



Asset management of irrigation infrastructure

The approach of Goulburn-Murray Water, Australia

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Abstract. This paper presents a case study of Goulburn-Murray Water's approach to the development and implementation of its asset management program for irrigation infrastructure. The success and effectiveness of asset management is not a matter of technical aspects only, rather it depends on an integrated package of institutional, organisational, technical and financial aspects.

Key words: asset management, irrigation assets, irrigation infrastructure

Asset management approach

Some background information is important to understand the asset management approach being taken by Goulburn-Murray Water. The particular approach taken by an organisation will be dependant upon its business and assets needs. Differences in organisational objectives, environment, constraints, assets, and what is achievable or acceptable to stakeholders will dictate different approaches to asset management.

There is no 'one best way', and an individual approach is required based on the range of external and internal influences. The external influences may include licensing, regulatory and statutory requirements, customer demands, current and future obligations, industry standards, financial framework and the taxation regime. The internal influences may include cost effectiveness, corporate policies, objectives and image, business strategies, due diligence and audit requirements. Asset management is also only one area of the business that has to be assessed, ranked and balanced with other areas to improve the total organisational performance.

Table 1. Business characteristics.

| | |
|---|----------------|
| <i>Infrastructure assets</i> | |
| Headworks current replacement cost | A\$1.4 Billion |
| Distribution current replacement cost | A\$1.6 Billion |
| <i>Total</i> | A\$3.0 Billion |
| <i>Financial profile</i> | |
| Revenue budget 1997/98 | A\$80 Million |
| Operating expenditure budget 1997/98 | A\$75 Million |
| Capital expenditure budget 1997/98 | A\$34 Million |
| <i>Resourcing</i> | |
| Workforce of 610 employees | |
| Outsourcing is about 50% of total expenditure | |

The authority

The Goulburn-Murray Rural Water Authority is a statutory authority which operates under the provisions of the Victorian Water Act 1989. It trades under the name Goulburn-Murray Water and is responsible to the Minister of Agriculture and Resources. Goulburn-Murray Water is the largest of the Victorian Rural Water Authorities created in July 1994, from the restructuring of the Rural Water Corporation under the Victorian Government water reform program. The Authority's 68,000 square kilometre region in north-east and central Victoria, encompasses over 500,000 hectares of irrigation.

Goulburn-Murray Water has two business divisions: Headworks, involving the management of the Headworks assets and the delivery of bulk water services; and Rural Water Services with the dominant segments being irrigation and drainage services. Goulburn-Murray Water works in partnership with the Victorian Government as equity owners of the business, as well as with its customers through Water Services Committees. Goulburn-Murray Water is headed by a skills based Board that includes the Chief Executive and seven Directors, appointed by the Minister and selected for their expertise in a variety of fields including business, finance, engineering, irrigation farming, water systems and environmental management.

Large scale irrigation development in the Goulburn-Murray Water region began in the late nineteenth century and continued until the 1960s, in response to social and economic moves to break up former large pastoral holdings and provide employment on smaller sized farms. In view of the relatively low

Table 2. Regional characteristics.

| | |
|--|-----|
| Output of irrigated agriculture about A\$830 Million at the farm gate: | |
| Dairying | 52% |
| Horticulture | 23% |
| Cropping and grazing | 25% |
| Value of irrigated agriculture to the regional economy about A\$2.2 Billion per year. | |
| Processed food exports from the region about A\$900 million per year. | |
| 520,000 hectares irrigated using a total of 2,500 million cubic metres in an average year. | |
| 60% of Victorian water use. | |
| Around 350,000 separate orders scheduled and delivered each year. | |
| Water use: | |
| Dairying | 55% |
| Horticulture | 3% |
| Cropping and grazing | 42% |

and irregular rainfall patterns, irrigation was seen as a means of intensifying farming in semi-arid areas and providing some assurance against drought.

The schemes involved conveyance of water over very long distances from rivers to farms through earthen channels on flat grades. The aim was to make irrigation water available to as many farmers as possible so as to provide drought assurance and supplement rain fed agriculture. By the 1970s irrigation development has reached a 'mature phase', and the emphasis is now on system modernisation aimed at improving water use efficiency, mitigating groundwater and salinity effects and reducing operating costs.

The management of Victorian irrigation schemes had been the responsibility of a central government agency. Restructuring of the water industry in Victoria over the last five years has resulted in major changes in management, financing and focus. Government has withdrawn from responsibility for the funding and direct management of irrigation schemes, and this role has been transferred to self funding corporatised bodies with a regional focus.

Goulburn-Murray Water utilises ageing irrigation infrastructure constructed over the last 100 years, with a current replacement value of A\$1.6 Billion, to deliver gravity and pumped irrigation, surface and sub-surface drainage, surface and ground water diversion, and domestic and stock water supply to customers on some 24,000 properties. These properties are located within the irrigation areas of Shepparton, Central Goulburn, Rochester, Pyramid-Boort, Murray Valley and Torrumbarry, and along the river systems of northern Victoria.

