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# Landscape Change in the Goulburn Broken Catchment Final Report

**For the Goulburn Broken CMA**

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# Executive Summary

## Changing landscapes

**Landscape change** is fundamental landuse, land management and vegetation management changes undertaken on a major scale to improve landscape health and address NRM problems such as loss of biodiversity, salinity, declining water quality etc.

This is the final report of a short consultancy project that explored landscape change and the opportunities to use policy and planning reforms and to bring major investment to these challenges.

The project investigated landscape change options for the non-irrigated agricultural landscapes of the Goulburn Broken Catchment in Northern Victoria. The Goulburn Broken Catchment Management Authority commissioned a team of consultants lead by Jason Alexandra of Alexandra and Associates Pty Ltd to undertake the work.

The project ran for 4 months – June, July, August and September 2002. The project brief required:

- An analysis and synthesis of many of the complex environmental, economic and social factors determining landscape health and landuse in the Goulburn Broken Catchment, a region with many of the environmental and natural resource issues typical of much of the temperate agricultural areas of South Eastern Australia;
- A strategic assessment of the policy, planning and investment opportunities for accelerating landscape change;
- The conceptual design and development of an investment framework capable of channelling substantial amounts of private sector capital into revegetating and repairing the catchment;
- GIS modelling of landscape change options to assess their potential areas of impact within a case study area in the catchment.

The project looked into:

- **Funding NRM -** How to attract and manage sufficient investment to finance landscape change on a scale sufficient to achieve NRM outcomes.
- **Aligning change mechanisms** - How to systematically match priorities for changes in landuse or management with potential mechanisms.
- **Choosing and using mechanisms** - How to develop improved capacity for choosing and using new and existing mechanisms (policy and planning instruments) to generate measurable landscape change.
- **Linking statutory and catchment planning** - How to use the statutory and catchment planning framework to achieve NRM outcomes.
- **Achieving landscape change** - How to apply new and existing mechanisms in a coordinated targeted and cost effective fashion to achieve landscape change.
- Opportunities to use more **spatially explicit planning** to support implementation of the various **NRM strategies** - salinity, water quality, biodiversity etc.

Appendix 1 provides a summary of the way the specifics of the project brief have been addressed.

## Structure of this report

The consultants undertook the project in three overlapping stages. The structure of this report follows these stages. They are:

**Part 1** of the project reviewed current drivers of and constraints to change and options for accelerating landscape change.

The findings of Part 1 of the project are documented in Part 1 of this report (Chapters 1-4). Chapter 1 gives the background to the project. Chapter 2, including Table 2.1 provides an overview of NRM, demographic and agricultural changes currently occurring.

Chapter 3 takes up landuse change as a policy reform challenge. It offers a brief summary of the theory of policy reform and implementation, including the selection and application of policy instruments.

Chapter 4 investigates and describes the Statutory Planning System as it is the framework for integrating policy and landuse. The Victorian planning system is described and the current use of the planning system by the three Shires that make up the bulk of the mid Goulburn catchment – Murrindindi, Strathbogie and Delatite – is reviewed. A range of recommended reforms are offered to improve the alignment of the catchment management and the Statutory Planning Systems and to improve delivery of the Regional Catchment Strategy (RCS) and applicable State policies. If these reforms are implemented the Planning System can more effectively support protection or enhancement of the catchment and it biodiversity.

**Part 2** of the project developed an investment framework capable of bringing increased investment to the task of changing landuses and repairing the landscape. This concentrated primarily on revegetation and reafforestation options due to the importance of increasing vegetation cover and the scale of change required to address priority issues such as salinity (Chapter 5). Chapter 6 investigates the challenges of pursuing new directions in forestry and plantations within the context of the changing nature of landuse policy. It provides an overview of reafforestation issues, documenting the complex biophysical, social and economic relationships currently framing and constraining afforestation. It explores some of the policy and research directions required to achieve a commitment to multi-purpose reafforestation.

An investment framework which aims to bring public and private sector investment together is presented in Chapter 7. To support an improved understanding of the many variables involved we developed a "*reafforestation calculator*" which is detailed in Chapter 8. This has been used to scope the economics of reafforestation and the possible costs and benefits of both natural regeneration and/or new forms of plantation forestry.

Chapter 9 provides some light relief with "*a story from the future – a 2020 review*". This models the impact of the landscape change project using pure (honest) fiction.

**Part 3** of the project attempts to model landscape change options in a case study area – the Strathbogie Ranges. It brings the policy, planning and investment elements together to define how and where policy reforms and new investment can be applied to changing the catchment.

Many of the drivers of landscape change will sit outside the statutory planning system because change will be driven by landholders' decisions on rural landuses or changes in land management – eg changing from current grazing practices to less or more intensive landuses like cropping or toward those practices which favour natural regeneration or reafforestation. These in turn are likely to be driven by a range of factors including: improved understanding of salinity risks; the changing value of eco-system services; the variable economics of commodity production in forestry and dryland agriculture; and the lifestyle and investment decision of those who own and manage land as framed by the wider market and policy context.

This GIS modelling provides information on the likely impacts and potential extent and scope of major new investments in increasing vegetation cover and other changes in landuse. This work is described in Chapters 10 to 14.

