Evaluating the multiple benefits of water reuse

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What is multi-criteria decision analysis?

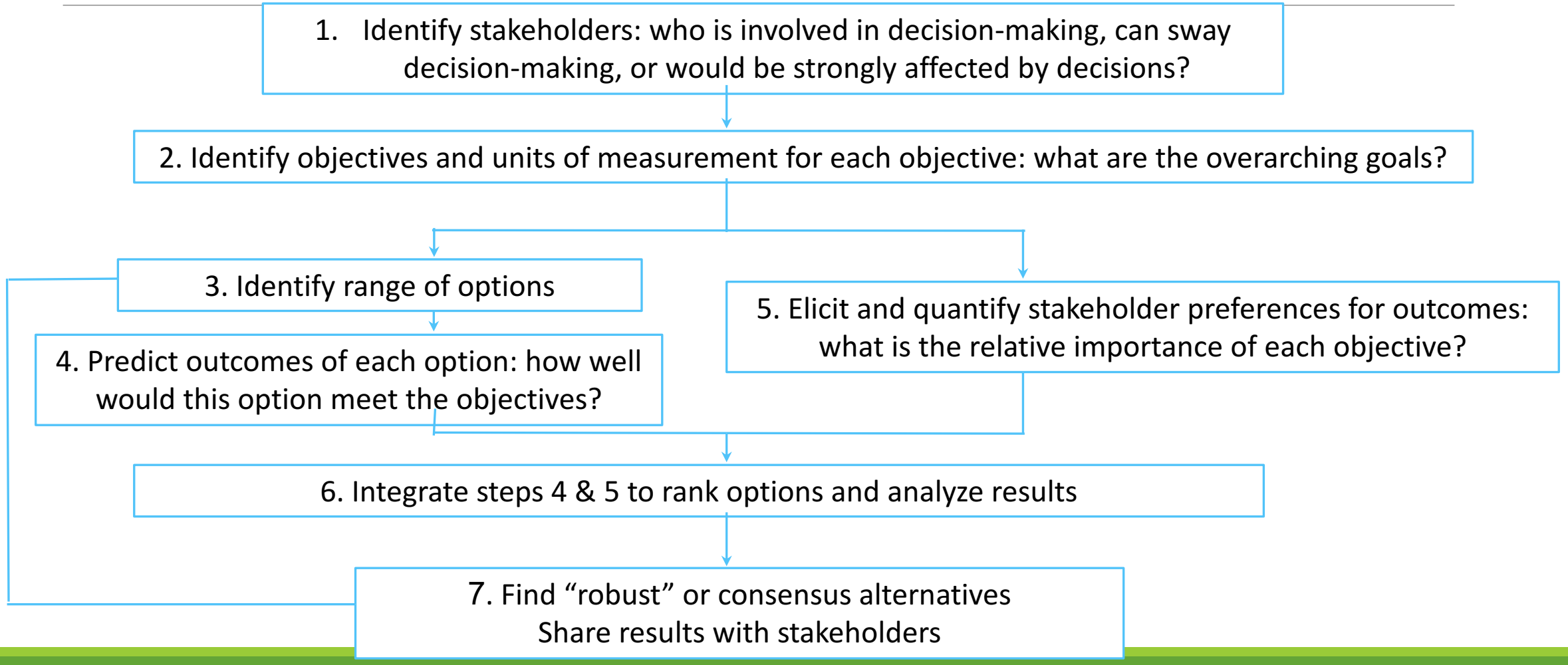
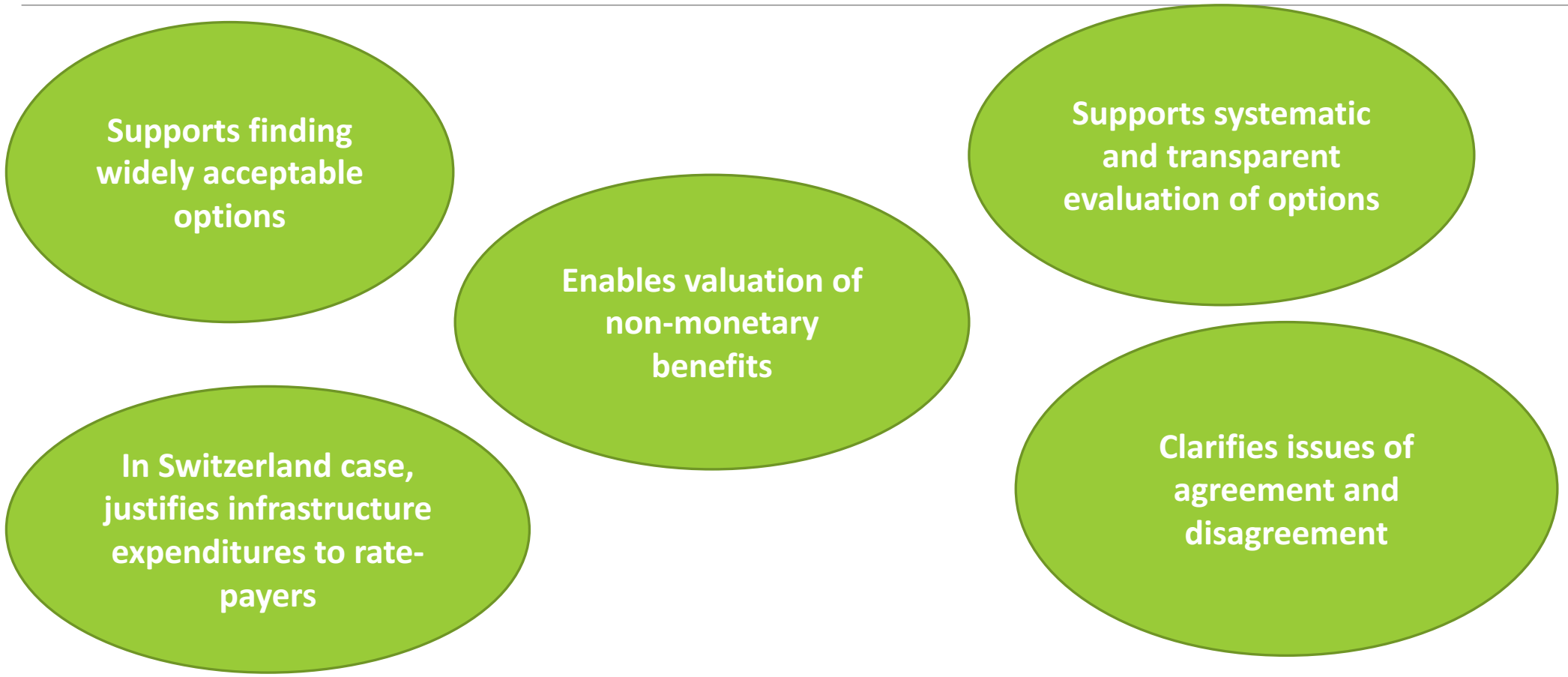


