BUILDING A BETTER WORLD

CENTROC CARBON PLUS

SUSTAINABILITY ASSESSMENT FRAMEWORK

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REVISION SCHEDULE

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1. INTRODUCTION

Central NSW Councils (Centroc – see Figure 1) has obtained grant funding for a Carbon Plus Study under the Planning Component of the Australian Government's *Water for the Future* initiative through the Strengthening Basin Communities Program. The aim of this feasibility study is to investigate potential solutions to minimise the carbon impact, along with other sustainability effects, arising from the program of works to secure the water supply of the Centroc region. The demand management program and infrastructure needs of the region over the next 50 years to improve the security of water supply were documented in the Centroc Water Security Study (MWH, 2009). The selection of this program of works was undertaken using a triple bottom line (TBL – economic, social and environmental) decision-making framework.

This report describes the proposed framework for identifying sustainability impacts and for selecting the preferred options to mitigate these impacts.

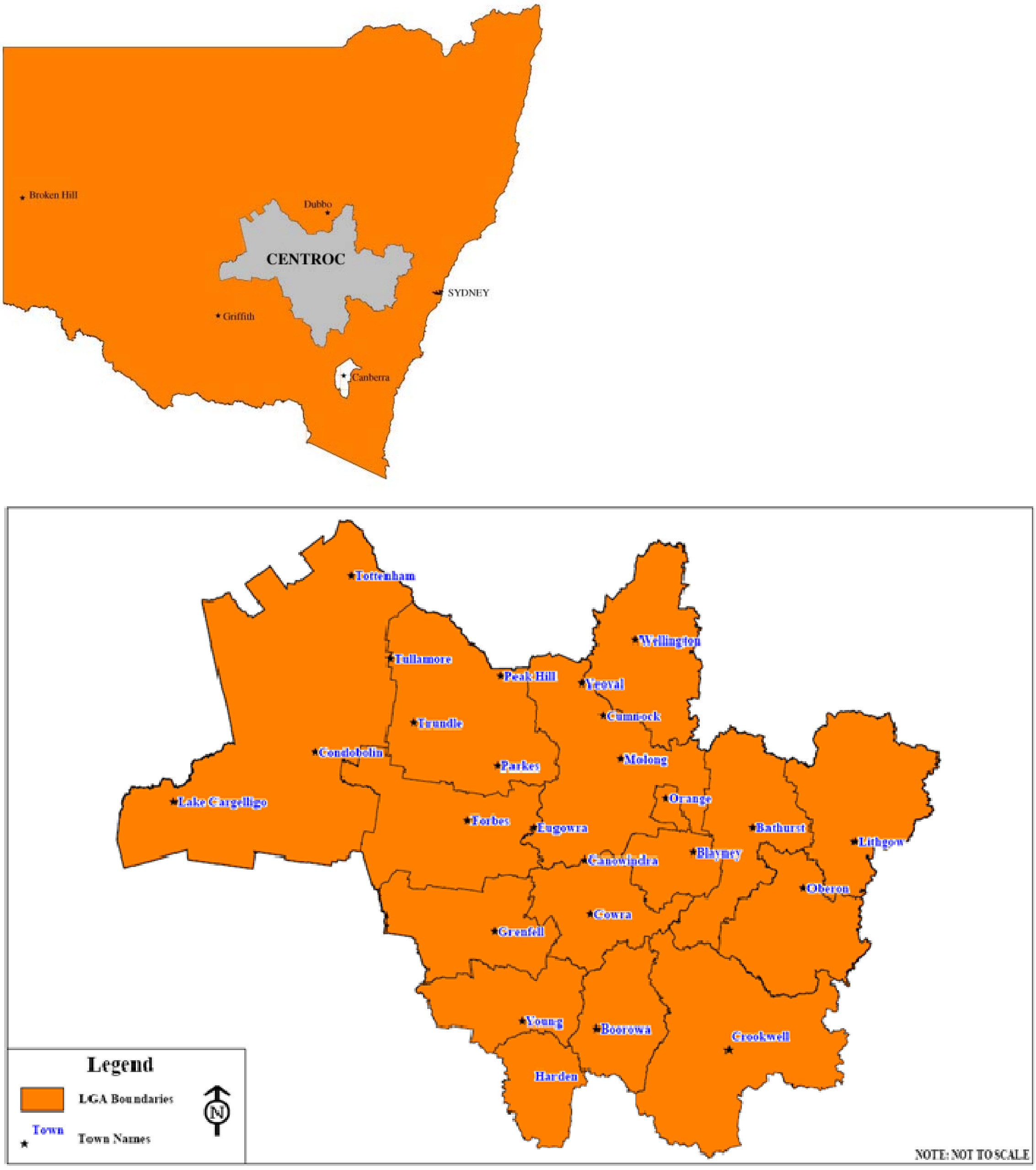

Figure 1: The Centroc Region

1.1 BACKGROUND

In response to the worst drought on record for the region, Centroc undertook to complete a Water Security Study to investigate and recommend solutions to improve water supply security across the Centroc region.

The water security study considered the catchment and potential water management options. A comprehensive list of options was considered including infrastructure links networking town water supplies and improving efficiency of water delivery, new and innovative water supply opportunities, re-use options for effluent and stormwater, demand management, water pricing and trading and water management structures. The study was completed in a catchment context, using TBL assessment, considering the potential for mutual benefits to towns, irrigators, mining interests and water dependent environmental assets. The water planning approach adopted represented best-practice and is in line with the ambitions set out in the National Water Initiative.

The approach to this study was built on three key principles:

1. Stakeholder engagement with a Project Reference Group, Technical Group, Steering Committee and the Centroc Board;
2. Consideration of the economic, social, environmental (triple bottom line – TBL) impacts of the choices for water security improvement to inform decision making; and
3. The integration of the management of water resources, recognising the need for holistic approaches to water management.

The key recommendations of the Water Security Study included:

