



Incorporating Multiple Benefits into Water Projects: A Guide for Water Managers

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About the Pacific Institute

The Pacific Institute envisions a world in which society, the economy, and the environment have the water they need to thrive now and in the future. In pursuit of this vision, the Institute creates and advances solutions to the world's most pressing water challenges, such as unsustainable water management and use; climate change; environmental degradation; food, fiber, and energy production for a growing population; and basic lack of access to freshwater and sanitation. Since 1987, the Pacific Institute has cut across traditional areas of study and actively collaborated with a diverse set of stakeholders, including policymakers, scientists, corporate leaders, international organizations such as the United Nations, advocacy groups, and local communities. This interdisciplinary and nonpartisan approach helps bring diverse interests together to forge effective real-world solutions. More information about the Institute and our staff, directors, and funders can be found at www.pacinst.org.

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ADVISORY GROUP

This initiative has relied on significant stakeholder engagement. In December 2017, we formed an advisory group with 30 representatives from local, state, and federal agencies; private sector and industry groups; academia; and non-governmental organizations with interest and expertise in water investment projects and multi-benefit valuation strategies. The advisory group was convened 10 times over two years and provided input on defining the Multi-Benefit Framework goals, categorizing benefits and costs of water management strategies, and examining opportunities for incorporating multiple benefits into decision making. The views expressed in this guidebook are solely those of the authors and may not reflect the opinions of the advisory group.

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Summary

There is broad recognition that adapting to climate change, coupled with the need to address aging water infrastructure and population growth, will require public and private investments in man-made water systems and the natural environment. These investments will take many forms, ranging from watershed restoration to efficiency improvements and stormwater management, and will address a combination of flood risk, water quality, and water supply objectives. In addition to meeting water-related objectives, many of these strategies can also provide important co-benefits, such as reducing energy use and greenhouse gas emissions, providing habitat, and enhancing community livability.

Government agencies, businesses, and others have acknowledged the importance of multi-benefit projects. However, co-benefits are often incorporated at the end of projects, as embellishments or justifications. Integrating co-benefits throughout the decision-making process provides an opportunity to build partnerships, leverage additional resources, and garner public support. Specifically, evaluating multiple benefits can help water managers to:

- Provide a more objective and transparent basis for comparison of water management options for a policy or project;
- Identify opportunities to share costs among project beneficiaries;
- Discover design improvements that can leverage additional benefits;
- Engage with stakeholders and decision makers to improve support for a policy or project;
- Optimize the investment of time, money, and other resources; and
- Increase equitable investments in communities and reveal and mitigate adverse or unintended consequences.

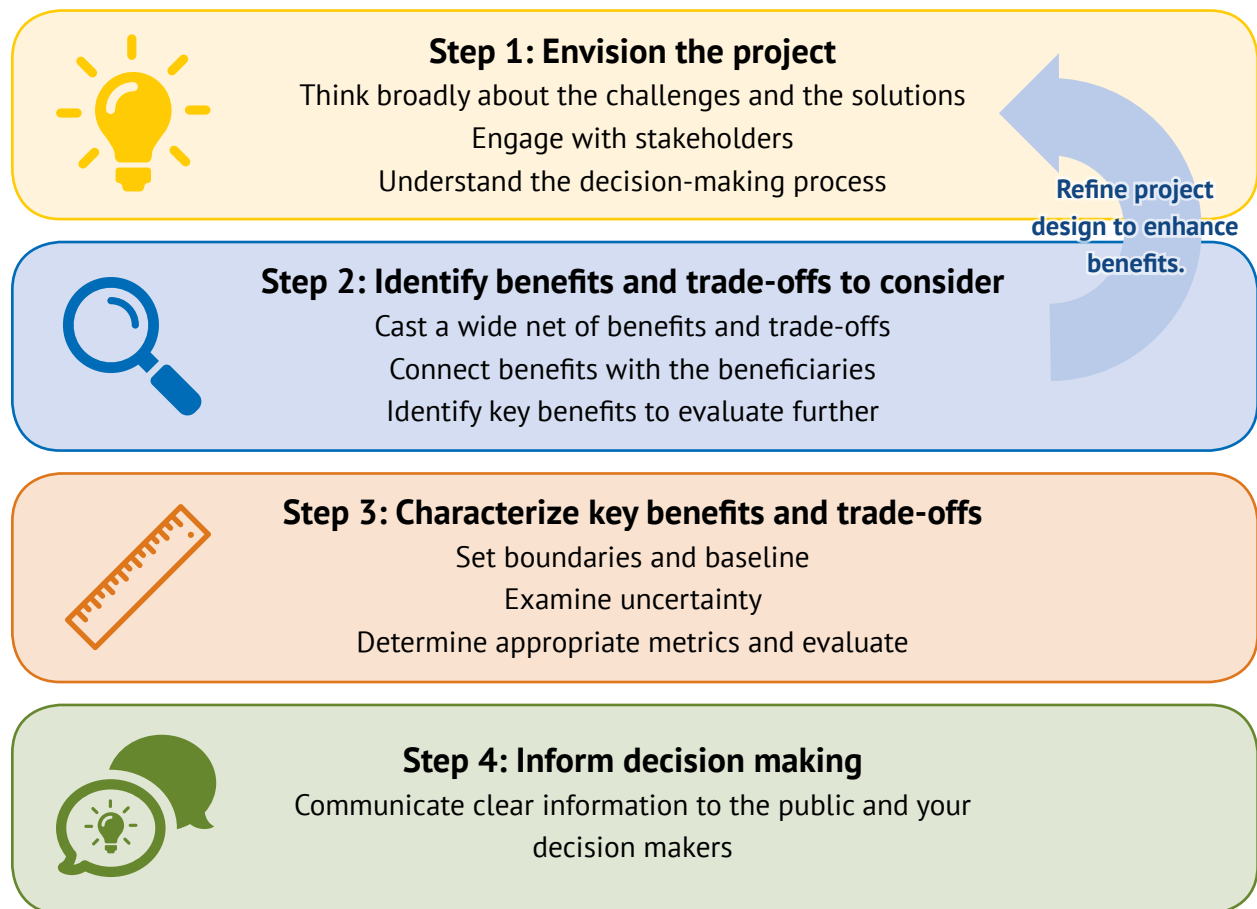


Source: Anna Earl, Unsplash

The Multi-Benefit Framework for Decision Making

To advance consideration of co-benefits, the Pacific Institute collaborated with public and private sector partners to develop a framework to incorporate co-benefits into water investment decisions (Figure S1). By using this framework and incorporating multiple benefits, water managers can identify potential project partners and co-funding opportunities, and modify project design to maximize the value of their investments.