Diagram adapted from Judit Lienert, 2016

Why multi-criteria decision analysis?



Example: MCDA to evaluate options for managing nutrients loads to SF Bay

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Research article

A mixed-methods approach to strategic planning for multi-benefit regional water infrastructure

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Stakeholder analysis

ABSTRACT

Finding regional solutions for water infrastructure and other environmental managemen
coordination, communication, and a shared understanding among different stakeholders
versatile and collaborative decision-making process for nutrient management in the San Fr
used a mixed-methods approach consisting of stakeholder analysis with cluster analysis, n
analysis (MCDA), and scenario planning. These methods allowed us to identify agreements
stakeholder objectives and preferences, clarify ways in which different options could mee

water

MDPI

Article

Towards a New Paradigm of Urban Water Infrastructure: Identifying Goals and Strategies to Support Multi-Benefit Municipal Wastewater Treatment

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check for updates

Abstract: Over the past decade, water professionals have begun to focus on a new paradigm for urban water systems, which entails the recovery of resources from wastewater, the integration of engineered and natural systems, and coordination among agencies managing different facets of

Example: MCDA results for nutrient management in SF Bay

Key take-away: increased recycling of wastewater for irrigation and construction of horizontal levees (wetlands for wastewater treatment) provide enough other benefits that they rank more highly than the 'Do Nothing' option for most stakeholders

Identified research/data gaps

Identified policy recommendations

Identified technology gaps

Identified key social discrepancies

From: Harris-Lovett, S., Lienert, J., & Sedlak, D. (2019). A mixed-methods approach to strategic planning for multi-benefit regional water infrastructure. *Journal of Environmental Management*, *233*, 218-237.