## A public-private partnership

The project found that there is a major opportunity to develop private-public partnerships to fund catchment restoration and industry development. The core element of this report (chapter 7) is an innovative strategy for leveraging private sector investment in reafforestation that could mitigate salinity, improve water quality, enhance habitat and sequester atmospheric carbon (carbon credits) as well as stimulate rural industry development by channelling capital into regional Victoria.

The report proposes the architecture of an investment model to finance a decade-long program of revegetation and strategic plantation establishment of over 100,000 hectares of the Goulburn Broken Catchments which aims to:

- Reduce salinity and protect and restore the health of the Goulburn Broken catchments;
- Improve water quality;
- Restore and enhance significant areas of habitat;
- Grow high quality hardwood timbers;
- Create a plantation firewood and bio energy resource; and
- Sequester significant quantities of carbon dioxide.

The challenges are to design a system that can equitably share the public and private costs and benefits generated, and the need to establish a framework for more detailed negotiations.

To achieve this, governments, investors and landowners must be willing to facilitate and negotiate new private-public partnerships. It will also require patient capital on the part of investors and ways of fairly defining and sharing risks, returns and benefits. An investment model is proposed which, if successful, would leverage public expenditure on rural environmental repair with substantial private investment. A preliminary leverage ratio of between 1 to 3 and 1 to 10 is considered feasible. More detailed planning and analysis are clearly required.

## Leveraging private investment

During the late 80 and early 90's over $300 million was spent on salinity in Victoria. Now the NAP (National Action Plan for Salinity and Water Quality) is likely to fund a similar amount to be spent in the next 5 years. Developing innovative private-public partnerships is a significant opportunity to

leverage these funds and show leadership on regional development and reinvestment, salinity and greenhouse sequestration.

DNRE estimate that to stabilise salinity between 150,000 and 300,000 hectares of land must be revegetated in the Goulburn Broken Catchment – never before has Australia attempted landscape renovation on this scale. Chapter 7 proposes the architecture of an investment model to finance a decade-long program of reafforestation of over 100,000 hectares, out of more than 1.4 million hectares of land in the catchment that is not forested or irrigated. Initial discussions indicate that up to $250 million of private equity may be available to pilot the scheme if suitable Government support can be gained. New or existing program funds from the NAP could be used to leverage this.

Victoria faces major challenges in rural landscape repair and in greenhouse gas reduction. The scale and nature of the problems has been well documented. CSIRO recently called for a "Revolution in Landuse" to control dryland salinity (CSIRO 2000). Governments have responded to the environmental problems with major funding programs demonstrating a willingness to invest substantial public funds. These include:

- the NAP (National Action Plan for Salinity and Water Quality)
- NHT (National Heritage Trust) 2
- State funded NRM programs
- Forest and agricultural industry structural adjustment
- Regional development and other related strategies.

Leveraging private investment represents a major opportunity to increase the total investment, to sponsor employment, innovation and industry development and to convert public funds focused on fixing problems to opportunities for sustainable economic development.

The proposed Catchment Revegetation Investment Model could leverage existing Government's rural environmental program with substantial private investment. It is a structured way of attracting and delivering major investment into multi-purpose reafforestation intended to result in numerous beneficial outcomes - salinity mitigation and improvement in water quality, biodiversity protection, new rural industry development and carbon sequestration.

## The Catchment Revegetation Investment Scheme

The Goulburn Broken catchment covers 2.5 million hectares in the north of Victoria. It produces approximately $7.8 billion across all sectors of its economy per year. The majority is generated by high value irrigation based industries in the north of the catchment. Vegetation clearing for agriculture and grazing have taken their toll: catchment health is threatened by dryland salinity. To reduce salinity we need landscapes that use more water by planting more woody vegetation – trees and shrubs. The Department of Natural Resources and Environment (DNRE) estimate that to stabilise salinity between 150,000 and 300,000 hectares of revegetation is needed. For the long-term social, economic and environmental viability of the region, a major program of landscape change must be implemented.

Strategic reafforestation has the capacity to achieve catchment-wide environmental benefits including improved biodiversity protection and habitat enhancement, carbon sequestration, improved water quality and salinity mitigation through reduced groundwater recharge. This can be achieved by the following range of commercial and semi-commercial revegetation opportunities:

- Expanding the range and extent of existing plantation based industries
- Developing new forms of commercial and semi-commercial forestry using a wider range of species suited to the medium and lower rainfall parts of the catchment
- Developing new woody land uses – eg biomass fuel crops
- Reviving or expanding traditional forest industries – eg firewood
- Environmental or new forests - establishing new multi purposes forests by revegetating and encouraging natural regeneration

Although many farmers are attempting to adopt BMPs to revegetate their land, much of the landscape in which change is required currently generates a low return on capital and the farm businesses have little internal capacity to invest in change. However the low rates of return mean that alternative land uses have a low return hurdle to overcome. There are therefore opportunities for generating income via a combination of conventional products and payments for ecosystem services such as improved water quality. Cost-sharing arrangements negotiated to pay fairly for a mixture of products and services could ensure the viability of plantations in areas currently regarded as uncommercial.

