AN IRRIGATION SUSTAINABILITY ASSESSMENT FRAMEWORK FOR REPORTING ACROSS THE ENVIRONMENTAL-ECONOMIC-SOCIAL SPECTRUM

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ABSTRACT

In order to promote irrigation sustainability through reporting by irrigation water managers around Australia, we have developed an adaptive framework and methodology for improved triple-bottom-line reporting. The Irrigation Sustainability Assessment Framework (ISAF) was developed to provide a comprehensive framework for irrigation sustainability assessment and integrated triple-bottom-line reporting, and is structured to promote voluntary application of this framework across the irrigation industry, with monitoring, assessment and feedback into future planning, in a continual learning process. Used in this manner the framework serves not only as a "*reporting tool"*, but also as a "*planning tool"* for introducing innovative technology and as a "*processes implementation tool"* for enhanced adoption of new scientific research findings across the irrigation industry. The ISAF was applied in case studies to selected rural irrigation sector organisations, with modifications to meet their specific interests and future planning.

INTRODUCTION

Worldwide irrigation productivity needs to be increased. Irrigators and water managers need to be encouraged to adopt more efficient and productive irrigation practices. However, it is of paramount importance that such adoption of improved efficiency practices takes place within the context of ensuring long-term environmental, economic and social sustainability. The "Sustainability Challenge Project" of the Co-operative Research Center for Irrigation Futures was developed to understand and promote irrigation sustainability through triple-bottom-line reporting by irrigation water managers around Australia (Christen et al. 2006a). An important aim of the project was to provide an adaptive framework and methodology for improved triple-bottom-line reporting by irrigation organisations, which enhances sustainability on environmental, economic and social issues of concern to the stakeholders. This could be achieved by (a) developing a comprehensive framework for irrigation sustainability assessment

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and integrated triple-bottom-line reporting, and (b) voluntary application of this framework across the irrigation industry, with monitoring, assessment and feedback into future planning, in a continual learning process. Such complementary applications of the framework thus provide a powerful tool for the communication of the irrigation community's position, contributions and concerns in the current water resource allocation debate. This in turn will allow a more balanced consideration by governments and the community-at-large of the concerns of the irrigation community in the allocation of limited water resources. In the urban irrigation sector, the framework could encourage progress toward more widespread use of sustainability reporting.

The desirable features to incorporate in developing such a voluntary irrigation sustainability assessment framework to guide irrigation water managers current and future practice of annual reporting are:

- Relate directly to irrigation managers interests in increasing irrigation sustainability, and provides for easy adoption in their current reporting practices
- Provide simple guidelines for comprehensive and detailed scientific reporting on irrigation sustainability in their reports, through adoption of the framework guidelines and procedures
- Provide a degree of comparability in reporting across the irrigation sector, which will promote uniformity in structured reporting and also encourage dialogue between stakeholders
- Provide a degree of flexibility for each irrigation manager to adapt to the local conditions and cater for the local regulator reporting needs
- Provide direct link to current and future sustainable management planning and actions
- Relate to standardized international reporting systems like the Global reporting Initiative (GRI) (Global Reporting Initiative, 2002) and their reporting principles, to obtain the benefits of conforming to such systems in complementary usage with the framework
- Accommodate compiling data to a national scale dataset which can be used in scientific lobbying of the irrigation community position, contributions and concerns to the governments and the broad community, in the current water resource allocation debates

In rural irrigation areas, the most suitable reporting units are the geographically well defined entities of irrigation schemes where in Australia annual compliance reporting is a widely prevalent current practice, which could be made more comprehensive by accommodating triple-bottom-line reporting. This paper describes the development of an appropriate framework for rural irrigation.

Triple Bottom Line Reporting

The triple bottom line (TBL) concept provides both a model for understanding sustainability and a system of performance measurement, accounting, auditing and reporting (Elkington 1998, Vanclay 2003). It is generally accepted that the TBL refers to the economic, social and

environmental aspects of business performance (Global Reporting Initiative 2002). However, the performance of these three factors should not be viewed in isolation from each other, but as an integrated suite for sustainability, and the broad nature of the three components should not be lost in a narrow indicator definition process that loses sight of the integrated and all encompassing nature of sustainability (Vanclay 2003).