Marin Municipal Water District – Water Resources Plan 2040

Figure 6-1: Resiliency Option Criteria Weights

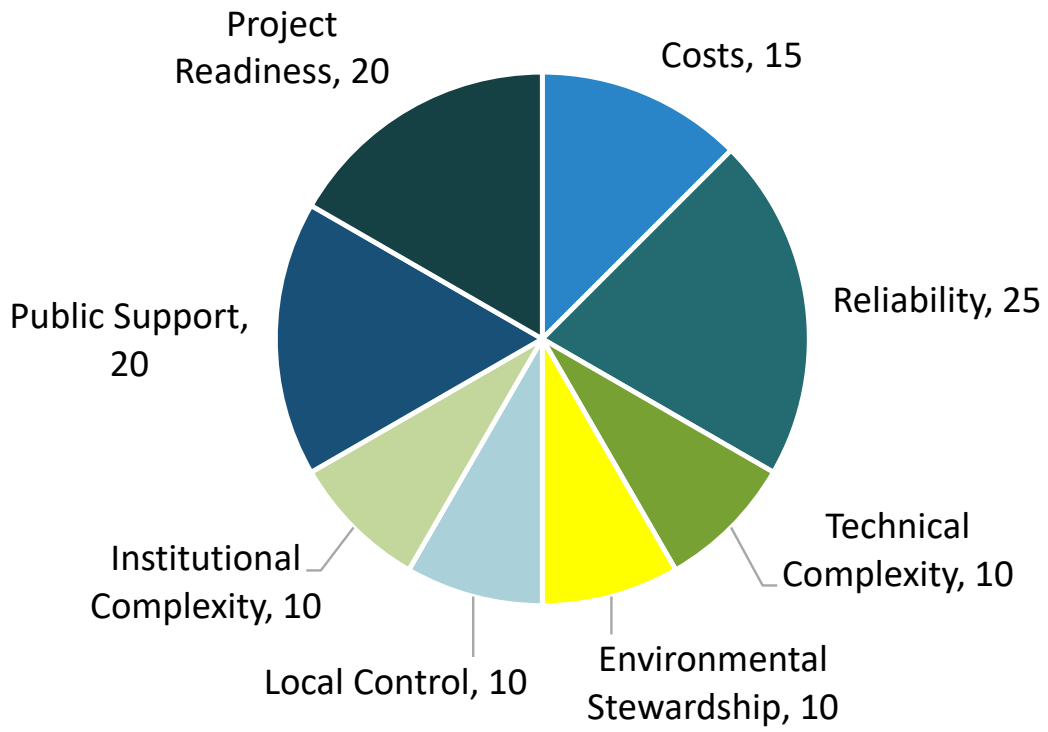
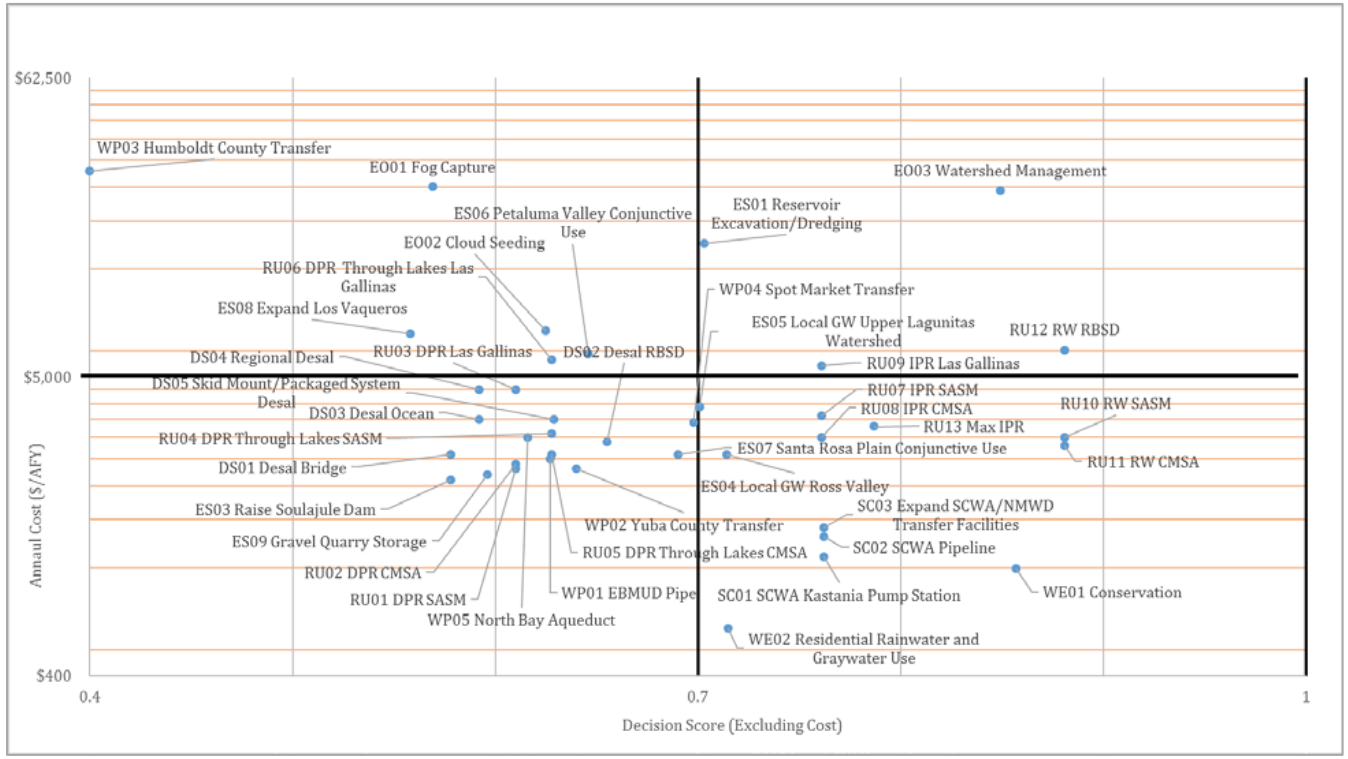


