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South Australian Murray-Darling Basin Environmental Values Report

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EXECUTIVE SUMMARY

As the South Australian Murray-Darling Basin Natural Resource Management Board (the Board) heads into the next round of regional natural resource management (NRM) planning, decision-makers will use a set of resource condition targets to establish trade-offs among environmental assets, short and long term economic capacity, and social values. Much of the information needed to establish trade-offs needs to be elicited from community policy advisors and used in a systematic and defensible way.

This report consists of the findings from 56 two hour semi-structured interviews in a project designed to help the Board calibrate its investment decisions to the values of regional community policy advisors. Interviewers developed an interview script that allowed for open-ended questions and still ensured the environmental assets of importance to the Board (water, land, biota and atmosphere) and the ecosystem services they provide were adequately covered. Each interview was taped, transcribed, and coded and included a mapping process, where respondents made spatial references to their values, which were then captured and transferred to GIS.

The frequency at which certain topics came up for discussion is a good indicator of the relative importance of each service either the environment or the people around it provide. In Figure 1 below, the **segment frequency** column summarises the number of times participants talked about that value across the entire set of transcripts. The **source frequency** column summarises the number of people who discussed a particular value as part of their interview or mapping exercise.

		Segment frequency	**Source frequency**
1	built-environments (towns, weirs, schools, …)	440	52
2	economic viability &-employment	418	55
3	zoning & planning (peri-urban, land use)	412	52
4	bequest, intrinsic & existence	399	55
5	food	394	52
6	recreation-tourism-lifestyle	359	54
7	water regulation (i.e. flows) quantity	329	54
8	fresh-water	318	55
9	knowledge systems & educational values	295	53
10	water purification & waste treat-quality	278	54
11	community	266	50
12	aesthetic & inspiration	237	51
13	fibre	204	39
14	pest regulation	199	52

Figure 1: Frequency of codes ordered by frequency of occurence

Discussions of built structures, economic activity and land use dominate the very high frequency (white) cluster. This cluster groups topics that are largely suitable for

inclusion in determining investment priorities. In the medium frequency (dark grey) category, the aesthetic values associated with the landscape are important to people. Taken as a whole, respondents appear to have been the most verbose about the impact people have had on the landscape and discussing the viability of continuing to inhabit that landscape into the future in an economically viable way.

While these values can largely be expressed under asset categories, many people did indicate that they preferred to discuss NRM associated values through ecosystem services. One of the challenges of addressing this perspective is the institutional framework of NRM policy management, which is largely grouped into asset categories. It is therefore still appropriate and useful to discuss these values grouped into assets as opposed to the services those collective assets provide.

Water

Two arenas of values towards water and associated services prevail in overall importance to any policy programs or considerations:

1. A sense of place and belonging respondents express towards the Murray River, including the deeply-held value they place on being able to participate in activities that include the river.

2. A sense of ownership people feel they have over the regulation of flows in the river, including a strong sense of responsibility for the environment and a sense of entitlement to a fair and equitable share of water for their businesses and to support their recreational and provisional needs.

Respondents recommended a policy approach that encouraged the uniting of the communities around the river in a management plan. Policy programs that include these values in clearly articulated goals are likely to find successful advocates in the community.

These conversations also revealed the potential conflict over community-wide trade-offs, as respondents were often diametrically opposed when considering whether to allow irrigators to save their permanent plantings or allowing environmental managers to save native vegetation. Understanding and addressing both sets of concerns will help ensure that a balance between these two competing sets of values can be struck without diminishing the social capital of the communities these decisions affect.

Land

Respondents were highly aware of their economic dependence on resource extraction from the land and there was little talk of income sources that were not dependant on consumptive resource extraction. However, values ascribed to land were dominated by cultural values. In particular, people described how their identity was shaped by hard work and commitment to their community.

From these interviews we can draw some insights into potential trade-offs. There is a willingness to build up the cultural values of the landscape. However, financial incentives are likely to be required to take land out of production. Similarly any large, significant changes to regulating or supporting services will require incentives. This information reinforced current policy practices of emphasising the economic impact of land use changes and trade-offs, as the economic considerations of resource extraction will form a large part of NRM decision-making on private properties.

Biota

Respondents that were passionate about NRM were passionate about the natural flora and fauna. However, those who are active and aware may be at the limit of their volunteerism. When considering the management of biota assets, linking knowledge of biota assets to the valuation of them would be an important policy consideration.

There was a tension around the definition of a pest, pest levels and how those pests should be managed, particularly as the environment is not longer in equilibrium. Many respondents feared that if a landscape was allowed to self-regulate, it would move to an unacceptable state.

Tension between long-term land managers and new, less commercially orientated land managers could be dealt with through constructive and positive policies, particularly given that so many NRM Group members cited their love of the community and their experience with practical land management as the key assets to their roles as community leaders.

Atmosphere

While people valued atmospheric assets, the reluctance of many respondents to 'decide' whether or not human-induced global warming was a relevant issue demonstrates an area where the SAMDB Board might have difficulties promoting mitigation actions that primarily appeal to the sense of responsibility people feel as stewards of atmospheric assets. Financial incentives might be more effective than suasion tools or perhaps programs that emphasise the protection of other, more highly valued and accepted ecosystem services.

People in the landscape

Respondents included discussions of produced and social capital in their valuation of natural capital assets. A sustainable family depended largely on participation in a sustainable and active community. To do this, respondents felt they need a stable and adequate income, social cohesion in the community, and the time and ability to participate in this cohesive community.

If investment policies and environmental programs can address the balance of these three aspects of individual's lives, they will have a high chance of community acceptance and this will increase the chance of policy and program success.

Key messages

Insights into respondent perspectives

- People value their families and communities and they use this as a lens through which to view their environmental values. In other words, they have anthropocentric values.
- People believe they are now a necessary part of the effective functioning of the landscapes. Both environmental and irrigations flows, weed and pest management, and soil quality and protection can no longer self-regulate and still produce an environment that people would find acceptable.
- Well-being and living in the country are inextricably linked for many respondents. This came through in discussions of all natural assets.

Perspectives on trade-offs

- Some small scale trade-offs are acceptable within the context of economic activity and recreation.
- There is a dichotomy of views surrounding the economy and the environment. One group of people would not contemplate the prospect of economic activity being curtailed significantly to achieve environmental benefits. Another group suggested precisely the opposite that economic activities need to be curtailed to achieve sustainability.
- There is a tension among various recreational activities such as canoeing, water-skiing, camping, bushwalking, motorbike riding, etc due to their perceived impacts.
- Similarly there is a tension among several consumptive uses and non-consumptive use of water (potable drinking water supply, irrigation, flows in the river) and land (native vegetation areas for grazing versus conservation).

Over and under representation of values

- Water, Water, Water – the need for more rainfall and more water flowing down the Murray River was emphasised by the people being interviewed.
- The role of regulating and supporting services is not highly valued – there is a disconnect between the articulation of the science and the investment process. At some level, participants perceived this lack of education and knowledge for all asset services, particularly for water assets.

CHAPTER 1: BACKGROUND

1.1 Nature of the problem

As the South Australian Murray-Darling Basin Natural Resources Management Board (the Board) heads into the next round of regional natural resource management (NRM) planning, it will be setting targets to reflect the minimum acceptable levels of resource conditions to ensure the sustainability of the region's resources. Target setting has two important components; first is the decision to invest funds into particular resources (e.g water, land, biota and atmosphere) and second, is the process of quantifying a target to ensure it is defensible, measurable and well understood. Bio-physical science data will help describe the natural resource conditions and the biophysical changes needed to shift those conditions. However, it will be up to the Board to prioritise resource condition targets and NRM activities within a limited budget and within the wider economic and social objectives of the community it represents.

Decision-makers will use a set of resource condition targets to establish trade-offs among environmental assets, short and long term economic capacity, and social values. For targets and the policy actions to be effective, the Board relies heavily on the voluntary compliance of landholders and on a proactive NRM community. The setting of NRM levies, changes in management practices and participation in ecological restoration activities all involve the participation and acceptance of the South Australian Murray-Darling Basin (SAMDB) community. When targets and policy programs are calibrated to align with participants' values, voluntary participation can be less expensive and more effective. This information needs to be elicited from these cohorts and used in a systematic and defensible way to help guide target-setting, define policy, and prioritise spending on natural resource management programs and actions.

1.2 Board project

In November 2007 the Board engaged researchers from the CSIRO to develop a project to help determine the prioritisation of investment options for the maintenance and protection of natural assets. The three-stage project is outlined below. Although the current report contains findings from only the first stage, understanding the complete project provides a useful context for considering the outcomes of Stage 1.

1.2.1 Stage 1 – Understanding the intensity, type, and nature of place-based community values in the SAMDB

The first stage identifies the values of the community in terms of the key resources such as water, biota, land and the atmosphere. The approach entails a set of 56 interviews, which engaged policy advisers in the community in expressing their views on environmental values.

The goal of the first stage was to understand how ecological assets and ecosystem services across the landscape are valued within the SAMDB and to establish a context for undertaking multi-criteria analysis methods.

As a set of interviews, this stage provides information about individually held values and the attitudes people develop towards natural assets. The combination of Stage 1 and consultation with the SAMDB should provide invaluable information about the types, structure, intensities, and nature of community values with respect to the environmental assets of the SAMDB.

1.2.2 Stage 2 – Developing weights for multiple environmental objectives using Multi-Criteria Decision Analysis

While the values and attitudes collected in Stage 1 serve as a starting point for the development of a decision tree to be used in Stage 2, the second stage brings in the complexity of publicly expressed values and the negotiations people make as part of a community. The construction of a decision tree will allow the Board to quantify the relative importance and trade-offs between resources in the SAMDB. This tool will include goals, objectives, and criteria needed in the multi-criteria analysis in Stage 2, and the potential policy/management/investment alternatives in Stage 3.

Stage 2 focuses on the implementation of a carefully designed and targeted multi-criteria analysis. Where Stage 1 investigated community policy advisers' values towards natural assets and the ecosystem services they provide, Stage 2 then asks these advisers to prioritise the established values in terms of potential Board management actions. The project moves from asking people to value the environment to asking them to value the Board's actions towards the environment.

Stage 2 uses Multi-Criteria Analysis (MCA) to quantify the relative importance and weights of multiple competing environmental objectives/criteria (land, water, biota, atmosphere etc.) and sub-criteria in the SAMDB as a basis for analysing investment priorities. MCA allows researchers to derive weights through a variety of techniques involving the analysis of trade-offs between environmental resources. Values and weights are derived in a series of workshops. The workshop setting enables a faster response time and more flexibility. MCA allows sensitivity analysis and consistency checking of the evaluation measures suggested by members of the focus group thus reducing bias in decision making and hopefully enabling the achievement of group consensus.

1.2.3 Stage 3 – Selecting the optimal portfolio of environmental policies and management actions and setting priorities for regional investment in NRM based on multiple community and scientific values

The final stage of the project is the integration of community environmental values with Board scientific, policy and project management experience advice and expertise in a multiple criteria decision analysis of investment priorities for the SAMDB. Priorities are specific to the various assets (land, water, biota, and atmosphere) and the actions and programs proposed to manage these assets (ecological restoration, education programs, auctions etc.). This information is used to prioritise actions/programs in the landscape within a multiple objective decision framework.

The framework can incorporate multiple criteria, objectives, assets, threats, and actions/programs. Weights are derived from the elicitation of environmental values in the workshops. The in-depth interviews provide context regarding what community leaders believe is important. This ensures that trade-offs in the MCA are not contrived through theory alone but include participants' expressed values. The interview process also provides insights on the potential differences between an individual's values and those expressed through a group context. In addition, other data is needed to complement the decision analysis, specifically, some measure of the likely impact and cost of the actions/programs.

In a multi-criteria context a decision maker, in this case the Board, needs to consider a set of alternatives. The Board considers the multiple criteria which are relevant for this analysis and seeks the "optimal" decision. Often this "optimal" decision does not exist because of the conflicts between criteria. The best decision is thus the decision that is not dominated by other decisions and which is in accordance with the Board's system of values.

Throughout Stage 3 we will work with the Board to identify a series of management alternatives (e.g. auctions for land management, fencing programs, education, information, engineering solutions etc.). At this point, the level of achievement of each alternative management action is assessed against the criteria established through Stage 1 and 2, including any uncertainty or risk. Investment priority scores are calculated for each action/program as a quantitative index against multiple evaluation criteria using Multi-Attribute Utility Theory (MAUT). This scoring allows the decision-maker to understand the trade-offs involved with undertaking different actions/programs and can inform the setting of targets and investment priorities. Management alternatives are evaluated on each criterion and ranked in order of their contribution to reaching the goals of the community and the Board.

Importantly, the Board also has a defined budget constraint and there may be complex interdependencies between management alternatives. Selecting the optimal set of management actions in which to invest then becomes a more complex problem where the management actions are selected that maximise the outcomes for the community and the Board subject to budgetary and other constraints.

This analysis is termed ‘Portfolio Analysis’ and is based on optimisation techniques such as Goal Programming. There are close analogues in finance where the goal of investors is to select the portfolio of investments (stock, options, real estate *etc*.) to maximise the expected returns given the risk. In the case of the Board, the problem is to select the portfolio of NRM projects, policies and actions which maximise the expected multi-attribute utility which incorporates community and Board values, and investment risk.

By combining the value intensity surfaces developed in Stage 1 with the results from Stage 3 we can map the spatial distribution of expected multi-attribute utility scores of the various alternatives. Thus, the analysis in Stage 1 identifies the spatial intensities of community values for individual objectives (land, water, biota). Multi-criteria analysis in Stage 2 can quantify the relative importance and trade-offs between these multiple objectives or criteria (plus other non-place related objectives such as atmosphere) and associated sub-criteria. By combining the layers of place-specific community value intensities with the trade-offs derived through the MCA process, we can obtain a more holistic picture of how and why people value particular biota, land, and water assets at the place-specific scale. The work will provide a more explicit basis for prioritising investment in different environmental assets through a portfolio of spatially-explicit NRM policy and management alternatives. (*i.e.* improve flooding regimes at Chowilla compared to altering fire regimes at Ngarkat CP). The project team from CSIRO will work with Board staff to explore the analysis and understand its uses in target and policy setting, development, revision and implementation.

1.3 Stage 1 report outline

This is the preliminary report detailing the findings for Stage 1. The report discusses some of the theoretical issues involved in establishing environmental values and using them in a policy context. We have aimed to investigate personal values in community natural resource management leadership groups and how those values might impact the policy recommendations these community groups make.

The first section of the report discusses some of the theoretical and methodological issues surrounding a study of environmental values. It lays the foundation for understanding the process of uncovering how respondents value the environmental assets they manage. It discusses both the theoretical framework and the methodology used during the interviews to ensure respondents were given ample opportunities to express their values in a variety of constructive ways.

The second section explores the value themes uncovered in the interviews. It addresses these by asset theme; water, land, biota, atmosphere, and people. The section also deals with ‘missing’ values; those researchers expected to find and did not. At the end of each chapter is a discussion of the potential implications the information has on the selection of policy tools in future programs.

A final section summarises the key values expressed. The emphasis in this section is the relation these values have to each other and how they will interact in the development of policy decisions. Particular emphasis is laid on how those values might impact trade-offs and policy decisions in the short term.

Following this summary is an analysis of the 'next steps.' Given the breadth of this information, the next steps include further areas of analysis using the existing interview set. The main purpose of the interviews was to establish the values community policy advisers hold and how they relate to environmental assets and ecosystem services. To reveal these values, interviewers collected information on the acceptance of information as 'fact,' opinions about progress, potential management actions and sets of attitudes, activities and personal histories of a set of dedicated men and women actively leading their community through critical landscape-scale natural resource management challenges.

CHAPTER 2: VALUES

This phase of the project was designed to identify the values environmental managers and policy advisers hold and how those values may have influenced past attitudes towards environmental management, management actions and policy recommendations. Interviewers allowed respondents to express themselves freely. Analysts then distilled and captured the values respondents expressed in the stories they told about their experiences. Consequently a discussion of 'what a value is' is an important precursor to understanding the outcomes of the project.

2.1 Management issues

Environmental management decisions are, by their nature, moral decisions in that the perceptions we hold of a shared environment necessitate that we consider the welfare of others in making management decisions. (Franz, 2001; Heberlein, 1972). It follows that the values farmers, community members, policy-makers and scientists hold will at some level influence their environmental management decisions and policy advice (Allen, 2001).

Even though NRM decisions rely heavily on scientific information, the decisions themselves are by nature value based. Scientific research provides options for decision-makers about the state of an ecosystem and the potential consequences of actions. Which option to take depends on how a decision-maker, a landholder, farmer or scientist perceives how a predicted action or inaction will affect the services provided by an environmental asset that they value. Since these values are the key to landholder actions and stakeholder policy recommendations, this project was designed to understand what those values are in the hope of discovering how they might influence individual and collective action and policy advice.

2.2 Definition debates

One of the active debates in the literature surrounding environmental values concerns the definitions of 'values' used by various disciplines. In Reser and Bentrupperbaumer's (2005) review of works on environmental values, the authors note that while 'there is a broad consensus that "values" are and represent important individual and collective investments and judgements about what in this world and in this life is truly important, worthwhile and meaningful,' there is no one accepted cross-disciplinary definition of a 'value' as it relates to the environment. Since this project proposes to unpick environmental values, it is worthwhile briefly touring the complexities of the debate before arriving at a working definition.

That the environment is valued is a given in the literature. How it is valued and how people develop and consider those values in their thinking, identity and actions is

under both debate and investigation. One of the crucial issues is the definition of intrinsic values as opposed to instrumental or 'use' values. (Reser and Bentrupperbaumer, 2005). Intrinsic values indicate that an environmental asset has a value in and of itself, without any reference to human beings, whereas instrumental values describe assets in terms of how people use them, even if only 'to look at.' Instrumental values are entirely anthropocentric—they value assets for what those assets do for humans. Ecologists, philosophers, environmental psychologists and economists have variously lined up on one side of the debate or the other and continue to debate the policy outcomes of accepting whether or not values can exist without reference to sentient beings and particularly humans (Lockwood, 1999).

In the context of this project, the debate about the anthropocentricism of values has been solved by the nature of the methodology. Respondents were not given a solid framework of value definitions to work within and so they expressed their own. Some respondents described natural assets as having intrinsic values (it has value because it is there) whereas others described only instrumental values (I value it because it exists and I gain something from its existence.) Consequently, the interview team included intrinsic values in the classification system to represent the beliefs respondents hold about values themselves. However, these intrinsic values were combined with bequest and existence values in one category. This is necessary to ensure that while all interpretations of 'value' are captured, the analysis of transcripts reflects the valuation of natural assets and ecosystem services, not the valuation of a system of values.

2.3 Values: a working definition

Despite the academic debates, a working definition from which to evaluate and shape our analysis of the interviews is still useful. While respondents had their own views on values, interviewers used the following definition written by Heberlein, which he based in part on Rokeach (1973):

> Values…tend to be single, stable beliefs, which are used as a standard to evaluate action and attitudes. Values have two notable characteristics which differentiate them from most attitudes. First, they transcend objects. …Second, values are most central in a person's belief system. Values are the basis for evaluating beliefs, and other linkages among beliefs. (Heberlein, 1981).

With this definition in mind, interviewers were able to guide respondents through their stories, encouraging them to continue speaking and explaining their thoughts until they arrived at statements that fit within this definition. The general model interviewers used to guide stories considered actions to be driven by goals, which

are expressions of attitudes that are developed by applying values to situations and objects.[1]

2.4 Qualitative and quantitative research

The purpose of qualitative research is ultimately not to answer a specific, pointed research hypothesis but to find new questions. The Board is embarking on a participatory planning process in which the values of community policy advisers will shape how the upcoming budget is related to natural resource condition targets. Understanding those values, including their strengths, locations and associations with assets and ecosystem services, will help construct meaningful and weighty questions and trade-offs to consider when planning for the coming years. We also hope it allows the Board and its NRM planning community to develop a useful understanding of the collective values they hold and how those values ultimately interplay to drive their collective decisions.

