

Evolution in regulated river-works programs: Using planning and MERI to demonstrate impact

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Key points

- Independent reviews of three major regulated river-works programs in the Murray Darling Basin found that, while substantial works had been delivered, a lack of alignment between activities, objectives and measurable outcomes limited the ability of the programs to demonstrate system-scale impact.
- In response, each program refreshed its strategic plan with documented program logic, explicit outcomes and quantifiable targets, alongside Monitoring, Evaluation, Reporting and Improvement frameworks aligned to those program logics.
- This new approach established a clearer line of sight from individual works to landscape-scale outcomes, improving transparency, accountability and the consistency of evidence available for adaptive management and investment decisions.
- Early results show a shift from counting work outputs to demonstrating outcomes, offering a practical, scalable model for regulated river management and other long-running programs seeking to show landscape-scale impact.

Abstract

Recent evaluations of major regulated river-works programs along the Murray (Hume to Yarrawonga, and Upper Murray) and Tumut Rivers, identified a consistent challenge. Although each program delivered extensive bank protection and restoration works, there were weak links between activities, strategic objectives, and measurable system scale-outcomes. Collectively, these reviews highlighted the need to move beyond activity-level works delivery and reporting (which demonstrates effort but not impact) toward a clearer, evidence-based approach capable of showing system-level change.

In response, each program has been undergoing a structured renewal of its strategic planning and monitoring, evaluation, reporting and improvement (MERI) frameworks. Strategic plans for each program were refreshed with explicit outcomes, documented program logic, defined governance arrangements and quantifiable targets, creating clearer lines of sight from activities to intended outcomes. MERI frameworks have also been progressively developed and aligned to the program logics, with a stronger and more consistent focus on monitoring themes such as bank stabilisation and secondary ecological, cultural and community benefits.

Early implementation across the three programs demonstrates that this approach is establishing a new structure and evidence base for planning, assessing progress, measuring change and supporting adaptive management, with programs at different stages of transition. It has also improved transparency and accountability by providing consistent, comparable information on program performance across years.

The new approach is shifting the focus from ‘works counting’ to an outcomes-based model that offers a more transparent, measurable basis for regulated river management. It also offers a practical and

scalable model for other long-running river management programs seeking to demonstrate landscape-scale impact while continuing delivery of on-ground works at the site scale.

Keywords

River works, regulated rivers, MERI, program logic, outcomes-based management, Murray–Darling, bank stabilisation, adaptive management

Introduction

Australia's major river systems have long been actively managed in response to the combined effects of settlement, river regulation and landscape change. In the Murray–Darling Basin, river works programs have become a routine part of that task, sitting alongside a broader suite of programs across the Basin aimed at waterway health, with investment directed toward both protecting water delivery infrastructure and improving riparian and instream condition. Programs operating on regulated rivers face a particularly complex set of challenges, including altered flow regimes, unstable banks, infrastructure risks and the need to balance engineering objectives with environmental and community values.

The Hume to Yarrawonga, Tumut and Upper Murray river works programs (Figure 1) have each operated in this setting for decades. Over that time, they have delivered substantial on-ground works, including rock and log revetment, revegetation, riparian fencing, off-stream watering, willow management and snag realignment. Collectively, these programs represent a significant and sustained public investment in river management.

However, independent evaluations revealed a consistent pattern: while on-ground delivery was substantial, it was difficult to demonstrate the broader impact of these works beyond individual sites. Annual reporting captured outputs (such as kilometres of bank treated, snags realigned and areas revegetated) but provided limited evidence of program-scale outcomes. As a result, key questions remained difficult to answer, whether bank erosion was declining, channel stability improving, or riparian condition recovering.

This paper describes how the three programs responded to that challenge. It outlines the renewal of their planning and MERI frameworks, the early changes that have followed, and the broader lessons this transition offers for regulated river management programs elsewhere.