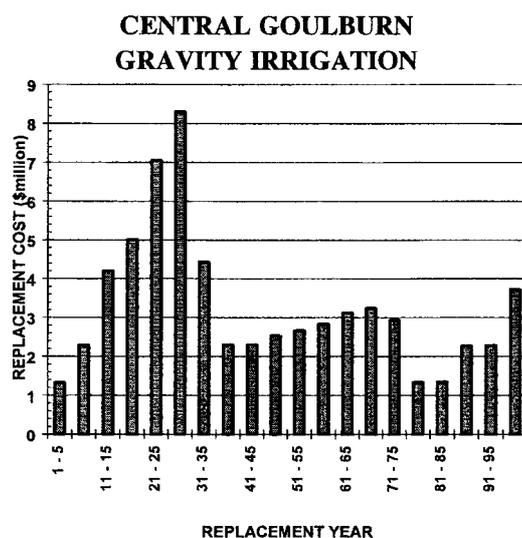


Figure 1. Asset replacement expenditure profile of Central Goulburn Irrigation Area.

The distribution infrastructure consists of a large mature network of long life passive civil assets spread over a wide geographic area, and effective asset management is a complex process. The assets include 6,756 km of irrigation channel, 394 km of domestic and stock channel, 249 km of pipeline, 2,931 km of drain, 25,244 structures and 24,492 water meters. Over the years many of these assets have been neglected, particularly during the 1970's and 1980's, through inadequate maintenance and replacement funding, and a large number of distribution assets are entering the later stages of their life cycle which will require sizeable expenditure in the future to replace assets now in use.

If Goulburn-Murray Water continues with its current practices, it is projected that replacement expenditure will have to increase from A\$30 Million over the next 5 years to nearly A\$200 Million over years 25 to 30. Figure 1 shows the 100 year asset replacement expenditure profile for one of Goulburn-Murray Water's six gravity irrigation services. While there is no immediate infrastructure crisis, the projected increase in future expenditure is a significant concern, requiring sound long-term asset management.

Asset management strategy

In a long-term capital intensive business, where maintenance and replacement costs of distribution assets currently represent over 50% of the cost of some services, effective assets management is recognised as critical to successful customer service, regulatory compliance and the business viability

of Goulburn-Murray Water. The Authority is therefore committed to the continuous benefit driven improvement in the performance of asset management to achieve ‘best appropriate practice’.

There is a need to define exactly what is meant by Asset Management. The term Asset Management is used by Goulburn-Murray Water to define the systematic and structured combination of management, financial, economic and engineering practices that are applied to physical assets over their whole life cycle, with the objective of providing the required level of service in the most cost effective manner. Goulburn-Murray Water’s asset management objective is to ‘*ensure that agreed service and integrity standards of the distribution assets can be met over the long term whilst minimising life cycle costs*’.

Goulburn-Murray Water’s asset management strategy places major emphasis on the integration of customer service, physical, financial and risk issues. Key elements of the strategy are:

- *Agreed levels of service* – A customer service focus with service performance objectives developed and agreed with customers.
- *Asset information* – Sound physical and financial asset data and appropriate management information and reporting systems to ensure efficient and effective management of assets.
- *Organisational focus* – Accountabilities and responsibilities for asset management are clearly assigned, staff at all levels of the organisation having asset management skills, and decision making processes are close to the customers.
- *Total life cycle approach* – Total life cycle approach to asset management, focusing on service delivery, risk and the minimisation of costs over the whole asset life.
- *Maintenance and replacement* – The appropriate maintenance and replacement of existing assets to meet agreed service performance objectives and safeguard assets.
- *Renewals pricing* – Renewals based pricing to ensure adequate financial provision for future replacement of required assets.
- *Cost reductions* – Cost reductions and flattening the projected asset replacement profiles.
- *Risk management* – Understanding and managing risk at acceptable levels.
- *Focus on performance outputs* – Focus on performance measurement, outputs, levels and costs of services.
- *Statutory and due diligence compliance* – Compliance with acceptable worker and public safety, property, environmental and risk standards, and statutory requirements and regulations.

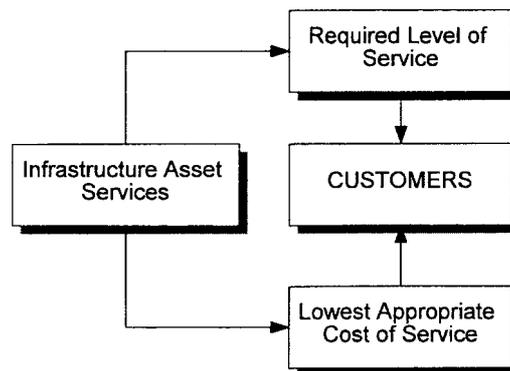


Figure 2. Asset management objectives.

- *Efficient resourcing* – Design, construction and maintenance of assets undertaken using the most efficient mixture of insourcing and outsourcing.
- *Continuous improvement* – Continual ‘benefit driven’ improvement in the performance of asset management to achieve ‘best appropriate practice’.

Approaches

Agreed levels of service

A key component of total life cycle asset management is the level of service and the need to ensure that assets can provide the level of service required by present and future customers, in terms of quantity, quality, access and reliability.

