

The background of the top half of the page features a large, semi-transparent watermark of the word "AITHER" in a bold, sans-serif font. The watermark is set against a dark teal background with a subtle geometric pattern of overlapping triangles.

10-year evaluation of the Environmental Contribution – summary report

A summary report prepared for the Victorian Department of
Environment, Land, Water and Planning

Monday 5 October 2015

A I T H E R

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Abbreviations

the Basin Plan	The Murray-Darling Basin Plan
BCL	Bore Construction Licence
BP3	Budget Paper Number 3
the CaLP Act	<i>Catchment and Land Protection Act 1994 (Vic)</i>
CEWH	Commonwealth Environmental Water Holder
CMA	Catchment Management Authority
COAG	Council Of Australian Governments
DEDJTR	Department of Economic Development, Jobs, Transport and Resources
the Department	The Department of Environment, Land, Water and Planning / the Department of Environment and Primary Industries / the Department of Sustainability and Environment
DESM	Drainage Evaluation Spreadsheet Model
DEWHA	Department of Environment, Water, Heritage, and the Arts
DPI	Department of Primary Industries
DTF	Department of Treasury and Finance
EC	Environmental Contribution
EGCMA	East Gippsland Catchment Management Authority
EPA	Environmental Protection Authority
EWMP	Environmental Water Management Plan
EWR	Environmental Water Reserve
EWRO	Environmental Water Resource Officer
FLUS	Future Land Use Strategy
GBCMA	Goulburn Broken Catchment Management Authority
GDE	Groundwater Dependent Ecosystem
GHCMA	Glenelg Hopkins Catchment Management Authority
GL	Gigalitres
GMID	Goulburn Murray Irrigation District
G-MW	Goulburn-Murray Water
GMWRP	Goulburn-Murray Water Recovery Package
GWMP	Groundwater Management Plan
HRWS	High Reliability Water Share
IDEP	Irrigation Drainage and Environment Plan
IFP	Irrigation Farm Plan
ISC	Index of Stream Condition
IWCM	Integrated Water Cycle Management

LRMC	Long Run Marginal Cost
LRWS	Low Reliability Water Share
LSRR	Large Scale River Restoration
LTCE	Long Term Cap Equivalent
LWMP	Land and Water Management Plans
MAR	Managed Aquifer Recharge
MDB	Murray-Darling Basin
MDBA	Murray-Darling Basin Association
MDBC	Murray-Darling Basin Commission
MER	Monitoring, Evaluation and Reporting
MERI	Monitoring, Evaluation, Reporting and Improvement
MID	Macalister Irrigation District
ML	Megalitres
MLE	Multiple Lines of Evidence
NAP	National Action Plan for water quality and salinity
NCCMA	North Central Catchment Management Authority
NDRRA	National Disaster Relief and Recovery Arrangements
NGIS	National Groundwater Information System
NHT	National Heritage Trust
NIDG	New Irrigation Development Guidelines
NPV	Net Present Value
NRIP	Natural Resources Investment Program
NVIRP	Northern Victorian Irrigation Renewal Project
NWC	National Water Commission
NWI	National Water Initiative
OFIEP	On-Farm Irrigation Efficiency Program
OLV	Office of Living Victoria
OWOF 2004	<i>Securing Our Water Future Together: Our water Our Future</i> White Paper (Department of Sustainability and Environment, 2004)
OWOF: The Next Stage	<i>Our Water Our Future: The Next Stage of the Government's Water Plan</i> White Paper (Department of Sustainability and Environment, 2007)
RRIP	Recycling Recovery and Investment Program
RtB	'Restoring the Balance' Program
RURI	Restoring Unregulated Rivers Initiative
RWMP	Regional Water Monitoring Partnership
SAFE	Secure Allocations, Future Entitlements Project

SDL	Sustainable Diversion Limit
SEACI	South Eastern Australian Climate Initiative
SEPP	State Environment Protection Policy
SEWPAC	Department of Sustainability, Environment, Water, Population and Communities
SFMP	Stream Flow Management Plan
SFT	Stream Flow Tender Project
SIALM	Sustainable Irrigated Agriculture for Land Management
SIAMP	Shepparton Irrigation Area Modernisation Program
SIP	Sustainable Irrigation Program
SIR	Shepparton Irrigation Region
SMART	Specific, Measureable, Attainable, Relevant, and Time bound
SOBN	State Observation Bore Network
Somers STP	Somers Sewage Treatment Plant
SRA	Sustainable Rivers Audit
SRW	Southern Rural Water
SUCF	Stormwater and Urban Conservation Fund
SURF	Stormwater and Urban Recycling Fund
SWF	Smart Water Fund
SWS	Sustainable Water Strategy
TLM	The Living Murray First Step Decision Initiative
TUL	Take and use licences
VAGO	Victorian Auditor-General's Office
VCMC	Victorian Catchment Management Council
VDP	Victorian Desalination Plant
VEFMAP	Victorian Environmental Flow Monitoring and Assessment Program
VEWH	Victorian Environmental Water Holder
VOTS	Victorian On Line Titles System
VRHS	Victorian River Health Strategy
VWMS	Victorian Waterway Management Strategy
VWR	Victorian Water Register
VWT	Victorian Water Trust
WAP	Waterway Action Plan
the Water Act	<i>The Water Act 1989 (Vic)</i>
the Water Industry Act	<i>The Water Industry Act 1994 (Vic)</i>

WaterMAP	Water Management Action Plans
WELS	Water Efficiency Labelling Scheme
WIF	Western Irrigation Futures
WMIS	Water Measurement Information System
WMP	Water Management Plan
WSPA	Water Supply Protection Area
WSUD	Water Sensitive Urban Design
WTP	Willingness To Pay

Key summary points

Evaluation objectives and scope

- The purpose of this evaluation was to examine the impacts and legacy, effectiveness and cost-effectiveness of \$598 million of investment associated with the Environmental Contribution (EC) between 2004 and 2014.
- The scope of the evaluation does not include assessment of the appropriateness of the objectives of the EC or the funding mechanism itself, nor does it include evaluation of the delivery efficiency and administration of the EC.

Evaluation approach

- EC investments were categorised into nine separate but inter-related themes: water planning (\$32.1m), irrigation modernisation and water recovery (\$130.4m), environmental water planning and management (\$70.1m), waterway health (\$149.8m), on-farm irrigation (\$36.4m), water entitlements and markets (\$19.8m), urban water (\$110.6m), water information (\$21.4m), and groundwater (\$27.3m).
- The evaluation involved several rounds of consultation with key Departmental officials and was structured around an agreed set of evaluation criteria and questions.

Evaluation findings

- The EC formed an integral component of the Victorian Government's Our Water Our Future (OWOF 2004) reform agenda and formed a vital part of a broader effort to restore balance to a pattern of unsustainable water use across the state that was resulting in significant environmental degradation and the risk of irreversible damage.
- Investments in EC initiatives were almost always aligned with the legislative objectives of promoting the sustainable management of water, and addressing adverse water-related environmental impacts.
- The EC investment was also closely aligned with the National Water Initiative (NWI), the Australian Government's Water for Future policy, and with other inter-jurisdictional agreements such as The Living Murray First Step Decision Initiative (TLM). EC investment played a role in enabling Victoria to meet its obligations under the NWI.
- The EC investment has resulted in a better understanding of Victoria's water resources and their associated environments. Investments from the EC have resulted in significant improvements in planning and management arrangements that have provided the guidance, structure and processes that have allowed the OWOF 2004 reforms to be delivered. The development of the four Sustainable Water Strategies (SWSs) has been a key outcome of EC funding that has been pivotal in ensuring ongoing water supplies for the community in an environmentally sustainable manner across the state.
- Investments in water data collection, accounting, reporting and compliance, and the development and incorporation of data in the Water Management Information System have provided a crucial information base for managing surface water. Similarly, groundwater management has been improved through investments in improving knowledge of groundwater systems, and the implementation of a groundwater management framework has resulted in a significant increase in the number of areas managed under groundwater management plans.

- The program of investment undertaken by the EC has provided the necessary foundation for the ongoing protection of Victoria's priority waterways and water-dependent environments, and restoration of many of those that have degraded. EC investment played a major role in meeting commitments regarding environmental water recovery (including the recovery of approximately 81.1 GL of water entitlements attributable to EC investment), while establishing a synergistic program of environmental watering and riparian and in-stream restoration that have been undertaken with a long-term view to improving environmental health, while also providing immediate benefits to waterway users.
- The EC funded the establishment of the Environmental Water Reserve and the Victorian Environmental Water Holder (VEWH), which were critical components of a shift towards a more sustainable water future that ensure that the environment receives targeted delivery of environmental flows. VEWH now manages a portfolio of over 650 GL of water entitlements across the state and has increased deliveries of environmental water in Victoria from 22.5 GL in 2007-08 to 1,167.8 GL in 2013-14, reflecting the increase in water holdings and wetter conditions.
- The implementation of entitlement unbundling and development of the Victorian Water Register were major achievements that have produced significant benefits to water users, government and the environment. Unbundling has resulted in benefits to market participants from improved confidence, flexibility, and certainty for investment in the long-term and for trading decisions in the short-term.
- Investments by the EC in the modernisation of irrigation infrastructure and complementary on-farm initiatives to incentivise improvements to irrigation systems and practices have resulted in productivity improvements that will continue to be accrued for many years into the future.
- EC Investments in the urban water sector have resulted in a reduction in the demand for water (approximately 15.3 GL per year) that would have otherwise been sourced from potable supplies. This helped alleviate the increasing pressure on water supplies and provided an integral component of broader water saving efforts across the state that served to free-up the availability of water for environmental purposes and make water use more sustainable.
- Improvements to water markets, institutional arrangements, water planning, and increased water information funded by the EC have been key to environmental water recovery while both protecting and enhancing irrigation productivity, during one of the worst droughts in Victoria's recent history.
- Our indicative analysis shows that the total quantifiable economic benefits of the EC are expected to be in the range of approximately \$590 million to \$930 million as a present value (over the life of the investment) as compared with the total investment of \$598 million.