- **Water Conservation and Demand Management:** Underpinning the strategy adopted was the need for continued efforts, building on the work already done by the Centroc member councils, towards ensuring efficient town water demands. A region-wide water conservation and demand management strategy was recommended including aspects such as a residential retrofit of inefficient water fixtures, continuation of the Water Efficiency Labelling and Standards Scheme (WELS), continuation or expansion of Water Conservation Education programs to improve efficient water use and audits of Non-Residential Water Users to identify leaks and potential areas for improvement.
- **The recommended region-wide strategy (Strategy 2a)** included:
    - Lake Rowlands Augmentation;
    - Lake Rowlands-Millthorpe Pipeline (CTW Trunk Mains D and F duplication);
    - CTW-Orange Pipeline via Millthorpe;
    - Lake Rowlands to Gooloogong Pipeline (CTW Trunk Mains P and C duplication);
    - Gooloogong-Forbes Pipeline (including connection to Parkes);
    - Woodstock-Cowra Pipeline (presently in planning);
    - Orange-Molong Creek Dam pipeline (lower priority action resulting from the level of surety around the security of Molong. There is an existing pipeline from Molong Creek Dam into which this new pipeline would connect);
    - New minor storage and water treatment facilities at Cumnock (note: the potential for a pipeline connection to CTW will be carried through the next phase of planning);
    - New minor storage water treatment facilities at Yeoval (note: the potential for a pipeline connection to CTW will be carried through the next phase of planning);
    - New minor storage at Condobolin (off-stream from Lachlan River);
    - New pipeline replacing existing channel and minor storage at Lake Cargelligo (note: a groundwater system has received emergency funding);

- Burrendong-Wellington Pipeline;
- Chifley-Bathurst Pipeline;
- Chifley-Oberon Pipeline; and
- Belubula Creek-Cadia Hill pipeline (already available).

In November 2009, the Centroc Board adopted the recommendations of the Centroc Water Security Study.

1.2 KEY PROJECT DRIVERS

The Centroc member Councils recognise the need to be sustainable and to minimise the carbon impact of water security, as well as the need to proactively mitigate its impact on climate change and to adapt to the impacts of climate change. In addition, a key requirement in the securing of grant funds for water projects is not only the demonstration of water efficiency (such as the demand management program which Centroc has committed to continue to progress across the region), but also demonstration that in managing water resource issues, consideration is also given to energy resource management. This is particularly important in terms of reducing emissions to mitigate climate change.

