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Siloed funding of multibenefit projects highlights the need for funding programs that integrate cobenefits

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Multibenefit projects, such as integrated flood risk management projects, are gaining attention as solutions for complex social and environmental challenges. Among other benefits, these projects offer opportunities to combine flood risk reduction, restoration, and climate resilience. However, multibenefit projects face institutional challenges to their implementation. One such challenge is securing adequate and sustained funding, partly because of a mismatch between the integrative goals of multibenefit projects and the narrower intent of siloed funding sources structured largely in response to the funding needs of traditional, single-purpose gray infrastructure projects. We explore how proponents can fund multibenefit projects and what the funding landscape means for project implementation. Using the Pajaro River flood risk management project in California as a case study, we analyze the project's funding sources and implications for cobenefits. We explore how project proponents are navigating a single-purpose flood risk management project authorization and a fragmented funding landscape to achieve benefits beyond flood risk reduction. Using thematic document analysis and consultations with local project partners, we outline pursued benefits, funding sources, and funding gaps. In our case study, motivated champions incorporated cobenefits like groundwater recharge and habitat restoration into the project, despite narrow funding provisions and a single-purpose project authorization. However, narrow funding provisions challenged these efforts, causing some funding gaps for cobenefits. To address these challenges, agencies can provide funding programs that reflect the integrated nature of many climate solutions and encourage cobenefits, rather than rely on champions to incorporate such considerations. If decision-makers want multibenefit solutions across sectors, agencies need to provide funding consistent with the integrated nature of these challenges and promote, rather than stifle, the pursuit of cobenefits. While institutional, jurisdictional, and administrative challenges to funding multibenefit projects are currently tackled by individuals on a project-by-project basis, a broader effort to reform funding regimes could ease these burdens and scale up integrated solutions.

KEYWORDS

multibenefit projects, flood risk management, nature-based solutions, funding, climate change resilience, Pajaro River, California

1 Introduction

Multibenefit projects (MBPs) are designed to address a range of social and environmental goals and interests, offering holistic solutions to complex sustainability challenges. They can integrate benefits for people and nature by recognizing, preserving, and restoring ecological processes (Serra-Llobet et al., 2022a; Rohde et al., 2020). MBPs are increasingly being used to adapt to and mitigate climate change. The increasing magnitude and frequency of flooding events coupled with aging infrastructure leads to a growing need for sustainable infrastructure development and climate adaptation (American Society of Civil Engineers, 2021). Integrated approaches to flood risk management (FRM) provide opportunities to address river and floodplain degradation linked to levees and other traditional "gray" infrastructure (van Rees et al., 2023, 2024; Chambers et al., 2024; Frantzeskaki et al., 2019; Nelson et al., 2020). Levee realignment, physically moving existing levees to create more space within a riparian corridor, is one such FRM approach. Levee realignments that reconnect floodplains utilize natural processes and offer potential cobenefits including flood risk reduction, water quality improvements, water quantity and water supply benefits, biodiversity conservation, and recreational access (van Rees et al., 2023, 2024). Many levee realignment efforts are needed now and in the coming decades in response to changes in precipitation patterns, urbanization, and other landscape modifications that increase runoff and decrease the time between rainfall and channel flow peaks (Mallakpour et al., 2020; Miller et al., 2014; Qi et al., 2020; Russo et al., 2013).

This research focuses on MBPs, an increasingly popular, yet inconsistently defined, concept. MBPs are generally defined as initiatives designed to achieve a range of benefits that address diverse interests and utilize large-scale or systems-level collaborative approaches (DOC, 2024; Harris-Lovett et al., 2018; Katagi et al., 2022; Pawley et al., 2023; Serra-Llobet et al., 2022a). MBPs can seek to achieve a number of co-equal outcomes, which can be managed simultaneously to optimize multiple interests. They may also prioritize primary benefits while simultaneously pursuing secondary cobenefits (Pecharroman et al., 2021). This feature of MBPs is especially relevant to our levee realignment case study, where FRM provides a canvas for pursuing cobenefits. Levee realignment by itself is not a MBP, but it creates an ideal situation for river restoration and multiple benefits (Serra-Llobet et al., 2022a).

MBPs encompass a range of solutions, including green infrastructure and NBS (Pecharroman et al., 2021). NBS are typically characterized as interventions inspired by nature that pursue multiple benefits and address societal challenges (Albert et al., 2017; Department of the Interior, 2023; European Commissions, 2021; IUCN, 2021; Nelson et al., 2020; Sowińska-Świerkosz and García, 2022). Because they enable natural processes for ecosystem restoration and flood risk reduction, levee realignments that reconnect floodplains are often discussed as NBS (Chambers et al., 2024; Opperman et al., 2024; van Rees et al., 2024). Since the literature on NBS is more extensive, we draw on it for context and reflection; however, we recognize that NBS represent one implementation approach within MBPs, often addressing a subset of the benefits that MBPs seek to achieve.

MBPs face institutional and technical barriers (Cantor et al., 2021; Chatzimentor et al., 2020; Kabisch et al., 2017; Nelson et al., 2020); narrow policy frameworks (Sarabi et al., 2019), limiting leadership structures (Harris-Lovett et al., 2018; Martin et al., 2021), coordination, collaboration, and engagement needs to create processes that reflect systems thinking (Martin et al., 2021; Wamsler, 2015), and a lack of decision-making approaches that value and quantify the full suite of project benefits and trade-offs (Chambers et al., 2023; Dumitru et al., 2020; Harris-Lovett et al., 2019; Opperman et al., 2017; Sowińska-Świerkosz et al., 2021) can all hinder MBPs. We define institutions as "the formal and informal conventions, rules, and norms of a society" (Kiparsky et al., 2012, p. 166). MBPs are funded, planned, permitted, implemented, maintained, and monitored within an institutional framework of siloed agencies with fragmented policies and narrow congressional mandates (Pecharroman et al., 2021). These institutional silos are at odds with the integrated nature of MBPs (Frantzeskaki et al., 2020; Kirsop-Taylor et al., 2022; Sarabi et al., 2020) and are reflected in the funding landscape on which such projects rely (Kalaidjian et al., 2024; Kurth et al., 2022).

Project costs, financing, lack of available funding, and financial incentives are widely acknowledged barriers to implementing MBPs (Diringer et al., 2020; Droste et al., 2017; Kiparsky et al., 2016; Serra-Llobet et al., 2022a; Tengberg and Valencia, 2018). Existing research outlines different types of funding and financing mechanisms for climate and biodiversity projects and NBS, highlighting the need to combine different funding sources, but lacks funding-specific analyses (Arkema et al., 2019; Atteridge et al., 2022; Coffee, 2020; Gordon et al., 2018). An enabling institutional framework includes funding for MBPs (Serra-Llobet et al., 2022a), but there is limited information on how to fund such projects (USACE, 2024a), and more research on funding structures is needed (Thompson et al., 2023). Project proponents can combine multiple funding sources (Opperman et al., 2017) from the public and private sector to increase practical viability, increase institutional capacity, and diversify benefits and support (Albert et al., 2019; Kalaidjian et al., 2024; Kurth et al., 2022; Thaler et al., 2023). Existing scholarship lacks analyses of the funding landscape for MBP implementation, including implications of combining different funding sources or meeting specific program and grant funding requirements to fund such integrated projects. We help fill this research gap by exploring how MBPs might effectively navigate a fragmented funding landscape, detailing a case study in the Lower Pajaro River Valley, California where motivated actors are successfully integrating multibenefit considerations into a FRM project.