[1] In particular, interviewers were cognoscent of discussions around a respondent's 'belief' in scientifically verified information and how people chose to incorporate competing information as fact or fiction. This was particularly relevant in discussions of soils, fauna management and human induced global warming. Interviewers attempted to uncover the values that drive the acceptance of information as 'fact.'

CHAPTER 3: METHODOLOGY

Understanding the interview methodology is an important step to understanding the context in which interviewers gathered qualitative information. Below is a brief description of the methodology used in this project.

There is a large degree of debate, particularly amongst oral historians, about the relative usefulness of interviewing as a form of data gathering, and the degree to which it can reveal objective 'facts' or truths about areas of research interest. This is largely due to the subjective and biased nature of narrative forms inherent in participant responses and the context in which they are gained (Teski and Climo, 1995; Grele, 1998; Perks and Thomson, 2006; Rubin 1986). However, oral historians, anthropologists and sociologists have used interviewing techniques as a part of qualitative research methodology to gain information that cannot be gleaned from other sources (Thompson 2000; Armstrong, 1997). Interviewing is also recognised for its strength in gaining subjective perspectives of those being interviewed. In this case, a project designed to reveal value systems, which by their very nature are subjective, was ideally suited to using semi-structured interview information gathering techniques. The set of techniques employed aided participants in revealing what they value in terms of natural resources and the services they provide.

3.1 Interview techniques

Interview techniques from anthropology and oral history were used to elicit information from respondents. Interviewers encouraged respondents to provide a personal context on three levels; how they came to be in the region, how they became involved in natural resource management and how they became community leaders. This provided context and illuminated linkages among participants. It provided the time needed to allow a sense of rapport and familiarity to develop between the interviewer and interviewee, which is necessary for successful interactive qualitative research (including interviewing) to be effective (Keats, 1993).

Three interviewers with backgrounds in ethnography and oral history interviewing techniques conducted 56 interviews between November 2007 and January 2008. While the time-frames were tight due to project constraints, one of the key benefits of conducting interviews in a rapid succession was the minimisation of respondent contamination. Many of those interviewed know each other and the time frames did not give them enough time to talk to each other and potentially collude on the 'message' delivered in the interviews.

Interviewers provided only minimal information about the direction and expected outcomes of the project in order to avoid subject contamination. Interviewers wanted to ensure that respondents could not interpret what they felt they 'should' say from a lengthy project description that emphasised the fiscal goals of the Board.

This strategy lasted until the Stage 2 MCA workshops (see section 1.2) were completed and participants were no longer asked to express individual or group values as part of the project inputs.

Where possible, interviews were conducted in people's homes in the expectation that people would be more comfortable and therefore more open and honest about discussing what they value. This also located respondents on the site with which they associated many of their environmental values, making it easier for respondents to 'think on their feet.' The interview team considered employing techniques that would allow respondents to walk and take photos in the landscape they discussed but time constraints made this option impractical.

Further situational context, gathered from external sources, was used in the analysis. For example, interviewers were cognisant of eliciting how people, pressured by the current drought and declining terms of trade in many areas of agriculture, both support and get others to support conservation measures that diminish their access to previously used natural resources (Kottak, 1999).

All interviews were taped with digital recorders for transcription. Each interview had two recorded sections, one for the interview and one for the mapping process. During the project, technical failure resulted in the loss of one interview and one mapping process, both from different interviews.

3.2 Interview design

The aim of the interviews was to answer the central question: what do you value in the environment and why do you value it? This one question was to be answered thoroughly and exhaustively over a two hour period. Because people understand questions and interpret them in a variety of ways, the interview plan approached this question from four different entry points into the topic of environmental values; open-ended questioning, natural asset-based prompting, ecosystem service-based prompting, and spatial prompting.

The interview process was largely respondent-driven in that people were encouraged to detail and expand on their environmental values in their own way. This meant they provided interpretation of assets, ecosystem services and values rather than being constrained to definitions provided by the researchers.

Interviewers began by reading a project description and privacy notice assuring respondents that they would not be identifiable through the project reporting. Interviewers then began a warm-up exercise by asking respondents to talk about how they became community leaders and their interests in natural resource management. While these conversations build rapport between the interviewer and the respondent, they also provided vital background information to help analysts understand the context of the environmental values in the study.

3.2.1 Open questions

The first section of the interview was loosely scripted with open-ended questions designed to avoid prompting respondents into talking about particular categories of values while avoiding others. However, respondents often needed some direction as to what the interviewer needed to know. To accomplish this, the interviewers either asked questions and used examples that did not pinpoint environmental assets or ecosystem services that could be valued, or, when asked for examples, they gave exhaustive (and often interrupted) lists of assets or ecosystem service values. This technique helped to avoid a response that interpreted a single example of subject prompting as the subject to be discussed.

Interviewers attempted to move respondents into a discussion of their values in a way that would flow from natural conversation patterns. This flow is a reversal of the way in which the project approached the formation of attitudes, goals and actions from an existing set of values. Interviewers first asked about the natural resource management actions the respondents undertook, then the goals those actions represented. Next interviewers asked about the attitudes that led to the formation of those goals and finally the values the attitudes represented. Respondents were then able to unpack their activities themselves and create narratives that helped express their values. Even respondents' silences revealed something about their values or underlying assumptions regarding what was important to them.

Interview Process
ACTIONS ➔ GOAL ➔ ATTITUDE ➔ VALUE

ACTIONS	• What natural resource activities do you undertake? • What would you do if you had enough time and money? • What needs to be done?
GOAL	• Why do you do these things? • What is the outcome?
ATTITUDES & VALUES	• Why is that important to natural resources? In general? • Where do these goals fit with the other priorities in your life? • What are the main things you value in the natural resources around you? How? Why? • Do you ever feel that you need to juggle between the different priorities you have in your life? • Can you talk about the relative importance of your natural resource values in relation to these other things in your life that you value? • How do you incorporate or make choices (juggle) between your natural resource values and the other things that you value?

Figure 2: Open questions from the script

The result is a collection of stories and discussions revealing the key values people hold towards environmental assets and the ecosystem services they provide. It also includes discussions of non-environmental values that might be relevant when respondents are faced with choosing among propositions.

The following two sections of the interview were prompted, but only if the issues were not been covered in previous discussions.

3.2.2 Asset-driven questions

Interviewers asked questions that allowed respondents to construct their own stories but they also wanted to ensure respondents were given ample opportunities to explore their values towards each category of asset. Asset categories are important to the institutions that govern natural resource policy, such as the Board. It was therefore important to ensure that respondents had the opportunity to address their values in the manner in which NRM institutions understood the classification of assets. Respondents were prompted to discuss the ecosystem service values they held towards water, land, biota and the atmosphere as individual natural asset categories in the region.

Natural Asset-Driven Prompting Questions

- Let's talk about 'X' as a natural asset in your region. What aspect of that asset do you value in your region? What form does that asset take?

Optional

- Do you think we should differentiate between natural and native?
- Do you think that there is value in [having] Agricultural systems?
- Do you think there is value in having non agricultural natural resources?
- If you had to compare them, what value do you place on each of these and why?

Figure 3: Natural asset-driven prompting questions

This exercise allowed respondents to think about natural assets individually and captured their views in areas that might not have come across in the unprompted section. However, respondents tended to drift back into stories and conversations relating to areas of most concern. For example, when asked about how they valued the atmosphere, a respondent chiefly concerned with surface water would mention concerns about climate change and then relate that back to water access. Many respondents also commented that this structuring of natural assets did not reflect the framework they use to think about the environmental and natural resources.

3.2.3 Service-driven questions

Like the asset-driven section, the ecosystem service-driven section aimed at providing an additional entry point for discussing the central question of what respondents value in their environment and why. This section approached the question from a prompted discussion of what service environmental assets provide that people value.

As a guiding principle, researchers used the ecosystem service categories found in the report 'Ecosystems and Human Wellbeing' (Millennium Ecosystem Assessment, 2005). The report outlines four categories of services ecosystems provide to people: provisioning, regulating, cultural and supporting. In testing the interview scripts, researchers found that these headings were unclear to those who were unfamiliar with the literature. The headings were changed to short phrases that captured the gist of the categories and provided plain English definitions.

Four Categories of Ecosystem Services	
PROVISIONING	**Providing for peoples needs** These are those things humans gain from the environment for food, shelter, physical existence and quality of life.
CULTURAL	**Providing for peoples wants** What we want from ecosystems, including their contribution to our cultural and spiritual values, and our understanding of the world; our ties to a locality, and our heritage, recreation and eco tourism uses.
REGULATING	**Regulating the environment around you** These are ways the ecosystems and the environment self regulate and process themselves in your region.
SUPPORTING	**Supporting the long-term health of the planet** What we feel is important in maintaining the long term health of the planet. The impacts of these are usually indirect.

Figure 4: Categories of environmental capital ecosystem services

Respondents had an easier time discussing natural resources from an ecosystem service perspective than they did from an asset perspective.

3.2.4 Spatial questioning

The final entry point for exploring environmental values was a spatial mapping exercise. This process allowed people to enter discussions about their environmental values from a spatial perspective, which suited some of the respondent's thinking styles better than a purely verbal interview. The spatial mapping of values has been undertaken as part of mail outs and telephone interviews (for example, Brown and Raymond, 2007; Tucker *et al*., 2006). In this project, the interviewers applied the same principles as those used in previous surveys. However, interviews allowed researchers to collect a greater amount of

detail about why participants value parts of the landscape, not just where, how much, and in which categories those values fall.

After the three main sections of the spoken interview, the interviewer produced two large maps (1189 mm x 841 mm) of the South Australian Murray-Darling Basin region. One map was a satellite photo (for referencing only) and the other was a topographical map with major roads and locations listed, as well as the boundaries of each of the four NRM regions in the SAMDB.

Participants were then given 40 green dots and 10 red dots and told to place the green dots on the assets they valued on the map and the red dots on the assets they devalued. Participants were allowed to stack their dots to represent a weighting, use any shape polygon to represent the area, and were not required to use the full number of dots if they did not wish to do so. They were also allowed to place dots off the map to represent non-spatial values (such as photosynthesis), but not to represent assets outside the region (such as Victoria). The green and red dots are not directly comparable in the sense that a red dot represents (-1) and a green dot represents (+1). Positive valuation of assets and negative valuation of assets do not necessarily represent directly comparable types of assets.

Once participants placed all their dots on the topographical map, interviewers then recorded map dots and their colours onto a smaller map and asked the following questions regarding each location:

- What is the shape of that dot or stack of dots?
- What natural asset do you value there?
- What ecosystem service does that asset provide that you value?
- Is there anything that could happen to impact what you value?
- Is there anything that could be done to protect what you value?

This information was spatially referenced and modellers produced each interview map in a GIS layer. These layers were compiled to create maps of spatial values.

3.3 Words to text: the transcription process

Once an interview was completed, the recordings were then transcribed. With 56 interviews varying from 1.5 to 3 hours, transcribers produced approximately 1500 pages of text as well as 56 spatial maps and associated notes. Transcribers summarised the interviewers' questions and removed many of the verbal ticks (um.. ah… like, like, like…etc.). While these verbal tools signify that a respondent is 'thinking on their feet' they also make transcriptions difficult to read. Furthermore, respondents often edit these 'ticks' out themselves.

Completed transcripts were then mailed or emailed back to participants for editing and expurgation. Where participants edited the spelling of place names, word use or verbal ticks and insignificant nuances, the transcripts were simply changed. Where participants expurgated sections of text with meaning, the sections were struck out and not used directly. However, analysts may have referred indirectly

and in general terms to information in an expurgated transcript. Expurgated sections of transcripts are never made public or shared with those outside the immediate project team. Once this process is complete, the project team will give the Board the expurgated information in an aggregate form. The project team will ensure that the information is relevant and useful but that respondents cannot be identified through the reports. However, respondents do have copies of their transcripts and are free to use them as they see fit.

As a final note on style, respondent material is kept as accurate as possible. Where we have removed words we have put in an ellipsis (…) in the space. Where we have changed a word, such as a change in tense or the addition of conjunctions, the additions are in square brackets [ ]. To differentiate respondents' words from our own, we have also italicised all quotes from interview materials.

3.4 Text to analysis: the categorisation of results

One of the primary advantages of semi-structured qualitative interviews from the respondents' point of view is that they get to present their own understanding of the issues in their own words. It is then the job of the research team to provide structure to the information respondents have provided. This is done with text coding software that allows an interviewer to create a structure for understanding the information and attach sections of the interviews to those codes.

Since each interview must be viewed in context, it is important to keep each 'story' together in one segment and apply all relevant codes to that segment. Many respondents discussed several asset and ecosystem service values within the same 'story' and sometimes within the same sentence. This method ensures all their relevant views are captured when the interviews are broken up into categories.

It is also important to protect the confidentiality of each respondent. To do this, we created an independent code called "background" to gather the warm-up sessions where respondents talked about themselves, their role in the natural resource management and how they came to positions of community leadership. These background segments are summarised to create a picture of the respondents but they will not be linked to the remainder of the interviews where respondents discussed their values and opinions about natural resource management. (See section 4.)

3.5 Categorisation framework

This report is divided into the four natural assets defined by the SAMDB Board; water, land, biota and atmosphere, as well as a discussion on 'people' as an environmental asset as expressed by the respondents. Each asset has its own chapter. Within each chapter, we have applied a categorisation of services under each asset category that follows an acceptable internationally understood standard but also remains both relevant to the themes and ideas expressed within the

interview population and succinct enough to digest in a single report. Discussion centres on natural capital services, which analysts have divided into four ecosystem service provision categories as outlined in the report 'Ecosystems and Human Wellbeing' (Millennium Ecosystems Assessment, 2005). In addition, we have added categories for built and social capital services in order to reflect the content of the interviews. Each service has a defined set of sub-categories, not all of which were relevant under each asset category. In each of these sections, only the relevant sub-categories are discussed. Detailed information on the categories and their precise meanings is located in Appendix A.

CHAPTER 4: INTERVIEW RESPONDENTS

The interviews do not represent a random sample of community opinions. The structure of the decision-making in the region is such that community desires and opinions are represented by the members of four NRM Groups. The Groups advise the Board on value-based decisions; on what the community wants as opposed to more scientific recommendations on how the Board should achieve stated community preferences. The Groups make policy recommendations to the Board, and through the Board to other government agencies, based on what these Groups believe is right for their communities. Since the project is driven by the need to establish the values decision-makers use to evaluate facts as they understand them, interviews targeted people in a position to influence natural resource policy in their region.

The SAMDB NRM Board has four NRM Groups; Ranges to River, Mallee and Coorong, Rangelands, and Riverland. Each group has seven members, all of whom were interviewed. In addition, the Board chose an additional 28 people whom they considered to be community leaders that can shape opinions and actions regarding the management of natural resources. Overall, the interview population represented all of the formal community decision-makers involved in Board decisions and a significant portion of other community leaders who also impact community opinions and influence decisions.

4.1 NRM Group respondents

Of the 28 NRM Group Respondents interviewed, 22 were male and 6 were female. Because of the low number of women involved in the group, we have referred where appropriate to everyone as ‘he’ or ‘him’ to decrease the likeliness of particular women being identified. While we did not ask people about the gender imbalance in group representation, this might be an area of interest in later studies.

One of the most relevant aspects of participant backgrounds to the content and strength of the values they held is the length of time and experience respondents have had interacting with the land. Exactly half of the NRM Group respondents had lived in the NRM Group District all their lives. The majority of NRM members who had lived in the district all of their lives explicitly expressed an affinity for the country environment whether it be a love of the land, the scenery or the lifestyle. Answers such as this were common among this group:

> *I'm a sixth generation farmer on the lower parts of the river... It's important through our parents and through my family after being brought up on the river that we keep the environment healthy, sustainable and good to everyone. And it's your water as much as the biggest irrigator. These are the values of the environment that are important to me.*

Even migrants to the region developed an affinity with the land. The shortest time lived in one of the SAMDB regions is three and a half years with the respondent moving from interstate for work purposes. Even over such a short period, he valued the region, stating '*obviously we love the environment so it's as much the climate as the environment around us. We certainly love the river and being in a river town*.' Other migrants to the region expressed similar sentiments.

> *Everything was here, it's a lovely environment in which to live so we settled and even though the kids have moved on, we still have our friends here and of course we love the environment but the whole aspect, the Mallee and the River and so why move when you've got that all around.*

When the NRM respondents were asked about how they came to be involved in the NRM Group, 18 sought out membership in the Group, 2 progressed from Landcare groups and 7 were approached to join. The most common answers when asked about how they became part of an NRM Group included an interest in the environment, in natural resource management, in improved sustainability of the dairy industry, sustainable land management, conservation, education, community benefits and in preserving the environment for future generations. The majority of these reasons speak directly about values as motivations for action.

The NRM Groups are volunteer groups and many of the respondents revealed deeply held values about the environment and community's role in them when discussing why they became or have remained involved in the NRM Groups.

Some respondents felt a sense of environmental stewardship that stemmed from their childhood. A typical respondent explained;

> *In terms of my involvement with NRM …I got into that … from a background in, or a childhood where we were provided with lots of opportunities to get out in the bush, camping, lots of time at the beach, really being outdoors a lot and seeing a lot of the country. I think that's fairly important and laying that groundwork for how you develop as an adult and the types of values that you hold and I think certainly my upbringing included some strong parental role models of environmental stewardship and care for the land.*

Many expressed a recognition that environmental management practices needed to change and that they were in positions to start those changes.

> *I got involved with the NRM because I believe that perhaps that was one way of having some influence of what was happening in the area because I wasn't particularly keen with what I was seeing and I thought that was an excellent opportunity to have some input.*

> *I … was a very strong - what I call an armchair environmentalist - strong opinions about things but not necessarily that active so it came to a point where I thought, well it's better to do something positive and get more involved hence where I am today.*

Others saw practical problems or behaviours they felt they could help fix. Many respondents wanted to offer their empathy and experience in trying to balance environmental outcomes with running a farm business to others in the community.

> *I think it's more an altruistic thing that we've got, everybody's got to do something to help. The only way to get people to do it is to help them, to share some of your feelings with them, passion with them; something. But also knowing that it's very hard unless there is somebody who can identify what needs to be presented, what needs to be done. I feel as though I've got that knowledge and background to do it.*

> *I know you have to give people the right information in the right way at the right time. There's no point, you can't just put out fact sheets and plans and things like that if you're not going to make contact with the actual people, sometimes on an individual basis. You just won't get the message through because they don't see any relevance to them, so it's the involvement that you need to get through.*

Overall, the NRM Group members portrayed informed and considered attitudes towards NRM, both on their lands and in their communities. Their involvement in community leadership displayed a balance of environmental and civic values and a deeply felt understanding of the trade-offs regional land managers must face when trying to build sustainable and economically viable communities.

4.2 Non-NRM Group respondents

Of the 28 non-NRM Group respondents interviewed, 18 were male and 10 were female. Again, all respondents are referred to as 'him' or 'he' to ensure that the women are not individually identifiable.

Twelve respondents have lived in the SAMDB all their lives. The shortest time lived in a particular area was two years. Other respondents reported living in the region between seven and twenty eight years. This group of respondents felt the length of time in the region was also relevant and referred to it as one of the reasons they had achieved positions of community leadership.

When asked about why they lived where they do, they had similar responses to the NRM Group members regarding their family and personal backgrounds. Some had direct parallels to the responses of the NRM Group members, such as those below.

> *I was brought up on the land and had always an interest in native vegetation and scrub land, biodiversity issues generally and at a very early age got to know a bit about the Murray and came to love the river.*

> *We've been involved for 5 generations so you do know that as a family we've farmed this land, well we're the only white people that farmed this particular patch of land, so I guess that gives us some sense of connection with it. It's*

a really good office to be around, you know, when I ride around on the motorbike first thing in the morning and look out and get on top of XXX Hill and look out over the Murray Plains and some times you think well, this is God's little piece of the country so it does have it's own beauty, it's not different to anywhere else, but it's ours and it's got our thumbprint on it, I suppose, and now we need to ensure that we keep that thumbprint. Well, keep the viability and sustainability issues at the forefront so we can pass it on to the next generation, whether that be our children or we sell it to someone else and it's still got to be looked after.