The Centroc Water Security Study took into account energy in a number of ways:

- The demand management program: the recommended program was developed through the consideration of the cost-benefit of a wide variety of water efficiency options. In deriving the cost-benefit equation, the saving of both water and greenhouse gases (from the saving of hot water and the reduction in treatment and transfer costs) was included in the assessment. In fact, the water efficiency program will potentially offset the energy consumed in operating the new infrastructure by in the order of 30%.
- Using a TBL approach that used the minimisation of energy as a criterion to select the recommended strategy.

However, a comprehensive assessment of the carbon impact of the proposed scheme is required, as is a plan to ensure that those emissions are minimised and offset. In so doing, the provision of the energy required to power the water security strategy infrastructure elements and the opportunities to mitigate the carbon emissions, raise the potential for new and innovative approaches to renewable energy and participation in the carbon economy. This is the basis for the development of The Carbon Plus Study in Central NSW.

The Carbon Plus Study offers a unique opportunity to holistically confront and manage the challenges facing the communities of the Central Region of NSW. It brings together a number of critical elements to enable the communities of the region to be strengthened and to adjust to climate change. The Carbon Plus Study will provide:

- A way to address the carbon emissions from the water security strategy, so that the water security strategy does not exacerbate the climate change problem;
- A comprehensive community engagement program that seeks to engage and involve the community in planning for its future and in adaptation processes;
- Developing opportunities to enhance the sustainability and productivity of the region through improved landscape and ecosystem health and economic development; and
- Development of an implementation plan for the Carbon Plus and Water Security Strategies so that both strategies can be implemented in a co-ordinated and holistic way.

1.3 PROJECT SCOPE

The scope of this project is to undertake a strategic level planning assessment of the options to sustainably manage the carbon emissions of the adopted water security study and to develop a plan of action to implement the most appropriate of those options in parallel with the continued implementation of the recommendations of the water study.

The project will be conducted in six stages (Figure 2):

1. Develop sustainability assessment framework and indicators: these indicators will form the basis of assessing the carbon management options to identify the most appropriate options from a TBL basis.
2. Develop a stakeholder consultation plan: identify key stakeholders and engage them in the process of developing and assessing the options considered in the Carbon Plus Study. The adopted plan will then be implemented during the course of the project.
3. Prepare forecasts for identified indicators including carbon emissions: before attempting to solve a problem, it is important to understand (and where possible, measure) the extent of the issue. Developing forecasts of carbon emissions from the existing water supply system and comparing those to the forecasts as a result of implementing the Water Security Study recommendations helps to quantify the extent of potential impact of the program. The forecasts will be suitable for relative comparison rather than absolute comparison to other benchmarks or analysis of, for instance, other water utilities performance.
4. Identify options for carbon neutrality and improved sustainability outcomes: in this phase, a wide spectrum of potential management actions will be identified and assessed (against the TBL defined in Stage 1) to identify the most suitable actions to adopt for the Centroc region. This assessment will include identifying opportunities to:
    a. avoid generating emissions;
    b. substitute fossil fuel generated power with renewable or alternative energy sources;
    c. ensure the purchase of sustainable materials; and
    d. to offset emissions through sequestration and offset programs.

    While the intent of the options identification step is to identify opportunities to mitigate the impacts of the Water Security Plan works specifically, it is likely that many of these initiatives will be independent of the Water Security Plan, and may be implemented prior to the Water Security Plan projects.
5. Develop implementation plans: following determination of the actions to be put in place to manage the impact of the water security program on carbon emissions, an implementation plan will be developed showing the anticipated timing, capital and operating costs for the recommended sustainability improvement strategies for the region. The implementation plan will consider regional and local actions.
6. Reporting: the study process and findings will be documented in a comprehensive technical report.