Figure 6-2: Example Quadrant Analysis Results



Extra slides

Legitimacy of potable water reuse

Environmental Science & Technology

Policy Analysis

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Beyond User Acceptance: A Legitimacy Framework for Potable Water Reuse in California

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Supporting Information

ABSTRACT: Water resource managers often tout the potential of potable water reuse to provide a reliable, local source of drinking water in water-scarce regions. Despite data documenting the ability of advanced treatment technologies to treat municipal wastewater effluent to meet existing drinking water quality standards, many utilities face skepticism from the public about potable water reuse. Prior research on this topic has mainly focused on marketing strategies for garnering public acceptance of the process. This study takes a broader perspective on the adoption of potable water reuse based on concepts of societal legitimacy, which is the generalized perception or assumption that a technology is desirable or appropriate within its social context. To assess why some potable reuse projects were successfully implemented while others faced fierce public opposition, we performed a series of 20 expert interviews and reviewed in-depth case studies from potable reuse projects in California. Results show that proponents of a legitimated potable water reuse project in Orange County, California, engaged in a portfolio of strategies that addressed three main

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ELSEVIER

The thorny road to technology legitimation – Institutional work for potable water reuse in California

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ABSTRACT

Technological innovation that is incongruous with established social rules and practices is often confronted with strong skepticism and a lack of societal legitimacy. Yet, how the early actors in a new technological field create legitimacy for new products is not well researched. This paper addresses this gap by proposing an analytical framework for the early technology legitimation phase that combines recent insights from innovation studies and institutional sociology. Both literatures agree that technology legitimation depends on a complex alignment process in which the technology and its institutional context mutually shape each other. Innovation system studies recently proposed to explore these processes in more detail. So far, this literature has mainly treated legitimacy as an outcome of overall system maturation and has not ventured into assessing legitimation as an active process. The framework we put forward in this paper conceptualizes technology legitimation as being enacted by different actors in a technological innovation system through specific forms of institutional work. This framework is illustrated with a case study on potable water reuse, in this case the injection of treated wastewater into

Table 1. Definitions of Key Dimensions of Legitimacy and Corresponding Strategies in Potable Reuse (Source: Adapted from Suchman (1995))

legitimacy types	dimension	definition	legitimation strategies in potable water reuse
Type 1. pragmatic evaluation based on self- interest	1.1 exchange	support for an innovation based on its perceived value to the end user	public outreach campaigns, explaining the innovation's benefits to different users
	1.2 influence	support of an implementing organization because it shares decision-making power with end users	user involvement in planning and management, focus groups and surveys, user representatives on decision-making bodies
	1.3 dispositional	support for an implementing organization based on a belief that the organization is acting in the end user's best interest, has "good character"	transparent information policies, cooperation with external evaluators and regulators, developing a "quality brand" for the proponent utility
Type 2. moral evaluation based on norms/societal values	2.1 consequential	support based on evaluation of the implementing organization's accomplishments	publicizing data indicating consistently high water quality, building a success story about the innovation
	2.2 procedural	support based on an evaluation of the implementing organization's specific procedures	adopting strict quality control and monitoring procedures, standardized emergency intervention plans, and professional training for operators
	2.3 structural	support based on an evaluation of the implementing organization's physical characteristics	having advanced water treatment technology, water quality management department, 24/7 monitoring technology, and emergency shut-off valves
	2.4 personal	support based on an evaluation of an implementing manager's charisma	water utility managers talking directly to the end users
Type 3. cognitive evaluation based on deeply held customs and beliefs	3.1 comprehensibility	support because an innovation meshes with the end user's daily life experiences and cognitive frames	organizing water tastings, providing bottled recycled water, developing comprehensible vocabulary
	3.2 taken-for-grantedness	support based on seeming inevitability, in which alternatives are "unthinkable"	relating potable reuse to other taken-for-granted activities (e.g., recycling)

