,000,000 / $476,500,000

= **1.9**

WSIP cost share < 50% of total project costs?

Ecosystem benefits at least 50% of total public benefit funded by WSIP?

Questions?