Built into our approach is stakeholder input to the planning process obtained through a series of facilitated workshops. This integrated approach to planning and engagement was successful in the Water Security plan and helped to identify mutually beneficial outcomes. The process also added to the depth of options considered and the level of support for the overall strategy finally adopted. The promise made to stakeholders in terms of their involvement in this project will be similar to the previous project: a commitment to keep them informed, listen to and acknowledge their concerns and to provide feedback on their input influenced decision making.

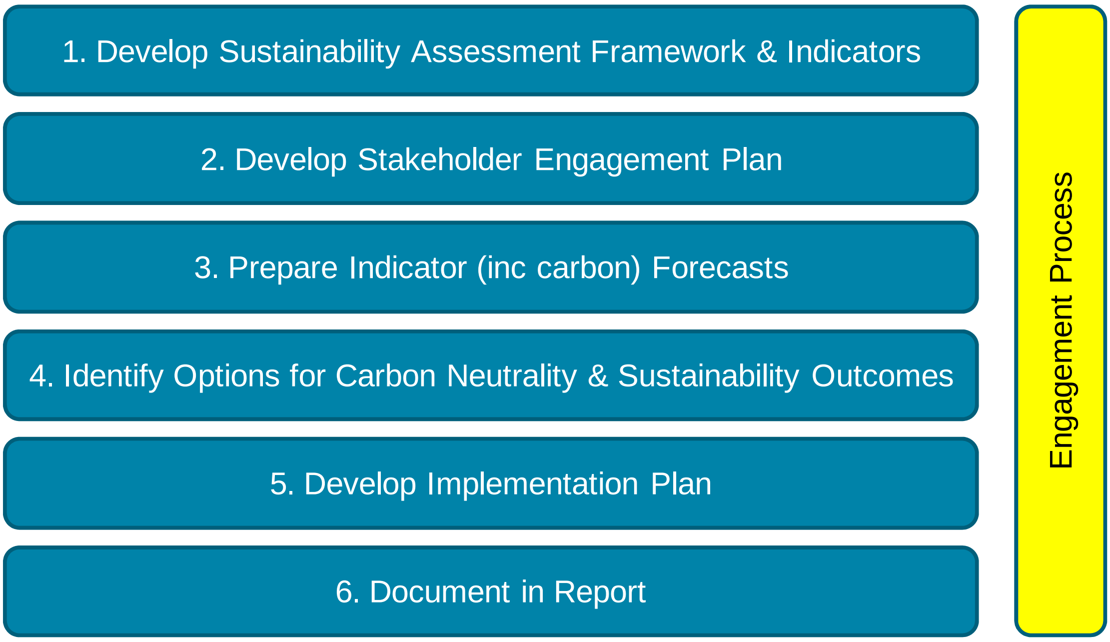

Figure 2: Study Process

1.4 MODELLING APPROACH

Stage 3 of this study will involve Life Cycle Assessment (LCA) utilising the University of Sydney's hybrid Integrated Sustainability Assessment (ISA) approach to develop a strategic forecast of energy, carbon emissions and sustainability performance for the Centroc region water supply systems, in the current mode and as identified in the Water Security Plan. These forecasts will provide the basis for identification of mitigation options in Stage 4 of the study.

Traditional LCA involves identification of energy, material and waste flows for a product over every stage of its life cycle, and provides an assessment of the positive and negative impacts on the environment. The University of Sydney ISA approach goes beyond traditional foot-printing and LCA methods to model both negative and positive effects of initiatives on the environmental, social and economic aspects of the TBL. The approach combines traditional LCA methodologies and macro-economic input-output analysis to provide an assessment that comprehends not only the impacts of direct flows of goods and services, but also the upstream supply chain impacts. ISA is a scientifically rigorous, quantitative, consistent and comprehensive approach to TBL accounting.