There are many worthwhile projects underway and while these projects are undoubtedly achieving positive results, additional sources of investment are needed to accelerate rates of change due to the scale of change required. A public-private partnership model to investing in landscape change has the potential to maximise these benefits through ongoing reinvestment. Timber production, carbon credits and catchment or habitat services could generate revenue.

A public-private partnership could reafforest large areas of the catchment if arrangements could be made that permit private companies to invest in timber production and carbon sequestration while governments fund public good outcomes such as salinity, habitat and water quality improvements.

If a regional vegetation investment scheme was established it should aim to package the deals so that sizeable investors could be attracted to a "major project" with a guaranteed return and low risk by way of secure Government contracts for environmental repair. More consideration needs to be given to the best way to achieve this including government endorsement and support, contracts for undertaking environment works and, if necessary, capital guarantees to attract lead investors.

Although this proposal focuses on the Goulburn Broken catchment, it is applicable to natural resource management and regional development in many parts of Victoria. It demonstrates a strategic approach to catchment management and will reinforce the long term social, economic and environmental viability of Victoria's regions. For maximum private investment, government commitment is imperative.

## List of recommendations

Table 1 below provides a summary of the recommendations listed throughout this document.

**Table 1: Recommendations**

| No | Recommendation | Page | Agency responsible |
|---|---|---|---|
| 1 | The CMA should work with State and Local Governments to introduce a package of new education, incentives, regulations | 15 | CMA, State and Local |

| No | Recommendation | Page | Agency responsible |
|---|---|---|---|
| | and market measures designed to achieve the landscape change needed for salinity, biodiversity and catchment health targets within a prescribed time frame, eg a decade. | | Govt. |
| 2 | That the package of landscape change reforms is designed so that wherever possible it generates social, environmental and economic benefits and is implemented efficiently, fairly and equitably. | 15 | CMA, State Govt. |
| 3 | That the Goulburn Broken CMA works to further develop structures and processes that will help establish markets for a range of ecosystem services in the Goulburn Broken Catchment. | 16 | CMA, State Govt, CSIRO |
| 4 | That the Goulburn Broken CMA pursues trials of market measures designed to generate positive landscape change in selected parts of the Goulburn Broken catchment, this may include establishing markets for land retirement from grazing, habitat enhancement, increased vegetation cover, riparian restoration, etc. | 16 | CMA, State Govt. |
| 5 | the CMA should explore suitable techniques and incentives for triggering natural regeneration of all EVC in the catchment as this is not only cost effective but also tends to ensure persistence of genotypes, species and communities | 20 | CMA, State Govt. |
| 6 | That the CMA and local governments should further explore under what conditions the development of village farms and time-share recreation facilities is a suitable means of accommodating the growing population pressure in rural areas, and determine an appropriate set of conditions and controls on their development. | 22 | CMA, Local Govt, DOI, DNRE |
| 7 | That Local and State Governments should give in principle support to clustering as a form of rural development in certain areas, but subject individual proposals to appropriate levels of planning review to ensure satisfactory environmental and social outcomes. | 22 | Local Govt, State Govt |
| 8 | That Local and State Governments should consider on a case by case basis proposals for cluster title “village farms” and time share recreation “resorts” as a form of “subdivision” that can accommodate the changing demand for land while enhancing NRM outcomes and agricultural production. | 22 | Local Govt, State Govt |
| 9 | That biodiversity assessments are prioritised in areas likely to be subjected to subdivision, development and/or intensification of | 23 | Local Govt, CMA, State |

| No | Recommendation | Page | Agency responsible |
|---|---|---|---|
| | landuse. | | Govt |
| 10 | That the CMA further investigates how to facilitate the development of a range of innovative rural business models that fit landscape change priorities and result in improved NRM. | 24 | CMA, DNRE |
| 11 | That the CMA should investigate the option of initiating Special Area Plans for those parts of the landscape known to have high catchment health and biodiversity significance, for example the CMA should consider preparation of Special Area Plans for the priority riparian zones given their ecological and natural resource management significance. | 26 | CMA, DNRE, Local Govt |
| 12 | The CMA should work with NRE to provide Councils with the best available information to inform their application of appropriate overlays, particularly the biodiversity & salinity overlays. | 32 | CMA, DNRE, Local Govt |
| 13 | That the CMA recommended to DoI and relevant Councils that they limit further subdivision in sub-catchments which are known to at risk form rising water tables and which export significant quantities of salt per unit area until further detailed assessment of hydrogeology and the capacity to address these issues is undertaken. | 32 | CMA, DOI, DNRE, Local Govt |
| 14 | That the Goulburn-Broken Catchment Management Authority include specific area based policies in the RCS matched to physical characteristics, and the specification of land use planning responses by identifying the appropriate planning provisions and the content of local policy. | 33 | CMA |
| 15 | That the Goulburn-Broken Catchment Management Authority seeks to include the full extent of the Victoria Planning Provisions into planning schemes as measures aimed at the implementation of the RCS. | 37 | CMA |
| 16 | That the Goulburn-Broken Catchment Management Authority liaise with local councils on the rewriting and strengthening of local planning policies aimed at implementing the objectives of improved land and water management and environmental protection, with reference to different area types including the characteristics of sub-catchments, to improve implementation of the RCS | 37 | CMA, DOI, DNRE, Local Govt |
| 17 | That the Goulburn-Broken Catchment Management Authority ensure that the RCS develops policies and measures aimed at | 37 | CMA, DOI, DNRE, Local |