When asked how they came to be community leaders most respondents discussed their community positions: four came from volunteer groups such as the Country Fire Service, three were involved in community organisations such as sporting clubs and eighteen became involved through their employment such as district councils, youth councils, teaching positions and soil conservation boards.

This group's motivations were also similar to the volunteers in the NRM Groups. They expressed senses of civic duty and their community's 'need' for people to play leadership and coordination roles.

You get into it because there's a need. You look around the community and there are low employment opportunities and health issues, social issues, problems that have been around for a long time due to lots of things and so I got involved because it was the right thing to do.

I think I've been volunteering for I don't know, 25 years that I've been in the area, and been farming. So during that time, obviously to keep farms sustainable, we need to be aware of the land and the management of that. … I'm just passionate about community development in general.

One respondent in particular shared a story that explained his realisation of the importance of both the land and his community to his own sense of place.

I realised all the places they took me, were actually dreaming spots, yeah. So, and you know, it goes all the way up to the junction of the Murray and the Darling, and so that's why I was so passionate about the river itself and the lakes, because our dreaming hero created that for us, and so we should be allowed to have more input in the protection of the river, and all the vegetation like that comes with it, the flora and fauna ... So when something happens, it affects the whole food chain and vegetation, all those things. It affects people's lives as well.

Others were specific that their current community roles are linked to their employment. However, employment in a position of community leadership did not diminish their sense of civic responsibility and the desire to achieve positive community outcomes.

Some of the Non-NRM respondents expressed an interest to move onto NRM Boards and some are already involved in the activities of the NRM Groups. Others

would like to get involved but cannot find the time. One respondent described the issues he faced in trading off volunteer and paid work and how he tries to achieve balanced outcomes when he said:

> *We don't have enough staff on [our property] that we can actually go away and join these groups, and put a lot of hours into the program, if we were dedicated to it. … So it's pretty important for us to try and do something really locally, put a couple of hours into it, get something done there rather than spend hours away from here and know that there's no one here.*

The overall impression is that this group of community leaders, though many of them are not directly involved with natural resource policy advice, are highly aware of the importance of natural resource management policy advice and see it as connected to the community positions they hold in different arenas.

4.3 Respondents in general

There are no obvious differences in the backgrounds of NRM Board members versus Non-NRM Board members. The two groups are not dissimilar in their backgrounds or their melding of environmental and community attitudes. A similar number of the respondents in each group have lived in the district all of their life – the only distinguishing factor is that there are very few new members in both these groups migrating to these districts. However this is to be expected as community leadership takes time to establish.

Respondents themselves gave the impression that the most important aspect of their own backgrounds was the empathy and practical experience they had developed over the years with others in their communities. This included both a love of the land and an understanding that they had to balance natural resource management with the economic viability necessary to keep themselves and their communities in viable positions.

CHAPTER 5: COMPARATIVE IMPORTANCE OF ASSETS

5.1 Value frequency

The frequency at which certain topics came up for discussion is a good indicator of the relative importance of each service either the environment or the people around it provide. Due to the nature of qualitative interviewing, these figures do not represent any absolute scaling of values. They simply represent the number of respondents that discussed the services certain assets provide as well as the aggregate number of times those services were raised in the 56 conversations that took place over the interviewing period. The pie chart and frequency table below provides impressions of the relative importance of topics as measured by the frequency with which they are mentioned. **It provides an impressionistic weighting inside the context of the broader interview information.**

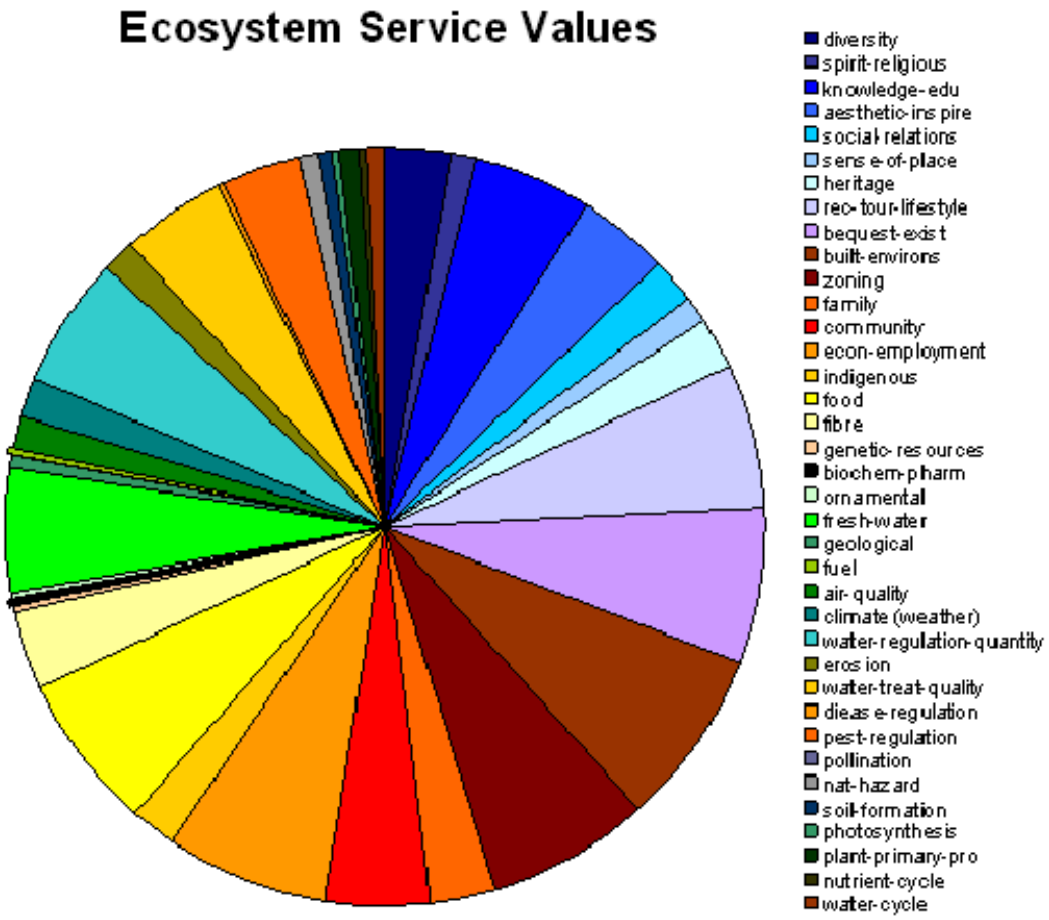

Figure 5: Pie chart of all service values

Figure 5 displays all of the asset service values and gives an impression of the relative frequency of each topic. There are some topics people felt were more important than others. To expand on this impression, Figure 6 below isolates the 14 categories respondents discussed the most.

Since each asset category was also a prompted category, frequency codes are not a significant indicator of the asset topics people wanted to discuss. Likewise, interviewers prompted respondents to talk about the high-level ecosystem service categories (provisioning, regulating, culture and supporting). However, since they were largely unprompted, the natural, produced and social capital sub-categories do provide some useful impressions about the overall content of the 1500 pages of transcriptions.

In Figure 5 below, the **segment frequency** column summarises the number of times participants talked about that value across the entire set of transcripts. The **source frequency** column summarises the number of people who talked about a particular value as part of their interview or mapping exercise. This does not include a breakdown between positive and negative values expressed about a code but simply when a value was discussed or expressed. The numbers are best understood in terms of highlighted clusters of very high frequency responses (white), high frequency (grey) or medium frequency (dark grey).

		Segment frequency	**Source frequency**
1	built-environments (towns, weirs, schools, …)	440	52
2	economic viability &-employment	418	55
3	zoning & planning (peri-urban, land use)	412	52
4	bequest, intrinsic & existence	399	55
5	food	394	52
6	recreation-tourism-lifestyle	359	54
7	water regulation (i.e. flows) quantity	329	54
8	fresh-water	318	55
9	knowledge systems & educational values	295	53
10	water purification & waste treat-quality	278	54
11	community	266	50
12	aesthetic & inspiration	237	51
13	fibre	204	39
14	pest regulation	199	52

Figure 6: Frequency of codes ordered by frequency of occurence

Discussions of built structures, economic activity and land use dominate the very high frequency cluster. Taken as a whole, respondents appear to have been the most verbose about the impact people have had on the landscape and discussing the viability of continuing to inhabit that landscape into the future in an economically viable way.

The high frequency (grey) cluster is an interesting grouping of topics that are largely suitable for inclusion in the investment prioritisation work. The cluster is dominated by recreation. Numerous topics were mentioned around water quantity, water quality and the use of water for growing food versus wine (which was seen by some as a luxury good). Landscape, as a way of knowing, and as a place for education and teaching was also important and emerged frequently. The community category represents values for and of the local, regional and agricultural social communities. These seem to be more immediate and personal concerns than the high frequency group. This cluster also seems to have more direct relevance to potential NRM programs specifically targeting landscape assets.

In the medium frequency (dark grey) category, the aesthetic values associated with the landscape are important to people. In part, they expressed this value in terms of well-being associated with being in the country and surrounded by the landscape in their everyday lives. The last two items in this cluster demonstrate how the list becomes somewhat regionally or thematically specialised after this point. The fibre category was mostly applied to dryland farmers, which is a regional distinction. Pest regulation, on the other hand, affects everyone but it is associated with a specific activity and so was not discussed across a wide range of natural assets. Discussion of pests was mainly associated with discussions of biota; for example weeds, rabbits and wombats.

5.2 Spatial distribution of values

The spatial mapping exercises also provide information about the relative priorities people attribute to the landscape. This exercise was more readily quantifiable as people were asked to ‘spend’ their 40 green dots and 10 red dots on natural assets in the landscape.

People spent the green dots on assets they valued for positive reasons and then took the opportunity to discuss potential threats and mitigation actions. The map in Figure 7 aggregates all the positive values people attributed to the region.

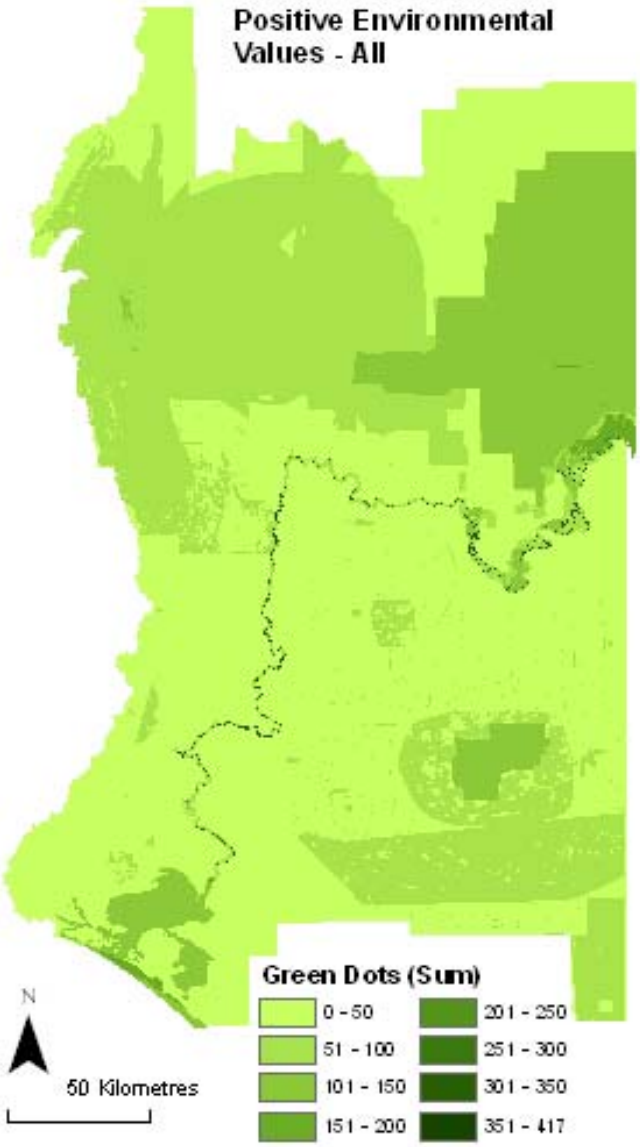

Figure 7: Map of all positive values

People could use their red dots on assets they valued negatively or 'devalued.' These could be located at the same place as green dots but for different, often complimentary reasons. For example, one respondent put green dots on the Chowilla floodplain for the ecosystem services that wetland provided and red dots on the Chowilla floodplain to represent concerns about feral pigs in the area. For this reason, the red and green dot maps have slightly different nuances. The map of red dots should be read as areas of concern to people, rather than a spatial representation of what they would like to get rid of.

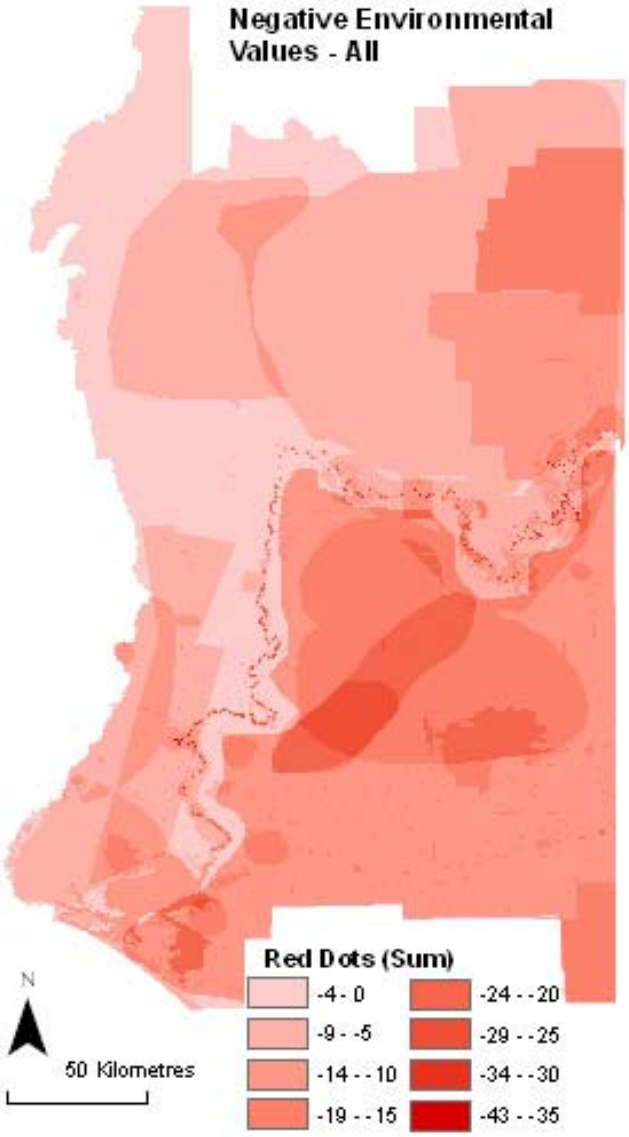

Figure 8: Map of all negative values

The idea that people are concerned but conflicted over environmental assets is evident when you consider the spread of red dots in Figure 8 alongside the overwhelming concern that people have that they can continue to make a living on the land. Many of the red dot areas locate irrigation districts as areas of concern, yet in the interview materials, it is clear that people do highly value both food production and economic viability. They are not necessarily willing to give up irrigation altogether and are looking for a solution where irrigation and natural resource management are not actually trade-offs. This is only one example of what might seem like conflicting values and impossible trade-offs expressed in the interviews. More will be discussed throughout the report.

5.3 Discussions of trade-offs

Interviewers did not ask respondents to make trade-offs among their values or to rank them in order of importance. Stage 2 of the project will ask people to trade off investment decisions around the values they have expressed in the interviews. The aim of the interviews was to reveal what respondents' values are. In general, people will avoid trading between values even if they conflict. They will try to find a way to fulfil the criteria of all their core values. That said, some observations are possible about potential activity trade-offs that might impact policy decisions.

Taken together, the clusters indicate that people frequently discussed broad-ranging values and that their discussions of issues became less frequent as they became more specific. It is these specific conversations that are often easier to put into policy action. For example, the Board has a clear and longstanding mitigation strategy for pests, and this is an important issue for the majority of the respondents. However, addressing the long-term economic viability of families and communities through the use of environmental assets is probably of more importance to respondents, though it might be harder to do.

The spatial mapping gives some indications about where these values are most important. Chowilla, the channel of the river, the Coorong, and to a lesser extent the Lower Lakes are all geographically important assets. While this is probably no surprise, the concentration of values on these few assets would be something to consider when developing investment priorities.

CHAPTER 6: WATER

The interviews for this project took place in the context of a drought across the entire Murray-Darling Basin. On 7 December 2007 the Murray-Darling Basin Commission released its Murray River Drought Update and described the state of the drought.

> The drought on the Murray, in terms of system inflows, is the worst on record. Inflows over the 2006/07 water year were just 55% of the previous minimum on record. Temperatures have been consistently higher than average, leading to increased evaporation and substantially less runoff. The low water reserves at the start of the 2007/08 summer irrigation season necessitated zero opening irrigation allocations for the first time in all three States. (MDBC, 2007).

While the Bureau of Meteorology did not report abnormal rainfall for most of the SAMDB, the region depends heavily on inflows from both dam releases and runoff in other states. Water storage was low; Dartmouth Reservoir was at 17% storage capacity, Lake Victoria was 60% and the Hume Reservoir was at 25%. This does not just affect water quantities in South Australia; it also increases the chances of high salinity and acid sulphate soil problems. Furthermore, the MDBC announced that, like the current irrigation season, the 2008-09 season would also be entirely dependant on rain and inflows. (MDBC, 2007).

Given this context, interviewers expected that access to a sufficient amount of high quality water would be at the forefront of respondent's minds and they were not disappointed. Respondents described water as '*the heartbeat of our country*', '*liquid gold*,' '*the lifeblood of our community'*, and '*the key to survival*.'

The immediacy of the water crisis prompted people to consider how deeply they value the existence of water in their landscape. Many of these had made connections between water availability and their presence and the perseverance of their community in the region.

> *Well it's pretty simple to say, no water, there's no life, and no life, there's no community.*
>
> *It's a domino effect, you take the water away, the people go with that.*
>
> *If we run out of water, I'll just go somewhere else.*
>
> *Simply because there is not enough water here or doesn't appear to be catching in my dam, will be enough to make me leave XXX. So there you are; that's what I think of water.*

However, the role of the drought can be overemphasised. Respondents using groundwater sources, which were not as immediately affected by the drought,

expressed the same attitudes towards water. One expressed his value for the groundwater as '*if you haven't got it out here, you're buggered virtually.'*

While the absolute value of water weighed in heavily in comparison to other, less immediately and obviously diminished natural assets, the ecosystem services for which respondents valued water varied. In other words, respondents had different priorities for the use of water. Approximately half of respondents talked about the social capital and cultural values of water; more discussed its provisioning and its regulating value. Far fewer respondents discussed how they valued water's role in supporting the long term health of the planet. This weighting fits with the overall impression that people value water for how it enhances their enjoyment of life and supports their continued existence.

6.1 Provisioning services

Many respondents value water for its provisioning services in general. Quite naturally in a context of hydraulic stress, water allocation is often at the centre of respondents' discussions. Many expressed concern at the values driving unsustainable levels of water use, or as one respondent put it '*sometimes I think our needs get too high, our wants get too high.*' Respondents in general felt water is precious and while they look forward to a better use of it, some also devalue the way water is currently used and expressed these frustrations in the interviews.