Summary report

Aither Pty Ltd (Aither) was commissioned by the Department of Environment, Land, Water and Planning (the Department) to undertake an evaluation of the Environmental Contribution (EC) over the ten year period between 2004 and 2014.

1.1. Evaluation objectives and scope

The Department committed to undertake this evaluation in response to a recommendation made by the Victorian Auditor General's Office (VAGO) in a 2014 audit.

The specific purpose of the evaluation was to examine the impacts and legacy, effectiveness and cost-effectiveness of the EC between 2004 and 2014. The evaluation provides an opportunity to demonstrate the achievements of the investment to date and to help inform future EC investment. It also allows the Department to demonstrate to the government and public the extent to which it is meeting its legislative objectives and delivering positive outcomes for the community.

The scope of Aither's evaluation is bounded in a number of areas, which was necessary given the scale of investment (approximately \$600 million), the short time frame for this evaluation, plus the desire to avoid duplicating the recent VAGO review. Specifically, Aither has not been requested to assess the appropriateness of the objectives of the EC or the funding mechanism itself. Similarly, the delivery efficiency and administration of the EC, including the selection and prioritisation of projects, has not been assessed as these aspects have already been evaluated by VAGO. Finally, the cost-effectiveness of individual EC projects has also not been evaluated given the focus on broader overall outcomes.

Aither's report is therefore focused on documenting and assessing the outputs and outcomes of the investment, considering the extent of alignment of investment with EC objectives and policy settings, and providing an indication of the overall return on investment. Aither has also provided advice and guidance to assist in the development of a more comprehensive monitoring and evaluation framework to be applied in the future for projects funded by the EC, in response to part of VAGO's recommendation.

1.2. Evaluation approach

Evaluation criteria and questions

The evaluation criteria and questions were based on a standard evaluation framework (see Figure 1) that was tailored to the evaluation criteria being considered for the EC.

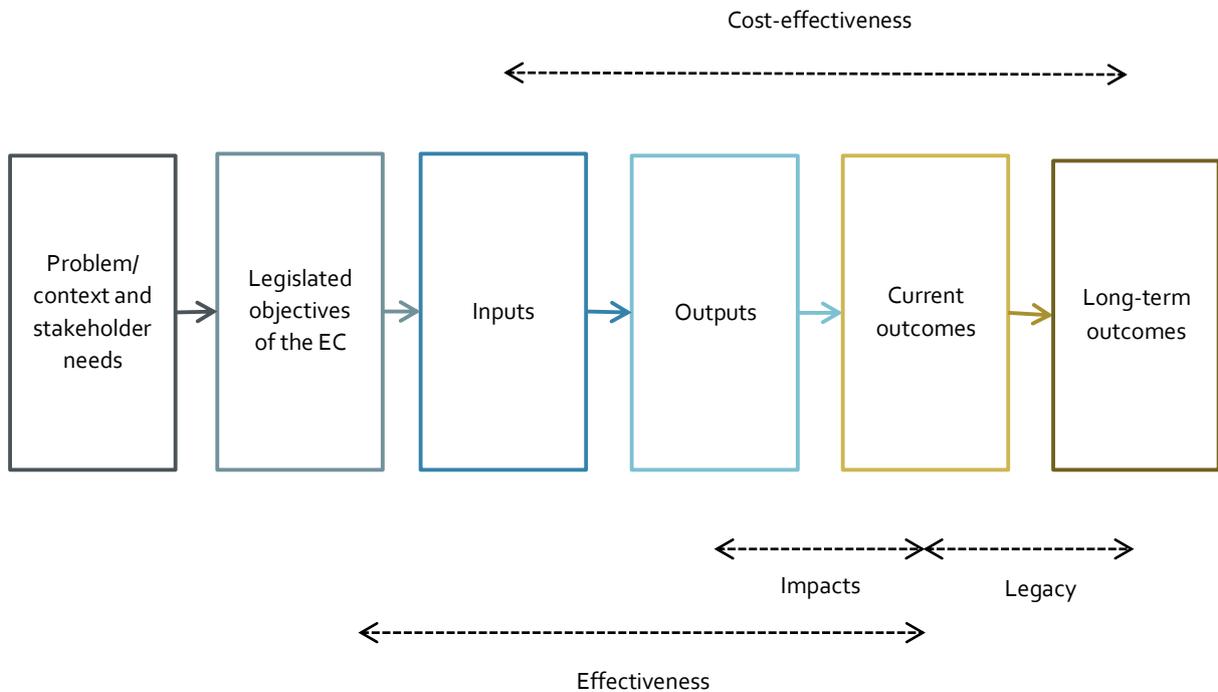


Figure 1 Program logic and evaluation criteria

The evaluation was structured around a set of clearly defined evaluation criteria and questions, which were discussed and agreed with the Department:

Problem / justification

- What was the problem the EC was attempting to address?
- Why was this important?
- How did the investment link to other initiatives?

Impact

- What were the inputs and outputs of the investments?
- What have been the outcomes, benefits and achievements of the EC investments associated with these outputs? (e.g. changes in resource condition, management activities or institutions)

Legacy:

- How will these outcomes change over the longer term (i.e. next 20 years)?
- What is the indicative value or likely significance of these outcomes?

Effectiveness:

- To what extent was the investment aligned with the legislative objectives?

- To what extent was the investment aligned with government policy?
- To what extent have the legislative objectives been met, both now and in the future?
- What is the evidence of a continued need for the investment?

Cost-effectiveness (return on investment)

- In aggregate, how do these benefits compare to the investment required?

Focus on investment theme evaluation

Given the large and diverse number of projects, and the substantially different outputs and outcomes associated with each initiative, the 104 initiatives were categorised into nine broad categories or themes of investment. This categorisation of the investment enabled the assessment to be aggregated up from the project level through the investment theme to the overall objective level. Many of the specific EC initiatives were found to be subcomponents or ongoing investments in the same types of activities over each of the EC investment tranches. This reinforced the benefit of focusing on the investment theme level and not examining all individual projects.

Evaluation methods

The broad approach employed to evaluate the EC investment included:

- development of a qualitative narrative describing the logic of the investment
- consultation with Departmental staff
- assessment against evaluation criteria / questions based on a range of qualitative and quantitative data analysis techniques
- quantitative economic assessment of the value of investment outcomes in key areas, where possible.

1.3. Evaluation findings

Problem and strategic response

To understand the EC and its achievements, it is vitally important to understand the extraordinary circumstances in the lead up to its establishment and through the 10 years of the evaluation period. By the early 2000's it was clear that the level of consumptive water use was unsustainable. This was fundamentally because the environmental costs of water use and the natural limitations on total resource use were not being adequately measured and accounted for, and they were not sufficiently reflected in water charges. Combined with these inadequacies in the policy framework, there was insufficient funding for developing more sustainable water management regimes and addressing the legacy of overuse.

The severe and prolonged Millennium Drought exacerbated these problems. Water dependent environmental assets like River Red Gum forests along the banks of the Murray River were dying and there were concerns about the likelihood of irreversible ecological decline. At the same time, consumptive users – in irrigation and urban communities – were also being affected. Water restrictions placed a heavy burden on urban communities through direct impacts on economic growth as well as impacts on community well-being.

All of this translated into pressure on state and federal governments to make major water policy reforms and investments. The need to act was heightened by the risk and uncertainty associated with the future impacts of climate change. In response, the Victorian Government launched the *Securing Our Water Future Together: Our Water Our Future* White Paper (OWOF 2004) in June 2004. OWOF 2004 reflected core national water reform priorities established in the Commonwealth's National Water Initiative (NWI) and provided the comprehensive water policy platform that would guide the Department's initiatives for the best part of the next decade.

Chapter 6 of OWOF 2004 announced the establishment of the EC, which was legislated through an amendment to the *Water Industry Act 1994*, to fund water-related initiatives that sought to:

- promote the sustainable management of water, or
- address adverse water-related environmental impacts.

The EC formed a vital part of a broader effort to restore balance to a pattern of water use across the state that saw the natural environment receiving a progressively smaller share of available water resources. Water prices did not adequately account for the environmental impact of water use and provided insufficient incentive for water users to alter behaviour appropriately. This was articulated in OWOF 2004 as follows:

“Extracting water from rivers and aquifers; whether it be for drinking, watering the garden, flushing the toilet, supporting industry, or agriculture; carries a cost to the environment. This cost, however is not included in the price we pay for water, Water pricing has generally indicated that the resource is plentiful and is readily available at a relatively low cost to consumers.”