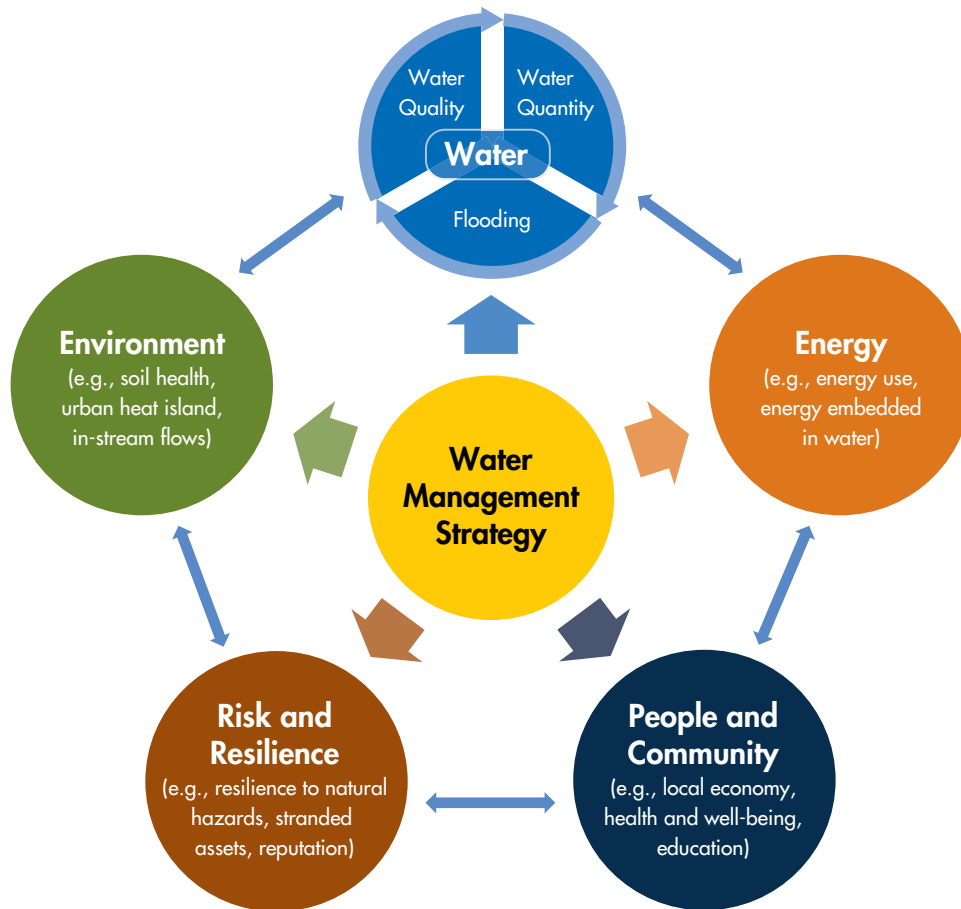
Figure S1. Multi-Benefit Framework Steps Toward Informed Water Management Decisions 



The *first step* in the Multi-Benefit Framework is to define the project vision and determine potential project options. This includes identifying the goals of the project and potential alternatives, as well as identifying the relevant stakeholders, including property owners, community members, local and regional government agencies or departments, and businesses.

The *second step* is to determine the potential benefits and trade-offs of the project options, regardless of whether these outcomes can be quantified. To facilitate this process, we defined five benefit themes: (1) Water; (2) Energy; (3) Environment; (4) People and Community; and (5) Risk and Resilience (Figure S2). These themes provide a starting point for identifying and organizing benefits and costs more methodically and transparently.

Figure S2. Benefit Themes for Identifying Relevant Benefits and Trade-Offs of Water Management Strategies 🔍



The *third step* of the framework is to characterize the benefits and trade-offs of greatest interest to stakeholders and decision makers. This includes methods for evaluating the benefits and trade-offs, as well as setting a baseline for comparing projects and incorporating uncertainty into the analysis.

Finally, the *fourth step* of the framework is to inform decision making through translating and communicating results of the analyses to decision makers and stakeholders. As a result of effectively communicating the benefits and trade-offs, decision makers will be equipped to make more informed and transparent decisions.



How to Use This Guidebook

This guidebook is designed for planners, engineers, advocates, and decision makers interested in maximizing their investments in sustainable water management. It focuses on project-level decisions, from designing projects that maximize benefits to building collaborative partnerships to support and fund implementation.

The guidebook mirrors the steps in the Multi-Benefit Framework, focusing on providing the “Dos” and “Don’ts” for each of the four steps outlined above. It intentionally follows and expands on many existing decision-making frameworks. As a result, the guidance provided by the framework can readily be incorporated into existing processes, including:

- Expanding the benefits and costs in traditional benefit-cost analyses or triple bottom line analyses;
- Determining project prioritization schemes that account for multiple benefits and trade-offs;
- Developing sustainability targets that meet economic, community, and environmental needs;
- Building relationships among public and/or private entities and co-financing projects;
- Streamlining proposal guidelines to encourage systematic consideration of multiple benefits, while allowing funders to track progress toward these benefits; and
- Engaging with stakeholders and community members in water management decisions.

This guidebook seeks to help water managers make informed decisions that systematically consider the broad benefits and trade-offs of their project options. As this work continues, we will provide additional real-world examples and work to scale consideration of multiple benefits from water projects into water programs and policies.

Introduction



Adapting to climate change, coupled with the need to address aging infrastructure, population growth, and degraded ecosystems, will require significant investments in natural and built water systems. There are a variety of water management strategies for addressing these challenges, from water reuse to watershed restoration, water efficiency, and green infrastructure. Because water is deeply linked with community, economic, and environmental well-being, these strategies can also provide other benefits, for example, through reducing energy use and greenhouse gas emissions, increasing wildlife habitat, and improving community livability. Water managers and decision makers often incorporate these multiple benefits at the end of projects, as embellishments or justifications. However, if incorporated throughout the decision-making process, there is an opportunity to build

collaborative partnerships and leverage additional benefits for people and nature through these investments.

By promoting a broader and more complete consideration of the wide range of benefits and costs associated with water management decisions, water managers can:

- Provide a more objective and transparent basis for comparison of water management options for a policy or project;
- Identify opportunities to share costs among project beneficiaries;
- Discover design improvements that can leverage additional benefits;
- Engage with stakeholders and decision makers to improve support for a policy or project;
- Optimize the investment of time, money, and other resources; and
- Increase equitable investments in communities and reveal and mitigate adverse or unintended consequences.