The paper proceeds as follows: after introducing our case study and methods, we analyze how project personnel integrated multiple benefits into a single-purpose FRM project with siloed funding sources. We do this by outlining the project's quantified and ancillary benefits and identifying the project's funding sources, including FRM funding and additional funding to enhance the project and its cobenefits. We analyze funding provisions to explore how funding caveats encouraged or hindered the integration of multiple benefits. We also identify funding gaps in order to explore opportunities for improved funding structures for MBPs. We then discuss the implications of our case study findings for funding and implementing MBPs in general and formulate recommendations to support a more integrated funding landscape.

1.1 Case study: the Pajaro River FRM project

The lower Pajaro River Valley is located along California's Central Coast. It includes the towns of Watsonville and the unincorporated area of Pajaro. The surrounding area is rural and relies on local water sources to support irrigation demands for high-value agriculture. Since the construction of the Pajaro River levees in 1949, the area has experienced several major floods. Impacts of the most recent catastrophic flooding in March 2023 fell heavily on the town of Pajaro, a disadvantaged community that is home to many of the region's farm workers. Congress approved an overhaul of the Pajaro River's levee system in the 1960s. However, the project's feasibility study did not conclude until 2019, because of coordination challenges and a low benefit–cost ratio (the benefits of reducing flood risk did not justify the cost of the project). After the U.S. Army Corps of Engineers (USACE) approved the plans, the project moved into engineering and design, which was expedited by the 2023 flood.

USACE's Pajaro River FRM project is a single-purpose FRM project that modifies, realigns, and rebuilds roughly 15 miles of levees along the Pajaro River, Corralitos Creek, and Salsipuedes Creek in order to provide 100-year flood protection to the city of Watsonville, the town of Pajaro, and surrounding agricultural areas (USACE, 2024b). The FRM project provides a rare opportunity to protect a disadvantaged community from floods while reimagining the river's potential to improve water quality, boost groundwater storage, conserve habitat, and enhance recreational access. Officials and the community broke ground on the project in early October 2024. Construction is expected to be completed in the early 2030s (PRFMA, 2024a).

The project is divided into six segments, called "reaches" (Figure 1), and includes levee realignment and floodwalls. Levees are raised embankments, often consisting of earth, and floodwalls are vertical barriers, usually made of concrete or steel. Construction began on Reach 6 first and Reach 5 will follow. Reach 6 includes a levee setback and floodwall along Corralitos Creek that incorporates terrace and side-channel excavation features. The design process for future reaches is ongoing. Reach 5 will include additional levee construction and setback, as well as a partial floodwall. Project plans also include levee setbacks on both banks of Reach 2 to rebuild a section of the levee and on one side of Reach 4 (USACE, 2019a). Given Reach 3's urban setting, this section will be improved with a floodwall.

The FRM project is funded through a partnership between USACE and the local, non-federal sponsor, the Pajaro Regional Flood Management Agency (PRFMA), whose construction funding is fully supported by the California Department of Water Resources' (DWR) Flood Control Subventions Program (PRFMA, 2020; USACE, 2024b). PRFMA is a Joint Powers Authority, an entity formed for a specific purpose by cooperating public agencies, and is responsible for reducing flood risk along the Pajaro River. Because the project along the Pajaro River spans Monterey and Santa Cruz Counties, PRFMA was formed to streamline project planning and funding. Its members include the County of Santa Cruz, City of Watsonville, County of Monterey, Santa Cruz County Flood Control and Water Conservation District, and Monterey County Water Resources Agency (PRFMA, 2021a).

The Pajaro River FRM project highlights challenges and opportunities associated with incorporating multibenefit considerations in a siloed funding landscape. It shows how an FRM project can go beyond its primary purpose to integrate cobenefits. Although the case study is a designated single-purpose FRM project, motivated actors worked creatively to incorporate

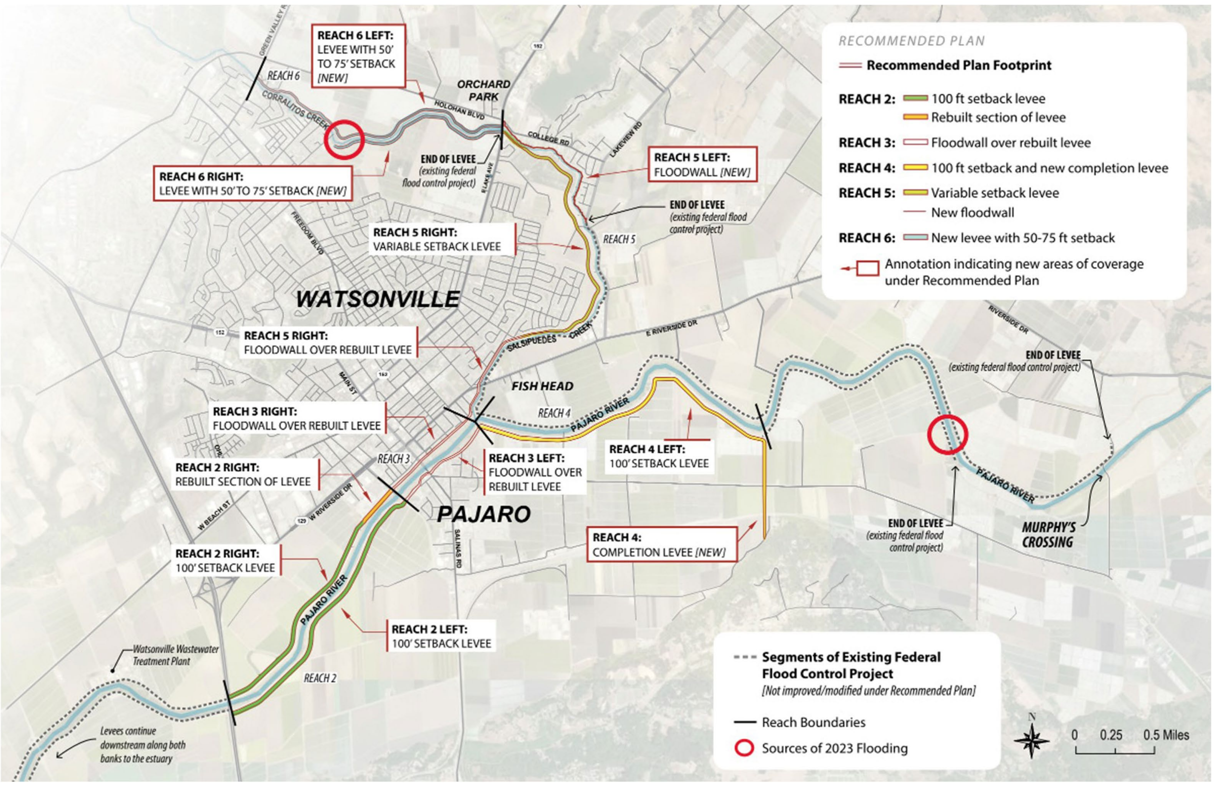

FIGURE 1
Pajaro River flood risk management project (Source: USACE 2023).

cobenefits like groundwater recharge and habitat restoration by enhancing floodplain reconnection. The case also exemplifies the challenges caused by funding caveats and illustrates the broader fragmented policy framework that affects integrated FRM. These characteristics allow us to examine possibilities and challenges for a MBP within the current funding landscape and provide broader lessons.

2 Materials and methods

We utilized a single case study (Yin, 2014) focused on the Pajaro Valley FRM project. Our analysis of the funding landscape combined the analytical components outlined below. The analysis reflects the state of planning as of January 2025.