> *We haven't got it [water] - we've exploited it - we fouled it up, we didn't let it run free and we're paying the cost of it. That gets that one off my chest."*
>
> *I just think at the moment we're too close to the edge in resource allocation.*
>
> *We're looking at short term fixes rather than spending any significant time.*
>
> *We're just draining the whole system.*

One respondent concisely summarised the main issues around water and its provisioning services:

> *I think the drought has brought that to the forefront in a lot of people's minds. I think that's one of the highest priorities that need to be addressed, is how much water is being taken out of the system. We need to bring that back to more of a balance. Also, because I grew up on a block and my parents are still irrigators, I understand that it's not as simple as just taking the water away or buying water back. There's a lot of social and structural adjustment issues tied to it. We need to address it because if we don't get more water back in the system then what we are experiencing now will be the norm and lots of people and communities won't be able to survive like that. The highest importance to me is getting the water back in the right amount at the right time.*

In discussions on the services water provides to irrigators, many respondents expressed their concerns that the water allocation system as it exists now is either under-regulating the resource or that the current rules are inequitable. In some cases they felt the inequities were between South Australian and the other States that share in the Murray. In these cases, respondents generally feared that South Australia might not get its share of water. Respondents called for both political and community-based solutions, but most of all, they called for someone, somewhere, to address the problem.

> *We need better allocation policy both in SA and the whole because we are at the bottom of the river. Just managing water allocation in our part of the river is not going to fix the problem. It's got to be whole basin approach.*

> *It's a matter of providing environmental flows, of better understanding of the issues along the length of the river, people in NSW and Victoria understanding the issues that South Australia is facing and vice versa and as for its condition, it has deteriorated because of the drought but more because of over-allocation and that's an issue that's never been addressed.*

Other respondents concentrated on the imbalances they saw in allocations among their local community.

> *I think there needs to be more control over the allocation of these resources rather than just leaving it to the individual. Because if you've got a river running past your door you're going to stick a pump in it and pump the water out until it runs out I guess. With little regard for what's downstream and who's downstream and what effect it's going to have on the environment downstream. Its one thing to prescribe for irrigation purposes, but when you are getting subdivision on such a scale as what's happening here, its actually the stock and domestic that I think is … taking away from our tributaries.*

Still others felt that the rules governing the competing uses of environmental and irrigation water were unfair, either to irrigators or to people who valued environmental watering. This was particularly poignant for the recent watering of the Chowilla floodplain, as illustrated in the opposing comments below.

> *I don't think we should be irrigating just at the moment, the red gums. I think we've got to put things in place, so that any water allocated to environmental values, when Murray River allocations go below 60% that water is able to be transferred to top up irrigators' allocations and then you'll have a great deal more support when you really need to put water on these trees from the irrigators.*

> *They made a decision the other day not to use their water allocation because of a community reaction. Because [of] people in around Renmark with all their citrus dying … He's almost in tears telling us about it that they're just probably going to lose those old red gums. They could use the water but they're not going to use the water because of the backlash but it's an important area. They're trying to sort of favour a flood plain [and] build back*

back its biodiversity.

While respondents almost all agreed that water allocation rules needed to be improved, they did not agree on the most important problem or who the beneficiary of revised water allocation rules should be. Probably the most salient part of this argument for the Board is the disagreement over prioritising the environment or irrigators during times of drought. The three following quotes aim to illustrate this dichotomy of views about water use.

> *Well if they get less water, if their restrictions are cut back to less water, all irrigators say they can't afford to buy in more water and they don't make any more. And to me personally I think there should be more restrictions on urban users because I think a lot of people don't realise that the peach they're eating has got to come from somewhere. They just don't fall on the shop shelves and if they can't access water, then you're not going to have any more peaches or any more meals.*

> *Now these growers who want every drop that they can get themselves, in a way are being selfish and greedy because in the end we're going to have, they may have their water and they may have their crops but they won't have a river system anymore. The environment will be dead so what's the good of that?*

> *Personally I'm not against irrigation, but I'm not sure that there's any such thing as sustainable irrigation either. I think all irrigation leaves a footprint but at the end of the day we do require food. Farmers do need to make a living, and there's a bit of a balance in there where I think you minimise your footprint and look at something that is long-term sustainable.*

These views illustrate the tension among several consumptive uses and non-consumptive use of water. The tension is actually within the comments of each participant, not between them. People are finding that the current water crisis requires them to negotiate a balance between core values they hold about the food provisioning and economic viability and the core values they hold towards the existence of environment assets that are water-dependant.

6.2 Cultural services

Many respondents did not differentiate how they valued the various cultural services water assets provided for them. A sense-of-place, inspiration, aesthetic beauty and an active lifestyle incorporating the lakes and channel of the Murray River were often wrapped together and explained in a family and community context that demonstrated how the waterscapes of the region created and reinforced social interactions.

People told stories of growing up on the river and establishing their environmental values through a close connection with the waterways around them. One respondent talked about his return to the region and his realisation of the importance of the river as part of his heritage.

> *I used to love to travel the river from where we lived. So all those things were part and parcel of my childhood growing up. They were pretty important influences on me, I think in the early days, and it was good to get back to that.*

Other respondents told similar stories linking memories and experiences to a sense of place and belonging.

> *How do I connect to [the river]? It's hard to explain. I connected with it intensely when I was young, like I used to play in it and live in it ... I lived by a billabong and I definitely established what I believe the Aboriginals relate to when they talk about a special, you know that spiritual thing. I definitely felt like that happened to me when I was a kid and now … I won't ever shift away from the river because there is definitely something ... I guess I feel comfortable near the river, it's like some people feel comfortable near the sea … I like to be near it, I walk along it and often feel very sorry for it [laughter] and talk to it and tell it that it's in trouble.*

> *But there's just love of the landscape that's sort of built into you I guess from being here and the River's always played a huge part in our life whether it be skiing or canoeing so it's just something that you don't want to leave now.*

More than any other asset, respondents consistently expressed a sense of belonging and place on the Murray River.

Water assets inspired people. They often expressed this as a love for a wet place; the river channel, the Chowilla floodplains, and in many cases the Coorong.

> *It's just magnificent; I don't know anything to describe it as anything else.*

> *From the farm house you could see the Coorong and the trees and the birds. It's a pretty simple answer but it thrills some people actually.*

I've spent a lot of time camping down there as a kid, I love Coorong mullet, I love the smell of the place, I just love the Coorong. It's just a wild and lovely place. I could watch Storm Boy every night if it was on telly. It's a lovely place.

The drought provoked one respondent to remember how much he valued water assets as they previously existed.

I really value the water and it's not for irrigation purposes. I mean obviously I value it to shower in and all the rest of it but I really have a deep passion for clear, running water… I just really would love to see that again in the area. Or water that looks alive … it's important for me to see fish in water and it's important for me to just see … My main passion is definitely that river channel, wetland area.

Another remembered what water had been like in the Murray River in a previous era and lamented that the children of today will not have a chance to enjoy clear water in the river.

We're talking about personal life having seen the river as a young child, not that old … knowing that I could see the bottom when I was a child, catch fish and lots of yabbies and seeing those changes over my … relatively short lifetime as far as the environment's concerned … and getting that across to children that this isn't how it's meant to be.

These values were deep-seated and often provoked discussion and carefully considered concern for the impact the drought and water use by their own community could have on the existence and longevity of these assets.

Respondents discussed their own wide-ranging recreational use of waterscapes. They recognised and discussed personal and community-wide tensions among various recreational activities such as canoeing, water-skiing, camping, bushwalking, motorbike riding, and other activities that had an impact on waterways.

I love going camping and just down from Swan Reach, Walkers Flats, Swan Reach. It just is the best camping spot in the world.

Loch Luna Game Reserve … it’s another one of these canoeing areas, so it's a massive wetland and creeks … making up a lovely wetland area. And because of the amount of water that is held up there by Loch 3, just down stream, it's a very healthy riverine environment. It’s good breeding place for regent parrots and a lot of other species as well. Of course it's a recreation area for camping as well, quite a number of good campsites right through it. Great canoeing area … I actually have even seen eagles nesting in there so it's a lovely area, beautiful habitat for wildlife. And you can't race speed boats around and that sort of stuff in there. If you really want to get through it you really need to go very slowly in a boat, which one commercial operator does, or you paddle in a canoe.

Watching the change and being able to go to there … And just being able to talk to people about it and go there. Going down the Coorong. I just love driving down the Coorong and having a look, or sailing down the Coorong …. I don't think you'd get very far now, but there wouldn't be many people that have done it either.

Interviewers were left with the impression that camping along the river and travelling it by canoe, houseboat or ski boat were somewhat mandatory regional pastimes.

One of the clear and relevant policy themes emerging from the discussions about water is the value of understanding the water system on several levels. People recognise that this is a complex hydrological, hydrogeological, engineering, social equity and political problem. No one is expecting a quick answer, but more importantly, none of the respondents are expecting to have the problem answered for them. They feel they own this problem as a region. Several people discussed the need for people in the community to learn more about aspects of water management, from personal behaviour to participating in community leadership and decision-making over water at regional, state and national levels. Some of the respondents voiced these beliefs, concerns and recommendations clearly.

I think within the river corridor, we need to educate people a lot more as to what the river is all about and what's going to help them survive. We tend to exploit the river, and a lot of people who are concerned about the health of the river don't realise that they're part of the problem. And so we need to make sure that more people understand the complexity of the river. And what needs to be done to keep the river in good health and to give them good health for good sustainability."

They see this education as indispensable for good management.

If you don't understand the environment or values, which is the quality of it, you'll do what we've done in some areas anyway and destroy the asset itself. So to me, it's an essential asset for lots of different reasons … but I think the thing that's important from my perspective is an understanding of how to manage that asset in a way that we don't destroy it. I think there are lots of signs that we haven't done that very well. And we need to keep reminding ourselves that we've got to value that asset.

Yep, we don't have enough [water] and we don't understand it very well. We use too much for what's available, so we're told. There's a lot going on underground which we're not aware of and understand very well, so there's the use of water that may or may not be sustainable. I suspect it's not but we don't really know.

While the drought has heightened sensitivities about water quantities and qualities, respondents' discussions of bequest, intrinsic and existence values provided a sense that water as an asset held strong, long-lasting values that had been developed before the drought and would persist long after the drought had passed. This was a typical comment:

It would be nice for my children and grandchildren and other people to enjoy the beauty of the system rather than have to suffer what we are suffering now as a result of the drought. But it's not just the drought itself, a lot of our management strategies over the last 30 odd years or more; we are seeing the signs of it and impacts of that stuff like salinity, erosion, that sort of thing. It would be nice to stop that so that some of the natural features out there could be enjoyed by other people.

Another respondent, in discussing a long-standing discussion in his family, expressed a desire to see *'a much healthier water system - so we could walk up to the river and have a drink and know it's not contaminated … I'd like to leave a legacy for my grandchildren and their children and not an Achilles heel and I think today it's an Achilles heel.'*

6.3 Regulating and supporting services

Respondents valued water as part of a cycle, for contributing to the health of an ecosystem, and for supporting the life of biota. Given the immediate need and ephemeral qualities of water as an asset that enters the region and then largely leaves, not much was said that differentiated regional water ecosystems services and services that supported the long-term health of the planet. Again, perhaps due to the drought, not much was said either about the regulating and supporting services of groundwater. The areas that are dependant on groundwater have been experiencing normal rain patterns. While these respondents were aware of the value and limits of their groundwater, they too discussed the drought as it affected the Murray River instead of using more local examples to express their values towards water assets.

One respondent expressed his values towards the water as '*an existence, it's an aesthetics thing, but it is also a regulatory thing because it acts as the cleaning system for the river. So its giving us a little bit of leeway for what we do around the river really. But yeah for me, I just love that country.*' Many respondents commented that without the supporting and self-regulating services, the provisioning or cultural services they value the most could not be fulfilled.

But the water course to me is almost to me like the artery of the whole property. It is potentially biodiverse, rich; because it's got water of course, land because of all the vegetation that grows there plus the fact that it is protecting the value of the resource which is valuable to other people

Well obviously water, it's sort of again, it's a cultural thing as well, but being the very point of the end of the Murray River, it's incredibly significant part of South Australia, that whole system down there really is… the health of that is an indication of how we're managing a large part of this country, and all the you know, huge amount of life that's sustained down there, whether that be birds, fish, and of course recreational activities if they count.

Water quantity is related to the question of flows, which respondents feel are often not sufficient, particularly right now. The flows are identified as necessary for the ecosystem, for supporting biota, and regulating water quality and flushing the system. They are aware that the lack of quantity is often not only due to drought, but also to over-use.

> *There's not a lot we can do about keeping the Murray River mouth open or a healthy Coorong without significant increase in flows.*

There was a sense that as a 'working river' the Murray could no longer provide these regulating services without human intervention. People have become a permanent part of the water regime as they have control over all flows.

> *The control of water into the backwaters has to be done and somebody has to make the hard decisions where someone is going to have to suffer if we want that healthy system, especially for the water species and the plants, and breeding.*

However strong the need for human regulation of wetlands might be, respondents in general also discussed the complexity of designing environmental watering regimes that protected ecosystems.

> *The wetlands in particular, you can't wet and dry a river, but you may be able to have a wetting and drying regime in wetlands that are appropriate. You can't have them in some, because some have got salt acid and some - if you dry it out they actually provide homes for Murray hardy head or some other native species, so you need to be careful about how you do things.*

Implicit throughout the discussions on water is that someone, and perhaps everyone, will have to pay a price. While this sentiment pervades throughout Australia right now, perhaps the pertinent point is that the community in the SAMDB is divided over whether the payment should be in River Red Gums or citrus trees and vines.

6.4 Summary: values towards water

Two arenas of values towards water and the services water provide prevail in overall importance to any policy programs or considerations. One is the sense of place and belonging respondents express towards the river. These values are long-held, often traceable back to childhood, they keep people in the region and on the land, sometimes at the expense of other financial and family opportunities, and they are actively expressed through recreation and lifestyle activities. Respondents' cultural values towards the river are not for its mere existence but for their ability to participate in that existence, whether that includes hiking along the banks, boating, fishing or looking out the window.

The second is the sense of ownership people feel they have, either personally or as a wider community, over the regulation of flows in the river. This entails both a strong sense of responsibility for the environment and the community and a sense of entitlement to a fair and equitable share of water for their businesses and to support their recreational and provisional needs. This does not mean respondents put themselves in front of environmental needs but rather that they put themselves within the environment that requires support. This attitude towards flows stems from the idea that the Murray River is a 'working river' and has not been in a stable, natural state for many generations. In addition, it could not go back to a stable, natural and desirable state without human intervention. As much as people identify with the river, they also feel the health and wellbeing of the River depends on their active management.

This attitude towards the River is closely related to the theme of knowledge and education expressed in the interviews. Respondents suggested that an improved understanding of the hydrology, hydrogeology, engineering, social equity and political problems associated with the SAMDB across the community would improve the situation. The hope is that to understand the system would be to value it and to present solutions as a united community. Policy programs that include these values in clearly articulated goals are likely to find successful advocates in the community.

Many people provided extended and well informed policy advice and recommendations for dealing with both the current water crisis and the longer term problems of over-allocation and increasing water scarcity as the region develops and water needs (and wants) grow. However these conversations were often diametrically opposed when considering whether to allow irrigators to save their permanent plantings or allowing environmental managers to save native vegetation. While in many years this is a theoretical debate and enough water can be found to prevent the death of any trees, if not the optimum health, respondents felt that this year or possibly in the next few years, the choice may be immediate and real. From a policy perspective, understanding and addressing both sets of concerns will help ensure that a balance between these two competing sets of values can be struck without diminishing the social capital of the communities these decisions affect.

CHAPTER 7: LAND

Within this group of community leaders and decision-makers, the importance of the land was an overwhelming and reoccurring theme in the interviews. Values associated with cultural services, provisioning services (specifically the production of food and fibre) and regulating services dominated discussions. Supporting services, though acknowledged by some with prompting as important, were discussed infrequently.

Respondents often spoke about land and biota together but they did express a distinction between the two. In many cases, they considered 'land' issues to encompass agricultural lands whereas 'biota' issues were discussed on non-agricultural lands, either on their own properties or in national parks.

7.1 Provisioning services

The importance of agriculture in the region was reflected in the values respondents expressed about the landscape. There was a general acknowledgement that the landscape has been vastly altered by agriculture over time and that this raised both opportunities and problems. No one was under the impression that a complete return to a pre-settlement state was possible or even desirable. Respondents consistently discussed how people needed to alter the landscape in order to exist within it.

Through the Riverland, Rangelands and into the peri-urban areas of the region, the production of food and fibre was important. Well-being was linked to hard work and the production of food. In a few cases, respondents expressed the fundamental importance of production over the environment to the farming enterprise.

> *I guess a feeling of self pride in being able to take a barren paddock and be able to make trees and shrubs bloom and fruit and flower and have the satisfaction of being able to send a truck load of produce out the front gate knowing that its going to sustain other people.*
>
> *It's hard for me to differentiate between production and - almost look at it as production and beauty … the resource is your dirt and how you look after it, your shelter, your water, providing for stock and your bores and what have you. But on a sort of beauty/custodial side of things, because this country was so heavily cleared by the mines in the 1850s and 60s, to try and get that balance back a bit better and in turn that will prevent erosion, which is a fairly major problem here. And in improved quality water and reduced salinity and all that sort of thing.*

Respondents were in some cases explicit about the trade-offs they would be willing to make between the production capacity of the land and any future environmental management activities.

As capitalist as it sounds, but I have to be, I'm here to make money. If I don't I'm going to lose the place. It's that simple. So I'd rather have a place that I could pass on that hasn't got many trees on it, than lose the lot in 10 years time because I'm too busy planting trees and not driving tractors.

Production comes first and if you can do something where you're also getting a gain in NRM outcomes then you achieve that as well.

There was an interesting priority setting process occurring in the minds of some regarding the use of land and water. The production of food was deemed more important than the production of wine as the latter was seen as a luxury good.

I've got no problems with wine but it's a luxury item that's being exported because of its dollar value. As maligned as rice and cotton is as water use out of the Murray, one is a food and the other provides clothing, whereas what does wine provide?

The potential for biofuels emerged in the discussions. Dryland farmers in some cases had an interesting perspective on the dilemmas around fossil fuels and taking land out of food production.

I like the idea of bio-fuels and personally I don't know what choices John Howard had when it came to sending people to the Gulf War but in hindsight, let them mad bastards kill themselves and don't even go over there and right the ultimatum is if you want food, wheat, you supply us with oil or we're turning our wheat into ethanol. We could build a very sustainable industry here and help us farmers, and ethanol is much more environmentally friendly.

Wind farms were mentioned in ways that reflect the mixed opinions and reactions of the broader society. Some saw promise in sustainable alternatives, while others mentioned the contentiousness of wind turbines on the landscape. However, having turbines located on the property was seen as a good source of income.

I think in a smaller way on a regional basis people can … hopefully start other process whether that be solar creation or wind power creation or even water powered systems from the locks. I think we need to explore that.

Well, this was our last property purchase, this one here, in 1997, the XXXX Group have got a lease on it, as a prospective area for wind farming, and they've… they've had monitoring tags there for four years, and if this goes ahead, well that will be a very significant change to that bit of land, you'll see it in that particular area. There's a proposed 100 turbo wind farm for that particular area.

Current and historical mining was mentioned frequently in the interviews. Some concerns were expressed about the potential for spills from tailings dams and the lasting degradation associated with land being cleared for fuel wood for smelters. Mining also represented jobs and a significant increase in economic activity.

[This area has] suffered from being one of the early mines so it's had lots of vegetation clearance to feed the smelters and that's led to a lot of soil erosion and now its been used as grazing land where it probably needs to be revegetated so its not improving I suppose. There's lots of degraded land and I don't' really see it improving.

In this area here, the mining could be the next big issue for this small property that we're on, they actually have said that they are going to do something on our land, we don't know what yet. If they do find something, where are they going to get the water from? …. If you think about that, there will be a lot of people that will be moving into XXXX, there will be more people, more shops, more economy spent, more tourism, more buildings, so then you've got workmen looking after those, or building those buildings, they might bring their family, so there might be more kids at the school. So if there is something here in this area, and it starts to get bigger, the whole district will feel it.

Though mines themselves might only exist on small plots of land, respondents were clear that mining has wider environmental and economic impacts.

7.2 Cultural services

People expressed their well being in terms of their connection to the land. There is a sense of continuity with the land and the landscape that is expressed. In some cases, their identity and sense of well-being is intertwined with this connection to the land.

I value the land significantly … I value it as a public asset virtue, even though individuals might own it. It's something that has been there virtually forever and will be there forever and you'd like to think that it's going to be in some sort of reasonable condition forever.