| No | Recommendation | Page | Agency responsible |
|---|---|---|---|
| | implementing the objectives of improved land and water management and environmental protection which are clear enough for local governments to interpret and apply within the areas of responsibility. | | Govt |
| 18 | That the Goulburn-Broken Catchment Management Authority liaise with local government on limiting the use of the Rural Living Zone, and on preventing the ad-hoc conversion of rural land into part rural-residential, residential uses or other developments. | 38 | CMA, DOI, DNRE, Local Govt |
| 19 | That the CMA advise Councils that it supports the use of a wider range of zonings, such as targeted use of environmental, rural living and landscape significance zones in appropriate parts of the catchment. Each zone should be supported by appropriate local policies in rural areas in order to facilitate positive landscape change. | 38 | CMA, DOI, DNRE, Local Govt |
| 20 | Local governments should specify landuse preferences in local planning schemes more accurately which identify preferred areas for intensification and those requiring protection from inappropriate developments | 38 | CMA, DOI, DNRE, Local Govt |
| 21 | The CMA should use its capacity to develop SAPs to drive systemic improvement in the detail and resolution of sub-regional and local government plans relevant to landscape change. | 38 | CMA |
| 22 | The CMA to investigate options for ensuring that detailed sub-regional and issue specific plans are incorporated into or given expression by the MSS and local government planning schemes wherever possible | 38 | CMA |
| 23 | That the CMA work to ensure that Councils recognise the catchment imperatives for increased vegetation cover including the establishment of new forests and ensure that local plans and policies do not impede these forms of landuse | 38 | CMA, Local Govt |
| 24 | That the CMA request DoI to undertake a regional assessment of land availability within the catchment to determine supply and demand of rural land in a variety of lot sizes with regard to tenement, lot size and future industry development. | 38 | CMA, DOI |
| 25 | That the State and Local Governments should develop policies which facilitate appropriate realignment and amalgamation of titles where this supports positive landscape change particularly | 38 | State Govt, Local Govt |

| No | Recommendation | Page | Agency responsible |
|---|---|---|---|
| | increased vegetation cover. | | |
| 26 | Local Government should introduce specific overlays to protect or enhance areas of high environmental significance and high environmental risk, for example, steep slopes and salinity risk areas, supported by appropriate local policies especially riparian zones and other areas of ecological significance. | 38 | State Govt, Local Govt |
| 27 | Local government should adopt Local Planning Schemes which identify habitat enhancement and revegetation priorities for areas identified as a regional catchment priority such as riparian zones and areas suitable for reconnecting fragmented vegetation. | 39 | Local Govt |
| 28 | Local Governments should adopt positively biased differential rating systems (discounts) which recognise the public good nature of land managed explicitly for conservation. | 39 | Local Govt |
| 29 | That the Goulburn-Broken Catchment Management Authority liaises with local government on implementing clear environmental and natural resource policies formulated in the Regional Catchment Strategy through planning schemes. | 39 | CMA, DOI, DNRE, Local Govt |
| 30 | It is recommended that the CMA develop a set of clear criteria for determining the likely cost effectiveness of revegetation options. | 49 | CMA |
| 31 | The CMA should pursue research and development opportunities for developing least cost reafforestation/revegetation techniques with funding agencies and research providers. | 49 | CMA, DNRE, CSIRO, JVAP, MDBC |
| 32 | A plantation based firewood industry should be encouraged by the CMA as it would play a vital role in the viability of medium rainfall plantation by providing a market for thinnings and other plantation wastes. This should include a detailed assessment of the VNPA Firewood Business Plan and NRE's Box Ironbark Firewood Plans. | 51 | DNRE, VNPA, firewood industry |
| 33 | That given the recent history of plantation policy and plantation development in Australia it is important that the Catchment Revegetation initiative is not "captured" by narrowly defined professional or commercial forestry interests. Therefore the CMA should ensure that the initiative is managed to maintain its core focus on generating multiple benefits and multiple outcomes - primarily catchment health and biodiversity enhancement. | 52 | CMA |

| No | Recommendation | Page | Agency responsible |
|---|---|---|---|
| 34 | That the CMA pursues opportunities to advance the directions outlined in the Catchment Revegetation investment model, in particular seek support for a pilot from the State and Commonwealth Government. | 60 | CMA, AFFA, EA, State Govt |
| 35 | That the CMA commission two additional projects that will build its case for substantial private investments – one a study into the regional economic impacts of the planned landscape change and another to further refine the design of the public-private partnership framework in order to bring the proposal up to the point of "investment readiness". | 60 | CMA |
| 36 | That the CMA identify, document and promote to philanthropists those activities that it believes are likely to attract funds, for example a program to protect and enhance the habitat of rare and threatened species such as woodland birds. | 61 | CMA |

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# PART 1 - EXPLORING LANDSCAPE CHANGE OPTIONS

Part 1 of the project focuses on exploring potential options for landscape change.