Forecasts of sustainability impacts will be developed using the ISA approach building on the data generated in development of the water security plan as follows:

- Baseline (current system):
    - Embodied impacts arising from capital investment in existing water supply assets: These will be estimated from proposed renewals/capital works plans. (Note that treatment of embodied impacts of previously constructed assets was a point of discussion at Workshop 1 and it was agreed that renewals and other capital works should be included. The project team has also considered whether embodied impacts from the original construction of these assets should be included in the baseline. However, as these impacts occurred in the past and any damage has already occurred, the team recommends that the framework includes only future impacts arising from renewals and planned capital works).
    - Operating impacts of existing water supply assets and capital projects: These impacts will be modelled based on current system inputs including labour; materials and services derived from operating and maintenance costs; known energy and materials consumption rates; and pass on of Council corporate overheads. Estimates will be made of operating expenses for major projects on

the capital works program based on the operating cost of existing similar infrastructure. Forecast estimates for the study period will be produced by escalating the current costs in accordance with projected water demand increases. [1]

- Forecast (system operating under the water security plan preferred region-wide strategy):
  - o Embodied impacts of proposed infrastructure: These will be derived from capital cost estimates and water security plan options characterisation.
  - o Operating impacts: These will be developed from water security plan modelling of proposed system inputs (labour materials and services derived from operating and maintenance costs and known energy and materials consumption rates). The impact of the proposed Water Demand and Conservation program, which is expected to have a beneficial effect on operating impacts, will be included in the modelling of the forecast system.

The ISA analysis will provide data on the sustainability impacts of the proposed water security study program compared to the business as usual baseline. In stage 4 of this study, options will be identified for mitigating these impacts. A desktop feasibility assessment will be undertaken to determine the whole-of-life costs for each identified mitigation option, along with the technical viability and impact on the identified sustainability indicators, including carbon emissions.

Options will be grouped in accordance with the sustainability impact that is addressed (e.g. climate change, employment) and a TBL assessment approach will then be used to evaluate each option in accordance with the sustainability framework recommended in this report.

[1] It is important to note that the Baseline assessment will be a strategic level forecast of the footprint of the Centroc Council water operations over the Water Security study period. As such, the forecast will not be suitable for benchmarking water operations against the current performance of other water businesses. In addition, when comparing the results of the assessment against industry benchmarks, it is important to understand that performance will vary depending on the nature of the system studied (e.g. gravity systems compared to networks requiring pumping).

2. SUSTAINABILITY ASSESSMENT FRAMEWORK

This section sets out the purpose and components of the sustainability assessment framework and describes the proposed assessment approach.

2.1 PURPOSE OF THE FRAMEWORK

The purpose of the sustainability assessment framework is to:

1. Identify the parameters to be modelled in stage 3 of the project, so that a baseline assessment and future forecasts of these sustainability impacts can be produced; and
2. Provide a basis for the stage 4 assessment of how options for the management of sustainability impacts perform on a TBL (economic, environmental and social) basis.

A comprehensive and robust framework will enable identification of the most suitable options for optimising sustainability outcomes under the water security program.

2.2 FRAMEWORK COMPONENTS

The framework comprises:

- Sustainability indicators;
- Weightings for selected indicators; and
- A system for scoring performance.

Considerations in the selection of indicators and weightings are discussed in the following sections.

2.2.1 SUSTAINABILITY INDICATORS

Sustainability indicators provide an estimate of the economic, environmental and social impacts of projects or a course of action. Indicators do not normally provide a direct measure of the impact, but rather an indication or approximation of the effect. For example, greenhouse emissions are used as an indicator for climate change, while wages and employment may be used as indicators of social well-being.

The selection of indicators should be broad enough to enable the full extent of the impacts of a project to be assessed. However, inclusion of too many indicators can result in duplication of measures, unnecessary complication of the analysis and increased difficulty in reporting and communicating analysis results. In our experience, selection of in the order of ten to fifteen indicators provides a good balance between breadth of the assessment and managing the complexities described above that arise from including many indicators.

A good indicator has a number of characteristics. It is:

- Meaningful: the indicator is relevant to the study and is of broad interest;
- Measurable: data is available to quantify or score the indicator; and
- Communicable: the indicator is easy for others to understand and results of the assessment can be readily communicated to others.

Typically indicators will be selected to align with organisational, regional and/or national economic, environmental and social objectives.

2.2.2 INDICATOR WEIGHTINGS

Sustainability frameworks often include weightings of the various indicators to give a cumulative score for each option assessed. Weightings are warranted when it is considered that assessment criteria are not of equal importance.