By requiring water corporations to contribute funding (5% and 2% of revenue from urban and rural water businesses, respectively), the EC provided both a price signal to encourage more efficient water use and a funding mechanism for implementing programs and actions to improve the management of water resources and address the impacts of consumptive water use on the environment. These initiatives included: major contributions to Victoria's water recovery effort including \$94 million to the inter-jurisdictional The Living Murray First Step Decision Initiative (TLM); \$150 million to restore priority waterways; establishment of the Environmental Water Reserve (EWR); and ongoing effort in coordinated environmental water delivery. The contribution of EC funding to

initiatives such as irrigation modernisation projects, and urban water savings initiatives reflected a clear policy position to improve technical water use efficiency while also managing the social impacts of drought and the adjustment process associated with water recovery for the environment. The Victorian Government's policy positions emphasised the need to bring communities along with the reform effort.

Consistent with the objective of sustainable water management, the EC was also invested in areas such as water market reforms (which facilitated adjustment to the drought), and investments in water information, management systems, planning reforms, and legislative and governance changes that better position Victoria to deal with future drought events and ongoing development pressure and population growth.

Overview of the investment

Between 2004-05 and 2013-14, a total of \$597.9 million of EC funds was invested in 104 initiatives across 9 different categories of investment (Table 1).

Table 1 Environmental contribution investments by theme from 2004-05 to 2013-14 – by tranche

Investment theme	Tranche 1 (\$ million) 4 years (2004-05 – 2007-08)	Tranche 2 (\$ million) 4 years (2008-09 – 2011-12)	Tranche 3 (\$ million) 2 years only (2012-13 – 2013-14)	Total (by theme)
Water planning	\$16.9	\$10.6	\$4.6	\$32.1
Irrigation modernisation and water recovery	\$27.6	\$99.0	\$3.8	\$130.4
Environmental water management and planning	\$25.0	\$23.9	\$21.3	\$70.1
Waterway health	\$48.7	\$68.8	\$32.4	\$149.8
On-farm irrigation	\$12.9	\$19.5	\$4.0	\$36.4
Water entitlements and markets	\$11.3	\$5.5	\$3.0	\$19.8
Urban water	\$51.5	\$44.4	\$14.6	\$110.6
Water information	\$4.0	\$8.4	\$8.9	\$21.4
Groundwater	\$9.1	\$12.3	\$6.0	\$27.3
Total (by tranche)	\$207.0	\$292.4	\$98.6	\$597.9

Source: DELWP

To put this level of investment in context, Victoria's water industry collects annual revenue of around \$5.6 billion to provide water-related services to customers and has an asset base estimated at approximately \$40 billion (source: DELWP based on water corporations' 2013-14 annual reports). As OWOF 2004 recognised, while this revenue covers the costs of services to capture, store and deliver water to customers, it does not capture the full opportunity cost of water use, particularly those costs that are borne by the environment. Within this context, and given the overall financial dimensions of the water sector, the collection of EC revenue has acted as a relatively modest catalyst to promote

more sustainable water management and capture the environmental costs of providing these services.

The EC funding was provided to the Department as the core organisation responsible for the coordination, implementation and delivery of the water reform agenda. Urban and rural water corporations and Catchment Management Authorities (CMAs) also received a portion of the overall funding (administered by DELWP) under various initiatives. A number of other state and federal programs and institutions also made funding contributions towards initiatives that were funded by the EC.

Alignment with policy and legislative objectives

The EC was established as an integral part of the Victorian OWOF 2004 water policy reform agenda. As a result, the EC investment, particularly in tranches 1 and 2, was highly aligned with Victorian Government policy. EC investment was also aligned with a range of federal government policies over the last decade, including the Water for the Future policy and the Murray-Darling Basin Plan (the Basin Plan). The EC investment was closely aligned with inter-jurisdictional agreements such as TLM and played a major role in enabling Victoria to meet its obligations under the NWI. EC investment assisted in leveraging Commonwealth funding for major investments, including in irrigation modernisation.

The investments in EC initiatives were almost always aligned with the legislative objectives, although this is unsurprising given the broad nature of the objective to “promote sustainable management of water”. There are some minor examples of specific initiatives, particularly in tranche 3, that were not part of a broader program of investment and not clearly aligned with the EC objectives (e.g. contributions to two dredging projects).

Summary of key achievements - outputs and outcomes

The range of investments described in the previous sections have worked in concert to produce a range of outputs and beneficial intermediate outcomes, and provide the basis for the achievement of long-term or ultimate outcomes that are aligned with objectives of the EC.

Investment across the themes in planning, markets, institutions, information, systems, capacity building, behavioural change, and works and physical assets, have worked as an integrated package to deliver desired policy outcomes (see Figure 2).

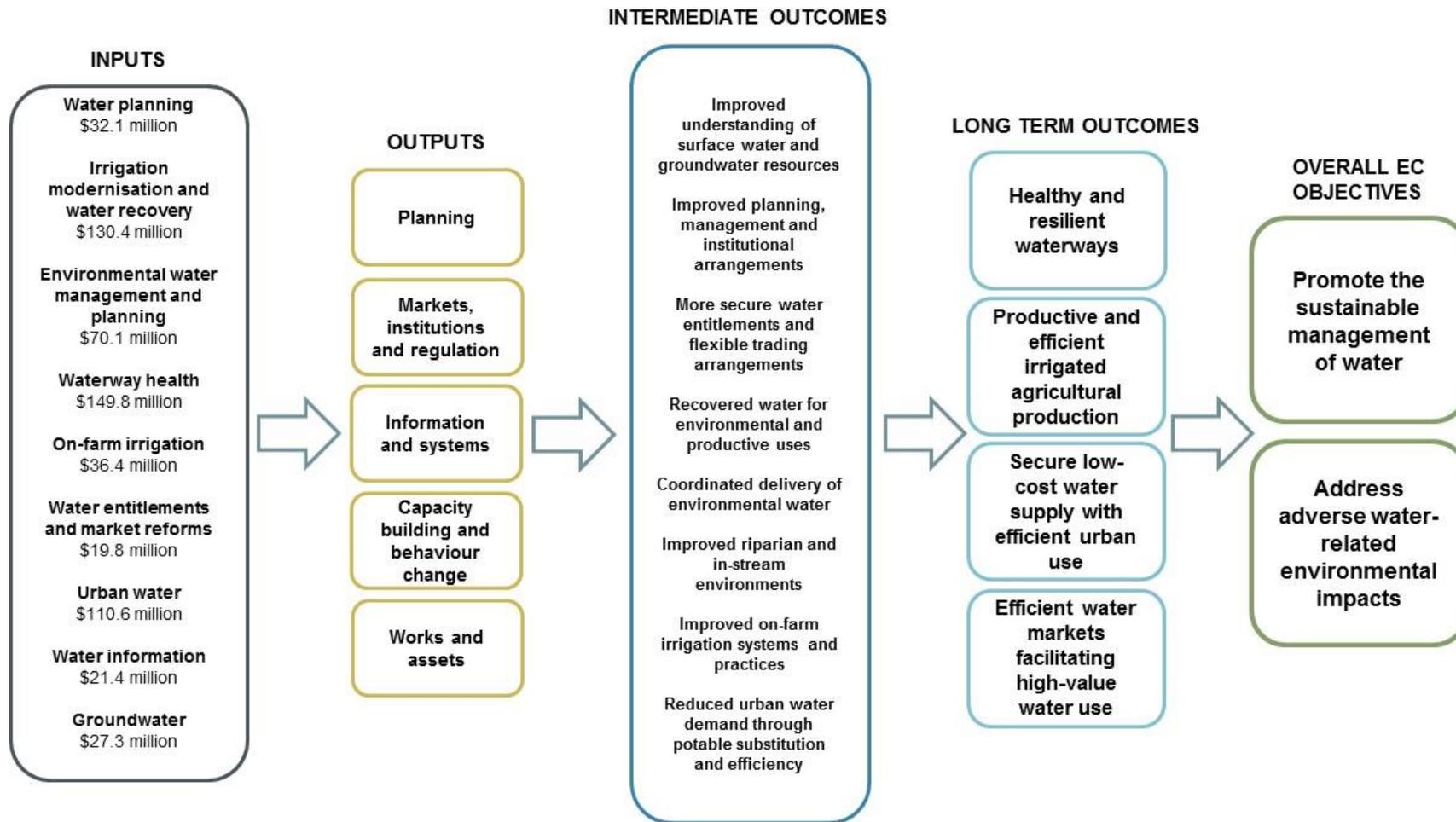


Figure 2 EC investment process from inputs to outcomes

Outputs of the EC investment

Some of the key outputs of the EC investment (leading to intermediate and long term outcomes discussed later) include:

- **Water planning:** The EC funded the development of the four Sustainable Water Strategies (SWSs) which articulated the key water resource issues being faced and set out long-term plans to secure the water future of the Western, Northern, Gippsland and Central regions. The SWSs are the key action statements for implementation of OWOF 2004 at the regional level. EC also funded important research on the impacts of climate change on water systems and on other risks to shared water resources.
- **Irrigation modernisation and water recovery:** The investments to modernise irrigation distribution infrastructure were intended to ensure that environmental objectives were met without significantly reducing the volume of water available within the consumptive pool through the buyback of entitlements. This was largely achieved through contributions to broader water recovery efforts including The Living Murray Initiatives (TLM), the Shepparton Irrigation Modernisation Project (SIAMP), and investments in the Macalister Irrigation District (MID). These projects mostly focussed on rationalisation, upgrades and automation of channels, regulators and meters, resulting in approximately 75 GL in Northern Victoria and 6.15 GL in the MID, attributable to the EC (based on proportionate funding contribution).
- **Environmental water planning and management:** EC funding facilitated the establishment of the Environmental Water Reserve (EWR) in legislation and the statutory protection of water for the environment. With EC funding, the government also set caps on diversions in many systems and enhanced the capacity of CMAs as the caretakers of river health. The Victorian Environmental Water Holder (VEWH) now manages a portfolio with over 650 GL of water entitlements across the state (worth approximately \$1 billion) with funding from the EC. Total deliveries of environmental water in Victoria increased from 22,555 ML in 2007-08 to 1,167,830 ML in 2013-14, reflecting the increase in water holdings and wetter conditions.
- **Waterway health:** Investments in large scale river restoration (LSRR) included a range of in-stream and riparian works to manage threats and improve the health of these systems such as barrier removal, fish ways, erosion control, fencing, off-stream watering, weed control and revegetation. These were implemented to complement the environmental watering initiatives outlined above. Between 2005-06 and 2013-14, it was estimated that EC funding contributed to approximately: 1,400 km of riparian fencing; 1,400 ha of revegetation; 130 stream bed and bank stabilisation structures installed; and 376 conservation agreements covering an area of 1,300 ha. The LSRR program has generally focussed efforts on a single priority waterway in each CMA. Numerous audits of discrete investments have found the projects to have been generally well managed, technically sound and able to demonstrate the outputs achieved.
- **On-farm irrigation:** The EC invested in the state's Sustainable Irrigation Program (SIP) aimed to facilitate actions by irrigators that would reduce the impact of irrigation on the environment whilst improving efficiency and productivity in the agricultural sector. Outputs attributable to the EC include estimates of approximately: 74,000 ha of improved irrigation systems; 37,000 ha protected by irrigation reuse systems; 633 new IFPs, and a further 14,000 ha protected by surface or sub-surface drainage, and water savings of 47.5 GL. In recent years, the EC has mainly contributed to the incentives provided for irrigation farm plans (IFPs) which involve the survey and design of properties to provide a plan for future works to address irrigation, drainage and waterway issues.
- **Water entitlements and markets:** EC investment in water entitlement and market reforms aimed to provide security, clarity and confidence to water market participants through the unbundling of entitlements and the establishment and ongoing development of the Victorian Water Register

(VWR). EC investment in unbundling meant that traditional entitlements of water rights were separated into a water share, a delivery share, and a water-use licence. Victoria's fully unbundled water access entitlement system became operational from July 2007 for northern Victoria, enabling a major increase in entitlement trade and facilitating adjustment to the drought. The VWR has improved flexibility and confidence in the water market, with faster processing time and reduced transaction costs. It has also greatly enhanced water accounting in Victoria.

- **Urban water:** Investments in alternative water supplies are resulting in almost 13,000 ML per year of water savings, with an additional 1,750 ML per year of savings associated with demand reduction and conservation measures. The investments in the urban water sector have not only achieved direct water savings, but have also served to demonstrate the potential for water savings through raising awareness, innovation and proof of concept. A range of wastewater and stormwater initiatives have also reduced potential water quality risks to receiving waterways.
- **Water information:** EC investment was directed to major improvements in water data collection, accounting, reporting and compliance, metering, information systems and modelling platforms. A highlight was development of the Water Measurement Information System (WMIS) which is now the primary access point for surface water and groundwater monitoring data. Data held in the WMIS is made available to stakeholders and the general public. The information held within the WMIS is used to inform several key strategies and plans prepared by the Department and other relevant agencies.
- **Groundwater:** More than half of the EC groundwater investment was directed to the maintenance and upgrade of groundwater monitoring capability through the State Observation Bore Network (SOBN) to reduce the cost and improve the efficiency of collecting data to manage the State's groundwater resources. Prior to the rationalisation program, the SOBN contained a number of bores that were very old and in poor condition, having either failed or that were at high risk of failure. A total of 55 new monitoring bores have been constructed through the EC. More recently, tranche 3 funding has driven the SOBN review and the rationalisation and renewal program. Overall, 17 deep monitoring bores and 39 shallow bores have been decommissioned. Through the EC investment, Groundwater Management Plans (GMPs) have now been developed for all Water Supply Protection Areas (WSPAs) and groundwater management units. As a result, the proportion of groundwater use covered by GMPs has increased from 26% of the State's licensed entitlement in 2004 to 85% currently.

Intermediate outcomes

Discussed below are the intermediate outcomes of the investment outputs described in the previous section, along with an assessment of the ultimate outcomes that have been achieved and/or are expected into the future as a result of EC investment. Where possible, some of the outcomes have been quantified in monetary terms so that an assessment of return on investment could be made.

Improved understanding of surface water and groundwater resources and information systems

The EC investment across the different theme areas has resulted in a better understanding of Victoria's water resources and their associated environments. This knowledge has underpinned and facilitated many of the other EC investments, a range of water and natural resource strategies at multiple scales, and broader management of Victoria's water resources.

Investments of the EC have been important contributors towards the continued delivery of a state-wide dataset of surface water quality and quantity for multiple purposes, collected from 790 monitoring sites. This data set has been formulated through the work of the Regional Water Monitoring Partnerships, which is partially funded by the EC and provides a single authoritative approach to collection, analysis and management of surface water information. This information,

along with groundwater data, has been made available through the WMIS. The continued investment in surface water monitoring through the EC has enabled a comprehensive and consistent long term record of water resources. Along with EC investment, the Government has been able to leverage off industry investment in surface water monitoring, as part of the surface water monitoring partnerships program. Without the investment in surface water monitoring through the partnerships program, an understanding of the operation of Victoria's water catchments and water supply systems would not occur at the system wide scale necessary for the effective planning for and operation of Victoria's water entitlement framework.

Similarly, much of the investment in groundwater management has been aimed at improving the State's understanding of groundwater resources. Investments in resource assessments, ongoing monitoring data and reports (including the on-line groundwater resource report, and mapping of GDEs and aquifer salinity across the State) have provided significant contributions to this knowledge base. Resource assessments have provided a much improved understanding of the characteristics of groundwater systems that are critical to determining reliable and sustainable resource allocations for consumptive use and the environment. Improvement in ongoing monitoring infrastructure and tools allow changes in these characteristics to be tracked so trends can be determined and the resource can be managed adaptively. Investments in metering of both surface water and groundwater extractions have provided more accurate information around extractive volumes and rates, which underpin efficient and sustainable allocations of these resources.

In addition, a range of other theme areas resulted in improved knowledge that will provide long lasting benefits in the sustainable management of Victoria's water resources and in addressing the impacts of adverse water related issues. These include:

- Water accounting benefits facilitated by EC investment in the VWR
- EC investments in monitoring and evaluating environmental flows and investments in waterway health
- EC investments in better understanding the impacts of climate change on water resources and in research on risks to water resources (e.g. interception)
- EC investments in water savings accounting methodologies for irrigation modernisation projects.

Improved planning, management and institutional arrangements

The EC investments have resulted in significant improvements in planning and management arrangements that have provided the guidance, structure and processes that have allowed the OWOF 2004 reforms to be delivered.

The development of the SWSs have been a key outcome of the EC that has been pivotal in ensuring ongoing water supplies for the community in an environmentally sustainable manner, across the state. By taking a long term (50 year) view of the water needs of urban users, rural users and the environment, the SWSs have sought to provide a balanced approach to the allocation of water resources into the future that has been integral in minimising conflicts between affected parties while achieving beneficial outcomes across these groups. The SWSs have provided the foundation for many of the reforms and action undertaken to achieve the objectives of the EC and OWOF 2004. They have provided the basis for nearly 300 actions across the water sector that included targets and plans to increase water conservation and recycling, specific commitments to short-term and smaller scale projects to augment the water supply, investigations of larger water augmentations options for the medium term, and safe guards to increase environmental flows. Many of these actions have now been completed.

The EC has contributed to a number of key legislative and institutional reforms. The creation of the Environmental Water Reserve, through legislative amendments to the Water Act and creation of

entitlements for key waterways, has been a critical component of the shift towards a more sustainable water future. The complimentary creation of the VEWH as an independent statutory body responsible for holding and managing Victoria's environmental water entitlements ensures that, through ongoing partnerships with CMAs and other relevant organisations, the environment has received targeted delivery of environmental flows.

The EC investment contributed to the establishment of the VWR which, in addition to providing the means to manage entitlements held by VEWH, provides market participants with comprehensive information on the trading process and administrative requirements to complete trades (see below).

The establishment of water resource accounting and reporting frameworks to inform the development of the Victorian Water Accounts has ensured that Victoria is meeting its obligations under the relevant Victorian and Commonwealth legislation as well as the NWI and other COAG commitments. The Victorian Water Accounts and other associated reports provide for stronger and more transparent water resource management and reporting through the improved consistency and accuracy of data. Effective water accounting has also been critical to the implementation of the EWR for groundwater.