To get close to its customers and understand their needs, Goulburn-Murray Water has established seventeen Water Services Committees to represent the rural retail customers in the six Irrigation Areas, ten river basins and the Waterworks Districts. As an informed customer group between the Board and the general customers, Water Services Committees have a major influence on service standards, and play a lead role in the development of associated distribution asset maintenance and capital work programs and budgets. Figure 2 defines this relationship and the trade-offs involved. They have also driven the introduction and refinement of transparent financial reporting, differential pricing and an agreed pricing policy.

Customers Service Agreements are negotiated with Water Services Committees on an annual basis and include for each service, levels of service,

key performance indicators and standards, pricing policy, tariff and billing arrangements, respective responsibilities and agreed asset maintenance and replacement programs. An abridged version of the agreement is distributed to all customers. The actual performance is monitored and the results are published annually.

Water Services Committees seeking improved performance and accountability are driving continual improvements in asset management. The informed and empowered Committees scrutinise the maintenance and capital works programs for their respective areas, and managers need to have answers to their questions to justify the programs and pricing proposals being put forward. This drive and scrutiny is ensuring that the asset management process is being carried out in a cost effective and accountable manner.

Asset information

Under the pressure for improved performance and increased accountability, Goulburn-Murray Water has had to operate in a far more transparent way than its predecessor organisations. Where and how to spend limited budgets, price justification, cost/benefit analysis, risk assessment, repair/replace decisions, planned maintenance requirements, and life cycle optimisation are key issues. The old approach of 'trust us we know what is required' is no longer acceptable.

Goulburn-Murray Water is under continuous pressure to prove that it is doing everything it can to improve performance and reduce costs. To demonstrate this objective and transparent decision support systems that can stand up to customer and central agency scrutiny are needed. The systems and associated data required to enable appropriate responses to these needs are becoming more comprehensive and sophisticated.

Financial reporting

Decisions on asset management must be taken within the overall business framework of an organisation. Unless there is a financial framework with an integrated 'commercial' approach, many asset management issues become abstract concepts that have very little practical application or meaning. Costs need to be wholly or partly recovered from users of specific services, directly by way of charges. The charge for services need to be linked to the cost of the services, and the relationship between the service provider and user needs to be transparent, not obscured by Government.

A good cost reporting system is essential. Costs need to be segmented, with specific O&M and capital costs associated with activities and assets identified. Budget responsibilities need to be allocated, with disciplined use of job costing and regular reviews to control costs. This financial framework

is essential for the preparation of realistic budgets, determining the costs of services provided, justifying cost recovery from users, ensuring users receive the correct price signals, improved investment decisions, performance improvement and cost reduction strategies.

In 1995, Goulburn-Murray Water implemented a new integrated financial management system it called FAME – Financial and Management Evaluation system, which provides general ledger, project and job costing, budgeting, purchasing, inventory and accounts payable services. It is a key support system that enables effective performance management and the timely monitoring of works actually undertaken against planned programs and actual expenditure against target levels for project and unit rate costs.

Profit and loss statements and balance sheets have been developed for all services, and this has enabled the Authority and Water Services Committees to monitor and compare the financial performance of services.

Asset management information system

Sound physical and financial information is critical for effective pricing, business planning and asset management decision making. It is vital to know what assets an Authority owns, where they are, in what condition they exist and whether they can operate to provide the current and future levels of service.

In the past, the lack of credible asset information meant that predecessor organisations did not have the confidence of customers that maintenance and replacement expenditure levels were appropriate nor was there recognition by stakeholders of the need for increased expenditure in the future. Decisions based on ‘intuition’ or judgement are no longer acceptable.

Asset data is a key building block, that is required before any real progress can be made. The highest priority has therefore been given by Goulburn-Murray Water to the establishment of a computerised asset management system. The benefits of an information system are proportional to the quality of data input, and considerable effort has been directed into the collection, validation and refinement of appropriate asset data. The data gathering process commenced in 1990, with an initial ‘desk-top’ assessment, followed over a five year period by the field verification of all assets.

Confidence in the asset data is paramount. The best software systems are of little value without good data, and the system users and customers must have confidence in the outputs. Independent audits have been used to establish a high level of confidence in the accuracy of the data. The physical and financial asset data that is now available has achieved a recognition by stakeholders of the need for improved asset management and a general acceptance of the requirement for adequate maintenance and replacement expenditure.

The development, in consultation with Water Services Committees, of 100 year replacement profiles and detailed forward maintenance and replacement programs has led to a change from short term thinking based on history, to longer term planning based on a picture of what is likely to happen in the future. Customers now have increased confidence that maintenance and replacement costs are appropriate and need to be incorporated into water charges. The asset management information systems have been able to demonstrate the need for additional maintenance and capital expenditure, and since the early 1990's significant increases have occurred.

An on-going commitment is required to maintain up to date asset information. Maintenance, rehabilitation and replacement of assets is being recorded on an ongoing basis, and field inspections of all assets are planned on a 5-year average inspection interval to maintain the currency of the data.

The experiences of other organisations that have made significant achievements in asset management have shown that good computerised information systems are mandatory to effectively deal with the large amounts of data, and carry out the predictive modelling requirements that are fundamental to asset management.