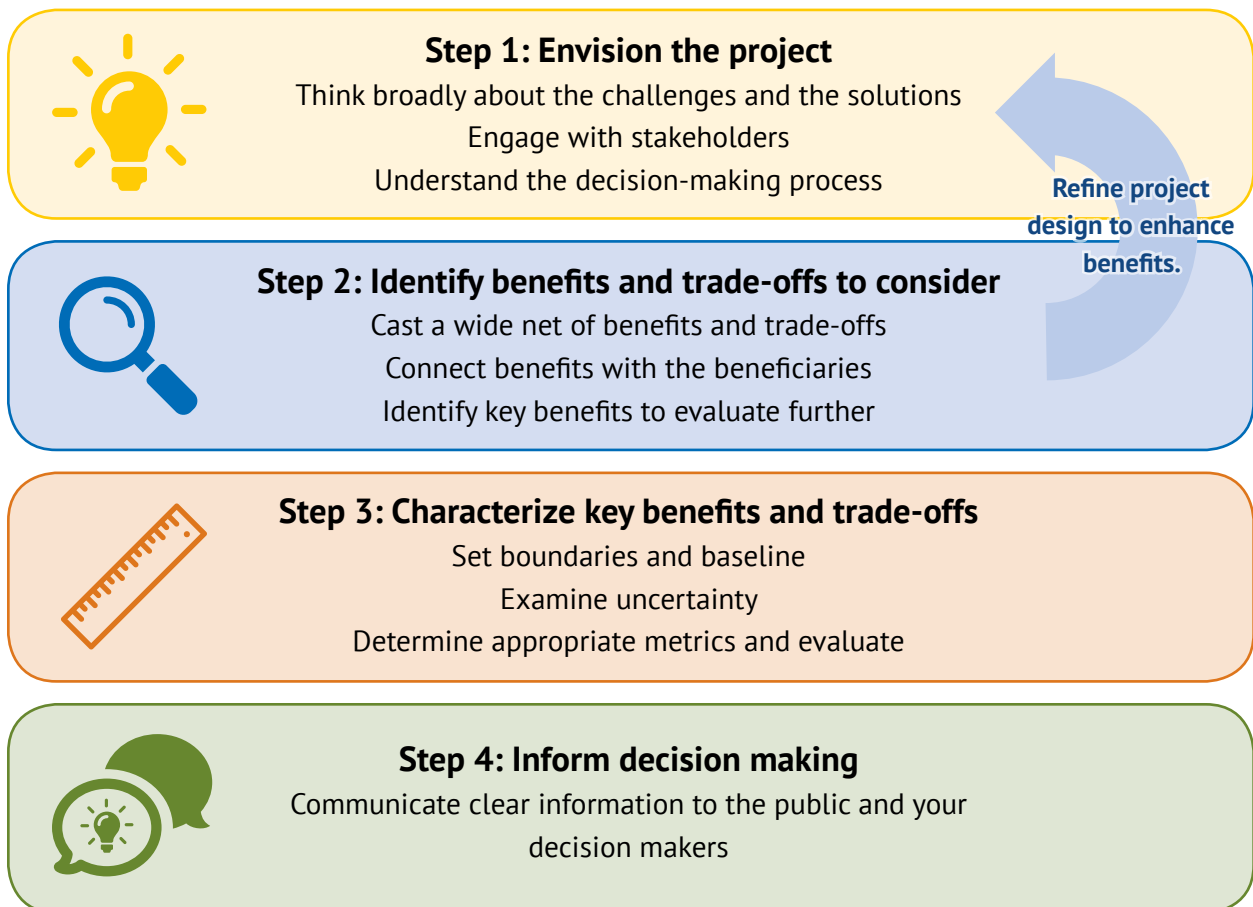


This guidebook provides practical guidance for incorporating multiple benefits into decision-making processes at municipalities, public and private water agencies, non-governmental organizations (NGOs), and businesses. It is part of an ongoing initiative by researchers at the Pacific Institute and University of California, Santa Barbara, to expand the consideration of multiple benefits and trade-offs in water management decisions. To support this effort, we collaborated with a broad range of stakeholders to develop a framework and supporting resources for water managers to incorporate multiple benefits and trade-offs into the decision-making process. It can be used by the public sector, for example, when evaluating water supply or water quality management options. Or, it can also be used by the private sector to prioritize investments, or by both the private and public sector when exploring partnerships. In this guidebook, we walk through the components of the Multi-Benefit Framework, using it as an outline for a multi-benefit approach to water management.

A Multi-Benefit Framework for Water Managers

The **Multi-Benefit Framework** provides a four-step process for incorporating multiple benefits and trade-offs into water management decisions (Figure 1). The steps are meant to be flexible and adaptable for a wide range of decision-making processes. Incorporating the entire process or key components can help to achieve more transparent, systematic, and informed decisions. In this guide, we focus on each step of the framework in order to identify, evaluate, and communicate the benefits of water management projects.

Figure 1. Multi-Benefit Framework Steps Toward Informed Water Management Decisions 🔍



The *first step* in the Multi-Benefit Framework is to define the project vision and determine potential project options. This includes identifying the goals of the project and potential alternatives, as well as identifying the relevant stakeholders, including property owners, community members, local and regional government agencies or departments, and businesses. Engaging with stakeholders at this stage can help to define a positive project vision that contributes to community goals and can provide important benefits for stakeholders.

The *second step* is to determine the potential benefits and trade-offs of the project options, regardless of whether these outcomes can be quantified. To facilitate this process, we defined five benefit themes: (1) Water; (2) Energy; (3) Environment; (4) People and Community; and (5) Risk and Resilience. These themes provide a starting point for identifying and organizing benefits and costs more methodically and transparently.

While the second step includes identifying the broad benefits and trade-offs, regardless of whether they can be quantified, the *third step* of the framework is to conduct quantitative and qualitative analyses for the benefits and trade-offs of greatest interest to stakeholders and decision-makers. While there are many potential benefits, finding high-quality data to assess each benefit or trade-off can be a challenge. However, there are methods and tools available for conducting quantitative and qualitative analyses. This step helps with determining methods for evaluating the benefits and trade-offs, as well as setting a baseline for comparing projects and incorporating uncertainty into the analysis.

Finally, the *fourth step* of the framework is to inform decision making through translating and communicating results of the analyses to decision makers and stakeholders. As a result of effectively communicating the benefits and trade-offs, decision makers will be equipped to make a more informed and transparent decision.

The Multi-Benefit Framework intentionally mirrors and expands on many decision-making frameworks. As a result, the guidance provided by the framework can readily be incorporated into existing processes. The Multi-Benefit Framework can, for example, be used to help:

- Expand the benefits and costs in traditional benefit-cost analyses or triple bottom line analyses;
- Determine project prioritization schemes that account for multiple benefits and trade-offs;
- Develop sustainability targets that meet economic, community, and environmental needs;
- Build relationships among public and/or private entities and co-finance projects;
- Streamline proposal guidelines to encourage systematic consideration of multiple benefits, while allowing funders to track progress toward these benefits; and
- Engage with stakeholders and community members in water management decisions.

This guidebook mirrors the steps in the framework. In each section, we provide water managers with 15 “Dos” and “Don’ts” of incorporating multiple benefits into project decisions.



Step 1. Envision the Project

The first step in the Multi-Benefit Framework is to understand the watershed context and the project vision. This includes understanding the social and environmental context of the watershed in which you are working, and identifying the project goals and alternatives that can address a local water management challenge. As project alternatives are identified, water managers can begin to determine relevant stakeholders, such as property owners, community members, local and regional government agencies or departments, NGOs and businesses. As a result of this step, water managers can clearly define the project goals, plan for the decision-making process and stakeholder engagement, and develop a list of potential management strategies to pursue.

1) DO: Think broadly about the challenges and solutions

Defining the water management challenge is critical for finding the best solutions. A poorly defined problem can limit the consideration of project alternatives and potential benefits. For example, if an area is facing a water shortage, then defining the problem as lacking adequate water supplies emphasizes the development of new supplies. However, more broadly defining the problem as one of demand exceeding supply allows for consideration of measures to reduce demand. This change in framing allows water managers to consider broader questions about the efficiency of existing water use. It also allows for the exploration of measures to reduce demand that will both stretch available water supplies and improve water quality, as well as the consideration of the local impacts of inefficient use (e.g., dry weather runoff from overwatered landscapes and increased water pollution to streams and bays).

Water managers may have the opportunity to address their local water challenges with a range of project types, from urban stormwater to water reuse and large-scale watershed protection. While green stormwater infrastructure may most visibly display multiple benefits or trade-offs, all water management options have impacts on energy, environment, people, and resilience. For example, groundwater recharge can provide a more resilient water supply and reduce energy consumed for pumping by raising the groundwater table, or water conservation strategies can increase environmental flows and reduce energy consumed for water provision and use. Thinking broadly about which projects can provide multiple benefits can help broaden the range of water management options to consider.



Source: Shutterstock

In some instances, the goals and options may be set relatively narrowly. For example, water managers may be restricted by funding or a legislative mandate to invest in particular types of projects, like flood management or nature-based solutions. However, even if the management strategies are relatively narrow, there are likely ample opportunities to examine the designs and implementation plans to maximize the benefits. For example, a turf replacement program to meet water conservation requirements while incorporating rainwater capture features to help reduce runoff from the property and to increase groundwater infiltration—two measures that can help improve local water quality.

[Appendix A](#) provides additional examples of questions to consider at the project outset to help clearly define the problem.

2) DO: Engage with stakeholders to understand the problem and define the solutions

Stakeholders are broadly defined as those who are affected by or have an interest in a project, program, or policy, and can include community members, NGOs, businesses, utilities, government agencies, and institutions. Effective stakeholder engagement relies on building relationships with a broad range of community members, including groups that are frequently harder to engage such as disadvantaged neighborhoods, and meaningfully incorporating their input into the decision-making process. While water managers often engage with stakeholders in later steps of project development, early engagement can dramatically improve the decision-making process, including for framing of the project, determining the potential benefits, and developing support for project implementation and uptake.