It describes the background of the project, sets it in a wider context and identifies the major issues associated with attempts at accelerating landscape change. A summary of the major trends affecting landuse and NRM was prepared. Many related R&D, planning and NRM projects were identified at this stage.

This part of the project explored the theory of how we could use a range of policy instruments to generate positive or beneficial landscape change via markets, incentives and regulation. The process of investigating the roles of local government, and the capital markets in landscape change commenced.

We found that unlike fisheries, forests or water, catchment or landscape health is currently ill defined as a "common property". We are more familiar with the consequences of declining landscape health – salinity, extinction, reduced water quality – than we are with the idea of using structural reform to drive positive change or protection of catchment health as community or "common property".

# 1. Exploring the challenge of landscape change

## 1.1 Project background and introduction

This is the final report of a short consultancy project investigating landscape change options for the agricultural landscapes of the Goulburn Broken Catchment in Northern Victoria. A team of consultants lead by Jason Alexandra of Alexandra and Associates[1] was commissioned by the Goulburn Broken Catchment Management Authority (GB CMA) to undertake the consultancy.

The project ran for 4 months from June until September 2002 and required an analysis and synthesis of many of the complex environmental, economic and social factors determining NRM and landuse in the temperate agricultural areas of Australia. Furthermore, using this analysis it required a strategic assessment of the opportunities for accelerating landscape change.

The brief also required the design of an investment framework capable of channelling significant funds (private and public) into the pressing task of revegetating the mid-catchments of one of Victoria's most important river systems.

The project focused on the dryland (not irrigated) parts of the Goulburn Broken Catchment. It is recognised that a wide range of processes including industry changes, water reform and salinity management is resulting in significant change in irrigation regions, but this is outside the scope of this particular project.

## 1.2 Why change landscapes?

The concept of landscape change is emerging to describe fundamental landuse, land management and vegetation management changes undertaken on a major scale to improve landscape health and address NRM problems such as loss of biodiversity, salinity, declining water quality etc. The project explored the scale and types of landscape change needed and the opportunities to align policy and planning reforms and to bring major investment to these challenges.

There is an emerging consensus on the scale, urgency and nature of the NRM challenges and the interconnectedness of biodiversity, vegetation, ecosystem function and landscape health (MDBC 2002). However, there is less clarity about what the options are for achieving the desired outcomes - either in terms of how to finance landscape change, how to utilise various tools, mechanisms or policy instruments or how to mobilise community support and resources.

In summary, the project explored:

- The need for new approaches to change;
- Options for using a range of policy instruments;
- The potential for new business structures and models;

[1] The project team consisted of Jason Alexandra; Professor Snow Barlow, Associate Professor Michael Buxton; Francis Grey and Neil Urwin.

- Use of the statutory planning system
- Financial and investment strategies;
- Options for redefining and marketing a range of property rights; and
- Innovative investment arrangements to fund landscape change etc.

The project team reviewed the prospects for applying a wide range of landscape change mechanisms and looked for opportunities for using a combination of aligned mechanisms to generate positive landscape change.

## 1.3 Project logic

There are many inter-related processes affecting NRM within the Goulburn Broken CMA region (see summary in Table 2.1). However, not all of these will result in positive landscape change.

The underlying question for the project was therefore *"how much change of what kind is needed to achieve what outcomes?"* At an initial team meeting at the Institute of Land and Food Resources the critical project questions were determined and form an underpinning logic for the project (see figure 1.1).

**Figure 1.1: Project Questions**

1. *How much landscape change is needed?*
   *Where? - Land systems* *Solutions appropriate to* *-Streams*
   *What kind of change?* *- steep hills*
   *How? - Ownership* *- plains and lowlands*
   *- slopes*

2. *How can the changes be financed or delivered in other ways?*

3. *How can policy instruments be used to deliver or support delivery?*

4. *How much spatial information is available to support 1,2 & 3?*

5. *How can we model the changes in the case study area?*

6. *What kinds of business models are appropriate? Can they span or go beyond tenure?*

   *Eg "Strathbogie Pty Ltd"* ® *FFORN?*
   ® *Critical mass?*
   ® *multiple property rights*

   *Economic Landuses?*

   *Intensification opportunities*

   - *viticulture*
   - *horticulture*

   *Communal grazing?*

7. *What is the key information required to support the project?*

*Biophysical data (DNRE?) ® knowledge of problems/opportunities*

*Tenure ® DOI, LGA ® how does this constrain opportunities for change*

*What planning tools ® ① Current + ② potential (precedents) + ③ other/new regulatory and policy approaches*