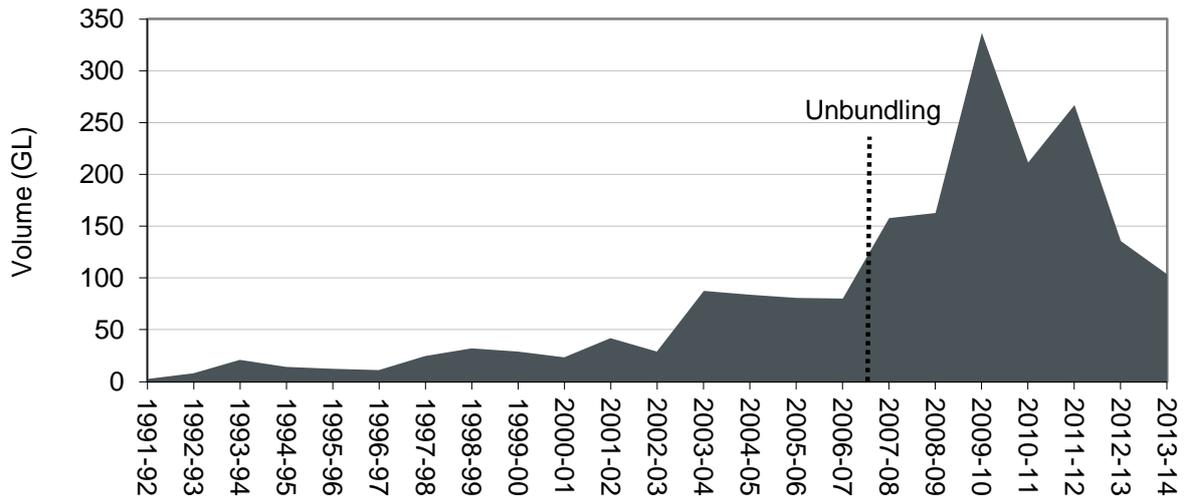
The investment to improve the groundwater management framework has resulted in a significant increase in the number of areas managed under groundwater management plans. These measures have resulted in the improved use of groundwater by providing certainty to users through transparent, cost-effective and adaptive local management. The new management framework ensures whole groundwater systems are effectively managed, ensures water users understand the nature of a licence and associated water sharing rules, and protects existing users' rights by ensuring statutory processes are followed before licenced entitlement can be changed permanently.

More secure water entitlements and flexible trading arrangements

The implementation of entitlement unbundling and development of the VWR were major achievements that have produced significant benefits to water users, government and the environment.

Improved flexibility, confidence and certainty in the market

Entitlement reforms have provided certainty to water users on their share of the available water, conditions on using water on land, and rights to have water delivered. Unbundling has ultimately made trade easier by separating entitlements into tradeable components. Market participants have been encouraged by the improved confidence, flexibility, and certainty for investment in the long-term and for trading decisions in the short-term. This was evident in the significant increase in the volume of high reliability water entitlements traded in Northern Victoria immediately following unbundling (Figure 3). While this increase was driven by drought, unbundling played a major role in enabling this trade to occur, providing benefits to both buyers and sellers.

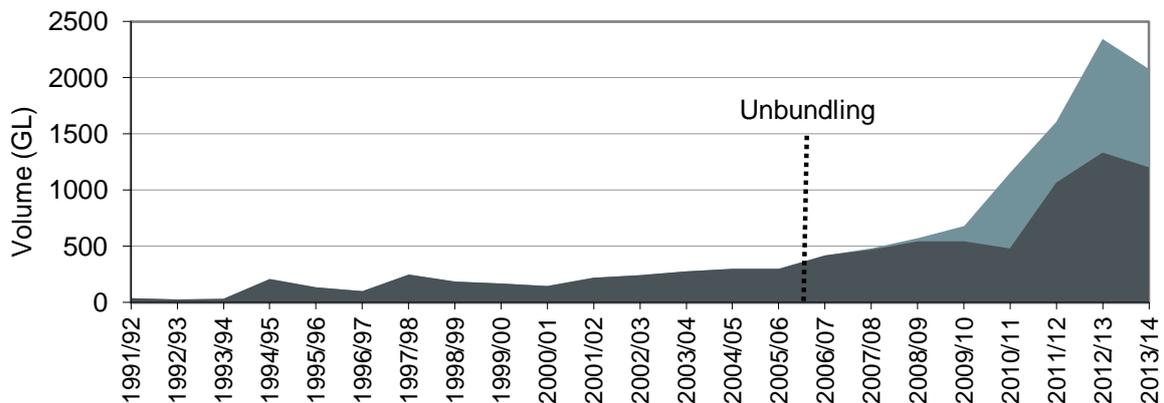


Source: DELWP.

Figure 3 Transfer of high reliability water shares in northern Victoria (1991-91 to 2013-14)

Increased allocation trade and environmental transfers

Improvements in water market efficiency were also evident in increases in allocation trades, with a three-fold increase in non-environmental water trade since unbundling was implemented (Figure 4).



Source: DELWP.

Figure 4 Allocation trade in northern Victoria (1991-92 to 2013-14)

Faster processing times and reduced transactions costs

The effectiveness of unbundling and trade was enabled by the introduction of the VWR and its progressive enhancement. Trade processing times of intrastate trades significantly improved as a result, with Victoria exceeding COAG standards (following their adoption in 2009-10) of 90% of trades processed within 5 business days. COAG standards for interstate trades of 90% of trades to be processed within 10 business days initially proved more difficult to meet, largely as a result of reliance on other states to contribute to the process in a timely manner. Enhancements of the register were undertaken resulting in significantly increased processing times that exceeded COAG targets by 2011-12. Both interstate and intrastate targets have been continuously exceeded since then.

Faster trade processing times have facilitated more timely access to water in critical dry periods and in response to changes in seasonal conditions, providing significant benefits to irrigators, while

providing greater security to entitlement holders by ensuring allocations are transferred to their accounts rapidly after purchase. In addition, the shift to online lodgement of allocation trades in November 2013 alone has resulted in significantly reduced transaction costs with total savings in fees now more than \$450,000.

More accurate and timely information, ease of accessibility, and improved water accounting

The VWR has established a platform that provides market participants with comprehensive information on the trading processes and administrative requirements to complete trades. According to the Independent Review of Water Trading report (Deloitte 2010),

The Register is arguably one of the most advanced water registers in Australia. Unlike other jurisdictions, Victoria’s register is integrated with a water accounting system through a chart of accounts and all transactions are recording using a double entry system of debits and credits to the relevant accounts.

The Register provides the market with regular updates and timely information which has ultimately led to more informed decision making. The integrated water accounting system provides the latest, accurate information on the state’s water resources including water volumes and usage within Victoria’s surface water, groundwater and recycled systems. This information is used for a range of purposes to sustainably manage the state’s water resources.

Recovered water for environmental and productive uses

EC investment played a major role in meeting commitments regarding environmental water recovery. The EC contributed to irrigation modernisations, purchase of entitlements, and other water recovery packages through initiatives including TLM, Shepparton Irrigation Area Modernisation Program (SIAMP), Goulburn-Murray Water (G-MW) Connections Project, and the Macalister Irrigation District Modernisation (MID) project.

As shown in Table 2, EC investment has recovered approximately 75 GL of water entitlements in northern Victoria as well as additional 6.1 GL in the MID (on a cost apportioned basis).

Table 2 Summary of water recovered – attributable directly to EC investment

Water recovery initiative	Volume of entitlement attributable to EC
TLM	65,060 ML Long-Term Cap Equivalent (LTCE)
SIAMP	5,836 ML High-Reliability Water Shares ; 4,858 ML Low-Reliability Water Shares
G-MW Connections Project Stage 1	3,249 ML LTCE
MID modernisation	6,150 ML LTCE
Total	Approximately 75,000 ML LTCE in northern Victoria plus 6,150 ML in the MID

Source: DELWP.