We conducted a qualitative, thematic analysis of funding documents and other content to identify funding sources for the federal/ state FRM project, benefits considered in funding allocation, and cobenefits that were integrated or pursued (Guest et al., 2012; Neuendorf, 2018). We distinguish between the project's primary flood risk reduction benefit and secondary cobenefits, together referred to as "multibenefit" or "multiple benefits". We deductively analyzed document content, looking for elements reflecting the potential social and ecological benefits of MBPs as outlined in the conceptual framework by Serra-Llobet et al. (2022a) (see Supplementary material). In addition to this analytical framework, we also applied an inductive approach to include additional funding considerations (such as cost savings) in the analysis. The analyzed documents include funding provisions and regulations, official project documents such as funding allocation documents, cost share reports, design agreements for the FRM project, and see supplemental material for Reach 6 (the only reach currently under construction). Documents for other reaches are still being drafted, and information pertaining to other reaches has been included where it was contained in available materials. We also included information from agency websites, press releases, news articles, and presentations at webinars and events.

Through agency websites and web searches, we then identified additional funding acquired to (a) enhance the FRM project, and (b) enhance FRM and other cobenefits in the Pajaro Valley beyond the FRM project. The scope of additional funding covered in this analysis includes funding acquired by or in partnership with PRFMA and USACE and connected to the FRM project and FRM in the Pajaro Valley (Table 1). We utilized another qualitative, thematic analysis of funding documents and agency websites for additional funding to identify the focus of each funding program, amounts, and the cobenefits pursued through these funding sources, and identified remaining funding gaps. The column headers of Table 1 provided the analytical framework for this step. We also included a quantitative analysis of funding amounts (Table 1).

We complemented information gleaned from our document analyses with information gathered in semi-structured, informal expert consultations with local research project partners involved in the FRM project. These consultations aimed at corroborating data, ensuring completeness of identified and analyzed funding sources, and gaining more in-depth institutional knowledge about the funding mechanisms and mandates of the different agencies involved in the project.

3 Results

3.1 FRM funding for the Pajaro River FRM project

Federal and state FRM programs fund this FRM project (Table 2). The construction cost estimate is \$600 M (in 2023 \$, including funding for finalizing the design) (USACE, 2024b). USACE covers 65% of project costs (DWR and USACE, 2023). Local agencies solicited the State for the balance of costs; DWR agreed to cover the remaining 35% through its Flood Control Subventions Program (DWR, 2024a). Although the Flood Control Subventions Program usually only allows coverage of up to 70% of these non-federal costs, the State assembly passed legislation allowing a rare 100% coverage due to the project's multibenefit potential (California Senate, 2021, 2022). In addition, USACE and local sponsors, with state funding support, spent millions on feasibility studies; however, these efforts began in 1966, and exact numbers are not available. PRFMA is responsible for funding and implementing operation and maintenance (O&M) once construction is complete (PRFMA, 2024b).

Each of these funding sources primarily targets FRM. The federal single-purpose FRM project authorization determines the project scope and, thus, which benefits proponents can pursue with the provided federal funds. As such, costs must be directly related to the project to be covered by state and federal FRM funding and compatible with its primary FRM purpose (State of California, 2025; USACE, 2019a, 2019b).

3.1.1 Cobenefits of the single-purpose FRM project

We illustrate that project proponents pursued a wider range of benefits than those considered in funding allocations (Figure 2). We link this difference between pursued and considered benefits to single-purpose funding provisions that also affect which cobenefits funding can accommodate. We also show that agency collaboration and motivated staff allowed for the quantification and integration of cobenefits into the FRM project.

3.1.1.1 The single-purpose project authorization and funding provisions

Narrow, single-purpose provisions hinder the integration of cobenefits in funding decisions and project implementation. USACE and PRFMA staff highlighted that the project not only pursues flood protection for disadvantaged communities and for agricultural lands, but it can also benefit groundwater management, riparian habitat, fisheries, recreation, open space, climate change resiliency, and can reduce the local cost burden (Beagle and Strudley, 2024; Strudley et al., 2024). However, federal and state FRM funding documents include only a narrow quantification of project benefits, including flood risk reduction for agricultural land, disadvantaged communities, and state transportation facilities (PRFMA, 2020; USACE, 2019a). Environmental assessment documents confirm that agencies acknowledge the project's potential cobenefits (USACE, 2019a, 2024c). However, these cobenefits are largely left unquantified in funding justifications.

Because federal funding documentation does not explicitly identify or quantify the costs and benefits associated with specific cobenefits, these cobenefits did not play a role in the

TABLE 1 Additional funding to enhance the flood risk management project and for additional efforts beyond the project's scope.

Funding agency	Type	Lead/ awardee	Program	Project description	Use of funding	Amount	Scope	Total	Add on	Sector/ funding focus
DWR	State government	PRFMA	Coastal Watershed Flood Risk Reduction Program	Partial funding for the Pajaro River flood risk management project	Design	$7,000,000	FRM project	$9,758,000	Supplementary funding to support FRM and multibenefit consideration and close temporal funding gaps.	Flood risk reduction and multibenefit
UCOP	Scientists	UC Santa Cruz and partners	University of California Office of the President Climate Action Seed Grant	Aid multibenefit considerations; further understand physical and biological processes in the Pajaro River; support the design of FRM project	Research, design	$1,995,000	FRM project		Multibenefit enhancement of FRM project, helping ground truth EcoFIP model and inform design of future reaches.	Multibenefit
NOAA	Federal government	California Marine Sanctuary Foundation	Climate Resilience Regional Challenge Awards (Inflation Reduction Act)	$71.100,000 awarded to 22 organizations in Santa Cruz and Monterey counties to address climate risks (flooding, wildfires); project: regional adaptation for climate resilience of Monterey bay coastal communities			FRM project (Reach 6) and beyond FRM project scope		Regional climate adaptation.	Climate resilience and multibenefit (NBS)
		Watsonville Wetlands Watch (subaward)		Workforce development program for young adults for floodplain restoration; planning to support revegetation and monitoring of Reach 6 (funding for workforce development, staff time, not for trees, etc.)	Program planning, Staff time, Monitoring	$763,000			Revegetation and monitoring for Reach 6 to enhance habitat features, community involvement	
		PRFMA (subaward)		Pajaro River-Salsipuedes creek confluence area restoration project; purchasing land to address flood risk reduction alternatives for the Santa Cruz County side of the confluence of the Pajaro River and Salsipuedes Creek, incl. Floodplain and wetland restoration	Design, implementation	$10,000,000	Beyond FRM project scope		Floodplain reconnection; can reduce levee maintenance needs. State funding used for land acquisition.	
DOC	State government	Pajaro Valley Water Management Agency	Multibenefit Agricultural Land Repurposing Program		Land acquisition	$900,000				Multibenefit

(Continued)

TABLE 1 (Continued)

Funding agency	Type	Lead/ awardee	Program	Project description	Use of funding	Amount	Scope	Total	Add on	Sector/ funding focus
FEMA	Federal government	PRFMA (partners: Santa Cruz County Flood Control and Water Conservation District Zone 7)	Building Resilient Infrastructure and Communities Grant	Scoping and feasibility study for the Pajaro Bridge to Bay project = Reach 1: Flood risk reduction alternatives for urban and agricultural areas from highway 1 bridge to the ocean; connecting the USACE FRM project upstream and the USACE ecosystem restoration project downstream.	Study	$420,000	Beyond FRM project scope		Study to provide FRM beyond project boundaries (Reach 1).	Flood risk reduction
FEMA	Federal government	PRFMA	Hazard Mitigation Assistance Program	Local hazard mitigation plan to position PRFMA to apply for and receive FEMA funding for non-emergency disaster projects and programs	Planning	$150,000	Beyond FRM project scope		Local hazard mitigation plan, FRM beyond project boundaries.	Hazard risk reduction
CalOES	State government		Prepare California Match	Access to federal match funds for community mitigation projects that vulnerable communities would otherwise be unable to acquire		$50,000		$28,410,000		Community resilience
Caltrans	State government	Association of Monterey Bay Area Governments; PRFMA	Sustainable Transportation Planning Grant, Climate Adaptation Planning	Pajaro bridge infrastructure resilient design study: planning and environmental work for improvements to the highway 1 crossing over the Pajaro River (levee breach in 2023)	Planning	$2,250,000	Beyond FRM project scope		Increased climate and flood resilience and safe passage during evacuation.	Sustainable transportation and climate resilience
USACE	Federal government	USACE (working with PRFMA)	Floodplain Management Services Program	Pajaro Flood and community emergency action plan: convene local, regional, state, and federal agencies to prepare an emergency action plan for the Pajaro levee system for the Pajaro regional flood management agency	Planning	$200,000 (including $65,000 non-federal funding)	Beyond FRM project scope		Improved emergency flood preparedness.	Flood risk reduction
USACE	Federal government	USACE	Ecosystem Restoration	Watsonville slough estuary restoration at the mouth of the Pajaro River	Total project costs	$14,440,000 (including $4,120,000 non-federal cost)	Beyond FRM project scope		Restoration project downstream (connected to FRM project through FEMA Reach 1 funding).	Ecosystem restoration (and EWN)