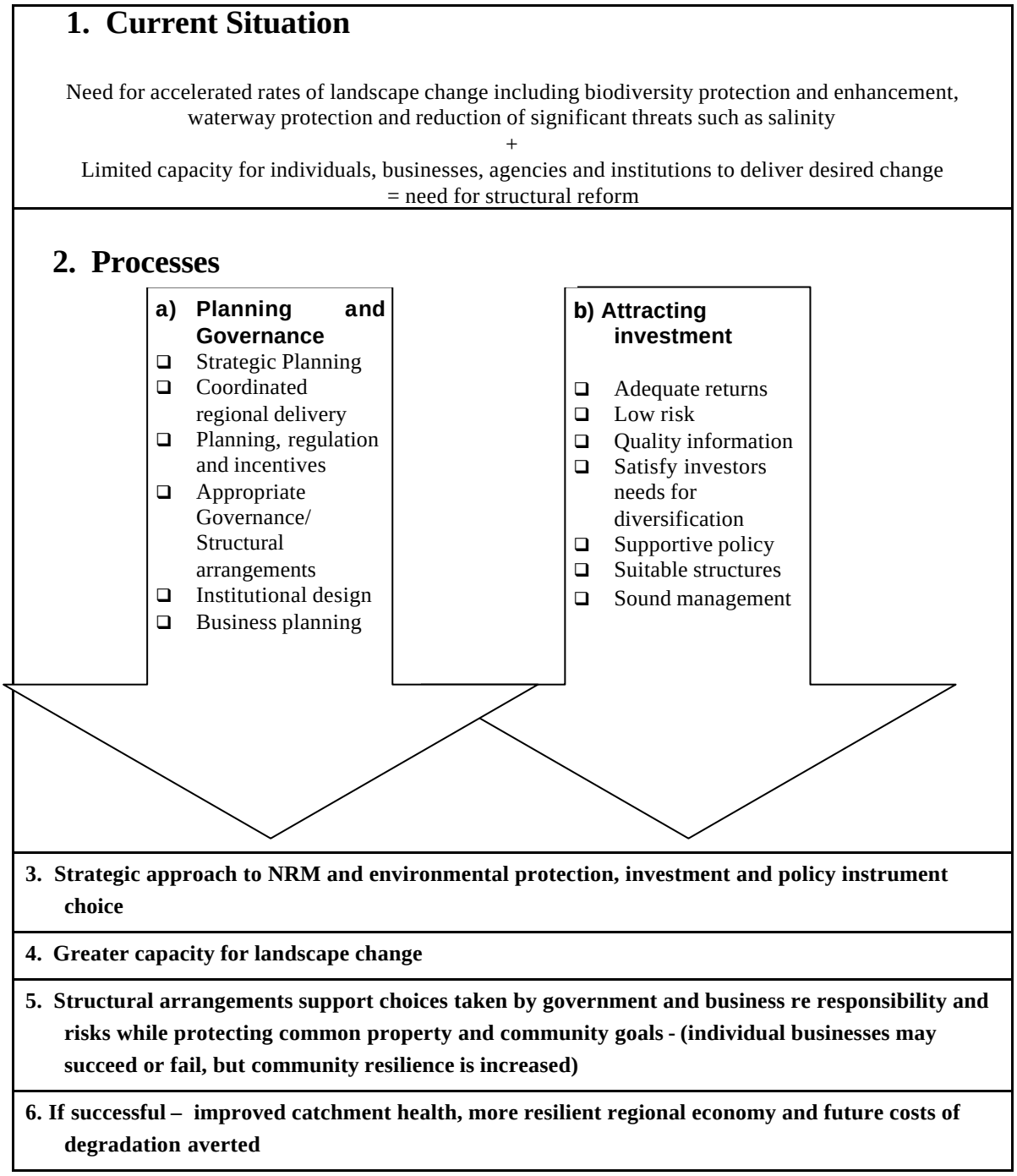
*Do we need to redefine property rights? ®construct scenarios ®recommend appropriate economic and policy instruments*

*Are there new investment and Business options ® forestry and intensive land uses*

These key questions and the underlying concepts have been further developed and are represented diagrammatically in Figure 1.2. Figure 1.2 is a simplified diagram of the underlying logic used in the

project. The two parallel arrows represent the primary activities of attracting investment and ensuring the design and adoption of an appropriate and supportive policy framework.

**Figure 1.2: Project Logic**



# 2. Landscape Change

## 2.1 The need for new approaches to change

*The incorporation of ecological sustainability into policy has been ad hoc, incomplete and tentative. The central problem is that Australian governments have yet to put in place a comprehensive, integrated and far sighted way of promoting the ecologically sustainable management of natural resources" (Industry Commission 1998).*

The Goulburn Broken catchment is a useful microcosm of the situation throughout much of the agricultural regions of Australia. Agricultural businesses are the dominant users of land and water resources in Australia (ABS 1996). The environmental challenges facing rural lands and land based industries are huge and widely recognised (SoE 1996, MDBC 2002). The stakes are high in both economic and ecological terms with numerous degradation trends, such as dryland salinity, loss of bio-diversity and declining water quality well established. These environmental challenges facing natural resource managers and agriculture are well documented (for further information see Industry Commission 1998; SOE 1996; LWRRDC 1988; MBDC 1999a, 1999b, 2001 & 2002).

There is a growing acceptance that current rates of positive land use change are insufficient to stop the decline of catchment health and that new approaches are needed (Stirzacker et al 2000, MDBC 1999 and MDBC 2000, MDBMC 2001).