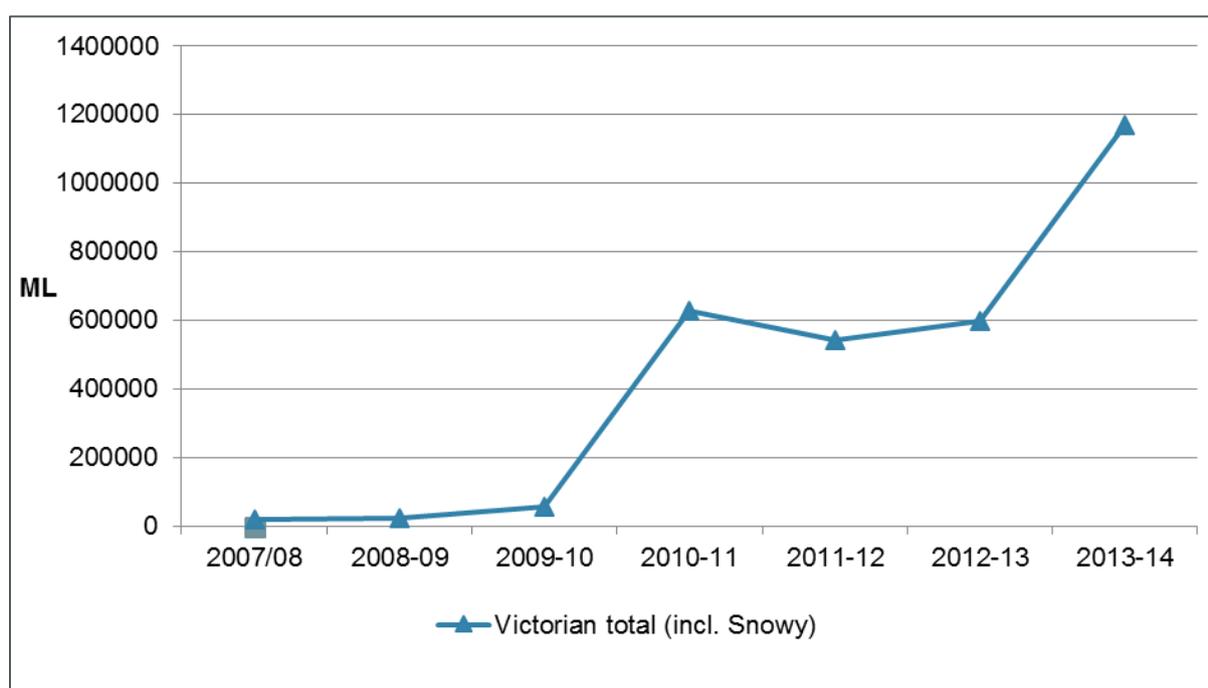
Coordinated delivery of environmental water

EC investments have allowed the Victorian Government to use environmental watering to actively address the ecological degradation at priority sites. During the Millennium Drought, water availability for the environment was extremely low, due to low seasonal allocations, fewer environmental water entitlements, and in many areas, qualifications of rights which reallocated environmental water to

meet critical consumptive needs. During this period environmental watering focused on the use of limited water resources to avoid critical loss of species and protect refuge areas.

Major floods across many regions in 2010-11 effectively ‘reset’ many waterways – with both positive and negative effects. Water available to the environment has also steadily increased as state and federal water recovery programs gathered momentum and storages refilled, particularly following the end of the Millennium Drought. Governments have also invested in significant structural works and measures to enable the delivery of environmental water to sites in a way that maximises environmental benefits with the most efficient use of available water. With increased water availability, environmental watering focused on the continued recovery of systems from drought and flood, and taking opportunities to enhance recruitment of key threatened or endangered species.

As a result, the delivery of environmental water to Victorian sites has steadily increased over the course of the EC with the securing of entitlements and increases in allocations. As shown in Figure 5, total environmental water deliveries in Victoria increased from 22,555 ML in 2007-08 to 1,167,830 ML in 2013-14.



Source: DELWP.

Figure 5 Environmental water deliveries between 2007-08 and 2013-14

The earlier deliveries were generally focussed on sustaining highly stressed water-dependent ecosystems, including the protection of a network of drought refuges across the State. The return of wetter conditions has meant that management activities have been able to focus on recovery and improvement in a number of important environmental sites.

Although these are undertaken with a longer-term strategy, case study evidence suggests that these efforts are already producing encouraging results. For example, environmental watering in the Barmah Forest has resulted in significant growth and flowering of Moira Grass, an aquatic grass species of ecological importance to the area that was trending towards local extinction. Watering of key sites in the Mallee and North Central region has allowed for the protection and recolonisation of Murray hardyhead, a native fish species that is highly sensitive to water quality, quantity, and ecological disturbances to habitat. Similarly, populations of one of Victoria’s most threatened fish species, the Australian grayling, are responding positively to the environmental watering regimes being provided. Regular environmental watering of the flood-dependent Gunbower Forest has

resulted in wetland plant diversity returning to benchmark levels while sustaining habitats for a range of waterbird species including ducks, spoonbills, cranes and pelicans.

Improved riparian and in-stream environments

In addition to securing and supplying environmental water, another significant component of the overall package of actions required to restore and protect Victorian waterways was the restoration and protection of riparian and in-stream environments.

Through direct intervention such as fencing and revegetation of riparian zones, stabilisation of banks, removal of exotic species and restoration of in-stream habitats, the EC has provided a substantial contribution to improving the health and resilience of Victorian waterways via the Large Scale River Restoration (LSRR) program. The LSRR program generally invested in one single, iconic, priority waterway per CMA region (Glenelg, Wimmera, Murray, Loddon, Werribee, Broken, Thomson-Macalister, Ovens) while in two regions multiple priority value waterways were the subject of on ground works (Great Ocean Road estuaries, East Gippsland Heritage Rivers).

Recognising that waterways are dynamic ecological systems that take many years to reach stable equilibriums, these waterway investments have been undertaken with a long-term view to improving waterway health. The improved environments, however, provide immediate benefits to those that choose to use the waterways for recreational and amenity purposes. Ongoing investments in planning, research, monitoring, and demonstration of outcomes has ensured that the trajectory of waterway health can be tracked over time and waterway management can be both responsive and adaptive.

Numerous audits of discrete investments have found the projects to have been (on the whole) well managed, technically sound and able to demonstrate the outputs achieved. The result of this investment is that priority waterways across the State have been either maintained or protected from decline through a particularly challenging decade which included record low rainfall and runoff in catchments across the State, and historic bushfire and flooding events.

There is also evidence that in delivering these works, there have been tangible social outcomes in the form of strengthened landholder engagement, trust and acknowledgement of the benefits of improved land management practices. The systems for planning and actively managing high priority waterways have been enhanced by EC investments in state, regional and local strategies and associated MER.

Improved on-farm practices

The EC contributed to the Victorian Sustainable Irrigation Program (SIP), which was developed with the aim of facilitating actions that reduce the impact of irrigation on the environment while working to improve productivity.

The investment in the SIP has resulted in significant areas of land with improved irrigation systems and practices resulting in water savings, reduced labour requirements, and increased productivity. Automated systems have reduced the burden of manual irrigation and have provided landholders with convenience and lifestyle benefits. Irrigation reuse systems have protected run-off of nutrients to waterways while providing water savings and reduced labour and nutrient inputs to production. Reductions in nutrient run-off from improved irrigation practices has reduced the impacts of algal blooms and associated costs. Considerable areas of land have been protected from waterlogging by surface drainage, and from salinity impacts by sub-surface drainage.

Of the \$420 million invested by the SIP program, the EC has provided \$34 million (8.2 percent). Benefits to date attributable to the EC investment have been apportioned on this basis. The extent and indicative value of these intermediate outcomes (to date) are presented in Table 3.

Table 3. Intermediate outcomes of EC investment in the SIP

Outcome	Measure	Total cumulative value 2004-2014 (\$M)	Total cumulative value 2004-2014 attributed to EC(\$M) @ 8.2%
Water saved	47,502 ML	\$28.5	\$2.4
Area of improved irrigation practices	73,725 ha	\$195.4	\$16.7
Area of improved irrigation systems	3,260 ha	\$8.6	\$0.7
Area protected by irrigation reuse	36,869 ha	\$5.5	\$0.5
Phosphorus diverted	55,382 kg	\$13.8	\$1.2
Area protected by surface drainage	4,398 ha	\$14.5	\$1.2
Area protected by sub-surface drainage	9,682 ha	\$14.5	\$1.2
Total	n/a	\$280.9	\$24.1

Source: Aither calculations based on DELWP outputs data.

In addition to these quantified benefits, the SIP program has fostered closer and more collaborative relationships between landholders, regional communities and regional implementation partners. These relationships should facilitate further cooperation and progress on other environmental initiatives.

Reduced urban water demand through potable substitution and increased efficiency

Reforms to the urban water sector funded by the EC have made a substantial contribution over the past decade to reducing the burden on water resources from consumptive use. Considerable permanent reductions in potable demand have been achieved that, despite the construction of the Victorian Desalination Plant (VDP), will continue to deliver significant cost savings into the future and defer the need for expensive future water supply augmentations.

Potable substitution projects have been the largest component of water saving outcomes. By focussing on incentivising recycling opportunities with large industrial users of potable water, potable substitution projects have delivered a conservatively estimated permanent reduction in potable demand of 12.8 GL per year, of which approximately 3.3 GL is attributable to EC funding.

Conservation projects have delivered a further 1.8 GL per year of water savings, of which approximately 170 ML per year is directly attributable to the EC. These figures are considered conservative as only projects for which water savings have been estimated are included in the assessment.

The values of these intermediate outcomes are presented in Table 4.

Table 4. Value of urban water savings

Urban Water Investment Category	Water Savings (ML/yr)	Total value of water savings produced between 2004-2014 (\$ million)	Total value of water savings produced between 2004-2014 attributable to EC (\$ million)
Potable substitution program	12,853	186.5	48.8
Conservation program	1,757	22.8	2.2
Other programs	675	8.8	1.3
Total	15,285	218.1	52.4

Source: DELWP and Aither analysis.

The investments in the urban water sector have not only achieved direct water savings, but have also served to demonstrate the potential for water savings through raising awareness, innovation and proof of concept. Investments in recycled water have demonstrated both technical and financial feasibility, particularly for industrial applications, which should encourage future adoption of similar technologies and drive further innovation in this sector. The home rebate program and other investments aimed at domestic users have raised awareness of residents' ability to reduce water consumption by implementing efficient appliances and water use practices.