2.2.3 SYSTEM FOR SCORING PERFORMANCE

A system for scoring of each indicator is necessary to undertake the TBL assessment (for groups of mitigation options) in stage 4 of the study. The system will describe scores to be applied for each level of performance. For example, for the indicator of primary energy, the scoring system may be:

Score of 10 (best) = 1,000 MJ primary energy used

Score of 1 (worst) = 10,000 MJ primary energy used

Various methods of applying scores are available, but it is generally helpful to postpone development of the scoring system until performance of each option is modelled and the full breadth of performance outcomes against each indicator is understood.

2.3 RECOMMENDED FRAMEWORK

The recommended sustainability assessment framework has been developed in consultation with the Centroc Infrastructure Group (IG) and the Carbon Plus Project Steering Committee (PSC). At Workshop 1, the IG and PSC participants identified the key regional economic, environmental and social drivers, relevant to the water security plan and Carbon Plus project, and corresponding sustainability indicators and weightings. The summary of the workshop was circulated within member organisations for further comment and this feedback has been incorporated into the recommended framework.

Following the Workshop the project team undertook further analysis of the available data, the likely impacts of the water security program and ISA model output and capability. On the basis of these activities, the project team refined the sustainability assessment framework drafted in Workshop 1. The recommended framework is described in the following sections.

2.3.1 INDICATORS

The recommended indicators are described below and tabulated in Table 1. Where the recommended indicator differs in some respect from that identified in Workshop 1, this is noted and a rationale is provided for the change.

2.3.1.1 ENVIRONMENTAL

The environmental priorities identified in Workshop 1 were to minimise the impact of the water security plan on climate change, resource use and biodiversity.

Impact on Climate Change

Climate change is a serious issue for Australia and the Centroc member Councils recognise the need to minimise the carbon impact of water security, while proactively adapting to the impacts of climate change and taking action to reduce its severity.

The indicator chosen for this priority is:

- Greenhouse gas emissions expressed in tonnes CO_2-e (carbon dioxide equivalent tonnes): This is a measure of the weighted sum of the key greenhouse gases calculated using global warming potentials, which account for the potential contribution each gas has on global warming.

Resource use and biodiversity

The water security study program comprises a mix of demand management and infrastructure projects. Construction of the infrastructure identified in the study's region-wide strategy will involve the fabrication of pipework and other structural elements using resources from the environment including energy, land and materials. Note that the greenhouse gas emissions produced as a consequence of extracting, refining, manufacture, fabrication and electricity generation will be encapsulated in the Greenhouse Gas Emissions indicator described above and indicators in this priority grouping are intended to describe the tax on the environment related to the extraction and/or use of resources rather than the emissions impact caused by these activities.

The indicators chosen for this priority are:

- Primary energy use expressed in MJ: This is a measure of the combustion of non-renewable fossil fuels (e.g. coal, natural gas, fuel, petrol, diesel, kerosene) required throughout the project. Included in this energy use is operational energy used directly to run infrastructure and the embedded energy in the materials and supplies used in both the operation and construction of infrastructure. Note that in this indicator, electricity consumption is expressed in terms of the primary energy source utilised to generate the electricity consumed (e.g. coal).
- Materials flow expressed in tonnes: Materials flow describes the mass of resources and other biomass extracted from the natural environment throughout the project lifecycle. This indicator provides an aggregate measure of the mass of materials that must be extracted from the environment throughout the project lifecycle. For example, the measure would include how much iron ore needs to be initially extracted in order to make the steel needed in structural components. Material flow can be used as an indicator of resource depletion.
- Water consumption expressed in litres: The quantity of mains water, self-supplied water, reuse water and in-stream water used throughout the project lifecycle.
- Land use disturbance in disturbance weighted hectares: This indicator seeks to provide an estimate of the land use in terms of area occupied and environmental impact throughout a project life cycle, For example, using this measure, occupation of industrial land would be deemed to have a lower land use disturbance than occupation of pristine bushland. Land use disturbance can be considered as a proxy measure for biodiversity impact but it is important to note that local effects (e.g. the existence of a threatened species on a certain site) will not be captured by this high level indicator and would need to be treated separately in the assessment framework.