The first computerised asset management system used by Goulburn-Murray Water was developed in 1990 by the then Rural Water Commission. The effective management of the authority's assets is a complex process, and in 1998 a more sophisticated Asset Management Information System (AMIS) with strategic planning tools was implemented by Goulburn-Murray Water. This second generation system, called AssetLife, with advanced asset register, flexible asset costing, asset lifecycle modelling, risk management, and optimised renewals decision making, is a commercially available package. Systematic analysis of costs and benefits of maintenance and replacement programs are now being carried out to assess if dollars are being well targeted.

Geographic information system

Predecessor organisations had prepared hard copy maps showing the infrastructure of Goulburn-Murray Water's irrigation areas. However, they were irregularly updated and were of limited use because of scale. To provide up-to-date and accurate location of assets over the authority's wide geographical area, a digital facilities mapping system of the six irrigation areas was developed, with the location of all assets shown and key textural information from the asset data base linked to the spatial data.

The digital data is stored on the mapping system in a series of layers. Each containing specific data types; topographic, cadastral, channels, drains, structures, meters and road network. Users have on-screen computer access to the up-to-date mapping data via a simple read only GIS package.

Organisational focus

Through the ensuring organisational changes of regionalisation, corporatisation, and the creation as a separate authority, Goulburn-Murray Water's organisational structure has developed a strong focus on asset management. Responsibility for asset management had been dispersed through predecessor organisations as part of normal line management duties, and the focus had been predominately on shorter term operational issues. There had been a lack of strategic focus in asset management, with inadequate attention being given to such areas as life cycle costing, risk management, and maintenance planning.

Asset management is now recognised by Goulburn-Murray Water as a key business activity, and the awareness and skills at all levels of the authority in asset management are continuing to develop. Roles and responsibilities are more clearly defined, and asset use has been separated from asset management, to provide long-term protection of the assets. A small central group of focused in-house staff with experience and technical expertise in asset management take the lead role in the corporate implementation of asset management initiatives. The work on asset management strategies, plans and information support systems is increasing in complexity, diversity and sophistication and this is requiring multidisciplinary team work and higher levels of technical, financial, economic and risk management skills.

The engineers, designers, operators, maintainers and accountants that relate to the asset life cycle must work together to achieve the optimum outcome. Asset management requires effective teamwork and flexible organisational structures, based more on 'process' rather than 'functional' lines.

The implementation of improved asset management in Goulburn-Murray Water has required patience and persistence. A senior management commitment is required, together with adequate resources and a culture of performance improvement. Asset management is not a glamorous engineering task, and the benefits are not recognised in the short term. The organisation must be receptive to change and responsive to customer needs. There will be resistance to change, and a champion with vision and fortitude is required to raise awareness, overcome doubters and blockers, and argue for resources.

Communication of the asset management objectives and awareness training programs are critical. The experience of Goulburn-Murray Water shows that organisational memory can be very short, and constant reinforcement of the principles of life cycle management are required.

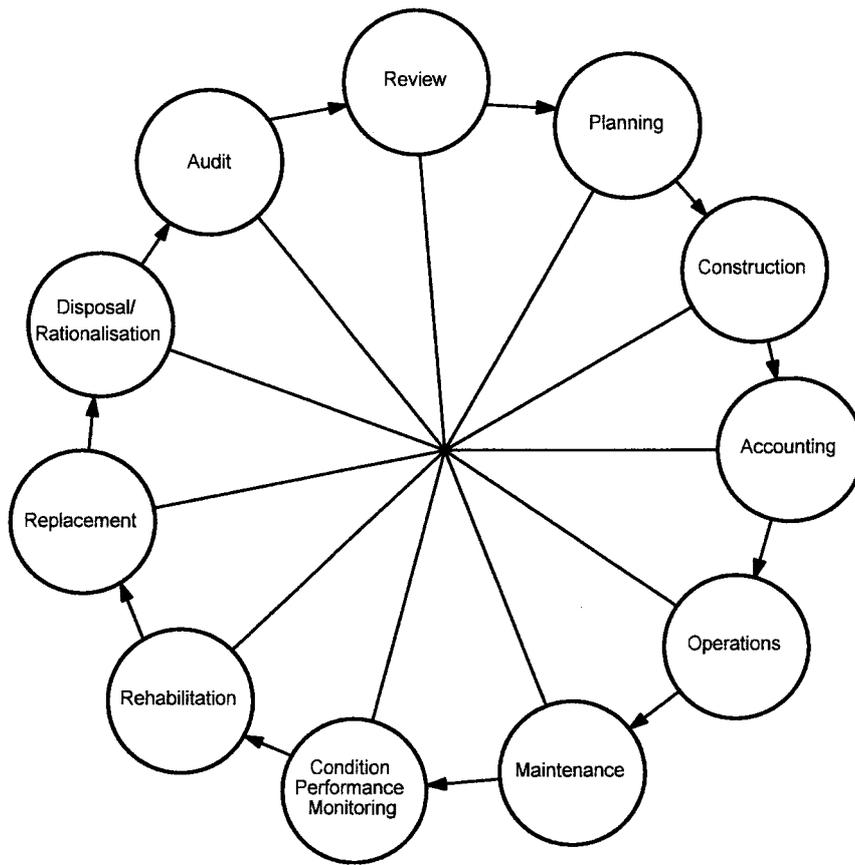


Figure 3. Life cycle process.