In [Appendix B](#), we provide links to stakeholder engagement resources and additional questions designed to help water managers and decision makers improve stakeholder engagement for multi-benefit water management decisions. While not exhaustive, this list can encourage water managers to pursue additional resources on effective outreach and engagement to increase the inclusivity of the decision-making process.

Box 1. Defining Community Values with Stakeholders

[Watershed Progressive](#), a water consulting and design-build collaborative, is developing a Resilience Index for landowners, which includes a checklist of benefits, that can help guide project visioning and stakeholder engagement by allowing landowners to define their values and interests. This checklist provides an “opportunity report” that is used to map interventions or project strategies that can achieve those benefits. While we focus on defining multiple benefits in more detail in Step 2 of the framework, for many projects, multiple benefits can help to determine project options.

3) DO: Examine equity throughout the process

Water management projects are not intrinsically equitable or inequitable. **Instead, we define equity as the just distribution of benefits and trade-offs among stakeholders.** For this reason, equity is not considered a “benefit” within the Multi-Benefit Framework. Rather, equity is a lens that should be applied to all benefits and throughout the decision-making process.

In most decisions, benefits and costs cannot be distributed equally among stakeholders, and there will be communities, agencies, or ecosystems that benefit more or are adversely or indirectly affected more than others. Throughout the decision-making process, water managers can work with stakeholders to examine the distribution of the proposed benefits and costs to a range of stakeholders through an equity lens in the initial project scoping. If done well, this can help promote a more transparent discussion and adapt the project to improve equity. For water management projects, water managers should consider these questions:

- Who are the beneficiaries of the project, and are the same stakeholders consistently receiving most of the benefits and/or incurring most of the costs?
- Can the project be adapted to reduce potential impacts on communities, maximize benefits for communities in need, and maximize benefits that reflect community values?
- What might prevent disenfranchised stakeholders from engaging in the process or project, and how can engagement, planning, and implementation address those roadblocks?



Source: Vait McRight, Pixabay

These questions can act as a starting point for engaging with stakeholders to define the project vision and understand community challenges and values. However, for a more robust examination of equity and water management, we recommend exploring resources from the Co-Developing Research and Engaged Approaches to Transform Environments ([CREATE](#)) Initiative at the University of Minnesota; the [Water Equity Clearinghouse](#) and other publications from the US Water Alliance; and the Framework for Long-term, Whole-system, Equity-based Reflection ([FLOWER](#)) from Climate Interactive.

Box 2. The US Water Alliance's Water Equity Resources

The US Water Alliance has developed an extensive set of resources on ensuring [an equitable water future](#), focusing on how investments in water management can help “build a society and economy that works for everyone.” They provide three strategies for advancing water equity in the US: (1) ensuring access to clean, safe, affordable water service; (2) maximizing the community and economic benefits of water infrastructure investments; and (3) fostering community resilience in the face of a changing climate. Their [Water Equity Clearinghouse](#) can help to operationalize these pillars by showcasing organizations and water equity practices throughout the country that are working to achieve water equity in their own communities.



Source: Scott Blake, Unsplash

4) DO: Understand the decision makers and the decision-making process

In water management decisions, there are often several decision makers, each with different decision-making processes. For example, municipalities and businesses may respond to benefit-cost analyses that compare project options and assess the costs of a project relative to the benefits it provides. On the other hand, homeowners may be more interested in investing in projects that support their personal or community values. Understanding and engaging in these processes will help to ensure that the benefits are included in a relevant and useful way. In understanding the decision-making process, discuss and consider the following questions with your stakeholders:

- Who are the key decision makers?
- What is important to them (e.g., cost-benefit analyses focusing on monetary values, qualitative support for community values)?
- Who do they trust for information?
- How can multiple benefits play a role in those decisions?
- How and when should information be communicated?

The answers to these questions will help guide the remaining steps in the Multi-Benefit Framework, from identifying benefits to evaluating and communicating these benefits effectively.



Step 2: Identify Benefits and Trade-offs

The second step is to determine the broad potential benefits and trade-offs of the water management options and to engage additional stakeholders that may benefit or be affected by the strategies. To facilitate this process, we conducted an extensive literature review and focused interviews with experts and practitioners, identifying more than 100 benefits and trade-offs that we grouped into five themes: (1) Water; (2) Energy; (3) Environment; (4) People and Community; and, (5) Risk and Resilience (Figure 2). These themes provide a starting point for identifying and organizing benefits and costs more methodically and transparently. Through Step 2, water managers will identify the benefits and trade-offs of project options, and then work with stakeholders to determine the key benefits of interest for evaluation.

Figure 2. Benefit Themes for Identifying Relevant Benefits and Trade-Offs of Water Management Strategies 🔍





5) DO: Cast a wide net

Many benefit-cost analyses focus on tabulating benefits and costs that can be monetized. However, some water management decisions are informed by factors beyond monetary benefits that can be difficult to quantify. By narrowing the scope of the analysis too early and focusing on monetary benefits, water managers may miss benefits and trade-offs that are important but difficult to quantify. Instead, expanding the boundaries of the analysis and identifying all benefits and costs (regardless of quantification or data availability) helps to deliver a more transparent and comprehensive list of benefits and trade-offs. Those that are not quantifiable can still be used to evaluate project options and highlight opportunities for future research or analysis.

Through a literature review, we developed a list of potential benefits that should be considered as part of multi-benefit decisions related to water management (Table 1). Additional benefits or trade-offs may be possible, and should be considered, especially based on stakeholder feedback and interests. However, be wary of selecting only a narrow set of benefits to consider, as this is likely to reduce the potential benefits of the project or lead to unexpected outcomes. While not quantitative, a checklist can still help to compare project alternatives and move decision makers toward considering a greater number of benefits.

Box 3. Expanding the Benefits Considered: Sun Valley Watershed

In 1998, the Watershed Management Division of the Los Angeles County Department of Public Works convened a group of stakeholders to design a [multi-purpose urban park](#) that would address significant flooding in the Sun Valley Watershed. The stakeholder group helped to identify the potential benefits and costs to consider for each project, effectively expanding the scope of the project beyond flood control to include water conservation, recreational opportunities, wildlife habitat, and stormwater pollution mitigation. The process also allowed for consideration of social benefits that were a priority for stakeholders. These benefits were incorporated into the [Sun Valley Watershed Management Plan](#) and allowed for a fairer comparison of each alternative based on community values. Ultimately, the water management solutions implemented alleviate flooding while providing many additional benefits, such as community park space that concurrently recharges groundwater, and bioswales along neighborhood streets that capture stormwater and improve water quality.



Table 1. Proposed Benefits and Trade-Offs Checklist for Evaluating Water Management Strategies

Themes	Benefits
Water Supply	Water supply
	Water demand
Flooding	Large-scale flood risk
	Nuisance structural flooding
	Combined sewer overflow events
	Flood peaking or erosive events
Water Quality	Surface and coastal water quality
	Groundwater quality
	Drinking water quality
Energy	Energy embedded in water
	Energy production potential
	Energy for operations
Environment	Urban heat island
	In-stream flows
	Habitat availability and quality
	Carbon footprint
	Air quality
	Soil health
	Resource recovery
People and Community	Local economy
	Access to high-quality jobs
	Health and well-being
	Education
	Recreation
	Aesthetics
	Household affordability
Risk and Resilience	Resilience to natural hazards
	Adaptability
	Financial risk
	Reputation
	Regulatory risk

6) DON'T: Forget about trade-offs

While water management strategies can provide multiple benefits, they can also have costs or trade-offs associated with them. We identified two types of trade-offs in this work: (1) the trade-off between two benefits that are achieved by different designs and may not be possible or optimized in the same design, and (2) adverse impacts of a projects (i.e., costs). For trade-offs that require balancing different benefits, there may be project or program design modifications that can provide both (or



Source: J. Carl Ganter, Circle of Blue

The California Aqueduct carries water from northern California to southern California through a series of canals, pipelines, and tunnels. It is one of many intensive water conveyance systems in the western United States that should be examined for its multiple benefits, as well as the negative consequences or trade-offs.

more) benefits. However, if this is a true trade-off, decision makers will need to consider if and where compromises can be made to move forward with the project.