At its core, TBL reporting is a process of developing, monitoring and reporting on indicators of performance across these three spheres seen as vital to the continuation of the enterprise. Because the three spheres are interdependent, a change in one sphere has the potential to impact on the other spheres. This approach allows those involved to reflect on what is occurring within the organisation, its own economy, environment and society but also to consider how the organisation impacts on the economy, society and environment outside

The TBL reporting approach is not only a communication tool, but becomes a part of a process to improve the sustainability of an organisation. A very important aspect of TBL reporting is the underlying iterative process of a learning cycle of planning, taking action, and observing and reflecting upon the result. Through this process, the data collected in the report provides information on which to reflect and develop new directions as required.

In particular, the process of TBL reporting provides an opportunity for the organisation to reflect on its role as part of a larger social system. Identifying the issues that undermine sustainability across the TBL requires input from a breadth of internal and external stakeholders. It establishes a platform for discussing these issues between people that wouldn't normally meet and communicate across boundaries within the organisation and between the organisation and its external stakeholders. Such an exchange provides some level of ownership of the outcomes by staff and the wider community, especially if it extends into deciding what should be done to respond to the issues raised.

A widely used format for the integration of TBL concepts about sustainability into business is provided by the 2002 Global Reporting Initiative (GRI) guidelines. For more information on TBL and GRI potential in irrigation sector see Shepheard et al (2006). These guidelines are used by Australian and international businesses to produce reports that rank highly on the world sustainability reporting stage (SustainAbility et al. 2004). TBL reporting, including the use of GRI format, is increasingly evident in the broader water utility industry (e.g. Sydney Water, City West Water, Melbourne Water, SA Water) and is becoming an important tool to complement sustainability management within irrigation companies (e.g. Murray Irrigation Limited).

Indicator Driven or Objective Driven TBL Reporting?

There is a large volume of literature on activities undertaken in Australia and overseas on sustainable development methodology and the use of indicators. These sustainable development activities have been carried out across a range of agricultural and business sectors, on scales ranging from local, regional to national. Chesson et al. (2000) provides an extensive and critical review of previous work relevant to agriculture, forestry and fisheries in Australia. Ashley et al. (2004) provide a detailed review on sustainability assessment in the water services industries.

The relatively straight forward approach of using a core set of indicators to measure sustainability in specific sectors has a great attraction, which has in recent years led to new initiatives and associated actions across many sectors. However, in dealing with more complex systems like agriculture and fisheries, using core sets of indicators have failed to live up to expectations due to the following characteristics which lead to problems in adoption, as described in a review by Chesson (2002).

There are a number of reasons why this process often fails to develop effective indicator sets. People may be suspicious of the potential use of the indicators, for example, there is concern that indicators may be used in determining the distribution of funds or for regulatory purposes. A specific indicator may not be appropriate in all circumstances. One size rarely fits all and different countries and regions discover that indicators need to be modified to suit their needs. For example, indicators such as length of hedgerows that are appropriate in some European countries have little relevance in Australia. Considerable resources are also needed to collect, collate and report on the indicators. These are difficult to justify when the people being asked to collect the information receive no obvious, short-term benefit. Simple indicator sets have trouble measuring all aspects of human aspirations, or adequately addressing complex concepts. If an indicator set omits aspects that are regarded as important, it is unlikely to receive widespread support."

A more successful approach to measuring sustainability in complex systems is to use a structured approach to identifying the main issues or objectives relating to sustainability, and then address these objectives using selected indicators and performance measures (Chesson et al. 2000). This approach correctly shifts the focus to what the stakeholders want to achieve and the indicators become a means of reporting against the specific objectives. Chesson et al. (2000) and Chesson (2002) proposed a four-step structured approach that addresses all these above-mentioned problems arising from using core sets of sustainability indicators, which increases the chances of broader industry support and adoption, in relation to sustainable development of fisheries in Australia. These four steps in the SCFA (Standing Committee on Fisheries and Aquaculture) method for a national framework for sustainable fisheries are:

STEP ONE: Develop a conceptual framework. The framework should clearly define who or what is being evaluated. It should explore the meaning of 'sustainable development' and articulate our visions and aspirations in achieving it. This would be in the form of an overall objective such as increasing total quality of life.

STEP TWO: Sub-divide the overall objective into successively more specific objectives until we get down to objectives that can be measured. These are operational objectives. Their identification requires extensive consultation involving all stakeholders.

STEP THREE: Identify indicators that address the operational objectives. An indicator often follows fairly easily once an operational objective has been defined. Technical effort is not wasted on indicators that are not relevant.

STEP FOUR: Aggregate indicators at lower levels to form a core set if this is needed for

reporting convenience. This does not mean destroying the information at lower levels. Information should remain accessible at whatever level of detail is required".