For well over a decade Governments have been making major investments in attempting to improve natural resources management in rural Australia. Landcare and the related initiatives[2] of the last decade have aimed to achieve sustainable landuse through a wide range of mostly voluntary initiatives and supportive Government programs. Most effort has been focused on encouraging farmers to change by use of informative, incentive or facilitative approaches to change (see for example Earl et al 2001 and the Goulburn Broken CMA 2001). The Goulburn Broken Catchment has been recognised as a leader in this field by being awarded the prestigious Riverprize in 2001.

In this period there have been major policy reforms in water resources management (Industry Commission 1992, Alexandra 1992), fisheries and native forest management with resulting structural changes to these resource based industries. However, structural changes in landuse and dryland agriculture have been largely determined by “market forces” with a more ad hoc approach to intervention by Governments. Some interventions may have assisted achievement of NRM outcomes, while others may have hindered it, such as drought relief and the Rural Adjustment Scheme (Alexandra 1996 &1997). This is despite the fact that grazing and dryland agriculture are the dominant industries managing natural resources and that significant demographic and structural changes are inevitable due to declining farm incomes and aging populations (MDBC 2000, Landmark 2002, Rural Atlas BRS 1999, and Barr 2002). Furthermore in many areas close to population centres there are significant pressures for subdivision of farms into smaller lifestyle blocks, with the attendant social and environmental complexities.

[2] "Landcare" is used as an umbrella term as there have been a range of government funded programs aimed at sustainable landuse or sustainable landscapes, such as those funded by the Natural Heritage Trust.

The fundamental difference between dryland agriculture and the other resources sectors subjected to planned reform is that dryland agriculture operates on the basis of well defined "private" property rights – land tenure – and all the presumed rights associated with this form of property right. In contrast, water, fish stocks and native forests are predominantly publicly owned and historically publicly managed resources (Young and McKoy 1996).

Although the nature of the property rights and responsibilities bestowed on private property continue to evolve in rural Australia (eg via native title and reforms to water and vegetation clearing and forest harvesting rights etc), reforms in dryland agriculture are fundamentally different to reform in the forest, water or fisheries industries which are based on regulated access to common property resources. Catchment or landscape health is currently ill defined as a "common property". We are more familiar with the consequences of declining landscape health – salinity, extinction, reduced water quality – than we are with the idea of using structural reform to drive positive change or protection of this "common property".

## 2.2 Types of change and change mechanisms

If we look over a large enough time frame – say several decades – we recognise that landscapes, economies and communities are in a continuous state of change driven by many factors including changing markets, technology and community values. The structural characteristics of rural industries continue to change and evolve (MDBC 2000). It is also important to recognise that there are well established trends in agriculture that are unlikely to change in the medium term:

- the reducing terms of trade for farmers,
- increasing economic efficiency and reduced employment, and
- greater intensification in many rural industries – viticulture, horticulture, dairying etc –
- and increasing extensification in the broad acre industries (Landmark 2002).

Governments tend to regulate, encourage and/or support change in a wide range of ways depending on commonly held perceptions of what kinds of change are valuable or desirable. Australian Governments have consistently intervened in "market driven change" in agriculture via a wide range of mechanisms including:

- Infrastructure provision;
- Research and development;
- Education and extension;
- Statutory marketing bodies;
- Landuse controls;
- Low interest loans;
- Taxation treatment;
- Incentives and regulations; and
- "Structural adjustment" programs – such as the recent Billion dollar dairy package.

Governments continue to drive some large scale landscape changes via taxation rules that provide incentives to some landuses – eg blue gum plantations (see section 2.3 for further examination of

this). At a wider scale the tax system has a big bearing on both the scale and the kinds of investment favoured by business.

Governments also continue to provide major natural resource subsidies to industry which are rarely accounted for (Environment Australia 1996, Industry commission 1996) and make massive direct payments or concessions to large corporations[3] which are rarely granted in a transparent fashion (ABC Radio National 2002).

Local Governments also play an active role in directing landuse change by limiting and restricting subdivision to certain areas or preferred minimum lot sizes.

In combination the "rules of the game" used by Governments are described as policy settings and individual mechanisms are referred to as policy instruments.

While there is much rhetoric about free markets and the problems of interventionist governments, in reality all markets are conditioned to a greater or lesser extent by the policy settings of Governments. The use of policy instruments is not independent of the market but works in conjunction with market processes. Governments should aim to establish "smart regulation" and elegant policy settings which enhance the markets to deliver to the community what it wants and needs. It is important to recognise that a range of policy settings condition the dynamic relationship between Governments and the choices and investment made by the private sector - together these can result in beneficial landscape change.

## 2.3 Current processes of change in the Goulburn Broken

For the purposes of this project the catchment can be grouped into five dominant landuse systems or zones:

1. The irrigation areas to the north – horticulture, dairying, etc with associated wetlands and riverine landscapes;

2. The plains – typically cropping and grazing, occasional low hills, vegetation along riparian corridors and roadsides;

3. The mid and upper catchment's broad valleys and lower slopes;

4. The slopes and hilly ranges used primarily for grazing; and

5. The forested ranges and mountains of the upper catchment.

In each zone different processes are driving landscape change. The project is primarily concerned with zones 2, 3 and 4 as there has been extensive planning and change processes focused on the both the forest and irrigation areas, in part driven by the national reform processes – the Water Reform Agenda and the RFA process.