Total life cycle approach

The operation and maintenance costs of a channel or drain over its life, can outweigh the initial capital cost by several times. Short term cost savings can have long-term penalties in increased maintenance costs and reduced asset life.

Goulburn-Murray Water has adopted a whole of life asset management approach, which places a major emphasis on the minimisation of life cycle costs, not just the initial costs. Figure 3 shows the life cycle process, which includes the planning, design, construction, operation, maintenance, rehabilitation, replacement and disposal of assets. Predecessor organisations tended to treat these in isolation, but there are clear trade-offs that need to be optimised in a systematic way. However, external and internal influences can

dictate more a pragmatic approach based on commercial or political reality, the source and availability of funding and taxation regimes.

Predecessor organisations had a focus on capital solutions, because of the availability of Government funding for capital works and the desire to keep water prices as low possible. The concept of total life cycle approach is therefore most applicable where these influences do not apply.

Maintenance and replacement

Irrigation development in Goulburn-Murray Water has reached a 'mature phase', and the emphasis is now on consolidation of development and maximising the performance of existing assets.

Computerised maintenance management

Annual maintenance expenditure in the six irrigation areas is over A\$11 Million, and 'if it cannot be measured, it cannot be managed'. Improved maintenance management is a key element of the strategy to minimise life-cycle asset costs, and Goulburn-Murray Water has implemented computerised maintenance management systems in its six irrigation Areas. The need for an improved maintenance management system had been recognised for some time, however the Authority's long life passive civil assets distributed over a wide geographic area presented special system requirements.

In 1995, the Facilities Maintenance Management System, a commercial 'off-the-shelf' computerised maintenance management package, running on PCs was adopted for the six irrigation areas, with on-screen access to digital maps which identify the location of the asset on which the work is to be performed. The sophisticated system is being used to optimise maintenance planning, resource utilisation and implementation, analyse workloads, measure results and provide maintenance histories for effective maintenance, replacement, rehabilitation decision making. Performance measurement is critical to continuous improvement. Implementation has been a significant challenge and not without its problems. Industry experience has shown that computerised maintenance management systems are difficult to successfully implement and prone to failure. The experience of Goulburn-Murray Water has been no exception. Implementation is not a short term project, it requires a significant cultural change, and will not be successful unless fully supported by managers, supervisors and staff at all levels. However, staff and supervisors may feel threatened by the loss of control, increased accountability and the new technology. A performance improvement culture is required, and the change process may take three to five years. FMMS has fulfilled the expectations of a computerised maintenance management system, but



Figure 4. Asset management strategic directions.

success probably depends less on selecting the best technology and more on managing the organisational change process.

Investment planning and appraisal

Planning. In the past, short term planning horizons have meant that asset management and financial issues were not always being adequately addressed. Goulburn-Murray Water's move to longer term planning and the adoption of life cycle cost analysis has led to a more proactive asset management approach that focuses more on the business needs and provides maximum flexibility in minimising life cycle costs.

The Asset Management Information System (AMIS) now allows investment requirements to be predicted with a high level of confidence and much more attention is focused on the real business needs. Typically 80% of the capital program is the replacement of existing assets, and when dealing with long life assets such as channels and drains, long term planning is required.

Figure 4 shows how asset management needs to be considered at both 'macro' and individual asset levels. The planning process involves:

- Long term – 100 year asset replacement profiles
- Short term – 5 year investment plan
- Annual – first year plan

The 100 year expenditure profiles of asset replacement requirements of each

service are used as a key business planning tool. The 5 year plan is the primary planning document that contains well-developed details, and provides accurate five year expenditure forecasts. Beyond five years, the details become less certain and more subject to change. The annual plan provides all the necessary costs, details and budgets for implementation.

Water Services Committees play a lead role in the development of the asset maintenance and capital work programs and budgets, that are prepared each year as part of the Authority's business planning cycle. The resulting assets plans and programs form part of the Customer Service Agreements.

Goulburn-Murray Water's administrative authorisations define among other things, individual officers authority to approve capital projects. Subject to the levels of delegation for managers, works of certain values pass through a project evaluation phase to justify the investment and obtain approval for expenditure. Once a project is on the investment program, the individual project approval process is:

- *Initiation report* – Approval to commit funds to investigate and develop preferred solution.
- *Project report* – Approval in principle to adopt the preferred solution, commit funds and commence detailed design. Economic evaluation required for projects > A\$50,000.
- *Design report* – Acceptance of design drawings and subject to funding, for approval to proceed with implementation.
- *Post-project evaluation report* – Assessment of project implementation. Review and feedback on lessons learnt.

For small or routine projects, a number of the steps may be combined.

Appraisal. To ensure funds are allocated to areas of highest priority and optimal renewals decisions are being made, new and replacement capital expenditure proposals are subject to rigorous commercially based economic evaluation procedures using the Authority's Investment Appraisal Manual, supported by the systematic involvement of an economist. Asset investments are evaluated on an economic 'whole of life' present value basis using life-cycle and real costs.