People ascribe aesthetic values to land altered through agriculture and in its natural state.

So my own paddocks are so special to me, every rock, every tree, everything is important. Whereas the place over the fence, sure, might be a nice bit of dirt and might look at it and say, 'oh okay, that needs to be sorted out, that's full of weeds or what have you,' but it's a totally different feeling. Having said that, the area as a whole, I think it's a beautiful area. Obviously I'm biased

Well because it's our home and … it provides our living I suppose and it's just - we've got some beautiful views you know. We think they are, obviously…

It's living here amongst the landscape, it's just seeing the seasons come and go and seeing the changes over time in the aspects of our environment. Its

seeing the fog on the water on early winter mornings, its seeing the stars at night on a summers night, its planting a tree and watching it grow.

Out in the mallee I would think of sand dunes and swales and sand dunes made up of this beautiful red coloured sand that really has a distinct colour and life of its own. Then you come down to the floodplain and you've got grey, boring grey clay floodplains but broken up occasionally by lovely white sand dunes that have developed as a result of wind sweep

People did not tend to put much emphasis on the spiritual values associated with the land. In general, there was a reticence to discuss religion. In some cases, people simply did not have values that they would express in this way. If they did talk about spiritual values, either the discussion centred on personal spiritual values associated with a specific belief system (Gaia, Christianity, Aboriginal spirituality) or with the belief systems of others, in particular that of Aboriginal people.

Religious, I'm not religious. Spiritual yes it is a probably strong spiritual side to me which is the connection with the land and I suppose my religion is round; yeah I suppose it's probably a central thing, I suppose yeah the closest thing I have to religion is a belief in the Gaia theory.

Being a Christian, being a believer, this is land that has been given to us that we have a responsibility to care for so therefore we do that in the best way that we can do it.

Well certainly that site very much [valued] because it's just the whole spiritual sense of the Aboriginal belief and dreaming, that's all one. So everything is all connected, whether it be the tree, the dirt, the lizard, the rock.

I actually have very, very limited, but some understanding or appreciation of indigenous cultural significance and there are areas in the basin that are quite significant culturally and spiritually for indigenous people and I think that needs to be understood and recognised.

Well I'm not very spiritual or religious but I suppose only in as much as I do believe in trying to make or minimise the impact we have.

Another related reoccurring theme was how personal identity has been shaped over time by the interaction of the community and the landscape. This theme emerged in the preliminary discussions about the respondent's history in the area and how they came to be seen as a community leader or involved in NRM decision-making.

Well it's an inner feeling that I think is developed in people that work on the land, that have been part of it … Anyone I've ever seen leave the land and walk away from it…they are never the same. And that's why we've got to try as hard as we possibly can to maintain this set-up that we've got to our absolute maximum because anyone I've ever talked to that's left it - they find it very, very hard to go back. So they won't ever come back and visit the

place because it hurt them so much when they left that that's created a void and a gap in their lives that they'll never ever be able to achieve.

We certainly enjoyed the environment, we went out canoeing and picnicking and yabbying and fishing and all those things but it was also this community thing where there's just so many activities that you can get involved in …. We've always been involved in sport and community type activities but at the same time, getting out enjoying the environment but in later years we started to mature perhaps and have a bit more time on our hands and started to really look at what was really happening to our environment around us.

In their own ways, many people discussed a sense of place, which they related to either the environment directly or to their communities as they existed within the context of the environment.

The landscape holds recreational use values for people and these community leaders ascribed values on a personal and at a community level. There are a relatively few purely terrestrially based recreational values discussed in these interviews. One respondent speculated as to why this might be so in his area, the Rangelands.

The majority of the community actually undervalue [the land] as being an asset. It has productive and biodiversity values and can be a really good example of how they can actually work together. From the tourism perspective, whilst it's not well known there are some of us that do appreciate that sort of country and actually might enjoy camping there because of the quiet and all of the rest of it.

Recreational activities and the values placed on them are largely aligned with water as a natural asset or in some cases recreational values are also intertwined with land, water and biota.

My favourite recreational activity is bushwalking and things related to bushwalking.

We are very outdoor people, so we like going fishing, camping and walking, swimming and those sorts of things.

When we used to go camping, it was never to a caravan park with lawn and palm trees, it was always somewhere fairly natural I guess. You look back now, it's probably built my values too.

However recreational use is often in conflict with the aesthetic values that an area holds for others. Recreational and sustainable land use also emerged as an issue.

There's got to be a greater education on the damage that motorbikes do off-road, there's got to be the ability to actually maybe give them what I call sacrifice areas, areas where they actually can ride, the only trouble is that they'd like to go somewhere that no one else has ever been.

I value areas where you can go that you can hear water running, birds chirping and not hear tractors and motorbikes in the background and not have to smell a piggery.

Don't get me on camp fires … like we had a beautiful tree on the river up in Chowilla again that Sturt had actually carved in the side of, and some stupid people on a houseboat lit a fire in it and burnt it.

Implicit in these statements is a concern that those using the landscape for recreation, whether residents or tourists, do not understand their impact on natural assets. Also implicit is the concern that fencing off areas for dedicated uses, such as national parks, does not always work to preserve natural landscape assets.

The topic of education emerged in the interviews with some people seeing value in how the land serves to teach people about the environment. The effort that people are expending as part of school programs, tourism or Landcare activities is viewed as an investment in shaping attitudes.

Another thing we're into is actually school kit education. We get two schools here per week that do our silly tourism show - and they don't realise there's an underlying environmental program - we're talking about animal management, low rainfall, poor soil type of country - hopefully down the track they will realise it. We do vegetation tours through here and we explain why things are growing on the river bank and we go in a straight line profile from the waters edge back to the harsh mallee just to soil profile, what you see living there.

You need the weeds and pest animals not to be there, you need to reintroduce the native vegetation that's gone out of the district. You need to make sure that people are educated, that they can tell the difference between what should be in an area and what is out of place, like aquatic species, they need to be able to just instantly see it and realise that is not really what we should have here.

In a number of instances, respondents felt that people needed more information and education in order to become better landholders. In particular, concerns were expressed about lifestyle blocks.

Urban rural interface basically you could put down there [on the map], it's very important, because those people are coming out into that urban area, they're buying land, they're actually, from my point of view, they need education.

Several respondents expressed concerns that people moving from the city for lifestyle reasons did not have adequate land management skills.

Repeatedly, the region was described as a good place for families to raise children. The importance of schools and sport were mentioned. There are long established communities in the region as well as new and emerging communities. Some

fascinating stories and perspectives are embedded in social values associated with the land. Communities and their leaders are being shaped by the landscape in a number of different ways. Within traditional dryland farming areas the drought has caused great pressures on social relations. Families face difficult choices and in some cases are struggling to stay on the land. Respondents expressed concern that each family leaving an area also pulls at the social relationships that have built up over time. Absence is felt.

The isolation of some areas in the SAMDB region reduced the social connections that people felt. This was not necessarily viewed as a negative but as the independence that the landscape required.

> *I suppose it takes a very special type of person to be out here and I respect those that do it and I think in the way they have their own inner confidence - they're able to live in a confined area - they don't need entertainment - they are able to live out here and enjoy the beauty of whatever it is, whether it's the birds or the sunsets or the wildlife.*
>
> *We can live without money, we can live without a lot of things, we have been living without those things, but we respect nature, and if you respect nature, nature will look after you, and that's how we look at things. You can't buy those things, you can't own those things, you know, because we belong to the land [that] owns us, we don't own the land, the land owns us, and that's why we have to look after the land.*

Respondents in all areas viewed involvement in environmental projects that enhance amenity values as a way of building community. Community development protected social cohesion. However respondents were cognoscent of the necessary balance in development.

> *We would love to be a Council that other Councils across the country looked at and said "Wow, these guys have really got it right", in terms of residential development because we're a high growth Council. So people want to come here because it seems a nice place to live. It's got lifestyle advantages - all of that sort of stuff - but through that growth we're starting to impact on those lifestyle advantages.*
>
> *And, the great thing about doing the environmental line is that, you are not just doing something for your community, you' re doing something for your environment and your community. So it is a bit of a double whammy. I'd like to have a bit of a lasting effect on it.*

The environment and environmental management projects were seen as avenues to build crucial social capital in the communities throughout the region, from communities facing urban influx and high property turnovers to those more isolated communities where neighbours are often lifelines.

There is a strong recognition of the history and cultural heritage of early settlers and this is strongly associated with the land. There is a pride in knowing that the land

has been cultivated for multiple generations. There is also an appreciation expressed regarding Aboriginal cultural sites and the dreamtime stories.

> *Again looking at the region, we've got huge responsibilities with indigenous cultural issues. Heritage relating to people of all walks of life certainly recognise the need of understanding indigenous culture, but also recognise the need to be able to learn from the early settlers that have been here for four generations or more and to learn about the mistakes they've made so we don't make similar mistakes in the future and I think there are opportunities there to be able to do that.*

7.3 Regulating services

When erosion was mentioned in the interviews, respondents expressed significant concerns about wind and water erosion. They made links to the need to increase production values due to economic forces and erosion. Good farming practices are valued. Interestingly, the role of native vegetation in preventing soil erosion was not discussed as a way of protecting farmland.

> *I value [the land] after it's cleared, being well maintained and not allowed to have soil erosion. It's a valuable asset in the aspect that it can help us make a living and maintain us in this area as long as it's kept in reasonably good health and probably the majority of farmers realise it and most of them are trying to do the right thing. Rotations sometimes get shortened up when economic pressures force a bit of a change sometimes.*

> *It's called no till methods …. So it maintains soil structure in a better condition, … so you have less compaction, you've got less exposure to erosion risk because the soil in between those cultivated rows is anchored, it hasn't been cultivated. So we employ that, to varying degrees ... purely economic to start with but it happened to also have excellent soil protection and NRM outcomes, so the two went together beautifully.*

People recognised the importance of landscape connectivity across properties and expressed the need for community efforts. Protecting watercourses from erosion was seen as a particularly important way to protect and enhance the potential biodiversity on a property. One respondent expressed these sentiments clearly when he spoke about the watercourse on his property;

> *Just putting a fence around it is not enough unless all the neighbours are doing the same sort of thing and there's no significant soil erosion you got some way of combating the reeds.*

Respondents did not agree on what constituted a pest. Some felt that a number of native species presented a problem to agricultural production including galahs, kangaroos and wombats. Others were concerned about feral animals such as goats, deer, and rabbits.

There are a lot of pests and it doesn't matter if you are here or anywhere else, so a lot of the introduced things have become a major problem.

I've seen local people destroying, for instance, emus. Not that they've done a lot of damage but because they're on their property they will shoot them. I've seen galahs being slaughtered because they settled in someone's almond tree, not that they're going to eat too many.

7.4 Supporting services

In the context of land as an asset, respondents had very little to say about supporting services. The absence of values being ascribed to these services is likely related to the lack of day to day visibility of the services. A few of the respondents who did discuss soils revealed something of the time-frames with which they considered the health of soil assets.

There have in fact been some positive changes. Some of those changes have been for instance we actually have a much more stable environment than what we did, and I'm talking about soils. Much more stable soils than what we did have in the 40's and 50's where there were basically rolling sand hills, basically that's what the Mallee was.

Our greatest resource of course is the soil, and I have consciously tried to improve the quality of our soil. It always goes through stages, I think when the land was first cleared it was very productive. It didn't take a lot to get it producing and then I think we went through a phase where fertility started to decline, organic matter started to decline.

Soil formation was the only supporting services for which people had significant comments to make. In some cases this was just a simple recognition, often expressed through experiences, of the value of good soil quality. In others, they recognised the importance of soil quality through the increase of organic matter. They also saw limiting erosion as an effective strategy in protecting soils.

It's really soils. Like atmosphere is air. I take land as soils. It's actually about maintaining your biota. So your soil functions properly. Creek lines are probably the biggest issue out here. Erosions and looking at flows and whether changes we've made affect them. Land use, the question I've never had really answered and it's been a bit of an argument for a while is things like cropping, and now that we have no till and all the new styles of cropping where we have reduced run-off, what effects is that having on our water tables?

Everything is treated as an asset not a waste product. So our effluent, as far as our liquid effluent, is pumped out over paddocks every two years and the used spent straw from the eco-shelters is spread over paddocks. So we're

actually helping to build up the nutrition within the soil by doing that as well as just a good way of recycling I guess.

Well basically there were smaller paddocks years ago and a lot more sheep … we're just trying to … be a lot more efficient with the amount of rain that falls on our land.

7.5 Summary: values towards the land

The role of primary production was a dominant theme in the interviews. People were deeply concerned about the viability of the rural economy. They spoke about the pain associated with leaving the land. For many, it seemed there could be little room for negotiation around taking land out of food and fibre production unless it was for biofuels or to create wind farms. The land was a resource that the community needed to use to survive and there was little talk of income sources that were not dependant on consumptive resource extraction.

Values ascribed to land were dominated by cultural values: aesthetics, recreation, the social relationships and the shared cultural history. In particular, people described how their sense of well being was tied to the land. Their identity was shaped by hard work and commitment to their community.

Other ecosystem services seen as important were largely related to agricultural productivity such as soil formation and soil erosion. Concerns were expressed about running down properties through over-stocking due to economic pressures.

From these interviews we can draw some insights into the trade-offs that there is a willingness to build up the cultural values of the landscape as this is central to well-being. However, financial incentives are likely to be required to take land out of production. Similarly any large significant changes to regulating or supporting services will require incentives as these latter services are not as central in their attitudes and thinking.

CHAPTER 8: BIOTA

Biota, as a natural asset, was generally not separate from land in the discussions. Repeatedly respondents discussed the importance of habitat areas in maintaining the diversity of species in this region. Interestingly, in discussions of biota, the tension around land and economic use was less pronounced in comparison to the discussion of land as an asset. However respondents expressed the paramount importance of economic viability of farming over the intrinsic value of biota. These two quotes represent the spectrum of views on this tension.

> *I guess because the bottom line is we're trying to make a living here, the bottom line is we need to do what we need to do, what we can do to be able to make that living…If it means the destruction of some of the native animals to be able to do that … If it came down to a crunch as to whether I get the crop or whether the kangaroos get the crop, I'm sorry I get the crop.*

> *Areas of remnant vegetation specifically [are] quite patchy across the region. And there's not great connection between those areas [of remnant vegetation] within the landscape to allow animals or birds or insects to move from one patch to the other. So what you end up having is these isolated communities and that's also not good from a flora perspective where you actually need cross fertilization and things to happen to enable the communities to actually have some resilience in the future, whether it be climate, whether it be other things.*

Both respondents were discussing the importance of wildlife corridors but from divergent perspectives.

Interviewers attempted to separate issues concerning native and introduced biota. This often generated discussions about the balance between native flora and fauna and introduced species. Interestingly, both native and introduced species were labelled pests (kangaroos, parrots and rabbits) in the interviews. Respondents also made distinctions between natural resources management assets such as native trees and introduced deep-rooted perennials such as lucerne in addressing dryland salinity.

8.1 Provisioning services

The primary importance of agriculture to the respondents was never far removed from discussions. The following comments were typical of discussion.

> *It's not all about diversity, it's all about being more productive … but ensuring that what we do in being productive and keeping economic viability because that's the first thing that you've really got to look after … We want to make sure that we've got ongoing economic viability for all future generations, so I guess everything that we do. And if I talk about things like rotation of grazing*

and better pasture management and when we do, we do a lot of re-fencing because of this better pasture of rotation of grazing and when we do that we actually also, if there's an area of dryland salinity we fence that off. If there's a bit of … remnant veg, we fence that off so that the stock don't have access to that.

There were no significant discussion of native bush foods beyond either a novelty aspect or as the food supply of pre-settlement indigenous populations. Even kangaroo was discussed as a food product for a market 'elsewhere.' Most respondents clearly saw the provisioning services of flora and fauna as reserved for imported species.

While it was mentioned only infrequently, some respondents did value biota for the potential genetic resources we might one day find a commercial use for. One respondent expressed his value of genetic resources as insurance against potential future disasters.

Someone asked me the other day at a conservation meeting you know why do you do it - why are you closing this land up. And I said it's because we've lost so much of it we've just torn up so much of it for farming - cleared that land - we don't know what we've lost and in the future we know - well I mean we know for instance there are probably bush medicines in there that could be very important to us. There are certainly all the - the whole biodiversity of it is important because one day we might need to breed from that biodiversity to reinhabit the land that we've ruined.

Respondents discussed most biological provisioning services as part of their land asset valuation. Many of them interpreted biota as native flora and fauna, either explicitly or implicitly, and they valued nesting sites, bird colonies and food supplies for native animals.

Graziers who were aware that their animals either did or could potentially survive on native grasses and plants, valued native genetic resources for commercial purposes. Biofuels based on native plants and other provisioning uses of native biota might have been mentioned, but they were not valued yet as something with the real potential to provide people with what they need to survive the way exotic species have done so.

8.2 Cultural services

The presence of wildlife was one of the reasons people lived in the country and were passionate about NRM. Respondents expressed a range of preferences but often centred on the presence of large old gums and the potential for seeing orange bellied or regent parrots. Other larger species such as kangaroos, wombats and emus were also frequently mentioned as contributing to the enjoyment of the landscape.

It's all those little lizards that come out from behind a bit of bark, it's the fish in the river, it's the pelicans on the water, it's the swans, its all of the native animals, the natural resource is obviously the water we take out for extraction for irrigation purposes, but it's more than that - it's the trees on the horizon.

I love the salt bushes and that sort of stuff, the eucalypts on the river, the red gums … little wallabies and that sort of stuff, but as far as kangaroos and emus, well I see those everyday … There is plenty of them out there, but you know the malleefowls and that sort of stuff. Would be more exciting to see some more of those around .... obviously snakes and regent parrots.

Many respondents revisited their appreciation of native biota by listing with great enthusiasm what could be found on their properties.

There was an appreciation for biota as an asset that was quite separate from ecosystem services that conferred personal enjoyment, such as aesthetic values. These values were expressed in terms of the sheer existence value of a wide variety of species as well as the potential of passing it down to future generations and often tied up in the values associated with the land which served as a habitat area.

like with the biota, it is just about the existence, like the broad shell turtles and the Murray hardy head and all those sorts of things, if you don't have the lower Murray swamps you are never going to have them. There are a lot of threatened species.

I value [the] malleefowl because it's a natural bird - its habitat is shrinking in the more outlying areas because of the foxes and the larger tracks of land and it doesn't fly - well it does but only short distances.

Well it is distinctive in terms of the value that I … put [on] Billiatt Conservation Park. I don't actually actively go down there, but I value it because of the population it protects, whereas Eremophila Park has the same things but I also … pretty actively go camping and actually watch the birds and stuff out there.

Respondents recognised biota as an asset that attracts international tourists, particularly the sites covered by the international Ramsar Convention on Wetlands. There are also issues around international attention focussed on the region to preserve the quality of Ramsar sites and sites protected by other international treaties covering migratory birds.

People come along here, tourists, and they stop and set up their cameras and tripods, and they're use usually Germans or English mainly, and they track these birds all over the world. They reckon they see the same bird and all of this. I don't know whether the have or not. Why is it important for the world? Because we don't want to break their breeding cycle. Endangered species are getting more and more and this is why, because we break their breeding cycles, their living habitat. They will lose them and we don't want to

lose these birds that have been here all their lives and we don't want to lose certain types of fish because of the intrusion of salt coming into the water and the environment.

This respondent in particular recognised the cultural values people external to the region place on its biological assets. Other respondents also discussed the value they place on ecotourism as an industry in the region.

We actually ran a little bit of ecotourism out in the shearers quarters there which I believe was the only place in this area that was doing it. It didn't seem to be of high value to a lot of people as compared to the Flinders, because it doesn't have the same attractions. We probably attracted a different type of clientele, people who were genuinely interested in the bush or were into reptiles or birds, or just plain and simply wanted somewhere peaceful and quiet.

While ecotourism is a cultural service, in these cases respondents have also identified its role as an element of produced capital. A carefully developed ecotourism industry could bring environmentally sustainable income streams into the region and serve to promote the development and preservation of the region's natural capital.