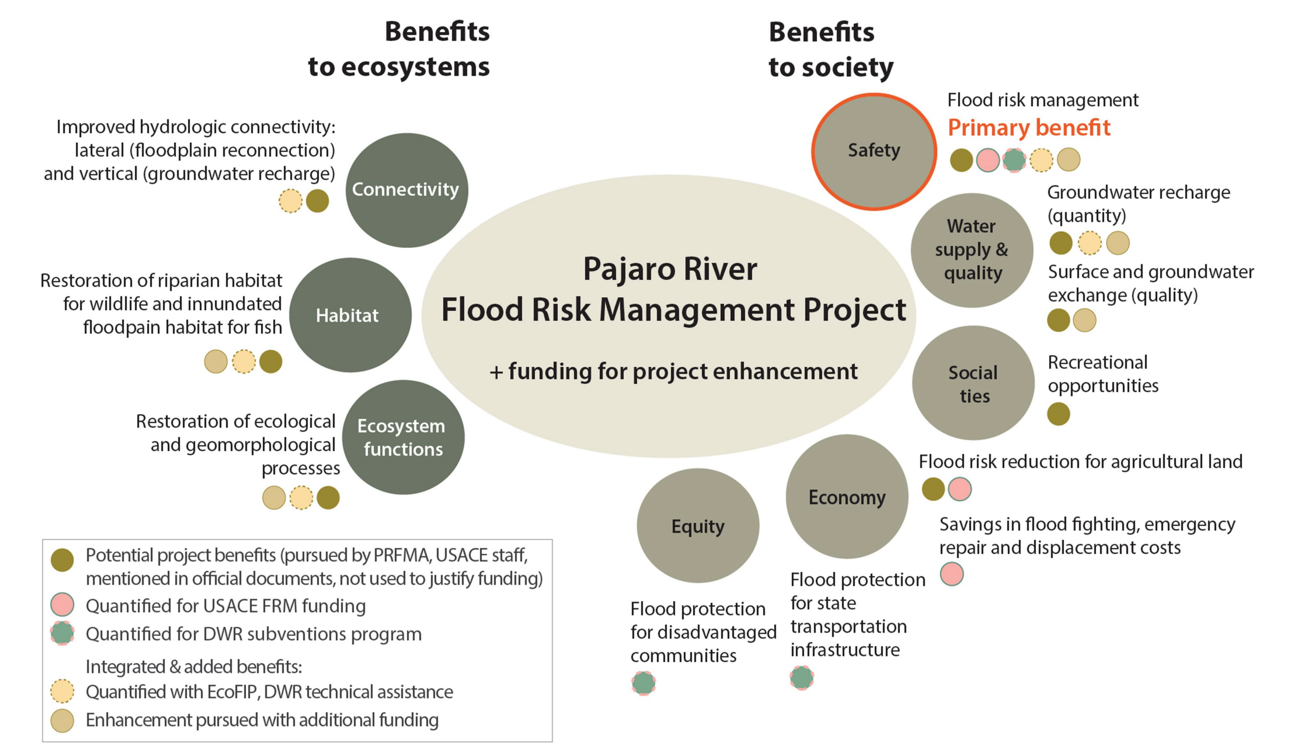

FIGURE 2
Funding of the Pajaro Valley flood risk management project and additional funding.

TABLE 2 Funding for the federal/state flood risk management project (construction costs, including costs for finalizing the design, excluding previous funding for planning and feasibility).

Agency	Program	Amount
USACE (federal)	Flood risk management; federal cost share ("construction costs")	$389,350,650
DWR (state)	Flood control subventions program; non-federal cost share ("construction costs")	$209,650,350
PRFMA (local, regional)	Operation and maintenance; community cost share	$400,000 annually

decision-making process for funding allocation. The project's planning and feasibility phase spanned from 1966 to 2019 and resulted in a 10% project design and a single-purpose project plan. The plan was approved by the USACE Chief of Engineer's report, which allowed USACE to solicit Congress for further funding (USACE, 2019b). The documents reflect the single-purpose FRM designation: the Benefit–Cost Analysis (BCA) used to justify project funding only considers flood risk reduction benefits and associated cost savings (USACE, 2019a). The narrow BCA was not only driven by the FRM designation, but also by the National Economic Development objective, which focuses on net economic benefits (USACE, 2019a).

For DWR's Flood Control Subventions Program state funding match, we also observe a discrepancy between the FRM project's narrow cobenefit quantification and the broader scope of DWR's funding provisions. According to DWR funding regulations, applicants for this subvention funding can increase the proportion of non-federal cost share by quantifying a wide range of benefits (including habitat, recreation benefits) (Cal. Water Code, 2025; State of California, 2025). Yet, the cost share report for the FRM project only quantifies project benefits to disadvantaged communities and state facilities (PRFMA, 2020)–fewer benefits than DWR's subvention regulations encourage. DWR's Flood Control Subventions Program supports federal FRM projects. Thus, how the subvention funds can be spent is determined by what USACE considers creditable contributions, tied to the project scope determined by USACE (State of California, 2025). Although PRFMA and DWR considered prospective cobenefits during funding discussions, they did not include them in the cost share report because USACE's provisions did not allow them to ascribe project costs to these cobenefits.

Funding O&M for cobenefits outside of flood risk reduction and floodplain maintenance (e.g., recreation) might be challenging because of PRFMA's narrow FRM mission, limited funding, and because some revenue streams are earmarked specifically for FRM purposes (Larsen Wurzel and Associates, Inc., 2022; PRFMA, 2024c, 2022). PRFMA's mission is to reduce flood risk from the lower Pajaro River and its tributaries. The agency's $3.8 M annual budget is primarily geared toward the agency's O&M responsibilities (PRFMA, 2021b). To carry out its FRM mission, PRFMA can generate revenue to finance O&M and other responsibilities. O&M activities will follow a USACE-developed manual (currently under development, cf. USACE, 1996, 2024c). O&M is expected to focus on levee and floodplain maintenance (USACE, 1994), including criteria for maintaining roughness values for the riparian areas that support FRM and are compatible with ecosystem cobenefits. PRFMA staff have indicated plans to follow the requirements of the manual, while doing O&M creatively to enhance habitat, or at least be minimally disturbing to it. In addition, the project's integrated design enables natural processes and thus potentially reduces maintenance requirements.