In this guidebook, we focus primarily on the second type of trade-offs: the potentially adverse impacts of a project. We purposefully do not refer to these trade-offs as “costs” because they are not only financial costs. In addition to current and future financial costs, they can include adverse impacts to communities and the environment. Examining the multiple benefits and trade-offs early in the decision-making process can help to better understand the overall impact of a project.

For example, recycled water can be used to recharge groundwater, augmenting water supplies while also raising groundwater levels and improving water quality. Recycled water can also reduce the energy requirements for pumping and treatment, although there may be additional energy required (and by extension, energy costs and increased greenhouse gas emissions) to treat and deliver recycled water to recharge basins. Or, if the wastewater had previously been released to a stream, the change in use may cause adverse impacts to in-stream flows and dependent ecosystems.

In some cases, negative consequences can be mitigated or avoided through project or program design, e.g., incorporating renewable energy to reduce the impact of additional energy use or greenhouse gas emissions associated with a project. However, in many cases, decision makers will need to evaluate the benefits and trade-offs of the project options and determine the best path forward with an awareness of how different benefits and costs accrue to different groups. While this process can be



contentious, systematically evaluating trade-offs and benefits will make the decision-making process more transparent. It is more likely to lead to a decision that is accepted by the community served.

To identify potential benefits and trade-offs, we examined how projects might affect natural or social “processes” around them. We then used these processes to examine how they cascade into a broad range of benefits or trade-offs. For example, water reuse can reduce wastewater effluent to receiving bodies, thereby reducing nutrient loading and potentially affecting the timing or quantity of in-stream flows. Or, water reuse may reduce the energy required for extracting and treating water compared to alternatives, thereby reducing emissions of greenhouse gases and other air pollutants.

Brainstorming tools, such as mind maps, can help organize benefits across themes, assess relationships, and define analysis boundaries. Mind maps, such as those developed through [Coggle](#) or [MindMup](#), visually display the relationships among projects and potential benefits or trade-offs. Similarly, presentation tools, such as [Prezi](#), can help to demonstrate complex relationships among benefits and tradeoffs. As one example, the Pacific Institute developed a mind map using MindMup to identify the benefits and tradeoffs of sustainable landscape for the site and the community (Figure 3; Cooley et al. 2019).

Source: ImagineGolf





Figure 3. Community Benefits of Rain Gardens Outlined in Cooley, et al. 2019





Source: Dmitry Anikin, Unsplash

The Chicago River provides benefits to people throughout the city, including recreational kayakers and tour cruises, transportation for the city's industrial sector, and commercial businesses along the Chicago River Walk. Connecting the benefits of water management projects with the beneficiaries can help to engage with stakeholders and refine projects to achieve the greatest number of benefits.

7) DO: Connect benefits and beneficiaries

Benefits and trade-offs accrue differently to different stakeholders, and the perceived benefit of a project depends on the lens that the decision makers are using to examine the project. For this reason, it is important to understand which stakeholders are benefiting (and how), and which stakeholders may be negatively impacted by a project.

Understanding the relationship between benefits and beneficiaries is useful for both the public and private sectors, but the process and outcomes are likely to differ. For the private sector, connecting benefits and beneficiaries can help to determine which divisions within the company may be interested in the project (e.g., public relations, environmental permitting and compliance, facilities management), as well as how the project could meet community or environmental goals. For example, when considering a sustainable landscapes project, the facility managers might want to reduce stormwater runoff, thereby meeting permitting requirements; reduction in water use associated with the project would also reduce the water bill, which may be of interest to the financial department. Engaging these parties early can help get buy-in on the project and prevent future hold-ups during project design and implementation.



For public sector projects, connecting benefits with beneficiaries may reveal additional stakeholders who may benefit from the project, as well as help identify those who may be negatively impacted, including communities and the environment. While a stakeholder group has likely been established during the first step of the process, at this stage, connecting the impacts of a project with additional stakeholders can help to improve the project design or implementation to mitigate some negative impacts, increase co-funding opportunities, and increase overall support for the project. In Austin, Texas, we worked with the Watershed Protection Department (WPD) to examine the benefits of a rainwater capture program. By connecting benefits with beneficiaries, we were able to identify how the program could help other city departments meet their own goals, including the water resilience benefits and energy savings that are important to the Office of Sustainability and Austin Energy. As a result, the WPD can engage more directly with potential partners for support and co-funding opportunities. In addition, understanding how the benefits accrue to residents will help with developing effective outreach materials that focus on how the program can benefit residents directly.



Installation of Austin's Rain Catcher Pilot Program in the Waller Creek Watershed, including a rain cistern, rain garden, and recently planted tree on a residential property in the Waller Creek Watershed.

8) DO: Refine project designs to enhance benefits

Water managers can and should periodically revisit the project design as additional stakeholders and potential benefits are identified. Projects goals and alternatives may be relatively narrowly defined at the beginning, either to meet a departmental goal or business objective. For example, a water manager may be only interested or allowed to work with a subset of options (such as conservation programs or nature-based solutions). However, this does not preclude entities from adapting project designs over time to incorporate additional benefits and stakeholders. For example, if stakeholders identify that mitigating urban heat island effect is especially important for them, then designers may be able to add trees and other vegetation to the design. Providing signage about heat island reductions can improve the educational benefits and bring in additional stakeholders. It is important that water managers revisit each step throughout the framework to consider how they might respond to stakeholder feedback, expand water management goals, and adjust project options.



Mitchell Kmetz, Unsplash

9) DO: Identify key benefits for further evaluation

As a result of this step, stakeholders may have identified numerous benefits and trade-offs associated with the project. During this step, water managers can include important qualitative values that are important to stakeholders and decision makers, such as aesthetics or community resilience. In the following steps, we will examine how to determine quantitative metrics for these values and to communicate them to stakeholders and decision makers. Before proceeding to the next step, water managers can identify the benefits of greatest interest for stakeholders and decision makers and the associated trade-offs that will be evaluated in Step 3.



Step 3: Evaluate Key Benefits and Trade-Offs

The third step of the framework is to quantitatively and qualitatively characterize those benefits and trade-offs of the project identified in Step 2. While there are many potential benefits, finding good-quality data to assess each can be challenging. There are methods and tools available to analyze specific benefits and costs quantitatively and qualitatively (e.g., an ecosystems services analysis) and for integrating these results into a comprehensive assessment (e.g., a benefit-cost analysis). As part of this step, water managers will define the boundaries of the analysis, as well as determine appropriate indicator metrics for characterizing key benefits of interests.

10) DON'T: Let the perfect be the enemy of the good

Many water managers and analysts have avoided evaluating the multiple benefits of a project because many are challenging to quantify and compare. But incorporating even a limited number of additional benefits and illuminating trade-offs can improve the decision-making process. During this step, water managers should evaluate key benefits of interest in more detail (e.g., the benefits and trade-offs identified with stakeholders during Step 2). Developing quantitative metrics for some benefits may be relatively easy, while others may present a larger challenge. Do not let the perfect be the enemy of the good: evaluate what you can and add in additional information as resources will allow.

11) DO: Determine the level of detail needed

Traditional cost-benefit analyses focus on tabulating benefits and costs that can be monetized, often missing important benefits and trade-offs that are more difficult to quantify or value. At the same time, many decisions are informed by qualitative data or even emotions that are not included in these analyses. For this reason, it is important for water managers to consider both what project-specific information is available to examine their projects, as well as the level of detailed information that decision makers will need to consider.