More often, people spoke about the value they placed on their own active enjoyment of biota assets. Recreational pursuits such as fishing were mentioned frequently as relaxing pastimes. People also expressed an appreciation of the diverse aquatic life and birdlife of fishing areas.

I enjoy the fishing and the aquatic life of the river that you don't see a lot of, not just to catch but the river is an intriguing sort of place. The river is floodplains, it's wetlands and all that sort in its general landscape, it's pretty impressive.

Fishing is a value that we have so, obviously, we like to see native species in the river, rather than catch carp all the time. It would be nice to catch a callop. I've never even seen a Murray cod in the wild. I've only ever seen them in captivity. I'd like our system to sustain a natural biota in terms of the aquatic stuff, and camping is a value that I have whether that's along the river or in some of the national parks that we have.

Ecosystems are complex and multifaceted. It is clear through the depth of descriptions of flora and fauna that respondents have an appreciation and understanding of this complexity and that they implicitly value it. However they also suggest that what they and the rest of the community do know is still not enough. One respondent signalled the value of education and knowledge regarding biota by talking about its inadequacies in the community.

I think part of the problem is that most of us don't really understand what biodiversity is or why it's important. We don't get real attention paid to biodiversity because most of us don't understand it. Or even if we do

> *understand it, I don't think we fully understand why it's good. We're also put off by when we look at native scrub for example, we think of it as a bit trashy with dead branches* etcetera*. We devalue a lot of what is important, even the dead twigs, all that sort of stuff is seen as messy or a fire burden, we still haven't grown out of that as a community. We don't value it. What we do like is something like Kaiserstuhl which is a beautiful park, because it's high rainfall and fairly lush. I think as a community we just don't understand and we don't appreciate it and we don't put much value on it.*

In a sense this respondent is correct. Most people interviewed emphasised the beauty, existence and use of biota assets but did not explicitly place a value on understanding biota as a series of complex living systems.

8.3 Regulating services

Respondents expressed the primary role of people in regulating the environment as part of preventing erosion, regulating pests and enhancing water quality through their fencing and revegetation activities. The environment was not valued for providing these services perhaps because the landscape was so altered by introduced species and agriculture that environment was no longer able to re-establish an equilibrium. Respondents did not appear to view NRM activities as protecting functioning ecosystems so much as (re)creating them.

Several respondents saw landscape connectivity as an important part of providing functioning ecosystems for biota. One respondent in particular acknowledged the importance of connecting patches of remnant vegetation to provide habitat and allow for pollination.

> *Areas of remnant vegetation specifically are quite patchy across the region. And there's not great connection between those areas within the landscape to allow animals or birds or insects to move from one patch to the other. So what you end up having is these isolated communities and that's also not good from flora perspective where you actually need cross fertilization and things to happen to enable the communities to actually have some resilience in the future, whether it be climate, whether it be other things.*

Overall, respondents were not concerned with the role of biota in spreading and controlling diseases that affect humans or other biota. The one exception was a respondent who did see a link between disease regulation and environmental health.

> *We don't have any idea about Ross River Fever and how to fix it and it's something to do with the way the system has changed in the last couple of years. It has become more prevalent in the last 5 years at this end of the river but there's something wrong somewhere. If the plan is going to encompassing, if there's an environment out of balance then things like this will happen.*

This isolated example is particularly interesting given a five-year peak in the Murraylands region of reporting the Ross River Virus during the 2005-06 season (157.1 notifications per 100,000 population) (Lin *et al*., 2006). Growing concern in the community is, therefore, understandable, but only this one respondent made a connection between disease and environmental health.

Water quality in terms of biota relates largely to aquatic habitats. A number of indigenous fish species prefer submerged aquatic plants and different water quality parameters. Indigenous fish can survive dry periods, whereas the introduced species can not. One respondent discussed water quality issues as a tension between recreational use of the river and the river as habitat.

> *If we actively altered the system … we are now encouraging carp. We've lost a lot of the semi emergence in our water plants that would normally have been in there that then contributed to clarity of the water and other things. So I guess we haven't got an idea of what the river should necessarily look like now but I had a bit of an understanding of what we've lost. The community at Mannum talk a lot about the semi emergence of water plants that used to stop them from swimming or fishing on the riverbank because there was a mass of water plants there. That's gone. It makes it nice for recreation now, but is it a good thing?*

This point he makes about questioning the trade-offs we have made in the past is highly relevant in such a modified system. Many respondents inferred that a return to more 'native' aquatic systems might mean we would have to change not only our behaviour towards the environment but also our use of it.

Ecosystems are not seen as self-regulating due to the introduction of non-indigenous species. Several respondents elaborated on this point and clearly saw their role as land manager as an integral part of the natural regulation of biota and pests.

> *We still have to manage some of those areas that we that we've locked off and you know there's management regimes which mean introducing the sheep in critical times just to knock down the weeds species and make sure the Blue Jane doesn't take over but pull them out and don't leave them there for long enough, don't leave them so long that they actually have a negative effect to the re-generation that's going on. So that's why it's that sort of thing, but it won't self regulate and we've got to manage it.*
>
> *There are a lot of pests and it doesn't matter if you are here or anywhere else, so a lot of the introduced things have become a major problem. It's no different here to anywhere else. And also I presume over time there will be a hybridization of native and introduced species as well.*

The impression is that it would be a landscape scale catastrophe to remove people from the land entirely. Weeds and pest, not native ecosystems, would replace farmland. In some cases, respondents felt pest control and farm production were

integrated; running livestock on paddocks is seen as a way of keeping the weeds down.

Respondents also felt that land management was an important skill set to understand and perform. In several interviews, the tension between lifestyle blocks (where land managers are perceived as lacking these skills) and traditional farming emerges strongly in discussions around pests. The lack of weed and feral animal control is seen as a looming threat.

> *They don't know their weeds; they don't control any weeds so you've then got threats against your native stuff again. In those areas, you've got a few ferals. They don't worry about the rabbit control. There's a few goats running through and those sorts of things. Kangaroos; we've just got them under control in those areas. We can no longer put a professional shooter in there because there's houses and population around and so you can no longer control natives.*

Whether these management issues are an accurate description of the role of professional land managers or not, the tensions they illuminate among 'natural' landscapes, traditional farmers, and lifestyle blocks are real. The tensions could impact the success and support of policy decisions.

8.4 Supporting services

Many of the discussions around biota and the supporting services they provide centred on appeals to common sense. When asked, respondents did understand and support the importance of the supporting services biota provides and they expressed an awareness that these services might not be well understood by others in the community.

> *If you have a planet and you denude it of 70% of its vegetation … there's going to be chemical reactions, there's going to be a loss of the ability to photosynthesise and convert carbon dioxide into oxygen and 'I don't know what' underpins the climate change atmospheric changes that we look like experiencing.*

> *I value the areas like the national parks because you go to school and know that trees provide oxygen and shelter and everything that trees and biota provides everything that you need for, not in our lives, but a food source, it's for more than just humans. I value what we've got and wish that we had more in better condition, biota, for future generations they can actually live in an environment that isn't polluted and does have decent water supplies, if we don't look after it now there's not going to [be] a decent Murray River or the birdlife that we've got.*

Despite these examples, supporting services were not widely discussed and often only came to mind when interviewers prompted discussions. This suggests that

while respondents may understand the importance of biota in providing supporting services, they have not incorporated this understanding into their expressions of values towards plants and animals.

8.5 Summary: values towards biota

Respondents that were passionate about NRM were passionate about the natural flora and fauna. However, those who are active and aware may be at the limit of their volunteerism. This could mean that relying on an informed and passionate few to actively and effectively manage biota on a volunteer basis could be less effective than it has been in the past. When considering the management of biota assets, the Board should also consider a need to develop suasion tools that increase the knowledge and awareness of the regulating and supporting services biota provide as well as financial incentives to encourage those who have less passion and drive to learn about and protect biota. In particular, linking knowledge of biota assets to the valuation of them would be an important policy consideration.

Interview respondents raised the importance of national and international tourism as a growth industry. The sustainable development of this industry may present an area of unrealised potential for the region, both publicly and privately, to raise funds for NRM through tourism and recreation activities.

Respondents also revealed a tension around the definition of a pest, pest levels and how those pests should be managed. People were seen as having a crucial pest management role as the environment is no longer in equilibrium. Many respondents feared that, with all the introduced species, if a landscape was allowed to self-regulate, it would move to an unacceptable state. Some feared that absentee landlords and lifestyle blocks were early demonstrations of this trend. This tension between long-term land managers and new, less commercially orientated land managers could be dealt with through constructive and positive policies, particularly given that so many NRM Group members cited their love of the community and their experience with practical land management as the key assets to their roles as community leaders.

CHAPTER 9: ATMOSPHERE

Discussions of atmosphere as an environmental asset were overwhelmingly the result of prompting. The absence of discussion, even following prompting, demonstrates a 'value gap' where respondents overall did not deeply consider atmospheric assets. When prompted, respondents valued clean air in the region and the impact of climate change on weather patterns but few were as verbose about these values as they had been about cultural values associated with land and water. The issue was not the importance of values like rainfall, pollution and climate change, but the positioning of these values in their discussions. One respondent summed up the general approach to atmosphere as; *'like everybody else, we breathe the stuff; it's intangible and nobody thinks about it.'*

Compared to other natural assets and ecosystem services, people felt they could have less of an impact on atmospheric assets and felt less responsibility for damage to the atmosphere.

9.1 Provisioning services

Possibly due to the drought, many respondents (but not all) discussed the lack of rainfall as a concerning factor and valued the atmosphere for its ability to create and provide rain. Rain was often at the forefront of people's minds. One respondent, when asked what needs to be done more than anything, probably spoke for the majority when he answered '*In this region? More than anything; rain, rain would be good."* The lasting impact of the current drought is a big concern. One respondent commented '*even in the short term the drought in the MDB, whether it be climate change-related or whether it be a climate that blips as normal, it doesn't matter. It is going to have a massive impact on everyone who relies on the basin and it already has.'*

While many respondents felt that their valuation of rain in the middle of a drought was self-evident, some explicitly talked about the potential impact of reduced rainfall in the future. One respondent outlined his concerns about a permanent reduction in rainfall:

> *Atmosphere is of particular interest to me because… I include things like temperature and, really, my burning passion is food production systems… There is a real need to be very, very astute at positioning our area, our horticultural community to look at what opportunities [temperature change] presents and to get to adapting to those things… Two degrees hotter may not sound much, but all the projections are just running off the screen with some of our food crop systems now. So really what we've got to do is start thinking for our children and stop thinking like our grandfathers… I think there is a connection back to temperature and what is going to evolve with a*

new climate, a climatic condition, just minute changes means that it just may not be suitable for some animals or plant species.

While most concerns about water – from any source – are expressed in the water section above, this issue of rain or a lack of rain is linked to valuing the atmosphere in the minds of respondents. Much of the discussions that began with rainfall quickly moved into wider discussions of climate change in general and the role human activities play in global warming.

9.2 Cultural services

Several respondents valued the generally good quality of the air and atmosphere in the region. Air quality, and especially the starry night sky, was cited as one of the region's best assets, which they valued for aesthetic and lifestyle reasons. Respondents often contrasted this to urban environments, which they saw as polluted. Some respondents also appreciated specific local climate manifestations such as thunderstorms, clear skies and weather changes for their aesthetics. A typical respondent explained his valuation of;

> *good, clean air most of the time. We have little industry up here… it's a part of living up here, you can go out and breathe in and appreciate that you're getting good quality air that's just come from that wonderful vegetation that's doing the job and recycling and sending the oxygen back to us ... If you go to the city all you breathe is smog and fumes and smells. I never feel happy in the city - never feel like even breathing, not quite, but you know, it's just not like being out in the river or in the bush and… having all that vegetation and so on around you, I often think how lucky we are with the beautiful, clean air we've got here to breathe.*

Respondents expressed their values for these environmental services for themselves and as a bequest to future generations.

9.3 Regulating services

While there were discussions of dust storms, these were regarded as occasional events only. However, respondents did generally feel they could impact the frequency of dust storms and minimise the damage they caused. One respondent pointed out the *'need to continually encourage farmers and other land holders to actually maintain their soil surface cover levels in their paddocks, because if they don't do that we will end up in a situation where we will have dust storms and it won't be too windy.'* He continued on to acknowledge that the current drought conditions might have encouraged some landholders to hold on to their stock for a longer period than in those of adequate rain and so the paddocks could be overgrazed. His concerns highlight the types of trade-offs landholders feel they face.

9.4 Supporting services

When they did talk about the atmosphere, respondents understood and valued the role the atmosphere plays in absorbing carbon dioxide and regulating greenhouse gasses and the importance of these functions for maintaining the basis for all life. However, valuing it as an asset did not mean that respondents took the same attitude towards climate change or human induced global warming. Some respondents were completely unconcerned about the current lack of rainfall and felt that regardless of short or long-term climate changes, they would adapt along with the natural resources around them. These respondents were in the minority and most people expressed some concern over the potential regional and global impacts of a changing climate.

Respondents disagreed on the 'facts' of long or short term climate change and the impact of human behaviour on global warming. A respondent commented that;

> *people all over… have so many different opinions that we've had some pretty heated debates about the reality of [global warming]. Even people that call themselves environmentalists are saying things like 'it doesn't exist,' 'it's garbage,' and people on the ground are saying 'I'm noticing differences you know, I'm noticing differences' and they're saying that those differences always cycle, [are] always happening. So it's good that people are debating. I think it's great that people are debating because five years ago they wouldn't have even been talking about it… but we need some real information… I think the scientific evidence is overwhelming that [the climate] is changing fairly rapidly and that we're creating a great deal of damage.*

Many people express concerns that this debate has become overly politicised and that the scientific community is still not in agreement over the future impacts of climate change or of human activities on those changes.

While the majority of respondents are concerned about long-term climate change and believed that some global warming is human-induced, about 40% of respondents express a belief that, while the climate may or may not be changing, they do not believe that human-induced changes are a significant factor.

> *I have no doubt that global warming is a fact and we've got to have an impact. You can't be doing what we're doing and the environment not having an impact. But there's nothing we can do to the planet that hasn't already happened naturally… So what we do in the greater scheme of things, I mean we're still a pimple on an elephant. Albeit, for our own survival and that of the other animals that we share the environment with - we should be a lot more careful how we treat it. But I don't think that what we're having now, I certainly haven't seen any evidence, or nothing that I've observed in the natural eco-system here that would indicate to me that we're heading towards a change in long term climate trends… I still believe that what's happening now is within the scope of this sort of eco-system out here to cope well with. I don't think there's anything that I've observed here that's*

actually changing things at this stage, I'd say that it's within the parameters of the natural change of climatic variation.

While some believed that the current shifts in temperature are neither permanent nor particularly problematic, others accepted that there are long-term shifts underway but doubted the role human activities have played in impacting those changes, as one respondent expressed:

> *I think that there is definitely global warming, I'm not convinced entirely as to what is causing it, I've got my suspicions that it is us… but I'm not completely convinced because there is a lot of conflicting data… at this stage we can't be convinced that [climate change and human-induced global warming] are linked. I personally tend to think they are; yes, but I'm not one hundred percent convinced because it could well be in a natural cycle.*

The belief in whether or not global warming is induced through human activities, while not part of a set of core values, will impact attitudes towards the atmosphere as a natural asset and will help determine whether or not people adopt mitigation activities voluntarily or altruistically out of a sense of responsibility towards the protection of the ozone layer as a global asset. These attitudes could be important factors in determining investment priorities and developing expectations around the success of localised greenhouse gas emissions reductions.

On balance, climate change, whatever the cause, was seen as something people, if not the environment, will need to adapt to. One respondent provided a concise summary of the general attitudes people held when he explained that *'it's a global problem that will impact on us so there is that "big picture" thing that we all have to deal with.'*

Many respondents were concerned about human induced global warming but were at a loss as to what they can achieve regionally. In spite of this, respondents were thinking about the mitigation activities they might need to undertake along with the rest of the world. Sequestering carbon was on a lot of respondent's minds, not just in trees but in the soil as well, as one respondent commented '*I think that is one of the great benefits of pruning vegetation, that you've still got plants that are growing and continue to put more and more carbon in the soil.*' People were thinking about their behaviour and the potential for behaviour change. One summed up the general sentiment by stating

> *I can't do it alone but I won't not make a change because someone else hasn't. If there is something that I can do which can make my impact less, I will have a crack at it. Climate change might be a big issue and may be political but that doesn't mean I shouldn't do something for myself.*

Adapting and mitigating climate change was seen as a large, long-term project that will take generations to achieve. One respondent confessed: *'I don't think it is going to be possible to alter the ginormous change in atmospheric conditions and pressures… so we've really just got to look at what we're doing today and ask ourselves "is that going to be relevant for our children?"'* Along the same theme of

climate change mitigation over time, other respondents also felt behavioural and technological changes would take several generations to find an appropriate balance and they expressed concerns over what they were bequeathing to future generations.

Many respondents recognised that if climate change is severe and rapid, they might have to take extreme measures to adapt their businesses and remain viable. One landholder expressed some of the practical considerations about the effect of long-term climate change on erosion patterns and subsequently business viability;

> *I suppose the first thing that springs to mind is the possibility of climate change…[it] could have a fairly large effect on the viability of the business, it could put at risk the integrity of the land, by exposing it to risks of erosion… Last year, we made the decision… to keep the place fully stocked, and we knew we were going to hurt it, and we took it on the chin and did it, and the place is okay, but… if climate change is as severe and rapid as some people are saying, you know, we might do this for another couple of years, and then go well shit, hang on, we've made a fair old mess here. That's the risk; at what point do you go …'We're pushing this system too hard'… I suppose if things did change dramatically, and the weather patterns changed, and say you were getting heavy rainfall in the summer etc., or bigger thunderstorms, then you know, you're going to have to provide some sort of protection to the land, which might mean taking certain steep areas of paddocks out of production, or something like that… no, dare I say it, might have to put a lot more down to… you know, trees and what have you just for protection.*

There were, however, some fears that landowners with livestock may bear the brunt of climate change as well as the policies put in place to address climate change in the future. One respondent expressed his frustration by stating that;

> *we're going to get absolutely caned by these people because we've got animals, we supposedly release greenhouse gasses, and we use vehicles… What they don't realise is we actually have got more reason than probably any other business in the world to look after our country because nearly all families have got succession planning issues… This place has looked after me and I want to hand it on to someone else and instead of us just… doing what's best, whatever we do, when we can [and] we've got money to do it, we're going to have to document [and] justify… I just think that's rubbish.*

The immensity of the task turned people to thinking about mitigation rather than reversal of any human-induced impacts. Regardless of the cause of climate change, many respondents do believe that the weather is changing in their region and discussed some of the local mitigation strategies they felt were necessary. This ranged from expressing a desire to *'work out how to manage what we've got in a sensible manner'* to well-researched and thought out plans that included the regional development of windfarms, solar energy, biofuels and carbon offsets to mitigate the impact of global climate change. In particular, some respondents are hopeful that landowners may also benefit from carbon trading and land stewardship schemes

schemes relating to greenhouse gas emissions trading markets.

People generally described activities they felt contributed to doing the ‘right thing’ to mitigate human induced global warming, but it was not a great concern in the region and most of the responsibility for both pollution and global warming was ascribed to urban perpetrators. Several respondents felt cars, lifestyles that included long commutes (including their own) and factory production contributed to the majority of global warming. These sentiments probably reflect the perception of many urban and rural Australians.

9.5 Summary: values towards the atmosphere

In the overall context of the interviews, discussions of values towards the atmosphere were sparse and short. While people valued the clean air and weather they currently experience, the effect of a long drought on respondent’s attitudes towards rain and climate change were evident.

While people valued atmospheric assets, the reluctance of many respondents to ‘decide’ whether or not human-induced global warming was a relevant issue demonstrates an area where the SAMDB Board might have difficulties promoting mitigation actions that primarily appeal to the sense of responsibility people feel as stewards of atmospheric assets. In these cases, other inducements to behavioural change should be considered. Financial incentives might be more effective than suasion tools or perhaps programs that emphasise the protection of other, more highly valued and accepted ecosystem services.