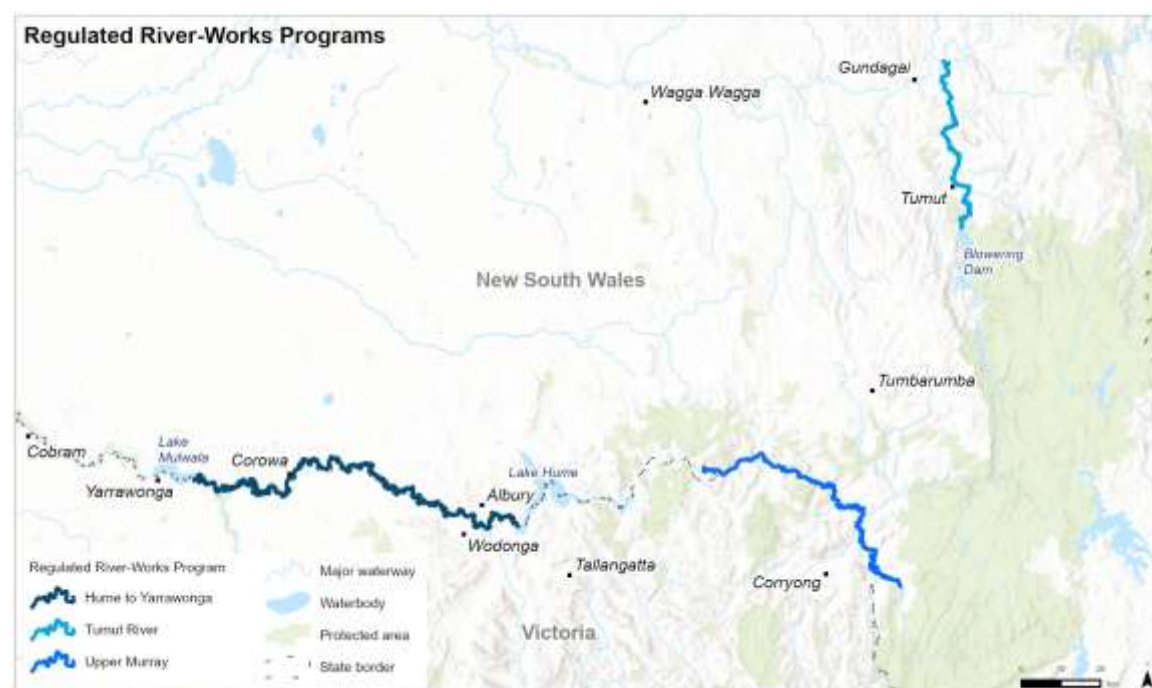


Figure 1 Location of the Hume to Yarrawonga, Tumut and Upper Murray river works programs

Three programs, one challenge

The three programs considered in this paper operate along regulated reaches of the upper Murray and Murrumbidgee systems. Each has its own history, governance arrangements and investment profile, but all operate in a similar context: rivers with substantially altered hydrology, where the legacies of past management (such as de-snagging and willow planting) continue to shape present-day condition and risk.

Table 1 Summary of the three regulated river-works programs

	Hume to Yarrawonga	Tumut River	Upper Murray
Location	Murray River, NSW/Vic border, Hume Dam to Yarrawonga Weir	Tumut River, NSW, below Blowering Dam to Gundagai	Swampy Plain and Murray Rivers, NSW/Vic, Khancoban to Hume Reservoir
Program partners / investment context	MDBA (Joint Venture governments)	NSW Independent Pricing and Regulatory Tribunal (IPART), Snowy Hydro Limited	MDBA, Snowy Hydro Limited, NSW IPART
Program length	~200 km (+120 anabranches)	~80 km	~114 km
Review period	2010–2020 (reviewed 2021)	2013–2022 (reviewed 2023)	2014/15–2022/23 (reviewed 2024)
SMP Completion	2022 (current SMP; renewal underway 2026)	2025 Strategic Plan	2026 Strategic Plan
Key works types	Rock and log revetment, engineered log jams, revegetation, willow management, snag management, fencing.	Rock revetment, revegetation, willow management, fencing.	Rock revetment, revegetation, willow management, snag management, fencing.
Works delivered	106km of capital works, 17km of rock and 18km of log revetment, 106km revegetation and fencing.	42km of capital works, including 10.3km of rock revetment; 19km of revegetation and fencing.	27km of capital works, including 8km of rock revetment; 19km of fencing and revegetation.