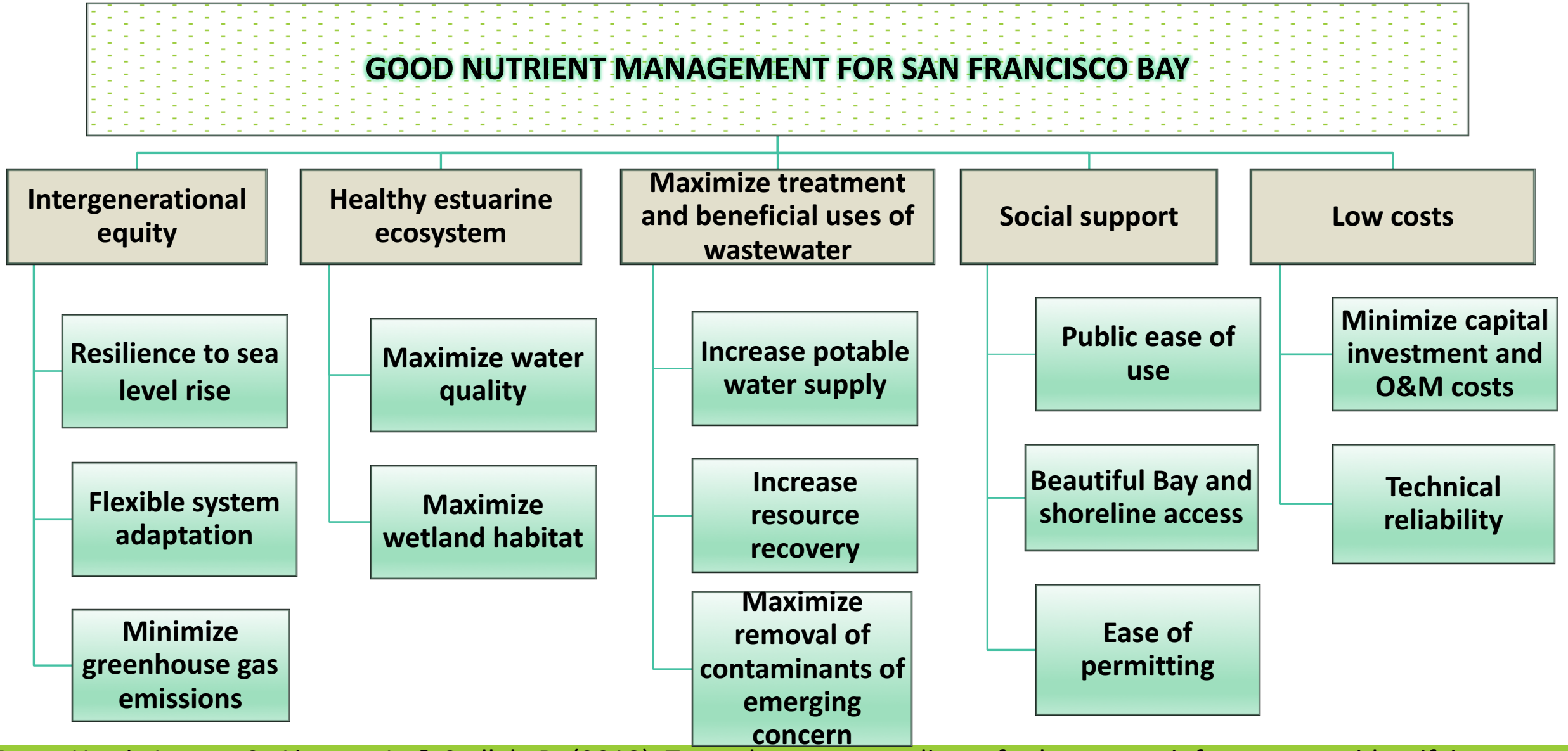
From: Harris-Lovett, S. R., Binz, C., Sedlak, D. L., Kiparsky, M., & Truffer, B. (2015). Beyond user acceptance: A legitimacy framework for potable water reuse in California. *Environmental science & technology*, *49*(13), 7552-7561.