2.3.1.2 SOCIAL

In Workshop 1, it was identified that the key social priorities were enhancing community wellbeing and providing leadership in progressing sustainable options by being early adopters of innovative solutions.

Community wellbeing

The impact on the community of the water security program and options identified for mitigation of sustainability impacts is an important consideration for the Centroc member Councils. The indicators chosen as proxy measurement of community wellbeing are as follows:

- Employment expressed in employment – years: Is a measure of the level of full time plus 50% part –time employment of employees and employers. Employment is included as a proxy for community wellbeing due to its implications on factors such as social cohesion and government revenue (which is subsequently redistributed to fund for community facilities and services).

- Wages and Salaries expressed in A$ million. Workshop 1 had identified household income as a social indicator. The indicator has been expressed as wages and salaries as this is the output that will be generated from the ISA modelling (i.e. household income can also be sourced from other areas unrelated to the project or options under investigation, the calculations here are for wages and salaries both directly and indirectly associated with the scenarios).
- Health and Safety: This indicator will enable consideration of any occupational or public health impacts of chosen options. As a qualitative assessment, this indicator cannot be modelled using the ISA approach. (In Workshop 1 it was identified that ISA modelling may be able to incorporate supply chain health and safety impacts. However, it is now understood that while work is currently underway to develop a database of health and safety impacts by sector for incorporation in the ISA model, this work will not be complete in time for application to this study). It is intended that the indicator will not be utilised to model baseline and forecast impacts under the water security plan, but will be relevant to the assessment of options for mitigation of sustainability impacts. A scoring system will be developed during Stage 4 of this project to provide a framework for assessment of the performance of each option for this indicator.

  An example of such a scoring system is as follows:

  - 10 – The option is unlikely to have any occupational or public health impacts.
  - 5 – Occupational or public health impacts are possible; however these are reversible and can be acceptably managed.
  - 1 – Serious and irreversible occupational or public health impacts are likely to be associated with the option.

- Amenity: This indicator will allow consideration of potential impacts on amenity (e.g. visual or noise impacts) of sustainability mitigation options. As a qualitative assessment, this indicator cannot be modelled using the ISA approach. It is intended that the indicator would not be used to assess the baseline and forecast impacts under the water security plan (unless a component of the plan is deemed to have significant impacts on amenity), but will be utilised in the assessment of options for mitigation of sustainability impacts. A scoring system will be developed during Stage 4 of this project to provide a framework for assessment of the performance of each option for this indicator.

  An example of such a scoring system is as follows:

  - 10 – The option is unlikely to have any impact on amenity (odour, visual disturbance, noise, access). The community are unlikely to be concerned with the option.
  - 5 – Impacts on amenity are possible; however these are temporary and can be acceptably managed. With consultation it is anticipated that the community will be accepting of the temporary disturbance caused.
  - 1 – Permanent and serious impacts on amenity are likely to be associated with the option. Significant community concern is expected.

Community leadership

Government agencies can play a key role in facilitating the uptake of new technologies by supporting the development of new technology and by being early adopters of viable, innovative solutions. In Workshop 1, participants identified that this would be a consideration in selection of options to optimise sustainability outcomes under the water security study program.

The indicator selected for this priority is:

- Innovation and leadership: This indicator will provide a measure of how novel, or cutting edge, the selected options are and to what extent implementation of the option would support emergent, promising technologies and industries. As a qualitative assessment, this indicator cannot be modelled using the ISA approach and is not relevant to the modelling of baseline and forecast impacts under the water security plan, which in itself displays community leadership. The measure will be relevant to the assessment of options for mitigation of sustainability impacts and a scoring system will be developed during Stage 4 of this project to provide a framework for assessment of the performance of each option for this indicator.

  An example of such a scoring system is as follows:

  - 10 – The option would be first application of technology in Australia. The initiative would be highly visible and well received by the Centroc and broader community.
  - 5 – The option involves the use of technology that has been adopted and proven elsewhere in Australia but would be the first application within the Centroc region.
  - 1 – The option entails the use of established technology used widely throughout Australia and the Centroc region.