In addition to water savings, there are a number of expected beneficial outcomes that have not been assessable due to a lack of appropriate data. Actions aimed at reducing potable water use through recycling and improved water use efficiencies also tend to reduce the volume of wastewater and stormwater discharges. Reductions in volumes of wastewater requiring processing at treatment plants further reduces costs associated with these processes, while reduced stormwater discharges protects the value of receiving environments such as waterways.

Long term outcomes

Healthy and resilient waterways

The program of investment undertaken by the EC has provided the necessary foundation for the ongoing protection of Victoria's priority waterways and water-dependent environments, and restoration of those that have degraded.

The significant portfolio of water entitlements that now form the EWR, managed by the VEWH, are available across a number of systems to deliver a range of watering events. These watering events are carefully planned and managed to achieve the maximum benefit to a variety of water dependent values in waterways, estuaries and fringing wetlands. The security provided by these environmental water arrangements allows managers to adopt long-term visions and plans to maximise environmental, social and economic returns.

The likelihood of achieving long-term ecological outcomes is increased by the complementary actions that have been undertaken and will continue to be undertaken. Projects under the LSRR were regional, multi-year restoration efforts that targeted systems with significant water recovery initiatives for complementary waterway management activities. These include the restoration of native vegetation to, and fencing of, riparian zones as well as removing exotic plant species from riparian and in-stream environments, restoring habitat, stabilising waterway beds and banks, and the provision of fish passage. Other actions elsewhere in these catchments such as improvements to irrigation systems and practices will also serve to reduce impacts on receiving waterways into the future. In

addition, all waterway investments were done in partnership with local landholders and community groups such as Landcare and Waterwatch. These partnerships provide a sound basis for the achievement of ecological outcomes over long timeframes by engaging, educating and empowering local stakeholders to take ownership of the works that are implemented and reduce and/or remove threatening processes (e.g. unrestricted stock access).

Although the nature of dynamic ecological systems makes long-term condition changes difficult to predict, ongoing MER of these actions will ensure that this management approach is constantly being adapted and improved to maximise environmental outcomes. The multi-pronged approach to managing waterways increases their resilience to environmental shocks such as drought, floods and bushfires.

The Victorian community is the ultimate beneficiary of these waterway health outcomes. Those that use waterways for active and passive recreation and general amenity appreciate all that a diverse natural ecosystem provides. Clean water and an abundance of native wildlife provide an enhanced experience for those that boat, swim, walk, fish and bird watch, to name a few. However, the benefits of improved waterway health flow far beyond those that directly use waterways. A significant body of evidence shows that the broader community are willing to pay for improved waterway health outcomes, despite the fact that they may not expect to ever visit the waterways being improved.

Based on these willingness to pay values and an assessment of expected environmental improvement over the longer term, the present value of waterway health benefits attributable to the EC are approximately \$0.6 - \$1.8 billion. However, there are considerable uncertainties associated with this analysis that have warranted a more conservative estimate at between \$230 million and \$335 million as a present value.

Productive and efficient irrigated agricultural production

The modernisation of irrigation infrastructure and complementary on-farm upgrades to irrigation systems and practices has resulted in considerable productivity improvements that will continue to be accrued for many years into the future.

There is case study evidence to suggest that the off-farm investments in irrigation modernisation have and will continue to result in efficiency improvements in the irrigation sector. However, more work is required to provide confidence around these benefits. By investing in infrastructure to recover water for the environment rather than buying entitlements, it is also likely that the productive capacity of the irrigation sector has been better maintained, thereby supporting regional communities, and maintaining support for the water reform agenda.

The benefits of on-farm investment attributable to the EC are more readily measurable and provide the basis for projections of benefits into the future. The present value of these future benefits, as well as benefits already accrued, are presented in Table 5. This shows that EC investment of around \$36 million will produce total life time benefits equal to approximately \$100 million.

Table 5 The total annual value of on-farm outcomes attributable to EC investments (\$2014)

Outcome	Total cumulative value 2004-2014 attributed to EC(\$M)	Future benefits (\$M) ²	TOTAL NPV (\$/M)
Water saved	\$2.4	\$7.6	\$10.1
Area of improved irrigation practices	\$16.7	\$52.3	\$69.1
Area of improved irrigation systems	\$0.7	\$2.3	\$3.1
Area protected by irrigation reuse	\$0.5	\$1.5	\$2.0
Phosphorous diverted	\$1.2	\$3.7	\$4.9
Area protected by surface drainage	\$1.2	\$3.9	\$5.1
Area protected by sub-surface drainage	\$1.2	\$3.9	\$5.1
TOTAL ¹	\$24.1	\$75.2	\$99.3

1 Differences are due to rounding errors

2 Discounted at 4% over 25 years

Source: DELWP and Aither analysis

Secure water supply with more efficient urban water use

The EC has provided the means to achieve many of the policy objectives for urban water articulated by OWOFF 2004. The investments in the urban water sector have provided a substantial reduction in demand for water that would otherwise have been sourced from traditional potable supplies. This has helped alleviate the increasing pressure on water supplies from ongoing urban development and expectations of reduced rainfall.

In addition to helping provide greater security to urban water users by diversifying away from traditional supply sources, urban water investments were also an integral component of broader water savings efforts across the state that served to free-up the availability of water for environmental purposes and make water use more sustainable.

The commissioning of the VDP was a “game-changer” for the urban water sector. The considerable investment in the VDP drastically altered the economics of urban water supply such that many of the prior investments in water savings were reduced in value considerably. The avoided costs of potable supply as a result of water savings initiatives fell by up to 80 percent, reducing the ongoing benefits provided by initiatives that were made on sound assessments at the time.

Despite the impact of the VDP, the investments in urban water initiatives have still provided significant benefits in the form of water savings that are expected to continue into the future. They have also provided a demonstration of the feasibility of technical approaches and encouraged changes in community awareness and behaviours with regard to water use, and thus pave the way for more innovative and efficient approaches to urban water management in the future. The intermediate water savings outcomes that were presented in Table 4 have been projected into the future to assess the full value of these investments, presented in Table 6. A number of these projects lacked sufficient data to include in this assessment, and therefore the total water savings presented can be considered to be a conservative estimate.

Table 6. Value of water savings outcomes from urban water investments

Urban water investment category	Total water savings outcomes			Water savings outcomes attributable to EC		
	Water Savings (ML/yr)	Total value of water savings produced between 2004-2014 (\$M)	Present value of future water savings post-2014 (\$M)	Total value of water savings produced between 2004-2014 (\$M)	Present value of future water savings post-2014 (\$M)	Total Value
Potable substitution program	12,853	186.5	97.4	48.8	25.5	74.3
Conservation program	1,757	22.8	14.3	2.2	1.4	3.6
Other programs	675	8.8	5.5	1.3	0.8	2.1
Total	15,285	218.1	117.3	52.4	27.7	80.1

Source: DELWP and Aither analysis.

Functional water markets facilitating high-value water use

The improvements to water markets, institutional arrangements, water planning, and increased water information not only provided the means to recover and manage water for environmental purposes, but also provides a range of benefits to both users and managers of Victoria’s water resources.

The ability for irrigators to trade water entitlements and allocations rapidly and with confidence means that water is increasingly applied in its highest value use for agricultural production. Confidence in this process also encourages further investment in more productive irrigative systems and practices, while more broadly facilitating structural adjustments to the irrigation sector.

Overall, water market reforms funded by the EC have been key to environmental water recovery while both protecting and enhancing irrigative productivity, during one of the worst droughts in Victoria’s recent history. In summary, some of the key benefits of Victoria’s water entitlement and water trading framework (which unbundling and the VWR are central to) include:

- providing for the efficient allocation of the State’s water resources
- providing for individuals to make choices to manage their own individual circumstances
- enabling governments to avoid conflict by allowing the market to decide who gets water when the resource is scarce
- providing confidence for investment.

In aggregate, these improvements make water a more valuable input to agricultural production. This increased value is reflected in an increase in water users’ willingness to pay for water entitlements. As a result, water entitlements are undoubtedly more valuable than they would have otherwise been without the reforms achieved with EC funding. However, separating this impact on prices from the impacts of all other market forces on the demand for water entitlements is a complex undertaking. Aither believe that it is reasonable to assign an increase in entitlement value increase of between 2 percent and 5 percent. The total value of entitlements on issue in Victoria is estimated at

approximately \$5 billion based on current median prices. It is therefore estimated that between \$100 million and \$250 million of this value is attributable to the EC (without apportioning benefits to other funding sources of the VWR).

Indicative return on investment

Our indicative analysis shows that the total quantifiable economic benefits of the EC are expected to be in the range of approximately \$590 to \$930 million as a present value (over the life of the investments - see Table 7), as compared with the total investment of \$597.8 million.

It should be noted that the approach taken to quantify these benefits is broad and prone to a number of inherent difficulties. It is considered to provide an impression of value, not a direct estimate. Importantly, there are considerable benefits that are methodologically difficult to quantify in monetary terms, or lack data. There may be some double counting between the waterway health benefits and the market value of recovered water, since this recovered water is delivered as environmental water to achieve the waterway health outcomes that the community ultimately values. In addition, environmental water from the overall portfolio delivered in Victoria is much larger than the portfolio of water recovered by the EC, and environmental water has been applied more extensively than large scale river restoration. While it is recognised that the management and delivery of this additional environmental water has been funded by the EC and is expected to produce significant waterway outcomes, it is difficult to directly attribute these outcomes to the EC because the full portfolio of water entitlements was not funded by it. The economic value of managing and delivering the remainder of the environmental water portfolio has therefore not been captured in this analysis.