3.1.1.2 Integrating a multibenefit perspective

Despite narrow project framing and funding constraints, agency staff pursued a multibenefit approach. USACE staff designated the project an Engineering with Nature (EWN) project, further strengthening this approach (King et al., 2024). EWN is a USACE program aimed at aligning natural and engineering processes for more sustainable outcomes (USACE, 2024d). PRFMA, DWR, and USACE staff worked collaboratively to enable a multibenefit approach by using a modeling toolkit to inform project design. This Ecological Floodplain Inundation Potential toolkit (EcoFIP) models inundation potential, including for those project sections with engineered terraces and side channels, and quantifies potential habitat and groundwater recharge benefits (Beagle and Strudley, 2024; CBEC and Jacobs, 2024). EcoFIP was developed for DWR's Flood-MAR Network, a State of California effort to support flood managed aquifer recharge (DWR, 2023). It informed Reach 6's design, using excavated material from the terrace and side channel to achieve savings of 20% on borrow material costs (Beagle and Strudley, 2024; USACE, 2024c). This design is also expected to reduce maintenance needs, because it lessens floodwater pressure on the levees (Beagle and Strudley, 2024).

EcoFIP quantified benefits that neither USACE's BCA nor the PRFMA-DWR cost share report quantified. This quantification enabled the incorporation of benefits to groundwater recharge, recreation, ecosystem function, habitat, and floodplain reconnection into project design (State of California and DWR, 2024). USACE and PRFMA plan to use EcoFIP to design the project's other reaches (Beagle and Strudley, 2024). PRFMA, USACE, and DWR worked collaboratively under different funding sources to use EcoFIP for the design of Reach 6. The EcoFIP-based design led to cost savings associated with using borrow material from excavations within the levees. Therefore, these features contributed to the project's economic value and thus aligned with USACE's narrow BCA framework. As a result, USACE staff could integrate funding for EcoFIP for future reaches and the associated costs for construction into the FRM project.

Rather than reinforce former levees, the Pajaro Valley FRM project uses a nature-based approach to enhance floodplain reconnection and pursue cobenefits (CBEC and Jacobs, 2024; King et al., 2024). A single-purpose authorization and siloed funding provisions limited the documentation and quantification of the project's benefits. However, creativity and collaboration enabled key project personnel to pursue a variety of project designs that are intended to benefit the community and ecosystems. This was possible because PRFMA, USACE, and DWR incorporated tools to enhance the FRM project's cobenefits and to quantify benefits that were not considered in documentation for funding allocation.

3.2 Additional funding

PRFMA and USACE collaborated with other actors and acquired additional funding to complement core FRM funding (Table 1 and Figure 3). Some of this additional funding enhances Reach 6 only and some of it enhances the entirety of the FRM project. PRFMA and USACE have also solicited additional funding that expands flood risk reduction, floodplain reconnection, and restoration beyond the scope of the core FRM project.

3.2.1 Funding to enhance the FRM project

To enhance the FRM project and its cobenefits, PRFMA, research partners (including UC Santa Cruz, UC Berkeley, UC Davis and California State University, Monterey Bay), and Watsonville Wetlands Watch secured $9.8 M in additional funding.

Additional funds pay for features that cannot be covered by the FRM project funds and aim to enhance multibenefit considerations (Table 1). These funds do not support construction, provide funds for land acquisition, or support implementation costs for creating additional benefits. They mostly fund research, planning, and design efforts—activities that tend to be less costly than the construction activities funded by the FRM project. Therefore, the amount is small compared to the funding for the FRM project (Figure 3).

DWR's Coastal Watershed Flood Risk Reduction Program (Coastal Program) provides a key piece of additional funding for the planning of the FRM project. The program extends statewide multibenefit flood risk subvention assistance in coastal watersheds (DWR, 2024b; State of California, 2017). PRFMA received a $7 M grant under the Coastal Program to close funding gaps caused by delays in Flood Control Subventions Program funding. This supported early-stage FRM project work, including partial support for establishing PRFMA (PRFMA and DWR, 2024a, 2024b). The Coastal Program can also be used to fund elements that are not creditable according to USACE and therefore will not be covered by the DWR Flood Control Subventions Program. The original funding agreement between PRFMA and DWR included funding for design, the EcoFIP multibenefit modeling tool, and EWN elements (ibid.). After the Flood Control Subventions Program grant was allocated and covered all design cost, the Coastal Program grant scope was amended to complement the FRM project and fund features that cannot be covered by FRM project funding (e.g., to complement revegetation efforts).

For Reach 6 specifically, USACE is working to incorporate further habitat improvement and revegetation into existing project plans (USACE, 2024c). For example, it is cooperating with a local non-profit organization, Watsonville Wetlands Watch, to enhance floodplain revegetation and habitat benefits and to provide monitoring of these features. Watsonville Wetlands Watch received funding for a workforce development program for young adults as a subaward ($0.7 M) of a larger National Oceanic and Atmospheric Administration (NOAA) Climate Resilience Regional Challenge Award. This program will provide native plant revegetation for riparian habitat improvement for Reach 6 and in other parts of the Pajaro Valley (Chun, 2024). The grant covers the workforce development program and staff time, but will need additional funding for plants.

A research grant also aims to contribute to the FRM project's multibenefit considerations. The University of California Office of the President (UCOP) provided a $2 M Climate Action Seed Grant. This award enables USACE, PRFMA, and DWR to collaborate with a team of researchers to aid in assessing current conditions along the project extent and inform designs that result in more cobenefits. UCOP funding supports assessment of: (1) institutional elements of the MBP (this research is part of this effort), (2) channel flows, stream and riverbed seepage gains and losses, and quantification of surface water-groundwater interactions (including recharge), (3) the influence of surface water-groundwater exchange on water quality and habitat, and (4) channel geomorphology to examine how sediment transport and deposition can influence project design and system maintenance. On-the-ground data collection complements existing EcoFIP modeling, in part because it helps ground-truth EcoFIP modeling to inform design of future reaches and FRM efforts. The collaboration can also inform multibenefit O&M by identifying areas where ongoing excavation can most effectively improve groundwater recharge.

3.2.1.1 Remaining funding gaps for the FRM project

Between the core FRM funding and additional funding for the project, gaps remain for some cobenefits and project phases. Federal, state, and local funds fully accommodate costs associated with the FRM project's study, design, and construction phases. Local community resources are expected to fund ongoing O&M. Collaboration, external resources, and additional funding initiated the consideration of potential cobenefits and further enhanced the FRM project. Yet, there is no funding for the construction of additional cobenefit features inside, or potentially outside, the levees, flood walls, and other structures.

Neither funding for the FRM project nor additional funding includes support for the implementation and maintenance of all cobenefits, including additional revegetation in setback areas, recreational area maintenance, and likely O&M of non-flood control multibenefit features. For Reach 6 specifically, USACE will engage in "limited post-construction monitoring to confirm the function and benefits of the borrow features" (USACE, 2024c, p. 35), with no funding for long-term monitoring. Although partnership with Watsonville Wetlands Watch intends to bridge some of the funding gaps for revegetation and monitoring, such efforts to enhance Reach 6's riparian area may require additional funding, as will the intended development of recreational features like walkways for Reach 5 and ongoing maintenance of these features.

Besides O&M for flood risk reduction, additional O&M could be needed for potential multibenefit features that could include habitat and water quality improvements, enhanced groundwater recharge, and recreation. Potential gaps in O&M for cobenefits will be clearer once USACE produces its O&M manual. PRFMA's funding structure produces a gap in maintenance of desired recreational benefits for Reach 5.

3.2.2 Funding to enhance benefits beyond the FRM project

Funding for additional projects creates a bigger multibenefit picture along the Pajaro River: USACE and PRFMA utilized \$28.4 M additional funding to enhance FRM, restoration and other benefits beyond the scope of the FRM project (Table 1). Portions of the projects funded with these grants overlap spatially, and all of them together provide a larger FRM and multibenefit effort in the Pajaro Valley. Additional funding in the Pajaro Valley comes from flood and hazard risk reduction programs (\$0.8 M), multibenefit and climate resilience funding (\$11 M), sustainable transportation (\$2.2 M), and one restoration grant (\$14.4 M) (Figure 3).