Once the broad objectives are identified, the subdivision of each broad objective into more specific sub-objectives and operational objectives constitutes a generic component tree. In the SCFA system, each individual fishery which constitutes a reporting unit, then takes the generic component tree as the starting point and tailors it to suit its circumstances. Some components could be expanded and others collapsed. Each fishery can then select the appropriate indicators and performance measures for the chosen operational objectives. Modifying the generic tree and selecting the appropriate indicators and performance measures are undertaken by each fishery, in an open consultative process involving the stakeholders.

AN "IRRIGATION SUSTAINABILITY ASSESSMENT FRAMEWORK" FOR THE IRRIGATION SECTOR

In developing a sustainability assessment system for the irrigation industry, a structured objective-driven approach was adopted and linked to the GRI. An Irrigation Sustainability Assessment Framework (ISAF) was developed to meet the specific characteristics of the irrigation industry (Christen et al. 2006b). The reporting unit can be an irrigation company responsible for providing and managing irrigation water to farmers or an agency with responsibility for urban irrigation activities such as sporting fields. The reporting unit is therefore be a physical entity with a specific geographical region. This allows reporting to be directly linked to management actions by the stakeholders in the area of irrigation.

We propose a structured framework and methodology which has many common features with the SCFA systems. The framework consists of four tiers of sustainability principles, high-level objectives, and generic component trees to define operational objectives, with links to indicators and performance measures. Quantitative indicators should be proposed wherever possible, as discussed in GRI guidelines 2002. As suggested in the SCFA system, each irrigation company can adapt the generic component tree to suit its circumstances in defining the operational objectives, indicators and performance measures. This could involve expanding some subcomponents of the generic tree and collapsing others. The irrigation unit can report against each selected operational objectives, using the indicators to measure performance and the associated management response. Since the ISAF system is designed for use within the rural irrigation sector, at the higher levels the generic tree is likely to be similar for all irrigation companies, while at the lower level they could diverge in response to different local environments. The achievement of common objectives, rather than measurement of common quantities, become the basis for reporting progress (Chesson 2002) and hence are more likely to be accepted by the industry at a national level. Although the ISAF was developed by working with water provider organisations, it is possible to modify the assessment framework for application by other irrigation related organisations. It has also been adapted for the urban irrigation sector (Atkins et al., 2006). We propose a structured framework and methodology which consists of four tiers (Figure 1);

1) Sustainability principles,

2) High-level objectives,

3) Operational objectives, and

4) Indicators and performance measures.

Each water provider company can adapt the generic component tree to suit its circumstances in defining the operational objectives, indicators and performance measures. The water provider companies can report against each selected operational objective, using the indicators to measure performance and the associated management response. Quantitative indicators should be used wherever possible, as discussed in GRI guidelines.

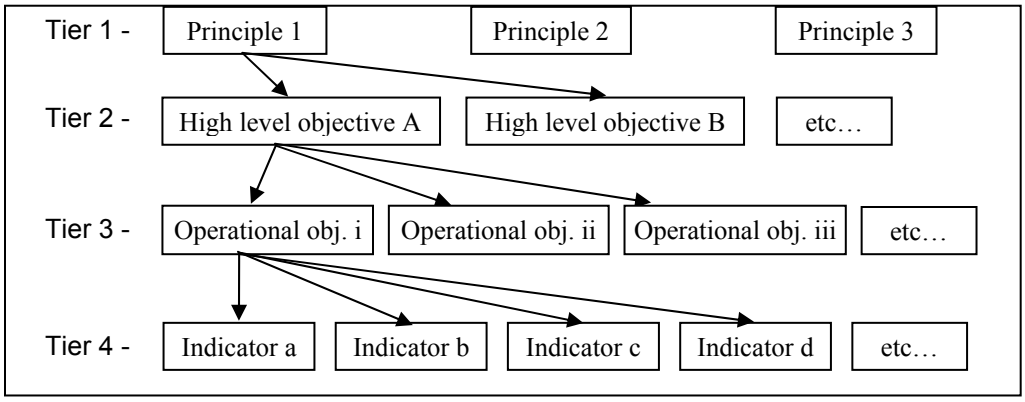

Figure 1. Four tiers of Irrigation Sustainability Assessment Framework (ISAF)

The four tiered ISAF is not intended as a stand alone approach but rather for complementary use and integration into the GRI reporting format, providing the irrigation industry specific context to the generic nature of GRI, whilst retaining the credibility associated with the internationally accepted GRI framework. As such, the ISAF is complementary to the GRI sustainability reporting approach, in providing a more detailed assessment framework on the specific scientific and technological sustainability aspects of the irrigation sector for voluntary compliance reporting. Thus, the tiers in the ISAF can be closely associated with the various levels in the current GRI guidelines, Table 1.