We developed a matrix to help determine the level of information that may be available for analyzing the benefits and trade-offs (Figure 4). There are two aspects of detail to consider when determining how to characterize each benefit or trade-off: the degree to which the benefit can be quantified or valued (e.g., qualitative, quantitative, or monetary) and the specificity of the available information to the project (e.g., general information, comparable strategy or geography, or project-specific information).

Figure 4. Matrix for Examining What Level of Detail is Available and Needed for the Decision-Making Process

How project-specific is the information?	Project-Specific Information			
	Comparable Strategy and/or Geography			
	General			
		Qualitative	Quantitative	Monetized
		Can the benefit or trade-off be valued?		

The matrix can help organize information on how much detail is available for quantifying or monetizing the potential benefits of each project option. Each of the key benefits identified in Step 2 can be placed into this matrix to understand the potential for obtaining project-specific and monetized information.

The matrix can also help with organizing information on the level of detail needed to make an informed decision. For example, a decision maker may not need to know the monetary value of water saved, but they may be interested in the quantitative volume. Similarly, some decision makers may be interested in project-specific information that models the expected carbon sequestration provided by a project, while others may only need an estimate based on comparable strategies in other geographies. By placing available information on benefits within this spectrum, analysts and decision makers can better understand the type of analysis that is possible and prioritize quantification or monetization efforts based on the level of detail that is needed.

Box 4. Assessing Benefits and Trade-Offs of Sustainable Landscapes on Commercial Properties

We assessed the potential benefits and trade-offs of installing sustainable landscapes on commercial properties. We identified reduced water use on the site and reduced energy use for pumping and treating water, as well as benefits to employee well-being, including employee satisfaction and productivity resulting from increased greenspace or outdoor areas. We placed these benefits into the matrix to understand what level of information was readily available for analysis (Figure 5). The benefits to reduced water use can be translated directly into monetary savings for the company and can be quantified for the site based on the change in irrigation requirements. While the energy savings for pumping and treating water will not necessarily accrue financially to the company, the energy savings can be translated into carbon or greenhouse gas emissions savings and counted toward corporate sustainability targets. The benefits to employee satisfaction and company reputation cannot readily be quantified or monetized for the site (though there are methods for quantifying these benefits or indicators for these benefits, see Landscape Performance Series [case studies](#) for examples). Literature can support how similar strategies generally led to these benefits, which can help to encourage and promote project options that provide these benefits.

Figure 5. Example of Information Available for Sustainable Landscapes on Commercial Properties, Placed into the Matrix

How project-specific is the information?	Project-Specific Information		Energy and GHG emissions savings; meet regulatory targets	Water savings
	Comparable Strategy and/or Geography		Employee satisfaction and retention	
	General	Improved reputation		
		Qualitative	Quantitative	Monetized
		Can the benefit or trade-off be valued?		



The Heifer International offices in Little Rock, Arkansas are LEED certified and include native plants with minimal irrigation requirements, as well as rainwater collection and storage for cooling the building.

12) DO: Determine appropriate metrics for evaluating the benefits and trade-offs

Methods for evaluating benefits and trade-offs can vary dramatically by project type (e.g., water recycling plant vs. toilet rebate program). For this reason, we provide a relatively basic overview of potential metrics and evaluation methods, including links to additional resources for evaluating benefits and trade-offs related to the project in more detail (Table 2). Metrics and resources were compiled from existing water accounting and evaluation methods, including from [Autocase Methodologies](#), World Resources Institute's [Volumetric Water Benefit Accounting](#), Center for Neighborhood Technology's [National Green Values Calculator](#), Green Infrastructure Leadership Exchange's [Co-Benefits Valuation Tool](#), American Society of Civil Engineers's [Envision Rating System](#), and the Landscape Architecture Foundation's [Landscape Performance Series](#). As this work develops, additional resources will be incorporated that provide increasingly in-depth information on analyzing these components. These resources, as well as additional valuation resources, are included in the [Multi-Benefit Resource Library](#).

Table 2. Benefits of Water Management and Potential Metrics for Measuring Benefits

Themes	Benefits	Potential Metric
Water Supply	Water supply	Water volume recharged, total volume captured
	Water demand	Change in total demand, peak water demand, potable demand, and/or withdrawal
Flooding	Large-scale flood risk	Change in flood damage to properties, insurance premiums, safety costs
	Nuisance structural flooding	Change in water damage to properties
	Combined sewer overflow events	Number of CSO events, pollution load from events
	Flood peaking or erosive events	Change in stream flashiness (i.e., baseflow, peak flow, and rate of change), percent change or number of erosive events over time
Water Quality	Surface and coastal water quality	Pollutant loading (e.g., nitrogen, phosphorous, fecal coliform), cost of water treatment
	Groundwater quality	Reduced energy for groundwater treatment or pumping
	Drinking water quality	Human health outcomes, water treatment costs
Energy	Energy embedded in water	Energy intensity of water (kilowatt-hour equivalents per volume), total energy used for water (kilowatt-hour equivalents)
	Energy production potential	Energy provided by flows to downstream (kWh)
	Energy for operations	Energy for heating and cooling buildings and other facility systems (kWh)
Environment	Urban heat island	Change in average or peak air temperatures energy consumption or costs
	In-stream flows	Changes in flow regime, changes in frequency or severity of erosive events
	Habitat availability and quality	Total restored habitat, available habitat for species, valuation of ecosystem services
	Carbon footprint	Greenhouse gas emissions (total and reductions), carbon sequestration, vehicle miles traveled
	Air quality	Airborne pollutants, oxygen production
	Soil health	Soil carbon, plant productivity
	Resource recovery	Mass of resource available for alternative use
People and Community	Local economy	Impact to property values, local jobs, gentrification
	Access to high-quality jobs	Total job availability by job type, shadow wage benefits, job retention
	Health and well-being	Physical health metrics (e.g. blood pressure, public safety), mental and emotional health metrics (e.g. improvement in mood, workplace satisfaction, quality of life)
	Education	Adult or child eco-literacy, time spent outside of school absorbing knowledge
	Recreation	Distance to recreation, total recreation time
	Aesthetics	Impact to property values
	Household affordability	Impact to total utility bills, relationship between bills and disposable income
Risk and Resilience	Resilience to natural hazards	Risks of natural hazards and ability to respond (e.g. insufficient water supply, flooding, or earthquakes)
	Adaptability	Modularity of project, ability to include adaptive management
	Financial risk	Risk of stranded assets, debt coverage, reserves
	Reputation	Public perception, engagement from public
	Regulatory risk	Ability to meet current regulation, ability to meet future regulation



13) DON'T: Ignore uncertainty

The future is uncertain, and water managers should acknowledge and include this uncertainty during investment planning. While quantifying benefits and trade-offs, uncertainty should be clearly articulated. Water managers can incorporate either traditional uncertainty analyses, such as scenario testing, Monte Carlo simulations, ranges of expected outcomes, and standard errors, or through other sector-specific practices. Developing multiple scenarios and more complex uncertainty analyses can provide insights into the range of possible future outcomes. Scenario testing allows water managers to speculate on, for example, the water supply opportunities from stormwater capture or impacts of water efficiency on in-stream flows. In addition,

uncertainty analyses, such as Monte Carlo simulations, can elucidate a statistical chance that an outcome may occur. The combination of all extreme outcomes is highly unlikely, and uncertainty analysis can quantify the risk of each scenario. There are readily available plugins that allow analysts to add Monte Carlo simulation to any spreadsheet model. The result would be a probabilistic range of outputs rather than a single, deterministic estimate. The probabilistic range will better inform water managers on the range of potential benefits or trade-offs, and more transparently demonstrate the uncertainty in analyses.