Table 7. Assessment of return on EC investment

Category	Lower estimate (Present Value, \$M)	Upper estimate (Present Value, \$M)	Confidence in valuation of outcome
Benefits:			
Improved waterway health	230	335	low
Market value of recovered water	110	135	high
Market value of urban water savings	72	88	medium-high
On-farm benefits	80	120	medium
Increased value of water entitlements	100	250	low-medium
Total	592	928	medium

Source: Aither.

1.4. Conclusion

Aither concludes that the EC investment has contributed to meeting its legislative objectives.

EC investment has resulted in a much needed step-change improvement in the sustainable management and use of Victoria's water resources through investments in more efficient water use, as well as the water planning, entitlement and market frameworks necessary to optimise the economic, social and environmental value of water and achieve the objectives of the NWI. These steps towards sustainable water management have been complemented by investments in knowledge and information that underpin public and private decision making.

The EC has also funded tangible and substantial initiatives that have addressed the environmental impact of water use, particularly through the creation of the EWR, recovery of around 75 GL of water entitlements, the establishment of caps on total extraction, ongoing efforts for coordinated delivery of environmental water to stressed rivers and wetlands, and complementary investment in LSRR projects.

The EC was used to fund improvements in the systems and knowledge underpinning the management of Victoria's water resources and to invest directly in large scale river restoration, recovery of water for the environment, more efficient use of irrigation and urban water, and potable substitution opportunities. The EC funded ground breaking and internationally recognised reforms to water access entitlements that improved security and confidence for water trading. The exponential increase in water trading enabled through these reforms was vital in minimising the impact of the Millennium Drought on irrigators, rural communities and the environment.

It is Aither's view that water resource management in Victoria leads the nation in many areas. This finding is broadly supported by inter-jurisdictional assessments by the National Water Commission (NWC) that highlight a strong level of overall achievement and performance towards objectives, particularly in comparison with other jurisdictions. The funding made available through the EC has undoubtedly contributed to the progress in water policy, planning and management reform in the state, as well as improved information and knowledge upon which management decisions are made.

Overall, the government, water users, and the environment are much better positioned for the next severe drought event as a result of the investments made possible by the EC.

The evaluation of the effectiveness and achievements of the EC would likely have demonstrated even better results if evidence on inputs, outputs and outcomes relevant to the EC had been collected and maintained by the Department in a more systematic manner. Gaps in consistent and more formal monitoring and evaluation processes also limit the ability for evidence based learning and adaptive management, particularly in complex policy areas involving significant private benefits (e.g. urban water savings, irrigation modernisation and on-farm investments) and those involving long-term environmental benefits that are inherently difficult to measure (e.g. LSRR).

The potential for poor value investment and/or misalignment with the EC objectives is greater for one-off ad-hoc investments (as opposed to longer term program of investment), and the effectiveness of such investments has proven to be more difficult to assess in this review. Aither notes that these sorts of investments became more prevalent in tranche 3. This risk can be reduced by ensuring that a strategic framework is in place that ensures that all investments are aligned with the EC objectives and demonstrate value for money.

1.5. Ongoing need

The EC provides much needed funding for water related policy reform and public investments in planning and knowledge. The EC provides confidence to invest and to maintain capability. It also provides a platform to tackle major water-related environmental issues and generate long-term benefits.

However, the ongoing need for EC investment depends on the Victorian Government's forward looking water policy objectives and other factors. As a result, a definitive assessment of the ongoing need for EC investment is beyond the scope of this project. In this context, Aither makes the following observations regarding the ongoing need for EC funding building on the more detailed discussion on this topic within each theme area:

- **Many of the initial policy drivers have changed:** There was an urgent need for step-change water reform in 2004 when the EC was established. With the easing of drought conditions and implementation of many initiatives (including major urban supply augmentations), the water policy agenda has moved on. The EC needs to be supported by a renewed, long term policy agenda addressing contemporary challenges and opportunities. Even in the absence of a formal policy paper, there is a need to provide clarity around how the objectives of the EC translate into a clear investment focus for the EC going forward.
- **The scale of need for investment in some themes has reduced:** With significant state and federal investment in water recovery and urban water systems and changing climatic conditions, the ongoing relevance of many of the major investment areas has diminished. If future EC expenditure is expected to be comparable to past expenditures, this further creates a need for the Victorian Government to redefine the future water policy agenda and major investment themes and focus for the EC.
- **Recent EC funding has moved away from the initial packages of investment:** As a result of the change in emphasis, tranche 3 investments are now contributing to a broader range of the Department's ongoing water management functions (also see VAGO 2014). Providing clarity around the ongoing role of the EC and ensuring that proposed investments are aligned with the objectives of the EC and provide net benefits will be important in ensuring that the EC remains an effective vehicle for achieving desired outcomes.
- **Follow through is required in many areas:** Despite the changes in priorities, there are some areas of investment that are ongoing and require further follow through to ensure that the benefits of previous reform efforts are captured and delivered in the future. Key examples include: environmental water management and delivery and complementary LSRR projects; ongoing requirements for effective water planning, entitlement management and markets; and knowledge and information. In some areas such as LSRR, significant investments to date (including water recovery for the environment) will be rapidly undone if past works are not protected. Moreover, the long-term aim of improving waterway health will achieve a better return on investment through the continuation of an integrated approach combining waterway activities and environmental water use. For river systems that have already had a significant investment in restoration activities, future investments will be small in comparison to the initial works. In addition, the benefit delivered by these works as they evolve and reach a point of ecological stability will continue to grow. They will also become more resilient to future shocks such as floods and droughts. However, the Department has noted that there are still systems across Victoria that require the establishment of new LSRR projects to achieve improvement in their environmental condition.

Overall, the early focus on implementing the OWOF 2004 agenda provided coherence to the first two tranches of EC investment. In response to changing conditions, there is a need for a renewed water policy agenda to guide the next phase of EC investment, and to ensure that the EC continues to

achieve meaningful outcomes. Without clear policy drivers and forward looking objectives, there is a risk that investment will be diffuse and outcomes will be difficult to demonstrate.

1.6. Recommendations

In the context of these conclusions and discussion of ongoing needs, Aither concurs with VAGO's recent recommendations. Aither recommends that the Victorian Government:

- 1) Continues to refine a set of clear policy objectives and clarifies the role and focus of the EC over the next four years and beyond.**

The EC was highly successful in delivering the OWOFF 2004 water policy agenda. This agenda has moved on considerably. Therefore, to remain successful in the future, EC investment should be focused around a renewed strategic platform with clearly defined needs, objectives and strategic solutions. This should include formal commitment to a set of policy objectives that add clarity and measurability to the current legislative objectives. This recommendation is consistent with VAGO's recommendation 2.

- 2) Further develops and implements an investment evaluation framework to assess the benefits and costs of proposed initiatives.**

All future EC project applications should continue to be accompanied by business cases that are consistent with an investment appraisal framework that is tailored to the types of investments for which the EC was designed (consistent with VAGO's recommendation 1). These should be consistent with Victorian Government requirements and include clearly defined benefits, risks and intended outcomes for the proposed investment. In addition, and in alignment with the requirements of the Department of Treasury and Finance, the business case should address: the role of government intervention; alignment with the EC objectives and future priorities (see recommendation 1 above); a description of the intended activities, outputs and outcomes; evidence of the links between outputs and outcomes; and a project specific monitoring and evaluation plan.

- 3) Implements a long term monitoring, evaluation and reporting framework to demonstrate effectiveness and efficiency and ensure ongoing appropriateness.**

Challenges encountered in undertaking this review stem from the absence of a systematic and comprehensive monitoring, evaluation and reporting (MER) framework that tracks outputs, outcomes and effectiveness over time. Adoption of such a framework will help better demonstrate the achievements and benefits of investment, and also enable opportunities for learning and refinement of activities and objectives. The monitoring and evaluation framework in Part C of this report provides an overarching approach that could be adopted to guide future effort in MER. It requires further tailoring to the future investment priorities. Aither strongly agrees with VAGO's recommendation 3 in this regard and note that this evaluation helps meet the Department's commitments to addressing the issues raised by VAGO.

- 4) Improves internal accountability and transparency for the management of the EC through annual public reporting.**

Aither agrees with VAGO's recommendation 4 that "the Department enhances public reporting of the Environmental Contribution Levy in annual reports and other mechanisms. This should clearly describe the purpose, benefits and achievements of the Environmental Contribution Levy and its funded projects and/or initiatives." However, we note that this recommendation is reliant on the full implementation of recommendation 3. It is also our view that enhanced transparency to external stakeholders will only be achieved through clear internal accountability for projects, investment themes and MER for the overall EC. Without clear internal accountability and sanctions for

inadequate performance (e.g. funding constraints to specific areas that inadequately report on outputs and outcomes) then it is likely that the challenges in assessing outputs, outcomes and cost-effectiveness will continue, to the detriment of the Department and the Victorian community.

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