Table 1. ISAF tier levels and associated GRI levels

ISAF Tier level	*Associated GRI level*
1. Sustainability principles	Vision and strategy
2. High-level objectives	Category
3. Operational objectives,	Aspect
4. Sustainability indicators and business performance measures	Performance indicators

Since the ISAF is designed for use within the irrigation sector we expect the sustainability principles to be a shared overarching vision and high-level objectives as shared goals. At the higher levels the generic tree is also likely to be similar for all water provider companies, while at the lower levels they can and will diverge in response to different local environments. For instance, the water provider companies can select their preferred indicators to suit the local monitoring and reporting requirements, thereby providing the appropriate flexibility required to promote voluntary adoption. The achievement of common objectives, rather than measurement of common quantities, become the basis for reporting progress and hence are more likely to be accepted by the industry at a national level.

The sustainability principles that we have developed are based upon Australian accepted definitions of sustainability (Commonwealth of Australia 1992). The National Water Initiative is a joint initiative of Federal and State Governments aiming at sustainable use of water resources in Australia. The National Water Initiative has recognised the continuing national imperative "*to increase the productivity and efficiency of Australia's water use, the need to service rural and urban communities, and to ensure the health of river and groundwater systems by establishing clear pathways to return all systems to environmentally sustainable levels of extraction for irrigation and other uses"* (National Water Commission 2004). This statement directly relates to triple bottom line sustainability associated with our water resources. Based on the above and other nationally accepted sustainability policy directions, our irrigation sustainability principles can be broadly identified as follows:

1. Ensuring the health of river, groundwater and drainage water systems that provide the irrigation water supplies, and maintaining extractions at sustainable levels.

2. Using, conserving and enhancing the land, water and biota resources in the irrigation areas and associated areas, now and into the future.

3. Maintaining and improving the economic benefits and social services to irrigation related rural and urban communities to enhance the quality of life, now and into the future.

We have communicated with Australian water providers and the irrigation industry at large to obtain feedback on these principles as the starting point for a national approach to sustainability reporting and the 1st tier of the ISAF. Selected case studies were used for developing and testing the ISAF, and for obtaining the stakeholder feedback.

Developing High-Level Objectives

The high-level objectives are essentially based on the "broad issues of concern" of the stakeholders, in relation to the environmental, economic and social sustainability of irrigation projects. An iterative process was used to facilitate the development of the high-level objectives for irrigation water providers in Australia, consisting of the following steps:

- Step 1 - Examination of the current annual reports of irrigation companies in Australia and their Land and Water Management Plans (LWMPs) to extract and compile the "broad sustainability issues of concern" of the stakeholders, and an assessment of their subcomponents and their relative importance, to prepare a preliminary listing.

- Step 2 - Circulation of this preliminary listing and the draft procedural guide to key personnel in irrigation companies. Using this feedback to revise this listing and developing the high level objectives in the environmental, economic and social disciplines and in multi-disciplinary areas.
- Step 3 - Seminar presentation and face-to-face discussion on the listing with the irrigation companies and other stakeholders to refine the list.
- Step 4 - Present the high-level objectives list and associated component trees at the pilot case study workshops with the stakeholders to adapt the component trees to local conditions in the irrigation scheme. Use the feedback from case studies to refine the high-level objective list.

Through an examination of the current annual reports of irrigation companies in Australia and their LWMPs the following "broad sustainability issues" of concern to the stakeholders were extracted into a preliminary listing of step 1 above. During a case study conducted with Murrumbidgee Irrigation Ltd (Mitchell et al. 2006) a meeting with staff was held, the participants were requested to provide a list of issues of concern. The issues identified at the meeting were combined with the preliminary listing from the literature, and grouped as follows:

- Water use efficiency and water productivity of irrigated crops (irrigation, drainage, groundwater use, reuse, infra-structure maintenance, irrigation technologies, energy reliance)
- Maintaining healthy landscapes (irrigated lands, wetlands, rivers, watertables, biodiversity)
- Water availability and supply from rivers and ground waters to irrigation schemes, and its seasonal dynamics/politics in meeting the demands of a variety of customers (Living Murray debate)
- Irrigation company governance issues such as finances/resource utilization services/administration/ staff management (communication, safety, training, employment security)/ monitoring and data management services
- Farmers economic performances, water trading opportunities, farm prosperity, markets
- Economic benefits to the region (employment, tourism, value adding industries)
- Irrigation community aspirations in education/health/employment opportunities/ recreation/desirable lifestyles
- Stakeholder engagement/education
- Image of irrigation industry, political significance, risk identification and management