Table 2. Summary of OCWD's Legitimacy Portfolio for Potable Reuse[a]

legitimacy type	dimension	strategies
Type 1: pragmatic	1.1 exchange	+ targeted outreach and education campaigns
	1.2 influence	+ elicited feedback from community leaders
	1.3 dispositional	+ demonstrated the utility's trustworthiness
Type 2: moral	2.1 consequential	+ consistent track record of high water quality
	2.2 procedural	+ emergency intervention and quality monitoring plans
	2.3 structural	+ state-of-the-art technology, sophisticated laboratory
	2.4 personal	+ management personally involved in outreach work
Type 3: cognitive	3.1 comprehensibility	+ serving visitors purified water from a tap
	3.2 taken-for grantedness	+ framing potable reuse as recycling, groundwater protection

From: Harris-Lovett, S. R., Binz, C., Sedlak, D. L., Kiparsky, M., & Truffer, B. (2015). Beyond user acceptance: A legitimacy framework for potable water reuse in California. *Environmental science & technology*, *49*(13), 7552-7561.

Example: Goals for controlling nutrient loads into San Francisco Bay



From: Harris-Lovett, S., Lienert, J., & Sedlak, D. (2018). Towards a new paradigm of urban water infrastructure: identifying goals and strategies to support multi-benefit municipal wastewater treatment. *Water*, *10*(9), 1127.