With the limited funds typically available, it is necessary to prioritise works to address the most serious problems first. Priority setting is based on assessment of the following criteria:

- asset provides core service
- asset is at risk or unsafe

- system security is threatened
- service levels cannot be met
- project economic analysis
- Water Services Committee priority

The standard options considered for each renewals project include continued maintenance (no change), rehabilitation, replacement, rationalisation and non-asset solution.

In order to ensure that its limited capital is spent wisely, Goulburn-Murray Water policy requires:

- Mandatory economic appraisal of all projects with a total project capital cost greater than A\$50,000, with periodic review by the Authority's economist of the adequacy of these project appraisals.
- Mandatory endorsement of appraisals by the Authority's economist, as part of the approval process, for all projects with a total project capital cost greater than A\$300,000.
- Mandatory post-project evaluation for all projects with total project capital cost greater than A\$50,000, with periodic review by the Authority's economist of the adequacy of these post-project evaluations.

Renewals based pricing

To ensure long-term financial viability, adequate provision for the future replacement of assets is required, and Goulburn-Murray Water has adopted the renewals approach for pricing of its infrastructure assets. This has had a significant asset management benefit, sending the right messages to managers and customers, and linking asset management to the bottom line of the financial balance sheet.

In the past inadequate financial provision have been made for the replacement of assets, and the financial and engineering aspects of asset management were being addressed separately. The physical and financial data that is now in the Asset Management Information System, and the use of the renewals approach, with a renewals annuity and asset renewals reserve, has achieved a seamless integration between asset management and pricing. In the past pricing considered only O&M costs, and through renewals, prices now reflect the full costs of providing services.

The renewals concept is to provide sufficient funds for the sustainability of the service by including a relatively constant amount in pricing for future refurbishment and replacement of infrastructure assets. Under the renewals approach, the capital charge is not based on past expenditure levels, but reflects an assessment of the stream of expenditure needed in the future to

maintain the service potential of the assets. The renewal approach requires good asset information and planning to establish an annuity.

Renewals is a system of accounting for long life assets which assumes that the infrastructure system as a whole is intended to be maintained indefinitely at a particular service level by continuing replacement and refurbishment. Renewals annuity is the amount which needs to be set aside annually over a specified planning period in order to meet the projected pattern of capital expenditure required to sustain the service.

The Rural Water Corporation introduced renewals in 1992/93 for pricing purposes, and Goulburn-Murray Water has adopted a 20 year rolling planning period for calculating renewals annuities, as well as using 100 year replacement profiles to predict future trends beyond the 20 year period. In summary, the renewals annuity approach consists of:

- Appropriate forward planning period, plus
- Technical assessments, and
- Financial estimates, which together produce the
- Cash flow forecasts, which are then subjected to the
- Calculation of net present values and annuities
- Annuity amounts are accumulated in the asset renewals reserve
- Refurbishment and replacement expenditure is deducted from the reserve
- Successive revisions of the annuity to reflect changes

Profit and loss statements, and balance sheets incorporating renewals have been developed for all services, and the inclusion of renewals annuity in pricing, which can constitute 30% of the cost of some services, has clearly raised the commitment to improved asset management at all levels of the organisation, and focused managers on ways to reduce the projected replacement expenditure. The effectiveness of asset management strategies can be judged on the bottom line of the balance sheet.

Cost reductions

Productivity improvement

The Government's requirement to achieve financial self sufficiency of the real operating and capital costs of each service by 2000/01, together with Goulburn-Murray Water's commitment to restrict price increases where possible, has led to the creation and implementation in 1995 of a productivity plan that has delivered and will continue to deliver a 3.4% annual productivity improvement each year until 2000/01.

Table 3. Productivity improvement is driving a wide range of initiatives in the following areas:

| | |
|-------------------------------------|------------------------------|
| Performance focus | Competitive environment |
| Contracting out | Bench marking |
| Cost/benefit justification | Risk assessment |
| Value management | Changed work practices |
| Reduction of overheads | Design innovation |
| Life cycle cost analysis | Computer technology |
| Non asset solutions | Asset life extension |
| New materials | Team based structures |
| Cultural change | Questioning of how and why |
| Service orientation | Emphasis on core business |
| Continuous improvement | Research and development |
| Optimised decision making | Identification of true costs |
| Allocation of budget responsibility | |

Goulburn-Murray Water operated as a monopoly, and as such is protected from competitive pressures. The nature of the business with its fixed supply infrastructure does not easily allow for the provision of alternative service suppliers. In the absence of direct competition, the monopoly situation is difficult to address, but artificial competitive pressures have been introduced through the productivity plan.

Cost reduction and flattening the projected asset replacement profiles through better management of existing assets, extension of asset life, asset rationalisation, technical innovation, research and development and productivity gains, is a key asset management strategy. In reducing costs, a long-term view needs to be taken, as short term cost cutting can have a longer term cost penalty that may not be evident for many years.

Asset rationalisation

Rural restructuring, urban development, changes in farm irrigation technology and practices, property amalgamations and subdivisions have made some of the Authority's infrastructure constructed over the last 100 years no longer appropriate or optimal for the properties currently served. There is often the potential to reduce the number of assets, by disposal or ownership transfer, to the long-term benefits of the Authority and in many cases to the benefit of the landowners.