The evaluations and what they found

Each program was independently evaluated by RMCG Pty Ltd between 2021 and 2024 (RMCG, 2021, 2023, 2024), using a common framework covering effectiveness, appropriateness, efficiency, impact and legacy, and drew on document review and available works data, stakeholder interviews and site visits.

Despite differences in scale, governance and funding, the findings were consistent. All three programs delivered substantial volumes of on-ground works. For example, in the Upper Murray program alone, approximately 27 kilometres of capital works were delivered between 2014/15 and 2022/23, including 19 kilometres of revegetation and fencing and more than 8 kilometres of rock revetment (Figure 2). The Hume to Yarrawonga and Tumut programs showed similarly sustained levels of delivery (refer Table 1 above). What the reviews also found was that this delivery effort could not easily be translated into evidence of program impact. Four common issues emerged:

- Weak alignment between activities, outcomes and objectives: reported works were not clearly linked to strategic priorities, making it difficult to determine whether effort was being targeted effectively.
- Output focused monitoring: reporting emphasised what was delivered rather than what changed, with limited evidence of trends in erosion rates, channel stability or riparian conditions over time.
- Inconsistent site identification: the site naming was not aligned across strategic plans, annual works plans, and monitoring databases, making it difficult to track activities at specific locations across the life of the program, or assess whether priority sites were receiving appropriate attention.
- Unclear governance and reporting arrangements: responsibilities for monitoring, reporting, and adaptive management were not well defined, leading to gaps and inconsistencies in the information available to support decision-making.

Taken together, these findings pointed to a structural gap between delivery and impact. While the programs were undertaking significant work, the systems needed to show lasting outcomes were either missing or not fit for purpose. Table 2 summarises the position of each program at the time of evaluation and what has since been addressed.

Table 2 Program renewal comparison: Before and after across three river works programs

Evaluation finding	<i>Before – all three programs</i>	Hume to Yarrawonga – adapting	Upper Murray – delivering	Tumut – developing
Program logic and strategic objectives	<i>Activities not mapped to objectives; intent understood but not documented or tracked.</i>	SMP (2022) established logic and objectives. Subsequent geomorphic assessment revealed systemic reorganisation not fully captured in the original framing; objectives and decision making framework (DMF) have since been updated.	SMP and MERI developed concurrently; program logic and outcome statements embedded from the start.	Refreshed SMP in place with documented program logic and outcome statements. MERI being developed.
Monitoring approach	<i>Monitoring included flow splits, cross-sections and bank condition, but otherwise mainly activity reporting (e.g. kilometres treated) rather than condition change.</i>	MERI framework established post-SMP. Revised DMF (2025) now aligns monitoring to geomorphic process, logic and system trajectory.	Outcome-focused MERI framework developed alongside SMP; photo-monitoring and bank condition ratings building longitudinal record.	SMP provides monitoring guidance; standalone MERI framework still to be developed.

Evaluation finding	Before – all three programs	Hume to Yarrawonga – adapting	Upper Murray – delivering	Tumut – developing
Site identification and prioritisation	<i>Inconsistent nomenclature across plans and works records. Priority sites not formally tracked against a strategic framework; however, bank condition, flow splits, blockages recorded, with geospatial data and field observations informing prioritisation.</i>	Original DMF (2023) introduced structured prioritisation. Revised DMF (2025) reframes from erosion severity ranking to project-based assessment by anabranch state.	Prioritisation framework links investment decisions to program objectives; consistent site referencing across documents.	Prioritisation framework in place within refreshed SMP.
Governance and reporting clarity	<i>Changes from in-house to contracted works delivery had led to some gaps and inconsistencies in governance and reporting.</i>	Documented roles and responsibilities; program oversight structure with regular investor review opportunities.	Governance arrangements documented alongside SMP/MERI; standardised asset baseline developed.	Governance addressed within SMP; full reporting cycle yet to be established pending MERI development.