Today's task

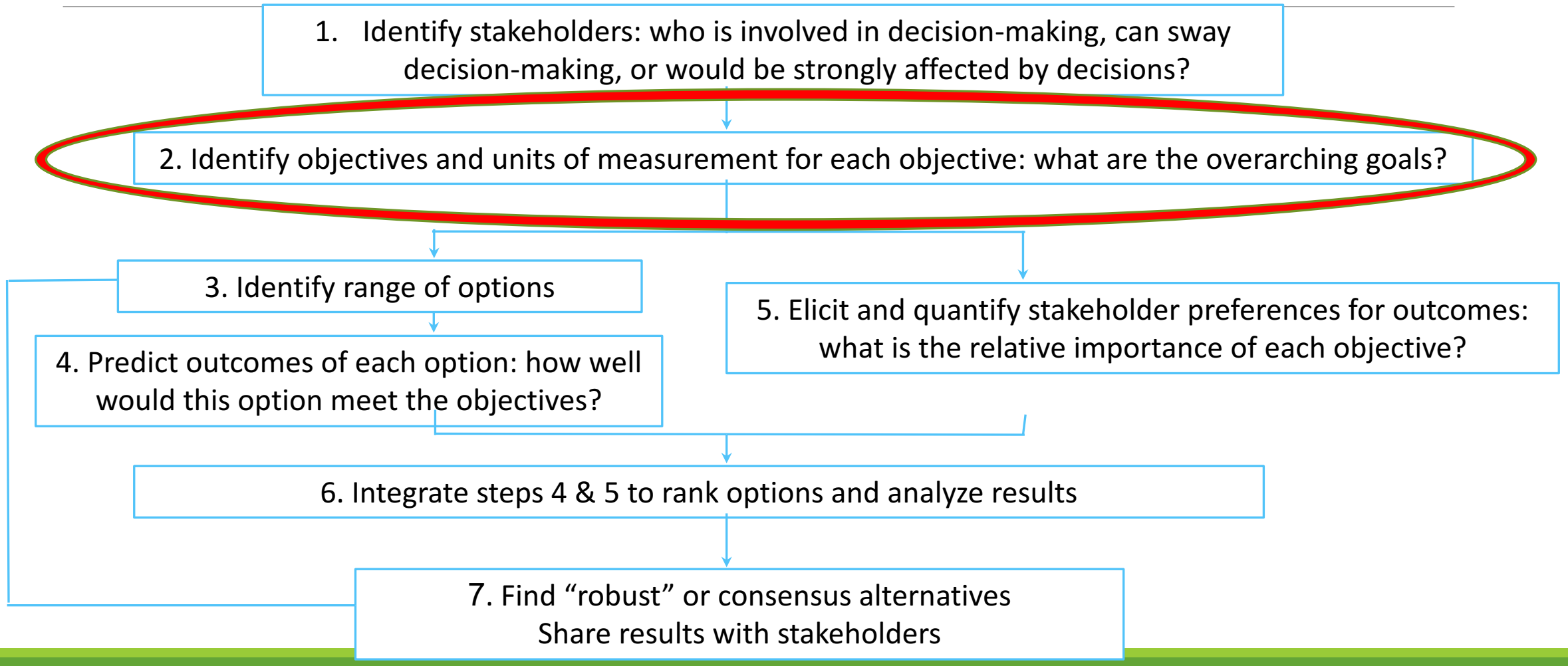
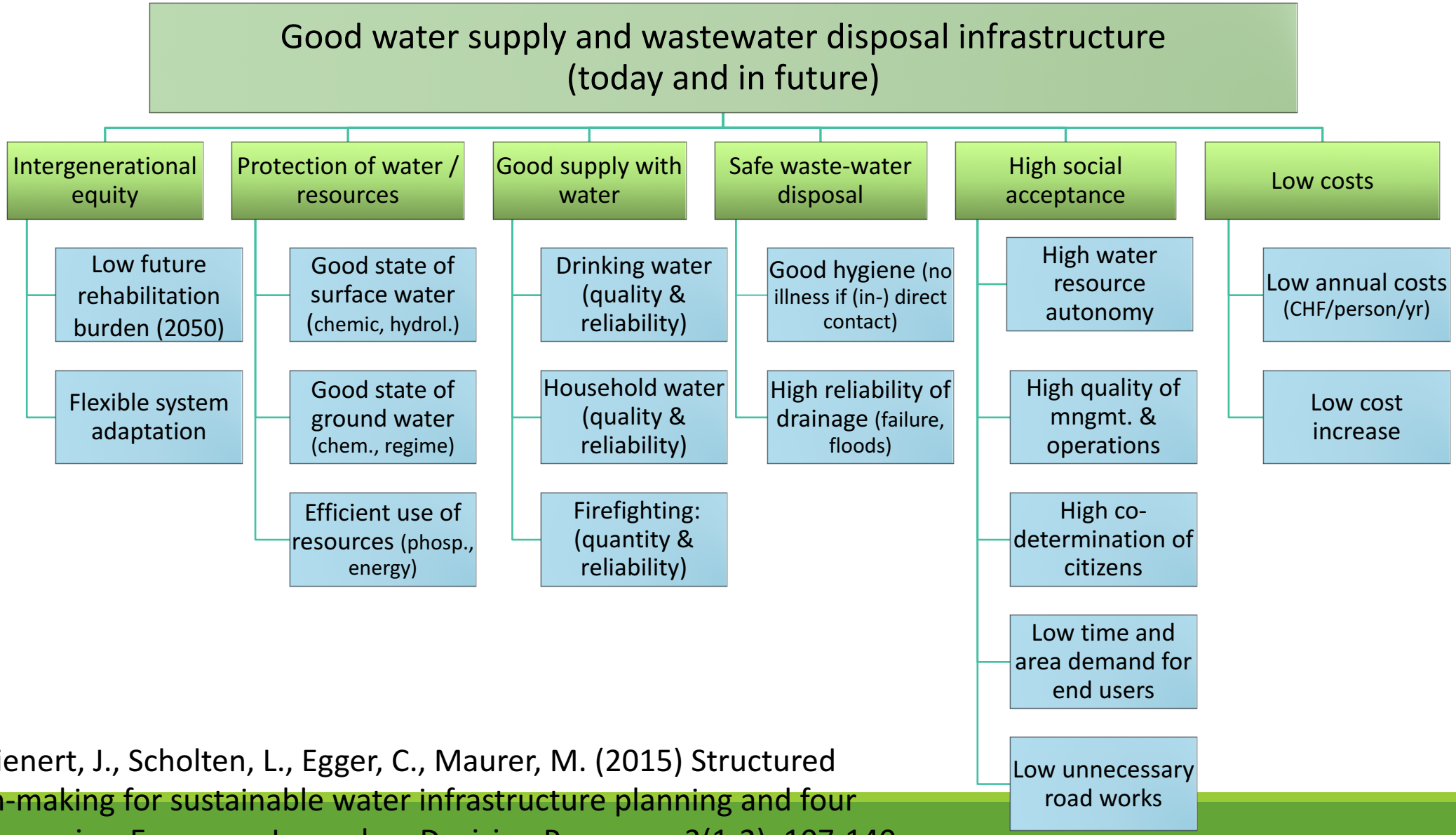