In addition to incorporating uncertainty into the analysis, water managers can consider how the design of their projects can help to reduce the impacts of uncertainty. For example, adaptive water management focuses on identifying uncertainty and designing strategies that allow for monitoring and changing implementation. This is particularly relevant for projects with long lifetimes that are likely to be strongly impacted by a changing and uncertain climate. For example, rather than investing in large, inflexible water infrastructure, water managers can invest in water infrastructure that can be modular and expanded over time, if needed. For more information on adaptive management, we recommend Rist et al. 2013, [A New Paradigm for Adaptive Management](#) and Pahl-Wostl et al., 2007, [Managing Change toward Adaptive Water Management through Social Learning](#).



14) DO: Set boundaries and a “do nothing” baseline

The selection of the baseline water management strategy fundamentally frames how project options will be compared to one another. This framing affects both the directionality of the benefits or costs and overall perceived value of the project options. Typically, for assessments of green infrastructure, the baseline strategy is conventional construction (or “grey” infrastructure). For example, the benefits and costs of a bioswale may be compared to those of a traditional curb and gutter system for dealing with stormwater. In these cases, an impact is deemed a benefit if it improves conditions and a cost (or trade-off) if it worsens conditions *relative to grey infrastructure*. We recommend incorporating a “do nothing” strategy as a baseline for comparison for the project. Explicitly defining the baseline as being the existing conditions at this step allows for a more systematic comparison of different strategies and their respective project benefits and tradeoffs. Expanding the spatial and temporal boundaries of the assessment (i.e., what is in and what is out) will allow users to capture additional benefits by helping to identify a wider array of stakeholders, management strategies, and benefits and costs of the project.

The scale of the assessment is a bit of a “Goldilocks” challenge. Setting boundaries that are too narrow runs the risk of ignoring important impacts that could alter the type of project pursued. For example, a water supply agency may conclude that an expensive stormwater capture project is not cost-effective if it only considers the value of the water supply benefit and ignores the value of the flood control and water quality improvements. On the other hand, setting boundaries that are too broad could increase the complexity of the project so much that the decision-making process becomes too time and/or resource intensive.



Step 4: Inform Decision Making

Finally, the fourth step of the framework is to inform decision making by translating and communicating results of the analyses to decision makers and stakeholders. The goal of this step is to ensure, as best as possible, that decision makers are equipped to make informed and transparent decisions, and stakeholders understand the benefits and trade-offs of the options evaluated.

15) DO: Communicate clear information to both the public and your decision makers

Throughout this process, water managers have gathered information on stakeholder values (benefits of greatest interest) and evaluated the potential benefits or trade-offs provided by different project options. This information should be compiled and shared transparently with stakeholders and decision makers.

Water managers should consider the best ways to communicate the project information to both stakeholders and decision makers. Often multiple approaches need to be used. For example, city staff may need a detailed, quantitative analysis of the project. On the other hand, residents and homeowner associations may be more responsive to professional, visually appealing guides with references. Understanding the decision makers and the decision-making process for each stakeholder at the beginning of the process can help determine how to analyze or quantify benefits and communicate those benefits to decision makers.

Water projects require engaged and adaptive management throughout implementation and maintenance. The Multi-Benefit Framework provides decision makers with guidance on incorporating co-benefits and trade-offs into their decisions, but the work does not stop there. As projects develop, additional benefits or trade-offs may be identified, and the strategies can be adjusted to help maximize the benefits. In addition, as water management projects scale into programs and policies, multiple benefits can play a role in guiding further investments in sustainable water management.



Outcomes and a Path Forward

Investments in water management can provide multiple benefits to communities, the economy, and the environment. However, these benefits are only realized if water managers intentionally incorporate them into project design and implementation. This guidebook aims to provide water managers with the resources they need to embark on a multi-benefit approach to their water projects. But it is only the beginning. Scaling these strategies will require sustained effort to systematically and holistically consider multiple benefits and trade-offs in water management decisions.

Maximizing Investments in Water Management

The [Value of Water Campaign](#) estimated that in 2017, annual public spending on drinking water and wastewater infrastructure reached \$113 billion, and an additional two-thirds of water infrastructure needs remain unfunded in the United States. Incorporating multiple benefits into water management decisions can help to leverage benefits for people and nature and build collaborative partnerships to close the water investment gap. The Multi-Benefit Framework outlined here can help water managers identify potential project partners and co-funding opportunities, and modify project design to maximize the value of their investments.

Scaling Multiple Benefits to the Policy and Program Level

This guidebook focuses on multiple benefits and trade-offs at a project level. However, scaling multiple benefits beyond a singular project will require incorporation into larger programs and policies. The Multi-Benefit Framework can inform a broader systems approach to examining benefits at these levels. For a project, multiple benefits can be used to help evaluate the business case for a project or provide insights into project design that maximizes the benefits. At a program level, water managers may be prioritizing funding among various projects. At a policy level, multiple benefits can help with determining the strategic direction that will provide the greatest benefits to customers and community members over the long term, while allocating funding accordingly. By integrating multiple benefits at each of these levels, water managers and decision makers can ensure the enabling conditions are in place to consider multiple benefits throughout water management.



Source: Aaron Burden, Unsplash

Advancing Equitable Water Management Through Engagement

Community engagement is a crucial component of effective and equitable water management and requires thoughtful commitment. Examining multiple benefits and trade-offs can help water managers to engage with the community on project goals and options, and the potential benefits and negative impacts of water management strategies. It can also develop community support for project implementation and uptake.

In most cases, benefits and costs are not distributed equally among stakeholders, and there will be some that benefit more or are harmed more than others. To advance equity, water managers and decision makers must identify stakeholders that are impacted by a decision, both positively and negatively, and work toward ensuring that the same stakeholders are not consistently receiving all the benefits or incurring all the costs. While the guidance provided here is not exhaustive, we hope that it can encourage water managers to pursue additional resources on effective outreach and engagement to increase the inclusivity of the decision-making process.

What's Next?

Researchers at the Pacific Institute are working in collaboration with our partners to apply the Multi-Benefit Framework to additional water management strategies and provide guidance on specific water management challenges. Research reports and outcomes will be provided on the [Pacific Institute](#) website. In addition, we will continue compiling methods and tools for evaluating specific benefits outlined within this framework and provide guidance on systematically incorporating them into water management decisions. Finally, we are working to scale the consideration of multiple benefits beyond water projects, and into programs and policies.

Appendix A. Example Scoping Questions for Inclusion of Multiple Benefits

These questions explore common issues affecting the inclusion of multiple benefits and costs in project scopes. They are a synthesis of observations of successful multi-benefit projects and interviews conducted with policymakers, regulators, project implementers, and other key stakeholder groups. Many of these questions should be answered collaboratively by project proponents and stakeholders, including community groups.

Problem Identification and Definition

- What are the core challenges being addressed with this decision/investment?
- What types of engagement will be most effective for soliciting meaningful feedback from relevant stakeholder groups? At what stages? Are these approaches procedurally required? Are there procedural or budgetary challenges to sufficient engagement?
- What factors motivated action towards solving this problem (e.g., regulatory compliance, system resilience)?
- What is the desired/required outcome(s) from solutions to this problem?
- What stakeholder groups are most invested in this problem? Who is missing from the discussion?
- What benefits/costs are of greatest importance to these stakeholder groups?
- Are there benefits/costs that are not being included, but may be of importance to non-involved stakeholder groups? Can those non-involved groups be engaged?

Screening to Assess Level of Effort and Available Supporting Resources

- What level of detail/information is needed to make an informed decision?
- What level of effort is possible within time/budget constraints?
- What are key priorities regarding the inclusion of additional benefits within these constraints?
- When making this decision, what planning/regulatory requirements (e.g., National Environmental Policy Act assessments or California Integrated Regional Water Management Plan), and/or assessment methods (e.g., water quality modeling, ecological assessment) are already being used that include certain additional benefits or costs?
- What additional benefits and costs are already being considered through required assessment methods?