These broad issues of stakeholder concern across the entire environmental-economic-social spectrum were then compiled and re-organised to define the high level objectives under the three disciplinary fields of environmental, economic, social areas. In carrying out the above identification of high level objectives there is flexibility in selecting the number of high level objectives identified to a convenient number, possibly around 10. However, the more important consideration was to ensure that all the issues of concern are adequately addressed within the specified high level objectives. Based on the above listing and subsequent organization under the

three disciplines, the high-level objectives were identified and defined through discussions within the research team, as follows:

Environmental/biophysical
(1) Increase water use efficiency/productivity
(2) Protect irrigated lands from adverse environmental impacts
(3) Control degradation of associated water bodies and surrounding environment, and maintain biodiversity
(4) Harmonise irrigation with water supply sources (Enviro-socio-economic)
Economic
(5) Maintain profitability of farm businesses
(6) Improve economic well-being of region and growth in business activity in the region
(7) Improve irrigation company governance (Socio-economic)
Social
(8) Increase well-being and quality of life of farm families (Socio-economic)

It is worthy of note that the workshops undertaken in urban communities identified the same issues with the addition of the availability and use of alternative water sources such as reclaimed sewage effluent. Because of prolonged drought and competition for potable water this emerged as a high priority issue. The high level objectives defined above were also found applicable with minor alterations to the urban context.

Developing generic component trees for specific high-level objectives

There are two basic approaches that could be used in developing the generic component trees for each specified high-level objective. A scientifically based top-down approach could be used, continuing the structured approach of the ISAF. This approach was used in developing the high-level objective of "increasing water use efficiency and water productivity". Alternatively a bottom-up approach could be adopted, utilizing information from selected case studies through the stakeholder consultative and participatory approach to identify operational objectives and indicators. These operational objectives and indicators can then be matched to the appropriate high-level objectives. In addition, we could use a combination of these two approaches. A combined approach was used in developing the component trees of other high-level objectives.

UNDERTAKING TBL REPORTING USING THE ISAF

The following is an example of the steps in developing TBL reports which might be applicable for any organisation, business, group or authority. The steps briefly outline a suggested process but can be adapted as required. Obviously not all steps will be necessary in all circumstances. For example in the urban context irrigation may be only one part of an organizations responsibility, therefore, rather than several workshops, communication may be on an individual basis and may be in a different sequence to that suggested.

The process shown in Table 3 was developed after reflecting on our involvement with rural-based irrigation supply companies as part of our development of the ISAF. If this seems

applicable to your situation, we suggest you adapt this approach to best suit your circumstances. Further details on each step are provided below the table.

Getting Started:

1) Determine who the project team is that will be involved in developing TBL reporting in the organisation.
2) Develop an invitation list for an initial goal-setting workshop. The invitation list should be as inclusive as possible.
3) Hold inaugural workshop to outline clear and accepted goals. It is best to have a skilled facilitator run the workshop. At the end you may need to reassess who is part of the TBL reporting project team – both from within the organisation as well as the inclusion of relevant external stakeholders.
4) Project team plans the process for developing the TBL report by studying the Irrigation Sustainability Assessment Framework (ISAF) and other related documentation – such as the Global Reporting Initiative (GRI) guidelines – as well as the current organisational reporting, business plans and the goals determined in the first workshop. In particular, decisions need to be made for the next workshop (step 5) about whether to adopt the sustainability principles and high level objectives in the ISAF as the basis for identifying the issues and objectives for your organisation or for the organisation and its stakeholders to determine your own set of sustainability principles and high level objectives at the workshop that correspond with the suggested four-tier ISAF structure. This may include determining the linkage and/or integration of the ISAF approach with any business plan.

Identify issues and establish objectives:

5) Hold another workshop according to the plans as decided in step 4 to adopt or determine the sustainability principles and high level objectives for the ISAF as adapted for your organisation. This workshop may extend to include a development of component trees of operational objectives or this can be done separately as part of the process of identifying indicators (step 6).