CHAPTER 10: PEOPLE IN THE LANDSCAPE

Most participants, roughly 90% of them, discussed or referred to people when discussing their environmental values. This arose out of non prompted questions about general values and how environmental values fit with participants other priorities in their lives, as well as more elicited responses about values for the four main assets; water, land, biota and atmosphere. The mapping exercises, which required respondents to explain why they valued certain locations, also instigated responses related to people and human society. The qualitative and response-driven nature of the interviews allowed participants to express their anthropocentric approaches to the environment. As one participant responded to a question about which of the four main natural assets he valued in his local township, he replied '*none of them. I have just realised that I have added the fifth asset of people.*' Another also explained when asked what their priorities in terms of NRM were, responded "*People…Absolutely. I just think you develop people and the other stuff comes.*" As many others expressed similar views, it was therefore necessary to create the fifth asset category of people and a series of human and society related service and value categories. The value of people as an asset also arose in relation to provisioning, cultural, regulating, and to a lesser extent, supporting services of natural assets, which also reflected respondents' anthropocentric appreciation, use and regulation of natural assets. Many of these later categories have been addressed in the related assets areas of the report and so this section will primarily address respondents' particular valuation of people, their activities and related aspects of human society.

10.1 Produced capital

10.1.1 Built environments

A major theme of importance amongst participants' values in terms of people and human society were those pertaining to built environments. Around half the number of respondents expressed their value for these human aspects of the environment, which they discussed more frequently than other aspects of human society. On the one hand they valued urban landscapes, and in many cases particular towns, for the infrastructure and services they provided, including schools, hospitals, shops, medical and other primary services and social activities. Without these facilities and services they felt that they and their communities would not be able to function, some feeling they would have to make choices about moving in order to provide education for their children. One respondent valued a *"community, that it is a country town, but it is still of a relative size to sustain businesses and communities and schools and all that sort of stuff."*

These issues of community sustainability and urban landscapes also corresponded with issues of land-use and zoning, and the extent to which increased farm sizes

impacted community and infrastructure viability. One participant expressed his concern and the interrelatedness of these issues by explaining his value for a local school.

> *[The school is] the education standard for this area and it's the real hub of the local area - sporting clubs and community events. (*So it's a bit of a social centre?) *Yep. (*So is there anything that could happen to impact what you value?) *Declining student numbers and the threat of closure, which is happening right now … [there are] less and less people around … Farmers are expanding their enterprises and there's just not enough young people around and young people are moving away from the land to get jobs with guaranteed incomes.*

Respondents also expressed their values and devalues for roads, telecommunication systems, fences, dams and in particular locks, weirs and salt interception schemes (SIS), which regulate NRM issues such as water quantity, quality, fire control and pests. Many of these were controversial areas of discussion. For example, while most valued locks and weirs for providing and regulating flows, a number of respondents devalued them for their impact on water quality and the entire river health, including the Coorong.

Respondents' valuation of 'government' and the regulation of salinity were both contentious issues. Views ranged from the regulation of water bodies to the value of engineering solutions to salinity, such as salt interception schemes. On the one hand many respondents devalued salt interception schemes for their pollutant impact on local areas and wildlife, while on the other, people valued them for their mitigation of salinity, which allows productive horticulture to continue.

Roads and communication systems were similarly valued and devalued for the way they adequately provided safe and efficient access and communication, either in terms of bridging distances, allowing access to, and means for, fire prevention as well as other natural resource management, recreational and eco tourism activities. It is in terms of these last issues that participants also valued human infrastructures and people for the ways in which they regulated the environment and Natural Resource management more generally.

A number of respondents also expressed their value, particularly through the mapping exercise, for their own properties and homes. This was not always specifically allocated to the actual built structures on their properties. For some it was the productive value of the land as a source of income, while for others their value was of the built structures and farming machinery, and the environment which, like the land, provided a productive value, and more specifically their economic security and employment.

10.1.2 Zoning

Many respondents expressed their values and devalue for land use zoning, particularly in relation to the natural assets land and biota. This related specifically

to decisions about how to use the land, whether it be government, federal, state, local or individual decisions and actions in relation to use of the land. This included issues of concern about peri-urban development and what some respondents called 'blockie-ism'. They devalued the impact this had on natural resources, either through absentee landholders who failed to maintain and regulate pests on their properties, or through over population.

There were also groups of participants who devalued certain types of productive land use, some dry land farmers and other participants devaluing irrigators' unsustainable and over water use, particularly in terms of salinity.

Various groups of participants' valued the preservation of certain native natural assets through the zoning of conservation and national parks, particularly in order to maintain certain flora and fauna species. Many valued these for recreational access and for eco tourism purposes, but noted that regulation was also needed to avoid human impacts. Some participants devalued these same parks, including graziers, who felt that the land would be better used for productive uses (including grazing).

10.1.3 Economics and employment

Respondents of various locations, occupations and involvement in agricultural and natural resource management expressed their value for the use of natural resources for human economic and employment security. This was particularly so in terms of their concerns for community and local economic sustainability. For example more than half of participating respondents discussed issues about the importance of their own, other community members or particular agricultural communities' use of natural resources in order to keep local communities functional, but more particularly, to feed and shelter their families. For many, this was an issue of adequately balancing introduced agricultural systems with the needs for the health of the natural environment. Some respondents viewing the environment and its health as necessary for human economic and employment security. One respondent explained "*it can't be any other way. You have no inhabitants without the environment.*" Another also explained;

> *the main things I value? I'd say the total environment, but that doesn't preclude anything else that has an effect on it though, you can't have a farming community without the environment, you can't have an environment without the community too, 'cause one depends on the other, you know?*

However some respondents emphasised that care for the environment had a human and productive incentive. As one of the above respondents described;

> *from a community point of view, you will have a very hegemonic sustainable community. The industries here actually make the money. That's what you want from a community point of view. Once they make money the rest of it just falls into place.*

This participant also emphasised the need for human natural resource activities, and that

> *whatever you can do to relieve the stress' was important, but that 'it's turned into a working river and it won't change from that and if you do change it from that then you virtually destroy every community that's on there. So it's trying to find a balance where you can have the environmental flows down and can recharge whatever is viable, but still have sustainable industries up and around [it].*

On the other side of this issue, some respondents actively devalued human use and over-use of natural resources for economic and employment purposes. One respondent remarked that "*the 'big landowners'… expect to push the land harder. Because of inflation, [they] have to get more out of it. [They] can't keep doing it."*

Others were subtle in their attitudes to human use of the land, one participant expressed a personal sense of place and connection to the land, and felt economics had become too important in people's lifestyles:

> *Everyone is too worried about economics these days….I don't feel the urge to go out and buy things all the time and keep up with the Jones…I would be quite happy out in the bush right out way out in the bush probably miles from anywhere just living a simple life.*

Even those who valued agricultural activity and irrigators still expressed their disapproval of their impacts. In line with other comments, one respondent suggested that the horticultural areas '*contribute to increased salinity out in the river plains … They really have altered the landscape significantly…but that rather than remove these horticultural activities, programs to mitigate the impacts needed to be addressed.'*

Another issue for economic employment arose in terms of respondents' desire for the promotion of certain industries and incentives to provide and establish community sustainability, either for particular local communities or more generally. Two respondents for example, valued and desired the establishment of a mining operation in their local community in order to provide jobs and bring people back to the area. Another respondent also suggested work in the mining industry as a means for solving issues of unemployment and lack of confidence amongst their local indigenous community members.

10.2 Social capital

10.2.1 Family and community

Community was of almost equal importance in terms of the numbers and frequency of participants who expressed value for economic and employment issues. Of these

participants, many valued their local communities as sources for social interaction and involvement, including support they provided and received through rough times. Many discussed their roles as community leaders in NRM and how they valued their sense of contribution to their community as much as they valued their contributions to NRM. People discussed how they valued leadership and participation roles. Some also discussed their participation in social and sporting groups, the CFS, church communities and other activities of a non NRM nature. Some needed to juggle their community ties and obligations with their environmental and family values, but for others the expression of environmental and community values took place in integrated activities.

Respondents also valued their communities for the way in which they were an important resource for managing and improving NRM. This included some respondents' value for the way certain pastoral leases such as Calperum and Gluepot are community run stations. One participant for example expressed her sense that while there was the potential that these communities might mismanage these properties "*I suppose it's the whole concept of the community actually—[that it] owns and values and looks after something, rather than just leaving it up to the government. That's what excites me about it.*"

Others valued particular communities or community groups for their active involvement in NRM and other social and community issues. Various respondents also expressed their general value of the community for maintaining and coordinating NRM activities not only for their knowledge but also their labour, and "belief" in the importance of NRM activities.

10.2.2 Human regulation of NRM

In terms of NRM, when asked about what regulating services the environment provides, many respondents instead expressed their sense that humans provided an important (often a more important) regulatory role in managing and maintaining the environment around them, particularly in terms of land (use) and introduced biota, particularly those which have since become pests. This was so for both economic or production benefits, but as one participant suggested '*but in terms of environmental values because it will promote greater biodiversity.*' In terms of agricultural land use and production, some dry land farmers for example, felt that the human impact on natural resources mean that human management was necessary for the continued health and benefit of the land. One respondent explained that

> *You know, you just can't leave the country to self regulate any more, because we've just introduced too much, we've just changed it so much in the last 200 years that if we did that we'd end up with an absolute disaster. So in saying that we still have to manage some of those areas that we …have locked off and there's management regimes which mean introducing sheep in critical times just to knock off the weeds species and make sure the Blue Jane doesn't take over but pull them out and don't leave them there*

long enough…that they have a negative effect to the re-generation that's going on.

Other respondents, dry land farmers and others, expressed similar values for people generally and for farmers who managed their properties through particular sustainable practices, like reduced stock numbers, fencing and native grass usage in order to guard against soil degradation, erosion and pest infiltration.

The positive valuing of sustainable practices also extended to the support for regulating activities in areas around valued natural resources, such as national and conservation parks, the Murray River. People suggested that there is a need for state and council regulation in areas of growing urban development, and property subdivision. However, others pointed out that over-regulation can be disruptive in communities' roles and responsibilities in NRM.

Some respondents expressed a different kind of responsibility for human involvement with the environment, one participant expressing that

> *I believe very strongly, personally, that we are stewards only of our environment, and stewardship involves not exploiting it, and leaving it in as good or better condition than you found it. That's the whole purpose of stewardship that is to be my personal belief. If you like, it is religiously-based…that I believe we have a very, very strong responsibility.*

Others described their sense that people provided an important role of custodianship of the environment, one explaining that;

> *I understand a holistic view of it and country means the land…but it also means the people that belong to our country and the plants and animals that culturally affect you whether it's scenery or a food source or a medicinal plant or something that's good to look at…I figure that if you develop people then their going to be better able to look after country and a custodianship of country…I understand that there is restoration work to be done so I just prioritise people to undertake the work to continue to undertake our custodial responsibilities around the country.*

10.3 Summary: values towards people

Respondents included discussions of produced and social capital in their valuation of natural capital assets. They were aware that many of the trade-offs they will need to make to achieve the natural capital they want for themselves and their community will need to be made, not between natural assets, but between natural, produced and social assets. Many hoped to find a way to do this without compromising the sustainability of their families and communities.

For these respondents, a sustainable family depended largely on participation in a sustainable and active community. To do this, respondents felt they needed to succeed in three key areas;

1. They need a stable income that allowed the family to purchase all of what they needed and enough of what they 'wanted' to provide for the maintenance of family and social ties.

2. They need social cohesion in the community to ensure that neighbours would still volunteer, help out and otherwise participate in the community.

3. They need the time and ability to participate in this cohesive community, which often meant taking part in recreational activities that included environmental assets and environmental management projects that also fulfilled other social goals.

If investment policies and environmental programs can address the balance of these three aspects of individual's lives, they will have a high chance of community acceptance and this will increase the chance of policy and program success.

CHAPTER 11: SUMMARY OF THE IMPORTANT VALUES

People discussed a wide variety of values and implications those values had for their activities in NRM. While these values can largely be expressed under the asset categories of water, land, biota and atmosphere, many people did indicate that their views on NRM are holistic and that they preferred to discuss NRM associated values through ecosystem services or 'how they used them.' One of the challenges of addressing this perspective is the institutional framework of NRM policy management, which is largely grouped into asset categories. It is therefore still appropriate and useful to discuss these values grouped into assets as opposed to the services those collective assets provide.

11.1 Asset: water

Two arenas of values towards water and associated services prevail in overall importance to any policy programs or considerations. One is the sense of place and belonging respondents express towards the Murray River, including the deeply-held value they place on being able to participate in activities that include the river. The second is the sense of ownership people feel they have over the regulation of flows in the river. People expressed both a strong sense of responsibility for the environment and a sense of entitlement to a fair and equitable share of water for their businesses and to support their recreational and provisional needs. This attitude towards flows stems from the idea that the Murray River is a 'working river' that depends on the active management of the community.

This raises the policy question of how this active management can take place. Respondents made several suggestions, many of which included the spread of education and understanding of the working systems in the river throughout the community, not just in the professional community. They recommended a policy approach that encouraged the uniting of the communities around the river in a management plan. Policy programs that include these values in clearly articulated goals are likely to find successful advocates in the community.

These conversations also revealed the potential conflict over community-wide trade-offs, as respondents were often diametrically opposed when considering whether to allow irrigators to save their permanent plantings or allowing environmental managers to save native vegetation. From a policy perspective, understanding and addressing both sets of concerns will help ensure that a balance between these two competing sets of values can be struck without diminishing the social capital of the communities these decisions affect.

11.2 Asset: land

The role of primary production was a dominant theme in the interviews. People were deeply concerned about the viability of the rural economy. Respondents were highly aware of their economic dependence on resource extraction from the land and there was little talk of income sources that were not dependant on consumptive resource extraction.

Values ascribed to land were dominated by cultural values. In particular, people described how their sense of well being was tied to the land. Their identity was shaped by hard work and commitment to their community.

Other ecosystem services seen as important were largely related to agricultural productivity such as soil formation and soil erosion. Many respondents expressed concerns about running down properties through over-stocking due to economic pressures.

From these interviews we can draw some insights into the trade-offs that there is a willingness to build up the cultural values of the landscape as this is central to well-being. However, financial incentives are likely to be required to take land out of production. Similarly any large significant changes to regulating or supporting services will require incentives as these latter services are not as central in their attitudes and thinking. This information reinforced current policy practices of emphasising the economic impact of land use changes and trade-offs, as the economic considerations of resource extraction will form a large part of NRM decision-making on private properties.

11.3 Asset: biota

Respondents that were passionate about NRM were passionate about the natural flora and fauna. However, those who are active and aware may be at the limit of their volunteerism. This could mean that relying on an informed and passionate few to actively and effectively manage biota on a volunteer basis could be less effective than it has been in the past. When considering the management of biota assets, the Board should also consider a need to develop suasion tools that increase the knowledge and awareness of the regulating and supporting services biota provide as well as financial incentives to encourage those who have less passion and drive to learn about and protect biota. In particular, linking knowledge of biota assets to the valuation of them would be an important policy consideration.

There was a tension around the definition of a pest, pest levels and how those pests should be managed. People were seen as having a crucial pest management role as the environment is not longer in equilibrium. Many respondents feared that, with all the introduced species, if a landscape was allowed to self-regulate, it would move to an unacceptable state. Some feared that absentee landlords and lifestyle blocks were early demonstrations of this trend. This tension between long-term land managers and new, less commercially orientated land managers could be dealt with

through constructive and positive policies, particularly given that so many NRM Group members cited their love of the community and their experience with practical land management as the key assets to their roles as community leaders.

11.4 Asset: atmosphere

In the overall context of the interviews, discussions of values towards the atmosphere were sparse and short. While people valued the clean air and weather they currently experience, the effect of a long drought on respondent's attitudes towards rain and climate change were evident.

While people valued atmospheric assets, the reluctance of many respondents to 'decide' whether or not human-induced global warming was a relevant issue demonstrates an area where the SAMDB Board might have difficulties promoting mitigation actions that primarily appeal to the sense of responsibility people feel as stewards of atmospheric assets. In these cases, other inducements to behavioural change should be considered. Financial incentives might be more effective than suasion tools or perhaps programs that emphasise the protection of other, more highly valued and accepted ecosystem services.

11.5 People in the landscape

Respondents included discussions of produced and social capital in their valuation of natural capital assets. A sustainable family depended largely on participation in a sustainable and active community. To do this, respondents felt they need

1. a stable and adequate income,
2. social cohesion in the community , and
3. the time and ability to participate in this cohesive community.

If investment policies and environmental programs can address the balance of these three aspects of individual's lives, they will have a high chance of community acceptance and this will increase the chance of policy and program success.

11.6 Key messages

11.6.1 Insights into respondent perspectives

- People value their families and communities and they use this as a lens through which to view their environmental values. In other words, they have anthropocentric values.

- People believe they are now a necessary part of the effective functioning of the landscapes. Both environmental and irrigations flows, weed and pest management, and soil quality and protection can no longer self-regulate and still produce an environment that people would find acceptable.
- Well-being and living in the country are inextricably linked for many respondents. This came through in discussions of all natural assets.

11.6.2 Perspectives on trade-offs

- Some small scale trade-offs are acceptable within the context of economic activity and recreation.
- There is a dichotomy of views surrounding the economy and the environment. One group of people would not contemplate the prospect of economic activity being curtailed significantly to achieve environmental benefits. Another group suggested precisely the opposite that economic activities need to be curtailed to achieve sustainability.
- There is a tension among various recreational activities such as canoeing, water-skiing, camping, bushwalking, motorbike riding, etc due to their perceived impacts.
- Similarly there is a tension among several consumptive uses and non-consumptive use of water (potable drinking water supply, irrigation, flows in the river) and land (native vegetation areas for grazing versus conservation).

11.6.3 Over and under representation of values

- Water, Water, Water – the need for more rainfall and more water flowing down the Murray River was emphasised by the people being interviewed.
- The role of regulating and supporting services is not highly valued – there is a disconnect between the articulation of the science and the investment process. At some level, participants perceived this lack of education and knowledge for all asset services, particularly for water assets.

These community leaders found many aspects of the in-depth interview to be thought-provoking and challenging. Repeatedly, they expressed some degree of exasperation over the difficulty in unpacking values associated with ecosystem services and the landscape. On the whole, however, the people interviewed seemed to find the process satisfying. The depth of knowledge and concern for their community can be observed even through a casual glance across the transcripts. There are deeply held values permeating throughout the interviews.

Values are expressed through both what is said and not said. Even after prompting there is an absence of discussion of supporting ecosystem services (nutrient cycling, soil formation, climate regulation, etc). This suggests for the next stage of the project that any trade-off involving economic activity and supporting services will be difficult for these decision makers to contemplate, even though indirectly decisions are being made – valuing economic activity over supporting services.

Regulating was often also seen as *regulation* applied by humans on the environment and not self-regulation of the environment (even after explanation).

Qualitative information can be a useful guide to more quantitative exercises as it provides a deeper and richer context for numbers. Key information from Project 1 will support the Multi-criteria Decision Support Analysis in Project 2. Many of the values are not consistent across community leaders and numerous tensions emerge from these expressions. Salinity schemes are often controversial. Support for tourism and recreation is an example where a number of different value expressions occur.

11.7 Next steps

It is likely that investigating the existing categorisation framework from a variety of different viewpoints will yield results relevant to the SAMDB Board in areas of interest other than the current specific project of investment prioritisation. This might include:

- analysing the data from an ecosystem service (such as *recreation and tourism*), instead of an environmental asset, perspective,
- comparing values of landholders over 2 ha to those without significant holdings,
- comparing the environmental values of regions, or
- a detailed comparison of NRM attitudes towards targeted fauna (i.e. wombats).

In addition, we have identified a value in coding the information in different ways. For example, interviewers specifically asked people to discuss their comparative attitudes towards 'native' and 'non-native' flora and fauna. Analysis of this subset of information could reveal how this interview population values the introduced species on which human economic development and food provisioning depends in relation to the native flora and fauna competing for basic land and water resources. This is a depth on analysis that the current report touches on, but does not exhaust.