This process of reducing the authority's asset base has been termed Asset Rationalisation, and it is an important part of the asset management strategy. The key objective is to reduce the asset base, and hence future operation,

maintenance and replacement costs, where it is economically justified and can be achieved without affecting service levels. A rigorous approach to asset rationalisation has been adopted, and assets with a total replacement value of A\$4 to A\$5 Million are being abandoned each year.

Design

Goulburn-Murray Water places a major emphasis at the planning and design phases on minimisation of life-cycle costs, rather than just the initial costs. Designers must assess the life cycle costs of options, and Figure 5 shows the trade-offs to be considered. A poor design may result in expensive construction problems, high ongoing operation and maintenance costs or reduced asset life. The planning and design phases are of major importance. They are the lowest cost phases of any project, yet it is here that the greatest opportunity exists for minimisation of long-term costs. This is done by:

- Up front consultation with customers on output requirements
- Smart functional design
- Efficient detailed design and clear plans
- Consideration of constructability
- Cost – benefit analysis
- Evaluation of life cycle costs
- Risk assessment
- Standardisation of design details, specifications and processes
- Up front input from operational and maintenance staff
- Selection of the most appropriate components
- Specification of the most appropriate construction materials
- Designing out maintenance problems
- Use of value management techniques

The objective is the lowest overall cost and this may be a non-asset solution. One or two percent more spent on design costs may save ten to fifteen percent of the project costs. Balance is required between either under-resourcing the design phase and hence non-optimal solutions, or over-resourcing and incurring high design costs.

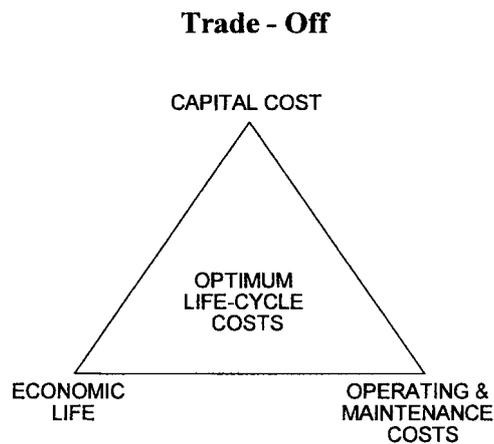


Figure 5. Trade-off.

Research and development

To achieve cost reductions in operations, maintenance, construction, replacement and rehabilitation of assets, Goulburn-Murray Water is committed to research and development of new technology, methods and techniques. Priority is being given to those areas of high future expenditure where potential exists for greatest efficiencies and cost reductions. Analysis of asset data is being used to identify the areas of highest strategic priority, and research and development proposals are considered as part of the annual business planning cycle. A research and development co-ordination committee has been established to oversee research and development activities and ensure that the Authority's strategic business needs are being targeted. Current asset research projects include earthen channel banks, open surface drains, channel regulating structures and meter outlets.

Risk management

A risk management approach has been adopted by Goulburn-Murray Water as a key business management strategy. Clear accountability and responsibility for assets and their performance have been established and systems to support due diligence requirements are being put in place. Risk management is an integral part of good asset management, as every asset management decision is a risk management decision. Some retail distribution assets fulfil a critical role in the delivery of service, while many other assets are much less critical, and the application of risk management to the life cycle asset management process provides an opportunity to gain benefits and reduce costs. This may

involve accepting higher levels of risks and adopting different approaches to reduce costs.

The objective is to identify all assets in order of business risk, and understand and manage the risk expose at acceptable levels, addressing areas of highest ranking first. Goulburn-Murray Water's new asset management information system (AMIS) has a risk management module, and this will provide asset managers across the organisation with a greater ability to systematically and consistently identify high and low risk assets, and deal with them in the most cost effective manner.

Focus on performance outputs

Goulburn-Murray Water has adopted an outward focus on standards and costs of customer services, with specific performance targets established and agreed with customers. Predecessor organisations were more focused on inward needs, such as continuing internal employment levels, and engineering solutions driven by internally perceived needs and design resources. Attention has been focused on results by assigning clear accountability and responsibility for assets and reporting requirements.

Statutory and due diligence compliance

Compliance

Stake holders are demanding higher standards of worker and public safety, and property and environmental protection. Environmental and safety issues are becoming more significant, with risk minimisation and due diligence important factors. The potential liabilities of continued operation of old works and equipment, involving staff working alone, carrying out physically demanding manual operations, and exposed to outdated lifting gear, walkways and hand-railing, has become an important driving factor in upgrading and modernisation.

Regulatory

It is proposed to establish an Operating Licence agreement between the Victorian Government and Goulburn-Murray Water, under a 'light handed' regulatory environment. The concept of an independent 'regulator' is sound in principle, but its practical application is questionable. A regulator will find it very difficult, if not impossible, to assess asset management performance in the short term (3 to 5 years), because of the long response time between inputs and outputs. Because of this 'lag effect', poor asset performance may only be evident in later stages of life and neglect may not be readily apparent.

The development of a monitoring regime can be a complex and difficult process. The regulator will require technical expertise, and there will need to be in place appropriate asset management systems to accurately assess maintenance and replacement requirements, to carry out benchmarking and trend analysis. Even then, the data and systems can be easily manipulated. In the short term an output focus will not be enough, and a regulator will have to monitor asset management inputs, such as methodology, processes and quality management approaches.