Table 3. Summary of TBL reporting development process for irrigation

Aspects covered in particular stages: Getting started	Sustainability principles	Higher level objectives	Operational objectives	Indicators	Producing and using the report	Stage	Who is involved: Project team	internal stakeholders	external stakeholders
■						1. Determine project team in the organisation (see section 4.3.1).	■		
■						2. Develop an invitation list for an initial goal-setting workshop. (see section 4.3.2).	■		
■						3. Hold inaugural workshop to outline clear and accepted goals (see section 4.3.3).	■	■	■
■						4. Project team plans the process for developing the TBL report	■		
	■	■	▨			5. Hold workshop to adopt or determine the sustainability principles and high level objectives for the ISAF, might include operational objectives	■	■	■
			▨	▨		6. Project team determines OR organises operational objectives into a format that resembles how it will be presented in the TBL report; and develops draft indicators (measures)	■	▨	▨
				▨		7. Workshop to discuss and refine the component trees and indicators and discuss proposed format of the report. Check that organisation staff and external stakeholders don't think anything has been missed. Discuss report format and GRI alignment	■	■	■
					■	8. Draft of TBL report produced and circulated for comment.	■	▨	▨
					■	9. Report finalised, published and circulated.	■		
					■	10. Improving the TBL Report Project team seeks feedback from stakeholders on the published report, and uses this as a basis for reflection to feed into further refining the report content for the subsequent year	■	▨	▨
					■	11. Learning from the TBL report Project team organises internal and external stakeholder opportunities to reflect on the achievements from the past year, and to be involved in problem solving. (see section 4.6)	■	▨	▨

Key:
■ task completion and full responsibility
▨ task may be completed here, partial involvement (it is possible that you choose to involve all stakeholders fully in these stages)

Develop reporting format and select indicators to be used:

6) Project team determines operational objectives or if previously determined as part of the workshop in step 5 organises them into a format that resembles how it will be presented in the TBL report and develops draft indicators (measures) for these operational objectives, a process that may require consultation with experts.
7) Further workshop to discuss and refine the component trees and indicators and discuss proposed format of the report. Check that organisation staff and external stakeholders don't think anything has been missed. Discuss report format and GRI alignment. Discuss plans for how the report will be used to garner feedback and spark a process of continuous improvement and better TBL outcomes.
8) Draft of TBL report produced and circulated for comment.
9) Report finalised, published and circulated.

Use the report, learn from it and develop a cycle of continuous improvement:

10) Improving the TBL Report
    Project team seeks feedback from stakeholders on the published report, and uses this as a basis for reflection to feed into further refining the report content for the subsequent year, and how the reporting process will evolve into the future as an ongoing learning cycle leading to continuous improvements in performance.
11) Learning from the TBL report
    Project team organises internal and external stakeholder opportunities to reflect on the achievements from the past year, and to be involved in problem solving to whatever extent has been previously determined.

CONCLUSIONS

There is considerable pressure on irrigators and the water supply authorities to improve their performance and to demonstrate their beneficial effects not only in the economic dimension but also in the social and environmental dimensions. The increasing use of a triple bottom line management and reporting arrangement is one way of identifying where improvement can be made and gauging how this is changing over time. There is a desire by the community that businesses/organisations become more responsible and transparent about the sustainability issues over which the business has some influence or impact. This desire for an ethical and accountable approach to business management combines with the drivers of financial value, risk management, compliance with legislation and benchmarking performance to an increase in sustainability reporting by water based and other corporate organisations in Australia across the triple bottom line of economic, environmental and social disciplines.

Through the "Sustainability Challenge" project of the CRC for Irrigation Futures we have proposed an adaptive framework and methodology for improved triple bottom line reporting by irrigation organisations, to enhance sustainability in environmental, economic and social issues of concern to the stakeholders. The proposed framework for irrigation sustainability assessment

is complementary to the Global Reporting Initiative sustainability reporting approach, in providing a more detailed assessment framework on the scientific and technological sustainability aspects of the irrigation sector for voluntary compliance reporting.

It is hoped that Irrigation Sustainability Assessment Framework will help irrigation organisations to set triple bottom line sustainability objectives, develop management goals and report performance on achieving these goals. Communicating a more balanced appraisal of the socio-economic benefits and environmental costs of irrigation through triple bottom line reporting, following an accepted international standard, should also engender greater confidence in the wider community regarding the performance and place of irrigation in Australia.

A set of six reports including guidelines for the implementation of TBL reporting in irrigation can be downloaded at the CRC for Irrigation Futures website
http://www.irrigationfutures.org.au/

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