PRFMA acquired \$13.8 M in state and federal grants to improve flood protection systems ancillary to the FRM project (PRFMA, 2024d, 2024e). This additional funding is meant to build out segments of the original 1949 levees that are not targeted under the FRM project. It includes grants from NOAA's Climate Resilience Regional Challenge Award (PRFMA and Watsonville Wetlands Watch are sub-awardees of the same \$71 M grant), from the California Department of Conservation (DOC), and from several other agencies (Table 1). For example, funding from the Federal Emergency Management Agency (FEMA) is earmarked for a feasibility study to reduce flood risk along Reach 1, one of the segments excluded from the FRM project because the BCA implied that the cost would not be worth the projected flood risk reduction benefits. This project connects Reach 2 to a USACE ecosystem restoration project downstream, enabling FRM and restoration efforts to span the lower Pajaro River (County of Santa Cruz and FEMA, 2023; PRFMA, 2023; RGS recruitment, 2023; USACE, 2024e). Hence, additional funding is used to expand existing floodplain and restoration projects, enhance community involvement, and reduce flood risk in areas beyond the FRM project's scope.

Other organizations in the Pajaro Valley have also received additional grant funds to enhance flood risk reduction and floodplain restoration not directly connected to the FRM project, illustrating the complexity of piecemeal funding approaches for large-scale multibenefit efforts. For instance, the Pajaro Valley Water Management Agency (PV Water) is administering a regional block grant from DOC's Multibenefit Land Repurposing Program (MLRP); MLRP supports regional programs that repurpose agricultural land to multibenefit uses that reduce reliance on groundwater (DOC, 2024). These additional projects and funding sources are not part of this analysis, but are mentioned because they convey the complexity of how different actors combine funding sources for larger restoration and FRM efforts; PRFMA and NOAA's Pajaro River-Salsipuedes Creek Confluence Area Restoration Project leverages PV Water's funding from the MLRP to enable the restoration project's feasibility study, combines this work with parcels acquired through the FRM project for the excavation of borrow material, and uses these parcels for additional floodplain reconnection and flood risk reduction (PRFMA, 2024f).

4 Discussion

The Pajaro Valley FRM project was originally envisioned as single purpose. However, motivated actors have taken creative steps to reconnect parts of the floodplain to stream and river channels, generate cobenefits, and solicit additional funding to enhance the project. This section highlights our case study findings, discusses broader implications for the funding and implementation of MBPs, and outlines recommendations for a more integrated funding landscape.

4.1 Main findings and implications for the pursuit of MBPs

Collaborative efforts and creativity have increased the scope and scale of potential cobenefits folded into the FRM project. Additional funding further enhances flood risk reduction and cobenefits in the Pajaro Valley. However, this approach relies on collaboration, individuals' initiative, and sufficient capacity, implying a risk that the scope and scale of cobenefits may not be achieved in other projects that lack these characteristics. The approach also produces hurdles and funding gaps for some cobenefits.

4.1.1 The need for a vision

MBPs require stakeholders to overcome institutional inertia to deploy projects that recognize rivers and floodplains as dynamic systems. To enable and encourage MBPs, project proponents and key institutional actors need to have an integrated project vision and recognize that naturally functioning systems can minimize flood hazards while also providing ecological value. For instance, floods contribute to groundwater recharge; they help maintain healthy estuarine equilibrium; they supply nutrient-rich silt that boosts soil health in floodplains; healthy floodplains provide essential habitat for juvenile salmon and other species. Floods are not inherently bad if managed holistically and allowed to function more naturally (Serra-Llobet et al., 2022a, 2022b).

Project proponents' understanding of the integrated nature of natural processes allowed the FRM project to reconnect parts of the floodplain and pursue cobenefits. Policy frameworks and funding models can help support such an approach on a larger scale. Some agencies have already begun integrating this thinking into their initiatives (e.g., PRFMA, DWR, USACE). Yet more opportunities to integrate multibenefit thinking into planning, funding, and decision-making remain. For instance, EcoFIP provides a tool to help quantify different cobenefits; a methodological framework that helps decision makers incentivize MBPs could further enable multibenefit thinking. Watershed scale, systems-level analysis and management approaches can support such an approach to FRM (Awah et al., 2024). However, most agencies do not have watershed-level jurisdiction. Limited jurisdiction and institutional silos make it more difficult to identify opportunities for synergies with other parts of the river system. Despite this, project proponents in the Pajaro Valley are applying a systemic perspective along the river and pursuing additional funding to expand flood risk reduction and cobenefits beyond the FRM project's jurisdictional scope. Institutions that reflect systems-level perspectives of such efforts can produce more efficient, equitable, and sustainable solutions.

4.1.2 Navigating siloed and single-purpose funding

Siloed and single-purpose funding structures can challenge MBPs like levee realignments that reconnect floodplains. The incorporation of multiple benefits into a project can enable access to additional funding sources (cf. Quesnel Seipp et al., 2023; Serra-Llobet et al., 2022a), but project staff need to have the capacity and vision to braid funding sources together.

Narrow funding caveats can also constrain the use of funds from matching state programs that encourage multibenefit considerations. For instance, USACE's funding provisions limit how DWR Flood Control Subventions Program's funds can be used. Additional funding from DWR's Coastal Grant program can flex around the single-purpose project, enabling project features that FRM funding cannot cover. This set-up requires proponents to develop and apply for separate grants from the same funder that then need to be reviewed by the agency and administered over multiple years. This causes funding staff to duplicate work, creating inefficiencies in funding deployment (Payne et al., 2024). Such piecemeal funding requires creativity and leadership–resources that can be scarce and thus constrain the scalability of these approaches (see section 4.1.3).

Further, a single-purpose project authorization can hinder the official consideration of cobenefits in funding allocation. Funding programs that do not mandate the pursuit and quantification of cobenefits limit funding agencies' leverage to encourage applicants to create integrated projects, thereby risking that grant recipients do not pursue potential cobenefits. In our case study, motivation, collaboration, and external resources were needed to assess potential cobenefits. Quantifying benefits is a key challenge for MBPs (Cantor et al., 2021; Kabisch et al., 2017; Sarabi et al., 2020), and assigning quantified benefits to different funding sources adds another layer of complexity. Project proponents who can access funding without considering cobenefits might view efforts to incorporate cobenefits as overly burdensome, thereby disincentivizing MBPs. Project proponents may nonetheless want to quantify cobenefits because showing the value of cobenefits can increase project support (Quesnel Seipp et al., 2023; Serra-Llobet et al., 2018).

4.1.3 The role of champions

It is possible to use siloed and single-purpose funding programs to integrate cobenefits into an FRM project (Figure 2), but this approach requires "champions" that have the capacity and vision to find creative ways to enable these approaches. Champions are motivated individuals or groups that play a crucial role in the implementation of innovative solutions: They collaborate to form coalitions, establish trusting relationships, generate new modes of decision-making, and adapt as they learn (Daniell et al., 2014; Harris-Lovett et al., 2018). The inherent complexity and integrated nature of MBPs amplifies the need for visionary leadership and dedicated individuals to enable innovation (cf. Green-Nylen et al., 2022).

The FRM project required champions to incorporate multibenefit considerations that did not conflict with single-purpose project provisions. Initiative and collaboration enabled staff to bridge gaps in funding and coordination, demonstrating that MBPs are possible in the current funding landscape. Their efforts exemplify the importance of visionary leadership in advancing MBPs, especially in the absence of coordinated, top-down multibenefit structures.