Efficient resourcing

The strategic approach adopted by Goulburn-Murray Water is to use a mix of insourcing and outsourcing to deliver its services and programs. Strategic and core business activities are undertaken by insourcing, while support and non-core business activities are undertaken by a mix of insourcing and outsourcing. Goulburn-Murray Water's view is that a mixture of insourcing and outsourcing will provide the most cost effective method. It is recognised that outsourcing can significantly improve efficiencies and reduce costs.

The benefits have included the creation of competitive pressures to provide best practices and reduce costs, specialisation, economies of scale and increased flexibility to meet demand and funding variations. The need to maintain in-house, sufficient levels of critical expertise, flexibility and supervisory skills is an important part of Goulburn-Murray Water's outsourcing strategy. However, it is recognised that there are potential problems in any outsourcing exercise, and the Authority has been cautious of sweeping assertions and the implications that outsourcing is the cure for all cases.

Its approach has been to examine each instance carefully and individually to determine if there is a business case to proceed with outsourcing. Where it can be identified that the benefits of outsourcing are both real and sustainable, those functions and activities will be contracted out. A regular monitoring and benchmarking process is used to review the competitiveness of in-house services and determine whether a particular activity should continue to be insourced or outsourced.

Continuous improvement

Best appropriate practice

Goulburn-Murray Water has looked at the asset management approaches, methodologies and practices used by a number of other organisations. In many cases, these organisations were pursuing world best practice asset management, however it is Goulburn-Murray Water's view that so called world best practice may not be required or warranted for every business.

The level of sophistication required is dependent on the assets and the needs of the business, and Goulburn-Murray Water's approach is to identify the amalgam of theory and practice, that can be cost effectively applied to distribution assets to achieve 'best appropriate practice'. The objective is a steady rate of progress towards this 'best appropriate practice', and any activity undertaken to be 'benefit driven'.

Asset management systems can generate a lot of information and identify many issues that need to be addressed. Do not attempt too much too soon, concentrate on priority areas, look for the 20/80 rule, (20% of assets cause 80% of problems) to achieve quick wins with minimum effort and maximum benefits. It is not an ideal world, and asset management processes are subject to all the pitfalls that exist in organisations. Asset management should be kept as simple as sensible, and be cautious of introducing complexities that may not add value to the outputs. Given a choice, adopt simple approaches and do not try anything too big too soon.

Advanced asset management can take considerable expenditure and time to implement, and it will take much longer if you do not have a lot of money. A long-term business view is needed, that spreads expenditure over a number of years and does not attempt to solve all problems at once. With limitations on available funding, an incremental 'pay as you go' approach has been adopted by Goulburn-Murray Water. The strategy is to develop asset management as an evolutionary process, based on realistic time frames, with ongoing performance monitoring and reviews to compare actual to predicted, expanding it in complexity and sophistication to suit the authority's needs in an order that produces the most cost effective benefits.

Performance measurement

The development of performance indicators and targets to measure how well an organisation is meeting its asset management responsibilities is a sound concept, but difficult to apply in practice. Asset management bench marking with other irrigation organisations is also difficult because of the differences between business objectives, asset age profile, value of asset base, geology, environment, seasonal conditions, construction and maintenance costs etc. These differences need to be taken into consideration when analysing results and can make comparisons difficult.

Cost effectiveness of strategy

The overall cost effectiveness of Goulburn-Murray Water's approach to asset management is difficult to quantify. Although the objective of asset management is to reduce costs over the long term, it does involve an initial investment

of resources and the costs can be quite significant. It can also be difficult at the time of implementation, to demonstrate a return to the organisation for the initial investment, as the benefits can be hard to quantify and are realised over the life time of the assets.

Over the last five years, in the order of A\$1 Million has been invested in gathering data on Goulburn-Murray Water's assets and development of the asset management data base. A significant component of this expenditure involved the initial data gathering, and based on the total asset replacement cost of A\$1.6 Billion, this expenditure represents a fraction of one percent. Given the magnitude of the projected increases on maintenance and replacement expenditure over the next 20 years, the size of the potential asset management 'prize' is too great to ignore. Apart from the initial data gathering, other asset management initiatives, such as computerised maintenance management, the digital mapping system and the new asset management information system have been subject to a cost benefit analysis to ensure the costs are justified.

The theory says that there will be real short and long-term asset management cost savings through avoiding capital expenditure, ensuring life cycle costs are minimised, and optimising asset performance. While, it is early days in respect of measuring the success of Goulburn-Murray Water's asset management strategies, counter to the theory, maintenance and capital expenditure has actually increased significantly as the backlog of asset neglect is addressed and the risk exposure is reduced.

Conclusion

Improved asset management is recognised by Goulburn-Murray Water as critical to its business viability. Whilst there is still a long way to go to achieve best appropriate practice, the advances that have been made by Goulburn-Murray Water have laid a firm technical and financial base on which to build for the long term. Managers will have the facts and analytical ability to better understand the business, and make better asset management decisions. It is hoped that the asset management approach being taken by Goulburn-Murray Water will be of interest to other organisations seeking improved management of irrigation assets.