Results: What has changed

A clearer structure for planning and reporting

The most immediate result of the renewal process has been a clearer and more consistent structure for planning and reporting across all three programs.

The programs are at different stages in this transition. The Hume to Yarrawonga (H2Y) program was the first to undergo renewal, with its Strategic Management Plan (SMP) (RMCG, 2022) and MERI plan (Streamology, 2022) developed following its 2021 evaluation. Together, these established a strong foundation for both strategic direction, performance monitoring and adaptive management.

Further strategic work within the H2Y program identified an opportunity to strengthen the connection between strategic intent, decision-making, and evaluation. This led to a subsequent phase of refinement, including a revised decision-making framework (DMF) designed to better reflect system-scale behaviour and more clearly link actions to outcomes.

This refinement was informed by a geomorphic assessment of change (Geomorphe, 2025a and Cheetham et al., 2026), which demonstrated that adjustment along the H2Y reach is underway at a corridor scale, rather than as isolated site-based erosion. The assessment showed that flow is increasingly distributed across anabranch systems and the channel dominance is dynamic, with implications for how intervention effectiveness is understood.

A key output of this work was the development of a five-stage anabranch classification (captured, developed, constrained, emerging, and stable), which converts complex patterns of anabranch change into categories that can be consistently applied in decision-making. This has provided a structured way to distinguish between anabranches that have already adjusted, those that are undergoing active transition, and those that remain relatively stable with minimal contemporary change.

These concepts are now embedded in the revised DMF (Geomorphe, 2025b), which uses anabranch development stage as the primary entry point for prioritisation. Areas in a captured classification are managed for long-term resilience of the dominant pathway. Areas in development are managed to

support controlled transition. Constrained, emerging, and stable anabranches are monitored and maintained, with intervention triggered by shifts in condition rather than isolated erosion. This adaptive approach has seen a shift from site-based prioritisation toward a more system-informed approach.

The Upper Murray program has also progressed through renewal, with its SMP and MERI plan developed (RMCG, 2026), while the Tumut program remains earlier in transition, with a refreshed SMP in place (RMCG, 2025) and development of a MERI plan pending.

Overall, the renewal process has produced a more coherent and evidence-based framework for planning, decision-making, and reporting, with clearer links between program objectives, interventions, and outcomes.

From works-counting to outcome-tracking

The practical significance of these changes is easiest to see in reporting. Under the earlier approach, annual reports reliably documented activity, i.e. kilometres of rock revetment, lengths of revegetation, numbers of willows treated. These measures remain important indicators of delivery and resource use.

However, those reports could not answer the questions that matter most to investors and managers:

- Is bank condition improving?
- Are priority erosion sites becoming more stable?
- Is the riparian zone recovering?
- Is the investment delivering value?

Answering these requires evidence of change over time, not just evidence of activity.

The new MERI frameworks are beginning to provide that evidence. Early results show both the promise of the approach and its current limits. In the Upper Murray program, for example, a baseline asset condition assessment found that 74 per cent of 368 assessed assets were in fair or better condition, providing a baseline measure not previously available. In H2Y, a comprehensive assessment of 1,120 river works assets recorded 972 assets (87 per cent) at condition rating three or better and 148 below, providing a consistent foundation for longitudinal tracking.

These results are early indicators rather than evidence of program-scale impact. Baselines are recent, monitoring records are still developing, and river responses occur over longer timeframes. Even so, this represents a clear step forward from the previous position, where such information was often unavailable. While site inspections previously informed river works maintenance and planning, this is the first systematic application of condition monitoring across the reach.

Greater consistency and comparability

A less obvious but consequential outcome of the renewal process has been greater consistency in how the three programs measure and report performance. With MERI frameworks structured around shared themes and indicators, it is now possible to compare, in broad terms, how programs are tracking against similar objectives.