Finally, when interviewers investigated the values the respondent population held, they also asked about the potential or perceived threats to those assets and any actions that need to be taken (either by the landholder or others) to protect what they value. These threads of discussion were implicit in the interview sections where people were encouraged to construct stories about natural asset values and explicit in the mapping process, where interviewers asked specific questions about threats and mitigation actions. This is a rich area of information worthy of further analysis within the body of interviews.

APPEXDIX A: TEXT CODING METHODOLOGY

The coding consisted of two families, assets and ecosystem services, which effectively formed a categorisation framework. Segments were then assigned at least one asset code and one high-level ecosystem service code. They could be assigned more than one code, or in the case of respondents that were unwilling to devolve their values into asset categories, all of the asset codes. In addition, sections were assigned a number of sub-codes under the ecosystem service codes.

The categorisation framework outlined below does not represent absolutes or silos of values. Rather it is a convenient way to understand the 1500 pages of information by theme and is based on the interpretation of analysts. Interview respondents expressed ideas in a multitude of ways, creating many novel and some predictable combinations of environmental assets and services. The analysis throughout the report is an attempt to extract information that will be useful to the Board. It is not the only way to categorise the information. The categorisation framework was designed specifically to present the information collected in a way that fits with the Board's existing classification of natural assets and the best estimate of the ecosystem services that will be relevant to its investment prioritisation processes.

A.1 Environmental assets

The asset categories discussed in the interviews were **water**, **land**, **biota** and **atmosphere**. Both at the direct request of interview respondents and as a result of analysing responses, we have also added **'people'** as a fifth environmental asset. People are considered an asset where respondents discuss them as an integral part of the management and service provision of the natural landscapes. An example might be where respondents describe the role people play in managing native populations of kangaroos to prevent the destruction of ecosystem restoration projects. Interviewers and analysts have not made decisions on whether or not these are factually correct or 'best practice' roles for humans as environmental assets, but have presented them as much as possible in the context that interview respondents intended them. Many respondents clearly regarded people as environmental assets.

Many interview respondents struggled to separate out environmental assets. They considered the environment an interactive whole and could not conceptualise environmental assets independently. One respondent felt the separation of assets missed the point of environmental management; *'I think we segregate too much… it does make it easier to break things down to manage in little chunks but the interaction to me is the key.'* Another succinctly responded to the idea of separating assets out by stating *'you have to have them all.'*

With this in mind, interviewers allowed respondents who wished to do so to discuss their values without separating them into asset categories. Analysts then attempted to separate out stories and discussions by assets into logical categories. Where this was neither possible nor practical, stories were coded with all asset categories to reflect the conceptualisation and descriptions of interview respondents.

A.2 Natural capital

The emphasis of the report is on the natural capital services natural assets provide to people in the region precisely because this is the arena in which the SAMDB Board has the most influence. Natural capital is defined in this report as the stock of ecosystem services natural assets provide (Millennium Ecosystem Assessments, 2005; Hatfield Dodds, 2008; Beeton, 2006). The framework has taken the Millennium Ecosystems Assessment as its starting point. However, where necessary, this framework has been either simplified or expanded to fit the reality of the landscape in the SAMDB. For example, under 'provisioning services' analysts have removed the 'ornamental resources' sub-category because no one mentioned the commercial production of cut flowers or other ornamental resources. In a similar vein, analysts added 'geological resources' to reflect discussions of mining.

A.2.1 Provisioning services

The Millennium Ecosystems Assessment defines provisioning services as 'the products obtained from ecosystems" (Millennium Ecosystems Assessment, 2005). In the project, this definition was simplified to 'providing for people's needs.' Subcategories under provisioning included **food and fibre**, whether these resources came from animals or plants. There is no plant-based fibre industry in the SAMDB so the fibre category consisted mainly of sheep for wool. Also most respondents running sheep either did not specify whether these were for meat or wool and many indicated that they were involved in both. **Fresh water** was a separate sub-category and by this we meant fresh water for human domestic use as opposed to irrigation use (which comes under food and fibre) or environmental flows (which is covered under regulation.)

Also in this category were **genetic, biochemical, natural medicine** and **pharmaceutical provisioning services**. All these sub-categories are general consumptive but non-food uses. In particular, genetic resources were interpreted as preserving potential resources for the future if we should find a use for them. Provisioning services also included **geological** services, to account for the provisioning services of mines in the region. Finally, the provisioning service of **fuel** provided an opportunity to capture respondent's use of firewood as well as any value put on the potential or realised value of biofuels in the region. Provisioning services were well-understood and discussed at length.

Most of these services were linked to the commercial activities of the respondents. It is worth noting that researchers used the Economic Viability and Employment

value under the Human Society asset discussed later in the report when respondents discussed how they value their present and future income (I value farming because I make money doing it), whereas provisioning services were used when they expressed a value towards the ecosystem service itself (I value farming because I feel I need local, fresh food.)

A.2.2 Cultural services

Cultural services in the Millennium Ecosystems Assessment are defined as 'the nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences" (Millennium Ecosystems Assessment, 2005). In the project they were described as 'providing for people's needs' and interviewers expanded that definition as needed. These services dealt largely with the ecosystem services people use to develop social capital, both on community and individual levels.

Cultural services included the concept of **cultural diversity**, meaning the contributions ecosystems and landscapes make to shaping the diversity of cultures in the region. **Cultural heritage**, in a similar vein, expressed the importance people placed on historically significant landscape features or species. Stories emerged where respondents expressed the value they attributed to some environmental asset in shaping either their culture's perspective or the perspectives of the cultures and communities around them.

Cultural services also included more specific **social relations**, where people identify with a community through some feature of the landscape. Active relationships to landscapes and assets are also drawn out through the sub-category of **recreation and tourism**, under which respondents describe their values through what they do with their leisure time.

Also included was the sub-category of **sense-of-place**, encompassing 'the meanings which people assign to a landscape through the process of living in it' (Tucker *et al*., 2006). Alongside this were the sub-categories of **spiritual and religious** values as well as **lifestyles** associated with a set of natural assets. Lifestyle values are different to sense-of-place values as they encompass how environmental assets enable activities more than imparting a sense of identity. Together, these three sub-categories were used to express connections people felt to natural assets that drew them to experience those places in ways that shaped their personal identities.

Cultural services also included two sub-categories that deal with ecosystem services people felt they could internalise and take with them out of the landscape. The first is **knowledge and education**, which included both formal and informal systems of knowledge and learning natural assets provide to people. The second, **aesthetic and inspiration**, captured how natural assets provide the inspiration we use to create or evaluate a world of beauty and establish a sense of well-being. In a sense, both sub-categories dealt with how people used first-hand knowledge of natural assets to build on their personal store of social capital.

The final sub-category was **bequest and intrinsic** values. Respondents often expressed a strong value towards natural assets that they had difficulty describing. They expressed the need to preserve natural assets for future generations, not necessarily their own children. One respondent described his sense of bequest values as *'what's important to me is that… I can actually work and pass it on to someone else, which means all of these [natural assets on my property.]'* Respondents also valued the preservation of assets because they felt these assets had a value independent of human use or valuation. It is important to note that analysts were careful not to use this sub-category as a catch-all. It was used when respondents specifically discussed a value in protecting an asset for future generations to value it or simply protecting it because it has a value to itself.

These subcategories included discussion of both indigenous and non-indigenous communities, though the interviewer specified neither. Respondents were left to decipher which culture they spoke about on their own. However, many used this prompt to discuss how they valued the existence of indigenous cultural diversity, sense of place and social relations in the landscape, regardless of whether or not they identified themselves as indigenous. This information has been included where appropriate but a detailed analysis of community valuation is beyond the scope of this project. It is sufficient to note that the cultural valuation of ecosystem services, including the indigenous and migrant people who are part of that landscape, is a complex issue tightly interwoven with the valuation of natural assets. Some of these values have been incorporated into the environmental asset framework with the discussion of built and social capital below.

A.2.3 Regulating services

Regulating services have to do with the 'benefits obtained from the regulation of ecosystem processes (Millennium Ecosystems Assessment, 2005). After testing definitions on a small group of people similar to the interview population, the project used a common definition of 'regulation of the environment around you' and explained that these were largely taking place at the regional or landscape level.

The sub-categories of **air quality**, the **local climate**, and **water quality** all cover the regulating ecosystem services that people valued for maintaining the quality of resources that impact us directly such as air, water and the weather. Water quality in particular captures the water purification and waste treatment functions of ecosystems. This aspect was often discussed in conjunction with the function of wetlands.

Interview respondents also spoke a great deal about the quantity of water available and this was captured under the sub-category of **water regulation**. The interviews took place over the summer of a long drought so respondents emphasised the lack of water, perhaps more so than they would in the winter of a wet year. The drought could also have led to a skewed representation of the sub-category **erosion**, as the prolonged dry period has led to a decrease in water erosion and an increase in wind erosion.

Regulating services also included the regulation of localised biological ecosystem services. The sub-category of **disease, pest, and natural hazard regulation** captures discussions of overpopulations, weed infestations, fires and other phenomena respondents are concerned about and attribute natural assets with a role in regulating. Finally, the service of **pollination** is included in the sub-categories and is conspicuous by the absence of valuation of this service among a population of natural resource managers and farmers.

It is also worth noting that many respondents chose to discuss 'regulating services' as the activities and services of people, not ecosystems. Interviewers provided definitions of regulating services, as well as examples, but in some cases respondents chose to interpret regulating services in their own way. They regarded the natural resource management activities of humans as ecosystem regulators in a highly modified environment; discussions of controlled burning and controlled native pest populations fit into this category. The sentiment is best expressed by one respondent who said that *'you can't leave the country to self-regulate anymore because we've just introduced too much, we've just changed it so much in the last 200 years that if we did that we would end up with an absolute disaster.'*

In other cases respondents persisted with an understanding of 'regulation' that fundamentally concerned itself with legislation and management policies aimed at the protection or destruction of natural assets. Where appropriate, the former comments were included under the asset of 'People' and the ecosystem service of 'regulation' and the latter comments were captured under the heading of 'Built Capital' and sub-category of 'zoning and planning' discussed below.

A.2.4 Supporting services

The final environmental capital category, supporting services, are defined in the Millennium Ecosystem Assessment as 'those that are necessary for the production of all other ecosystem services. They differ from provisioning, regulating, and cultural services in that their impacts on people are often indirect or occur over a very long time" (Millennium Ecosystems Assessment, 2005). While interviewers explained this to respondents, they generally referred back to a shorter definition; "supporting the long-term health of the planet."

Many respondents recognised the importance of these underlying services, though they were not foremost on their minds. These services included the four sub-categories of **soil formation**, **photosynthesis and plant primary production**, **nutrient cycling**, **water cycling** and **global climate regulation**. Given the anthropocentric nature of the value discussion, it is perhaps not surprising that the supporting services, while recognised as important, were not discussed at length across the breadth of interviews. Discussions were often conspicuous by their absence.

A.3 Produced capital

When discussing the environment around them, many people included the structures and regulation that their community had constructed. This is termed 'produced capital' and includes physical infrastructure and financial services (Hatfield Dodds, 2008; Hatfield Dodds and Pearson, 2005; Beeton, 2006). We have also included institutional arrangements that alter the physical landscape, such as decisions about where to allow irrigation or national parks.

While respondents were reminded that the focus of the interview was on environmental assets, they included produced capital nonetheless. In some cases, they considered buildings, roads and weirs to be part of the natural landscapes. In others, they wished to express how they valued these structures in opposition to natural assets. A sub-category of **built environments** was created to capture these values. Discussions included anything from schools to the system of locks that regulate the Murray River.

People also expressed their values for rules and regulations that had physical manifestations on the landscape and enhanced, threatened or in some other way interacted with natural assets. The sub-category of **zoning and planning** included discussion of landscape 'rules' imposed on the population, from the spread of irrigation zoning to the establishment and maintaining of conservation parks.

A final but extremely powerful form of produced capital is **economic viability and employment**. Respondents discussed at length the need to make money and to retain meaningful employment within the landscape using natural resources. This was periodically discussed as a set of trade-offs between aspects of environmental and built capital services. However, analysts were careful not to confuse discussions of the need to make money and have meaningful employment with any of the specific provisioning services, such as the provision of food and fibre, natural assets provided. What this means is that someone not willing to trade economic viability for natural resource management goals would be willing to 'farm biodiversity' if they could make the same amount of money from it, whereas someone not willing to trade off food provisioning services for natural resource management goals might not be willing to 'farm biodiversity' if it diminished the amount of food produced in the region. This distinction has a clear relevance for any programs that might involve paying landholders for the provision of ecosystem services.

One of the most salient aspects of produced capital discussed was the trade-off respondents acknowledged that society has made between leaving the natural assets 'natural' and modifying them to suit a variety of needs. Given that the SAMDB is a highly modified environment and is set to continue as one, the valuation of these modifications is of significant importance to natural resource managers attempting to prioritise investment. While the SAMDB Board often is not the major decision-maker in the development of the regional economy or produced capital in the region, the valuation of that capital will have an impact on the success or failure

of projects where the management of natural assets competes with the development or maintenance of assets humans have produced.

A.4 Social capital

By social capital we mean the set of services provided through the connections people build among members of their community. In his review of the development of the concept of social capital, Lehtonen synthesises the following useful definition.

> Social capital… refers to the networks of social relations characterised by norms of trust and reciprocity that can improve the efficiency of society by facilitating coordinated actions (Lehtonen, 2004).

Some economists and theoreticians expand this definition to include the laws and institutional arrangements people create to govern each other (Woolcock, 2001; Glaeser *et al*., 2002). We have chosen to use a definition more akin to the original meaning the sociologist Pierre Bourdieu originally proposed; one that concentrates on human relationships and a community perspective (Bourdieu, 1986; Svendsen and Svendsen, 2003). Increasingly in an Australian NRM context, financial and social capital are separated because they often form a set of potential trade-offs and so are more easily understood as distinct forms of capital (Beeton, 2006).

While respondents discussed the natural and produced capital as a series of necessary trade-offs between the services provided through environmental assets and through human endeavour they were less likely to express willingness to trade social capital. Many saw the purpose of built and natural capitals as the support and development of social capital. When asked about prioritising competing values, one respondent expressed the general attitude of the interview population when he said;

> *ultimately the family comes first…I feel strongly about community input…I feel if I don't contribute to a community, I won't have a community to live in…there won't be a structure around us and that's going to impact on lots of other things. Those two probably go hand in hand, family first and then I guess community.*

Respondents expressed a variety of social connections and configurations they felt were relevant to their valuation of natural assets. When taken as a body of information, social capital was easily delineated into two distinct sub-categories; the valuation of **family** and the valuation of **community**. While interviewers did ask about the general, competing priorities in people's lives as a way of introducing discussions of trade-offs, they did not elicit social capital valuations. Despite this, respondents wove social valuations, both their own and those of surrounding communities, into their explanations and discussions of the value of natural assets, ecosystem services and built capital. In a poignant example, one respondent describes the consequences of environmental degradation (soil salinity) driving community disintegration;

> *Once you have people leaving the area, the whole community itself is at risk… The bank is at risk, you start loosing teachers out of the school, businesses close, the whole thing. The end outcome of not only having a very aesthetically pleasing environment is to have a very viable community.*

For this respondent, environmental protection is community protection; there is no trade-off between the two. For another, community protection leads to environmental protection; *'if the community is not profitable then nothing gets spent on natural resources.'*

These were common sentiments and therefore analysts felt it was necessary to include social capital into the categorisation framework. Even though respondents generally did not discuss social capital as a set of trade-offs, an understanding of their impact could help shape investment prioritisation and the manifestation of investment projects.

A.5 Categorisation

The coding software allowed researchers to generate reports for analysis based on any combination of codes. These coded reports form the basis of this report.

Codifying the information into a categorisation framework aimed at informing an investment prioritisation strategy is only one way to productively use this set of qualitative interviews. The current report focuses on the valuation of ecosystem services across the general set of natural assets. The information that respondents provided is wider than the current report and we recommend consideration of further analysis.

While future arenas of analysis are possible, they have not been included in this report in order to avoid an overloading of information and perspectives. Values are complex, layered and intertwined. While this is the nature of values, we have attempted to ensure that the report is clear, simple and relevant to the current project of investment prioritisation.

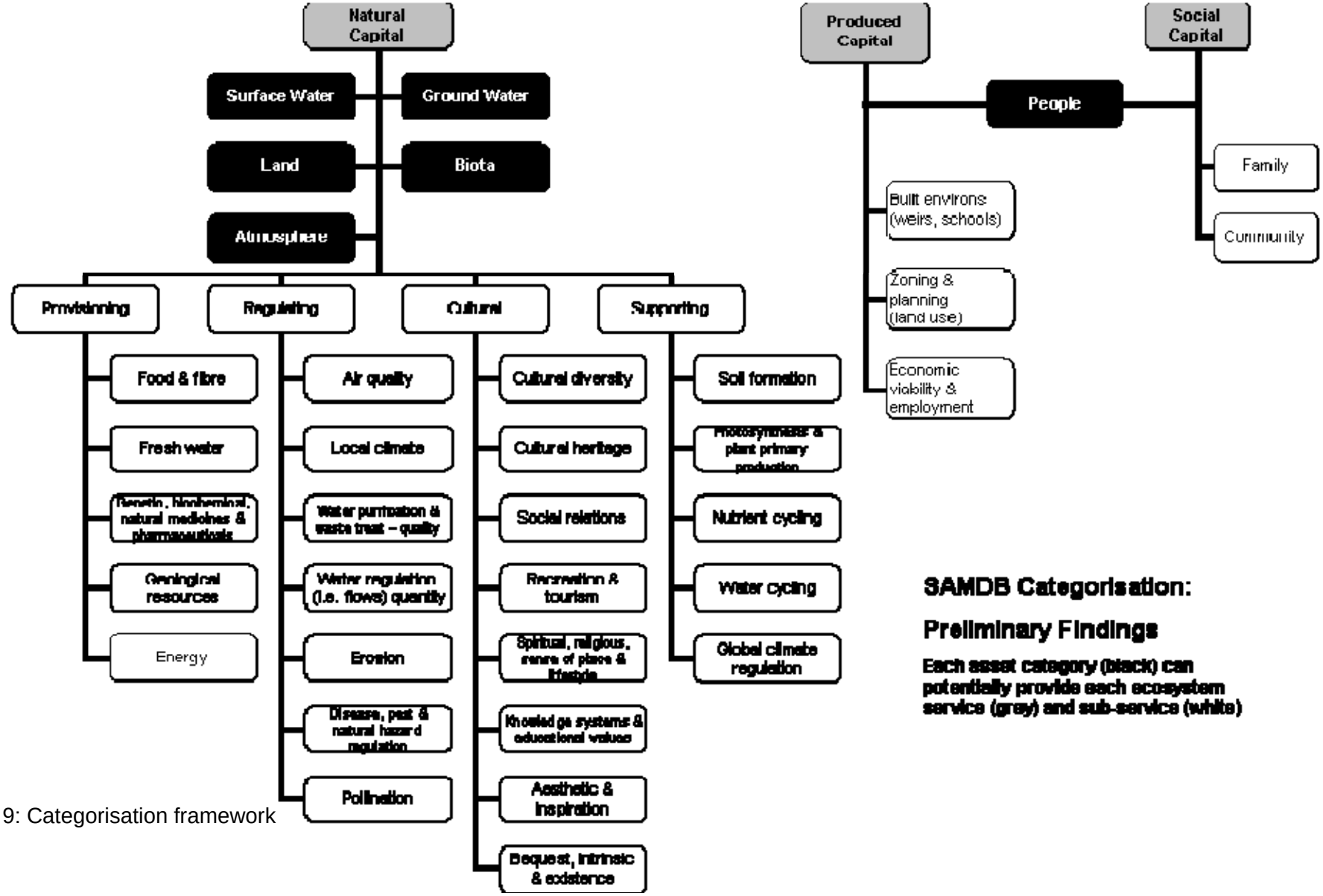

Figure 9: Categorisation framework

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