- Where are there gaps?
- At what stage(s) in the process do these assessments occur?
- Can better coordination of existing assessments help identify additional project-related benefits?

Scoping to Facilitate Characterization and Accounting of Multiple Benefits

- Who are the primary beneficiaries being considered?
- What benefits and costs are most important to include in this analysis? Why?
- What additional analyses will need to be conducted to include the full range of relevant benefits and costs?
- What options are available for funding these additional analyses?
- What geographic region(s) are included? Why?
- What timescale is appropriate for this analysis? Why?

Appendix B. Developing a Stakeholder Engagement Process

Community engagement is a crucial component of effective and equitable water management. The Multi-Benefit Framework can provide a platform for community engagement for framing the project, determining the potential benefits and negative impacts of water management strategies, and developing support for project implementation and uptake.

Effectively engaging with community stakeholders requires thoughtful commitment. The Multi-Benefit Framework and guidebook provide a short list of questions designed to enhance stakeholder engagement in water management decisions. While this list is not exhaustive, we hope that it can encourage water managers to pursue additional resources on effective outreach and engagement to increase the inclusivity of the decision-making process.

Meaningful Engagement

Generating meaningful engagement should be accomplished throughout a project. In Step One, water managers begin by identifying how stakeholders can be engaged throughout the decision-making process. There are different levels of stakeholder engagement, from informational to empowerment (see [IAP2's spectrum of public participation](#)) (IAP2 2014). As engagement moves towards empowerment, the community is given more power in the decision-making process. Allowing for the highest level of engagement practical to the project is important for building a stakeholder group, as low-level engagement can lead to apathy (Bogle, Diby, and Cohen 2019). Stakeholders will be more likely to engage if their time is respected by showing it has actual impact on the project.

Who Is and Is Not at the Table?

The next step toward building an inclusive stakeholder group is to identify communities that are affected but may not be at the table. Comparing the demographics of the area with the demographics of past community involvement can help with this identification. Once these groups have been identified, forming partnerships with community institutions such as social justice groups, religious institutions, or neighborhood associations can be extremely beneficial. These institutions often have extensive networks and can identify individuals with useful input (Newman 2014). Additionally, people are often more likely to respond a local entity. For example, outreach materials sent with partner institutions' letterhead were found to be more effective in a US Forest Service diversity in urban forestry campaign (McDonough et al. 2003). Consulting with these local organizations can help identify the resources required to improve participation in outreach meetings. Childcare, language translation, transportation, and hosting meetings at accessible and familiar locations could be required to lower participation barriers (Newman 2014; McDonough et al. 2003).

Showing Appreciation

Throughout the engagement process it is important to show respect to partner organizations and participants. Demonstrating appreciation for the stakeholders' time and energy can and should include compensating them financially or through other benefits. This puts community stakeholders on an equal level with other experts and, in some cases, can allow for greater participation from traditionally marginalized groups ([Newman 2014](#); [McDonough et al. 2003](#); [Falkenburger, Arena, and Wolin 2018](#)). This is especially important if the same community leaders are involved in many projects ([Polonsky, Cohen-Cline, and Wolf 2018](#)). Effort to bring in previously voiceless communities will be paid back through stronger community support and increased social benefits.

Six Questions for Developing Stakeholder Engagement

Developing and engaging with an inclusive stakeholder group can expand the breadth of benefits considered, support long term implementation, and improve equity in water management. Stakeholders can identify benefits that fall outside traditional research. Prioritizing stakeholders' desired outcomes may incentivize the community or multiple communities to be more invested in the project's continued success. Additionally, giving community stakeholders more power over their environment improves equity through rectifying past injustices and decreasing displacement ([Lopez et al. 2019](#)). Effectively engaging with stakeholders requires thoughtful commitment. Analyzing the current conditions and engagement processes through these questions can help develop an active and inclusive stakeholder group.

Evaluating Current Conditions

Engagement needs to be sensitive to the current social and environmental conditions, as well as the history of water and environmental management in the area. This can help to elucidate the areas in greatest need of water management investments and highest opportunities for potential benefits.

1. What is the history of similar interactions with the communities this project will impact?

Environmental challenges and inequities are long-term problems. As a result, the context of the historical interactions of stakeholders is important to consider. Communities may be distrustful of engagement depending on past stakeholder interactions. Past action or inaction from governments, utilities, businesses, or other entities could have created community trauma ([Falkenburger, Arena, and Wolin 2018](#)). Understanding this history in the context of the project should shape both how it is designed and how engagement is performed. For example, if local advocates have brought environmental concerns to government attention and not gotten assistance, new efforts could be treated dubiously. Even without creating community trauma, there could be other tensions such as historical failures in monitoring. For a more detailed discussion, we recommend the Urban Institute's report entitled "[Trauma-Informed Community Building and Engagement](#)."

2. What is the existing vulnerability of the area? How can this project address it?

The Centers for Disease Control and Prevention (CDCP) defines social vulnerability as “the resilience of communities when confronted by external stresses on human health, stresses such as natural or human-caused disasters, or disease outbreaks.” Areas or groups of higher social vulnerability will be more sensitive to changes in water policy, both positive and negative. For example, lower income communities are more sensitive to small changes in the cost of water or services, as well as impacts of gentrification and displacement. At the same time, people with health issues could benefit the most from improvements to the local environment. Understanding the social vulnerability of the area and people affected is important when designing the project. The CDCP has created a tool that maps social vulnerability in census tracts in the United States (<https://svi.cdc.gov/>). Additionally, the EPA has created an environmental justice metric incorporating both social vulnerability and nationally available environmental data (<https://www.epa.gov/ejscreen>). These tools can help identify locations in particular need of engagement.

3. What are the unique challenges and interests specific to the community?

Even if a similar project was conducted in a similar area, it is important not to generalize the concerns of the host community. The US Forest Service conducted a series of focus groups in different cities across the country on including minorities in urban forestry. They found communities that appear similar on paper often had very different concerns and priorities, from lack of open space to potential loss of historic resources ([McDonough et al. 2003](#)). Throughout the engagement process, be careful to see the issues specific to the area.

Engagement Processes

Once the initial conditions have been established, engagement processes should be developed so all potential beneficiaries have feedback opportunities.

1. Are we engaging with all relevant stakeholders?

Traditional community participation efforts can miss key interest groups. This is reflected by the lack of diversity in formal environmental comments submitted, which often includes participation by the same group of individuals repeatedly. However, lack of participation does not imply lack of interest ([Newman 2014](#); [McDonough et al. 2003](#)). Underrepresented groups have cultural, financial, linguistic, and logistical barriers impeding participation. Consider how engagement could strategically include and engage with underrepresented stakeholders.

2. Are there sufficient resources allocated for effective stakeholder engagement?

Stakeholder engagement is a crucial component to achieve long-term environmental goals. At the same time, developing holistic engagement requires financial and time commitments. Budgeting time and resources for engagement from the beginning of the project ensures stakeholder engagement is a central goal (Polonsky, Cohen-Cline, and Wolf 2018). In some cases, stakeholder engagement is mandated as part of a public process, and water managers should first consider if this is sufficient for their process. If it is not mandated, water managers should thoughtfully weigh the positive outcomes of effective stakeholder engagement with the resources that are required and ensure that adequate resources are available.

3. Are we engaging people in a reasonable way for them?

Considering the logistical and cultural barriers preventing engagement can help identify ways to improve attendance for hard-to-reach stakeholders. For example, the US Forest Service's diversity in urban forestry groups discussed with local partners and scheduled meetings for 7:00 pm (McDonough et al. 2003). This time worked better than having outreach during business hours. Additionally, the US Forest Service scheduled meetings in buildings familiar to the local community, such as local churches or libraries. Providing services such as childcare, language translation, and transportation can lower additional barriers (Newman 2014; McDonough et al. 2003).

Appendix B. References

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