This has particular value for program investors, such as the Murray–Darling Basin Authority, which has interests across the Hume to Yarrawonga and Upper Murray programs as part of its management of River Murray operations. It also provides a foundation for genuine portfolio-level reporting, assessing the combined effect of investment across the upper Murray and Murrumbidgee systems, rather than treating each program in isolation.

It also creates a basis for cross-program learning, where effective monitoring approaches developed in one program can be adapted elsewhere, and evidence about the success (or otherwise) of particular interventions can be shared more readily across the portfolio.

Strengthening engagement and communication

All three evaluations identified the need to strengthen stakeholder communication and engagement, particularly with First Nations communities and local landholders. The renewal process has introduced a more structured basis for this through the MERI framework's community and cultural outcome's theme, alongside program-specific communication and engagement plans developed alongside the renewed SMPs.

In the Upper Murray program, the renewal process has brought more explicit attention to engagement with First Nations communities, recognising both the limited engagement to date and the need to improve in line with broader commitments to self-determination and cultural heritage protection. While still at an early stage, the MERI framework now provides a way for tracking progress against these commitments.

For landholders, the move toward outcomes-based reporting should make it easier to demonstrate the value of the programs in terms that reflect their experience of the river. Report cards showing changes in bank and riparian condition (such as vegetation cover and willow extent) over time are likely to be more accessible and persuasive than tables listing works outputs alone. All three programs have now committed to developing annual public-facing report cards as part of their renewed reporting approach.

Discussion: Lessons from the transition

The importance of starting with program logic

A central lesson from the renewal process is the importance of starting with program logic. When monitoring and reporting are weak, the instinct is often to focus on technical fixes, such as better databases, revised monitoring methods or improved reporting formats. While important, these are unlikely to be effective unless the program is first clear about its outcomes and how its activities are expected to achieve them.

Program logic provides this foundation. It clarifies what success looks like, surfaces the underlying assumptions built into program design, and creates a practical basis for deciding what to monitor and report. It also strengthens adaptive management by making it easier to identify where expected change is, or is not, occurring.

The H2Y experience highlights the central role of program logic in linking objectives, interventions, and outcomes, and the importance of grounding that logic in a sound understanding of system behaviour. High-level program objectives, such as improving bank stability or maintaining channel function, carry implicit assumptions about how the river operates. Program logic provides the structure to make these assumptions explicit and testable.

In the H2Y case, the 2022 SMP established a clearer and more structured program logic than had previously existed. Subsequent geomorphic assessment (Geomorphe (2025a), however, showed that the reach is adjusting at a corridor scale, with increasing anabranch development and shifting channel dominance, processes not fully captured in the initial framing. Drawing on Light Detection and Ranging (LiDAR) change analysis, flow split monitoring, relative depth mapping and field observation, this work refined understanding of system behaviour, and in turn, strengthened the program logic.

This demonstrates that program logic is not static but evolves as evidence improves. In this case the geomorphic investigation provided a stronger basis for linking interventions to expected outcomes at a system scale, improving confidence in how program success is defined and assessed.

Scaling works with budget variability

There is also a practical limit to how ambitious monitoring and reporting can be. River works programs operate with finite budgets, and increased investment in MERI can quickly come at the expense of on-ground delivery. For that reason, the renewal process in each program has been deliberately designed

to be proportionate, robust enough to generate useful evidence and support adaptive management, but realistic enough to be sustained.

That has required trade-offs. For example, more sophisticated monitoring options, such as comprehensive macroinvertebrate sampling or full drone-based vegetation mapping were beyond the available resources. Instead, programs have prioritised simpler methods such as bank condition ratings, the use of remote sensing data, photo-monitoring and structured landholder feedback, with the intention of building capability over time.

The broader lesson is that consistency matters more than complexity. A simple indicator measured reliably over many years is often more valuable for adaptive management than a sophisticated one applied inconsistently or abandoned when resources tighten.

The value of external evaluation

All three renewal processes began with external evaluation. Long-running programs gradually lose clarity continuing established practices without revisiting underlying assumptions, such as reporting the same things, responding reactively, and doing what they do because that's what they do. External review provides the independence needed to interrupt that pattern.