Due to the lack of established structures, champions must step in to address the coordination gap and integrate multiple benefits, rather than relying on predefined roles or frameworks provided by agencies. Narrow, siloed funding programs leave the discretion to incorporate cobenefits to individuals, meaning those projects without visionary champions may not achieve broader impacts. A lack of regulatory leadership in the form of more encompassing project authorizations and funding programs leaves MBP implementation vulnerable to staff turnover, lack of motivation, and insufficient local capacity (cf. Green-Nylen et al., 2022). Financial and time constraints can therefore pose a barrier to the capacity necessary to coordinate funding sources and incorporate cobenefits (Chatzimentor et al., 2020). Smaller communities may lack staff, financial means, and expertise to navigate complex funding landscapes (Payne et al., 2024; State of California, NRA, and DWR, 2023). Furthermore, champions are influenced by the policy context, organizational structure, and support in which they operate, potentially limiting their effectiveness (Arnold, 2020; Wamsler et al., 2020).

4.1.4 A favorable funding landscape

A favorable funding landscape can facilitate MBPs. For example, DWR's Coastal Grant program can provide funding for features that

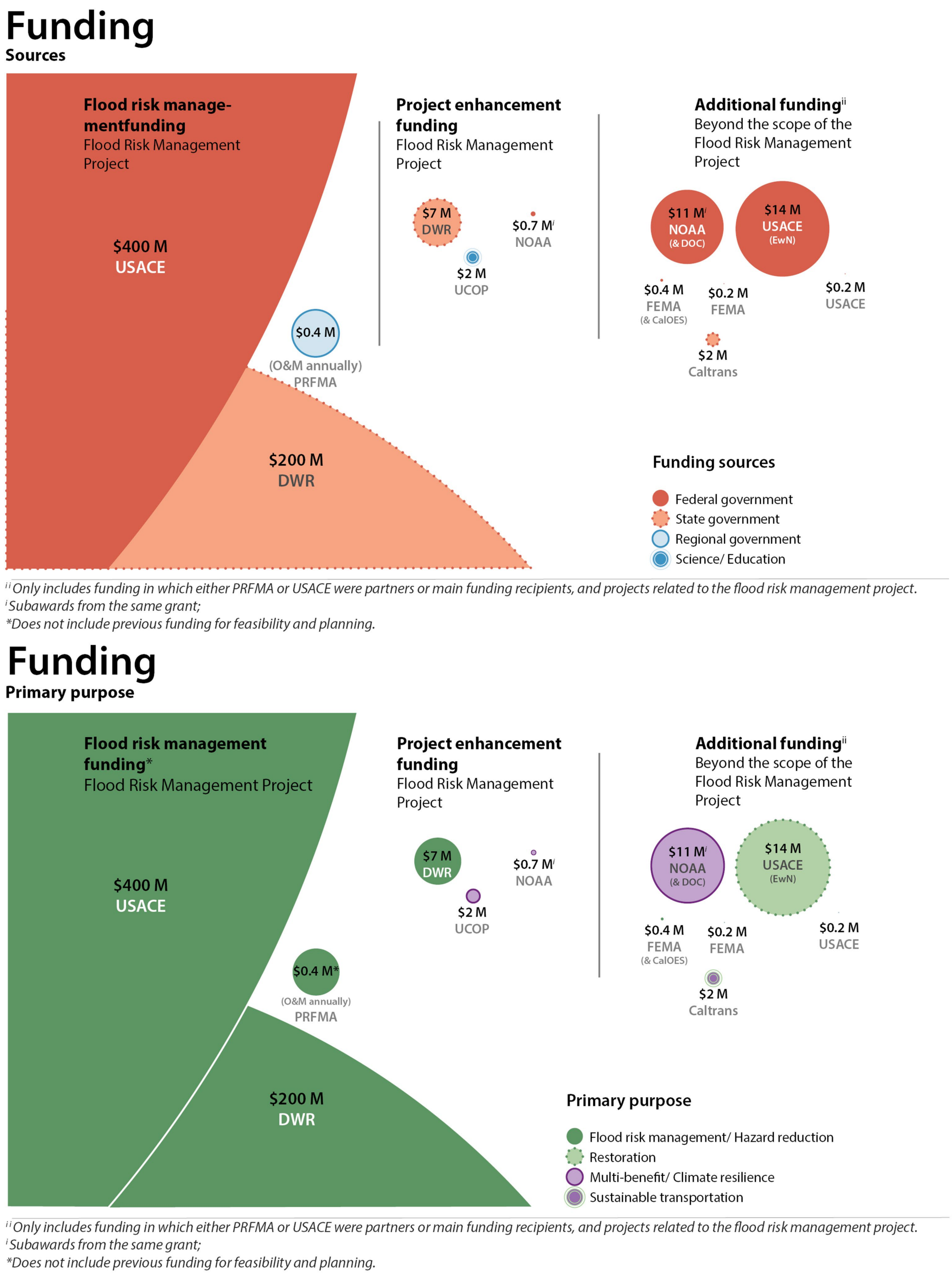

FIGURE 3
Multi-benefit considerations for the Pajaro River flood risk management project.

cannot be included in FRM funding. In addition to MBP funding programs in California, some federal agencies are also providing more integrated grants (e.g., NOAA's Coastal Resilience Grant) (NOAA Office for Coastal Management, 2024). MBP funding programs have gained traction with state and federal governments, but may not be sufficient to independently fund large-scale, integrated projects.

Sizable FRM grants provide a canvas for incorporating multibenefit features, highlighting their potential for encouraging MBPs within FRM funding structures. Implementing a multibenefit FRM project currently requires substantial designated FRM funding (Figure 3). FRM funding for the Pajaro River project funded the levee realignment and created opportunities to pursue cobenefits. Because the integrated design led to cost savings, it could be folded into the FRM project despite narrower funding provisions, using FRM funds to incorporate multibenefit features.

Recent USACE policy and guideline developments aim to incorporate a more integrated perspective into their projects, including FRM. The Pajaro Valley FRM project was largely planned before introduction of newer policies that foster a more "comprehensive benefits evaluation for NBS" (USACE, 2021a, 2021b) and before the San Francisco USACE District Office's designation as an EWN Proving Ground (King et al., 2024). The 2020 Water Resources Development Act calls for civil works projects that produce multiple benefits. The Biden Administration took multiple executive actions to emphasize multibenefit perspectives (Ehrenwerth et al., 2022). These policy changes allow USACE to incorporate cobenefits rather than have to justify multibenefit considerations as cost-savings measures, even with single-purpose projects. Some projects that were planned after these policy changes were able to incorporate cobenefits more easily (USACE and EWN, 2023; USACE and SFD, 2023). USACE recently updated its guidelines and standards for FRM projects that require considering a broader range of benefits (Fischbach et al., 2023a, 2023b; USACE, 2024f). This includes social justice considerations, as required by the Biden Administration's Justice40 initiative (recently rescinded Executive Order, E.O. 14008; Executive Office of the President, 2021). Although funding decisions for the Pajaro Valley FRM project were made before these requirements, the FRM project does benefit disadvantaged communities, even if these benefits were not part of the benefits evaluation for funding. Although the Trump Administration has not announced specific changes to these revised rules to date, there have been changes that affect funding for MBPs in general. For example, rescinded and new executive orders affect the funding made available through the Bipartisan Infrastructure Law, which allocated billions to NBS and largely funds NOAA's Coastal Resilience Fund (E.O. 14154, Executive Office of the President, 2025; NOAA, 2024). Other rescinded executive orders (E.O. 14030, E.O.14072, and E.O.14096) also indicate upcoming changes to how MBPs are funded in the US.