2.3.1.3 ECONOMIC

The key economic priorities identified are economic prosperity and project affordability which are described below.

Economic prosperity:

Economic prosperity on a national and regional scale is a key consideration for both Centroc member Councils and the broader community. The indicators selected are:

- Gross operating surplus expressed in A$: This indicator is a measure of operating profit generated due to inputs to the project or option from business sectors. The higher the gross operating surplus generated, the greater the capacity of business sectors to invest in innovation and expansion.
- Imports expressed in A$: Imports are the value of goods and services purchased from foreign sources. The lower the level of exports, the less exposed the option will be to international resource constraints and potential price increases. In addition purchase of local goods and services will lead to greater direct benefits to the Australian economy. (In Workshop 1, there was a question, which was taken on notice, as to how the impacts of imports are calculated. Impacts from imports are calculated at the moment as if they are produced in Australia. This is standard Input/Output LCA practice. However, the University of Sydney is working to develop a full global Input/Output model, which accounts for imports based on global data. Such a model is cutting-edge research and the University has advised that this tool will not be operational for at least a year.)

The ISA model will produce estimates of national gross operating surplus and imports. It is intended that an estimate of regional gross operating surplus and imports will also be made to assist decision making.

Note that Exports were included in economic considerations under consideration in Workshop 1. However, the University of Sydney ISA modellers have recommended that Exports not be included in the framework for this study because the level of exports will not change on account of the water security plan or sustainability mitigation options. Therefore, this indicator is not included in the recommended framework.

Project affordability

The affordability of selected sustainability assessment options will be important as projects which are more expensive (per unit of improvement in sustainability impacts) will be more difficult to justify and secure funding for. The indicator selected for project affordability is:

- NPV expressed in A$: This indicator is a measure of the whole of life cost of a project or option. NPVs have been calculated for the water security plan program and this information was incorporated into the Triple Bottom Line assessment and selection of options. NPVs for options to mitigation sustainability impacts will be developed and a scoring system will be developed during Stage 4 of this project to provide a framework for assessment of the performance of each option for this indicator.

Table 1: Recommended Indicators

CATEGORY	PRIORITY	INDICATOR	BASELINE & WATER SECURITY PLAN FORECAST	OPTIONS ASSESSMENT
Environmental	Impact on climate change	Greenhouse gas emissions	✓	✓
	Resource use and biodiversity	Primary energy use	✓	✓
		Materials flow	✓	✓
		Water consumption	✓	✓
		Land use disturbance	✓	✓
Social	Community wellbeing	Employment	✓	✓
		Wages and Salaries	✓	✓
		Health and safety (Scored by IG/PSC)	-	✓
		Amenity (visual impact etc) (Scored by IG/PSC)	-	✓
	Community leadership	Innovation & leadership (Scored by IG/PSC)	-	✓
Economic	Economic prosperity	Gross operating surplus (profits) (at national and regional level)	✓	✓
		Imports	✓	✓
	Project Affordability	Net Present Cost/ % improvement	✓	✓

2.3.2 WEIGHTINGS

With respect to weightings, the participants in Workshop 1 agreed that the weighting between priority groups would be equal and that within each group indicators would be weighted equally. However, it is proposed that sensitivity testing of weightings will be undertaken to explore the significance of this decision (see sensitivity analysis discussion below) and to ensure selection of the most robust solutions.

2.3.3 SCORING OF INDICATORS

As noted earlier, a system for scoring of each indicator is necessary to undertake the triple bottom line assessment (for groups of mitigation options) in Stage 4 of the study. Once initial modelling is undertaken, the full breadth of performance outcomes for each indicator will be understood and a draft scoring framework will be drafted for review by the IG and PSC.

2.4 PROPOSED SENSITIVITY ANALYSIS

Sensitivity analysis will be undertaken to explore the impact of key assumptions and adopted weightings on the performance of options. For example, following analysis of the outcomes under equal weight, sensitivity testing of all of the priorities (assuming that one priority is valued at twice and half of each of the others) will be undertaken. In particular, given the objectives of the project, the consequences for decision making under the weighted sensitivity analysis of the climate change and resource priorities will be carefully analysed.

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