External evaluators are often able to ask basic questions that internal teams may stop asking, not because they are unimportant, but because the answers appear self-evident. In these programs, the difficulty of linking works to outcomes was more apparent from an external perspective.

The H2Y program offers a further example. Following its initial renewal, a subsequent geomorphic assessment revealed system-scale changes not fully captured in the original strategic framing. Increasing anabranch development and shifting channel dominance prompted a shift in intervention priorities, moving from site-based erosion rankings toward a framework grounded in geomorphic processes and evolutionary stage.

This builds on earlier work that had already recognised the laterally active, anabranching nature of the system and applied professional judgement to manage anabranch dynamics within available data constraints (Tilleard et al., 1994; Bowman, 2024). The 2025 geomorphic assessment therefore represents a step change in resolution and confidence rather than a first identification of these processes.

This highlights that renewal is not a one-off event. As understanding of river systems evolves, programs must evolve with it. External evaluation plays a critical role in supporting this adaptation, not only by assessing delivery, but by testing whether programs remain aligned with the best available understanding of the systems they manage.

This suggests that external evaluation should be embedded as a regular part of governance for long-running programs, rather than triggered only when issues emerge. The eight-year adaptive management cycle in the Victorian Waterway Management Strategy (DEPI, 2013) offers one useful example of that approach.

Broader lessons

The challenges identified across these three programs are not unique to the upper Murray and Murrumbidgee catchments. Long-running river works programs elsewhere in Australia often share a similar pattern: years of sustained on-ground delivery, deep practitioner knowledge, and a gradual weakening of the link between works delivery and the strategic outcomes that originally justified the investment.

The approach described here offers a practical response. It does not require abandoning the established works that these programs have relied on for decades but complements them with clearer planning, structured monitoring, and outcome-focused reporting. In doing so, it strengthens the ability of programs to demonstrate impact, support adaptive management, and sustain investment over time.

Conclusions

The three programs examined in this paper had a strong history of on-ground delivery behind them, but a more limited ability to show what that delivery was achieving at a broader scale. The program reviews highlighted this gap clearly, showing that the issue was not a lack of effort or commitment, but the absence of planning, monitoring and reporting structures capable of connecting site-based works to longer-term program outcomes.

The response across the Hume to Yarrawonga, Tumut and Upper Murray programs has made those connections much more explicit. Renewed strategic plans, clearer program logic and fit-for-purpose MERI frameworks have created a stronger foundation for understanding whether works are improving bank condition, riparian function and other broader program outcomes. Just as importantly, they have made roles, expectations and reporting requirements clearer for program partners and investors.

This transition remains at an early stage, and the evidence base will take time to develop. Even so, the direction of change is significant. Moving from works-counting to outcome-tracking provides a more credible basis for assessing progress, demonstrating value, and supporting adaptive management over time. That makes the approach relevant not only to these three programs, but as a practical model for other long-running river works programs facing similar challenges in demonstrating impact at scale.

The renewal process also highlighted opportunities to better align river works programs with broader catchment and Basin-scale initiatives. Future program design could consider system linkages, cumulative effects and opportunities to leverage complementary investments and monitoring programs, helping improve the ability to demonstrate broader-scale outcomes. Broader monitoring and evaluation initiatives such as Flow-MER (CEWH, 2024) provide an example of how information and outcomes generated through river works programs may have value beyond their immediate management objectives.

Acknowledgements

The authors thank the program partners, investors and delivery teams who contributed to the evaluations and renewal processes described in this paper, including staff from the Murray–Darling Basin Authority, Snowy Hydro Limited, the NSW Department of Climate Change, Energy, the Environment and Water, and Soil Conservation Service. We also acknowledge the Traditional Owners of the lands and waters on which these programs operate, and their ongoing connection to Country.



Figure 2 Bank restoration works (rock revetment and riparian revegetation) along the Upper Murray River (T. Wallis, RMCG, 2024)

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