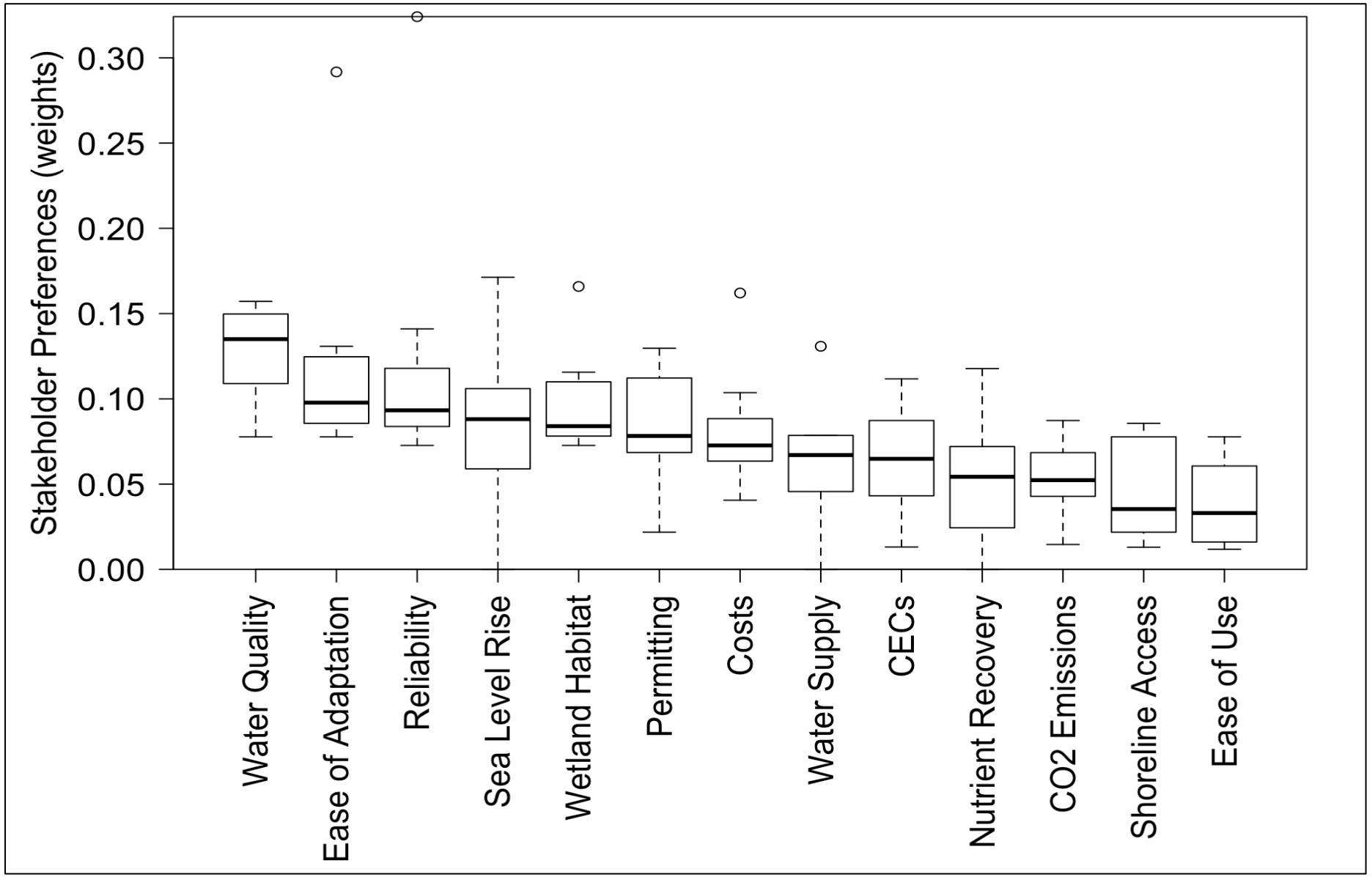
Diagram adapted from Judit Lienert, 2016

Example: goals from Swiss sustainable water infrastructure planning



From: Lienert, J., Scholten, L., Egger, C., Maurer, M. (2015) Structured decision-making for sustainable water infrastructure planning and four future scenarios. European Journal on Decision Processes 3(1-2): 107-140

Example: stakeholders' relative importance of the objectives for good nutrient management in SF Bay



From: Harris-Lovett, S., Lienert, J., & Sedlak, D. (2018). Towards a new paradigm of urban water infrastructure: identifying goals and strategies to support multi-benefit municipal wastewater treatment. *Water*, *10*(9), 1127.

Example: Nutrient management MCDA results

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