4.2 Recommendations: toward a more integrated funding landscape

Creating a funding landscape that reflects the integrated nature and benefits of naturally functioning systems like floodplains requires reimagining the institutional setting. Institutions, including funding programs they administer are most effective when they reflect the social and ecological characteristics of the systems they govern, such as by addressing the integrated nature of flood risk reduction and the social and ecological benefits that reconnected floodplains (Folke et al., 2007; Guerrero et al., 2021; McGlynn et al., 2023; Young, 2002). If institutions do not reflect systems' integrated nature, they might produce adverse outcomes (e.g., through only "gray" FRM projects) (Epstein, 2023; Fried et al., 2022).

If decision makers want to address climate resilience across sectors, funding frameworks that integrate ancillary project benefits can help address funding silos and more fully reflect the interconnected realities of natural systems. This approach requires embedding an integrated perspective into funding structures and encouraging multibenefit considerations, even if there are primary benefits like FRM, rather than relying on exceptional efforts by champions.

The following sections outline options to move beyond the current, fragmented funding framework to create integrated funding programs. Policymakers and agencies can consider these options within their unique institutional realities. By supporting a funding landscape that advances integrated solutions, policymakers and decision makers can help pursue outcomes that align with diverse public priorities, including potentially positive economic impacts (cf. Chausson et al., 2024).

4.2.1 Single-entity funding programs for MBPs

Agencies that hope to encourage MBPs can advocate for adjustments to their funding provisions that support more encompassing projects. Key funders of traditional, gray infrastructure projects can promote MBPs by requiring or rewarding project proponents, non-federal sponsors, and other project partners that pursue cobenefits. Efforts like USACE's EWN initiative and programs offered by the State of California (cf. MLRP, Coastal Program) can model a possible shift to the paradigm, thereby supporting integration of cobenefits from early planning phases onwards. In addition, funding agencies can also provide technical assistance and other forms of support to enable multibenefit considerations and make funding opportunities more accessible to project proponents interested in pursuing MBPs (Payne et al., 2024).

Funding availability may need to be scaled to support incorporation of all cobenefits across project phases. This case study demonstrates that a preexisting modeling tool and collaboration can help integrate multibenefit considerations into existing FRM funds. If this result is generalizable, it suggests that existing grants can incorporate multibenefit considerations. Yet, the case study's need for additional funding to enhance the FRM project coupled with enduring funding gaps suggests that scaling funding might be necessary. Ancillary benefits may not be incorporated without additional funding, especially when collaboration opportunities and multibenefit tools are not as readily available as in the Pajaro Valley. Further research is needed to determine whether these findings are applicable to other MBPs. Costs should be compared to potential cost savings; the FRM project shows that an integrated approach can reduce capital costs and maintenance requirements by enabling natural processes. This aligns with cost savings in other EWN projects (USACE and EWN, 2023; USACE and SFD, 2023), and research indicating that integrated projects can pursue multiple benefits at a lower cost than conventional approaches (Li et al., 2017; Pecharroman et al., 2021; Vicarelli et al., 2024).

Furthermore, our case study shows funding gaps for multibenefit O&M and monitoring, which appear widespread across funding programs. Whereas most federal funding programs offer funding for planning, design, and implementation, many do not offer funding for O&M, and even fewer programs include funding for monitoring (White House Council on Environmental Quality, White House Office of Science and Technology Policy, White House Domestic, Climate Policy Office, 2022). The associated costs and potential trade-offs of moving away from a locally funded O&M model require further research.

4.2.2 Agency collaboration for MBP funding

Given the limitations of agency mandates that constrain the jurisdiction of funding agencies, another option is to coordinate and pool funding across agencies to create funding programs that target MBPs. Such funding could cover a project's full lifecycle, close funding gaps, and reduce the need to navigate fragmented funding structures. Agencies can (1) coordinate across single-entity funding programs to produce complementary funding programs (cf. Santos et al., 2015; Werdiningtyas et al., 2020 on instrument interaction) and (2) provide combined funding programs that allocate funding to projects that span multiple agency priorities and cobenefits.

Research on innovation in government indicates that horizontal collaboration and interagency coordination can help break down silos and reduce costs (Harrington et al., 2021; State of California, NRA, and DWR, 2023; Urban, 2018). To address permitting challenges of integrated restoration projects for climate adaptation, Grenier et al. (2021) call for coordinated permitting through interagency cooperation; we suggest a similar approach to break down funding silos. FRM and multibenefit efforts in the Pajaro Valley are split into more than 10 projects and even more funding programs (Table 1). Collaboration among agencies can help approach such efforts more deliberately by providing more integrated and strategically scaled funding programs, thereby contributing to systems-scale governance (Serra-Llobet, 2025). DWR's pilot grants under the California Water Plan show that the State has acknowledged the importance for watershed-scale planning, and DOC's MLRP program is implemented in partnership with other state, federal and local agencies (DOC, 2024; State of California, NRA, and DWR, 2023). Whether such approaches can be increased to a meaningful scale remains to be seen.

Simplifying funding across agencies can reduce administrative inefficiencies and enable agencies and policymakers to better leverage available funding to maximize outcomes (Payne et al., 2024). This approach requires legislative support and agency leadership (Droste et al., 2017). Government agencies can take on this coordination role, institutionalizing what champions are currently doing on a project-by-project basis at a larger scale. To facilitate this, policymakers can encourage funding agencies to work together across their missions, such as by establishing programs where funding requirements give higher scores to projects that deliver cobenefits across agency missions. This would create a process-based incentive to promote MBPs and reduce risks associated with piecing together funding from multiple sources. Efforts to implement inter-agency collaboration and improve water management across jurisdictions could begin with inter-agency working groups (WFX, 2024).

5 Conclusion

MBPs are increasingly being used to address crucial environmental and social challenges. To implement such projects, funding frameworks must support integrated project approaches. This case study of the Pajaro River FRM project illustrates the challenges integrated projects confront within fragmented, single-purpose funding structures. Despite the Pajaro River FRM project's single-purpose authorization, champions pursued a more integrated approach to project design and implementation, integrating potential cobenefits like groundwater recharge and habitat restoration.

Although California and some federal agencies have designated multibenefit funding programs, most funding mechanisms continue to reflect a legacy of siloed governance. The current, fragmented funding framework does not reflect the integrated nature of ecosystems and the benefits they provide (Thompson et al., 2023). Integrated funding programs can more effectively fund MBPs. To support broader implementation of integrated projects, agencies would ideally reform funding structures to prioritize cross-sectoral collaboration through joint grant programs and encourage the integration of cobenefits, regardless of funding source. Although this research identifies funding opportunities for and limitations to MBPs, future research should target additional case studies to confirm these findings.

We recognize the significance of these recommendations and the immense challenge in implementing them. Ideally, research on implementing multibenefit approaches would generate detailed road maps that demonstrate how to effectively integrate across siloes, alter institutional incentives, and navigate or adjust legal constraints. Doing so is a non-trivial undertaking (cf. Cantor et al., 2018; Green Nylen et al., 2018). While the institutional and administrative challenges of funding MBPs are currently addressed on a project-by-project basis, a broader effort to reform funding regimes could reduce these burdens to scale up integrated solutions.

MBPs are increasingly necessary for addressing climate change. Fragmented and siloed policies, funding programs, and jurisdictions must be adapted to support naturally functioning floodplains and their myriad benefits. Policymakers and agencies that seek multibenefit outcomes can align funding structures to support inherently integrated projects, incentivize MBPs over single-purpose projects, and create more sustainable FRM solutions.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

MG: Conceptualization, Formal analysis, Investigation, Methodology, Visualization, Writing – original draft, Writing – review & editing. AS-L: Conceptualization, Visualization, Writing – review & editing. MB: Investigation, Methodology, Writing – review & editing. MK: Conceptualization, Funding acquisition, Supervision, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The authors declare that no Gen AI was used in the creation of this manuscript.

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Supplementary material

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