[3] This is often referred to as corporate welfare which is estimated to run to many billions of dollars per year in Australia. The nature of this corporate welfare was document well by ABC RN Background Briefing July 2002.

The opportunities for generating landscape change differ in each landuse system and therefore the landscape change mechanisms will either be different or be applied differently in each landuse system.

In the past most rural landscapes were defined as being production systems and therefore rural and NRM policy focused on ways of changing the production system and thus the NRM outcomes. The basic premises adopted and promoted by Government's agriculture and natural resource agencies were that farmers were free and independent decision makers taking rational decisions in the best interest of their business and their land. Much rural policy was based on opposition to direct intervention by governments and therefore most NRM policy was based on encouragement, voluntary adoption and provision of information. However, the legislative process in Victoria has continued to redefine property rights – most notably via the introduction of vegetation clearance controls in 1988 applied via statewide planning controls and more recently the 2002 Farm Dams Legislation.

Over time the regional economy and landuse practices have evolved. It is now useful to redefine these landscapes as mixed landscapes in the sense that are part of a mixed economy that has production, lifestyle and recreation values.

Rural property prices reflect these values as does the many small lot subdivisions, the "rural housing boom" (3000 new houses since the 1970's[4]) and the increasing importance of tourism and recreation in the regional economy (Abel pers com).

Table 2.1 summarises the types, scale and influences of NRM change drivers applicable to the catchment.

[4] Bill Cathcart – Delatite planner workshop presentation

**Table 2.1: Summary of NRM change drivers**

| Types of change - | Scale | NRM influence - outcomes | Comments |
|---|---|---|---|
| Increasing scale of large farm businesses – multi tenure | National /Catchment wide – typically in irrigation and cropping zones | Fewer more professional managers | Slow processes of adjustment. Busier managers |
| Many part time and hobby farmers and the "churn" of ownership | Greater Melbourne regional centres Catchment wide - typically in mid to upper catchments | variable | Off farm income – tends to drive diversification and micro business development. |
| Age of many graziers | National/Catchment wide - typically in mid to upper catchments | Anticipate generational change of many grazing properties in the next decade – Increased pressure to subdivide land to smaller titles | Risk adverse and unlikely to change by education and convincing programs – unlikely to " plant trees" (Barr et al) |
| Many absentee land owners | Catchment wide - typically in mid to upper catchments | Much land is leased and has no full time owner- operator | New forestry may be able compete with lease rates |
| Increase in diversification of enterprises | Catchment wide – tends to be land system specific. Often requires water | Intensively managed units more important to regional economy | Tends to result in selection of preferred sites for intense industry |
| Increasing area of private forestry - plantations | Upper catchments | Rarely located to generate maximum NRM outcomes | Tends to go to higher rainfall ends of valleys |
| Increasing interest in integrated farm forestry | National | Variable | Relies on individual interest and capacity |
| Transferable water rights | National/Catchment wide | Will result in significant movement of water to "non traditional" irrigation areas and crops | Further adjustment ongoing |
| Development of eco-system market theory | National | May result in markets for services rather than commodities from the landscape | Increasing interest will support trials and further investment |
| Redefining land owners rights | Catchment/State wide | Vegetation clearance and water harvesting rights have been redefined | "Rights" to subdivide may be the next debate |
| Hardening of NRM targets | National / MDB / Catchment wide | May stimulate land use reforms particularly in salt export zones | Sanctions and incentives not yet well defined |
| Plans to leverage private investment for NRM | National | Should result in increased efficiency of public dollars | Requires innovative approaches to NRM expenditure |
| Urban rural wealth disparity | National | Rural landscapes are becoming either lifestyle, production or mixed economy zones | Dynamic nature of mixed urban rural fringe landscapes poorly understood by agricultural agencies [5] |
| Victorian native vegetation framework | Victoria | Defines vegetation management and revegetation policy targets | Major implications re how these will be met in a timely and cost-effective fashion |
| Off reserve conservation focus | National | Increased recognition of the importance of biodiversity conservation in rural landscapes | Shifting focus from production to conservation |
| Greenhouse climate change predictions | National | Climate uncertainty – increased need for species migration / evolution corridors | NRM consequences not yet apparent |
| Increasing recognition of the importance of salinity | National | More funding, policy status, R&D and planning focussing on salinity management | NAP provides a degree of investment certainty for NRM agencies |

[5] As per recent work by Peter Housten (forthcoming) for RIRDC

# 3. Landscape change as policy implementation

## 3.1 Policy instruments in context

*"An assessment of the current suite of instruments needs to consider their efficiency and effectiveness in achieving the desired objectives; and also any equity issues such as the impacts the instruments have on various stakeholders (i.e. the winners and losers)" Allen Consulting 2000.*

The project reviewed various tools, mechanisms and policy instruments and how to apply them, because while there is a general understanding about using policy instruments like regulation and incentives (Allen 2001, Young et al 1996, Industry Commission 1998), there has been little work done tailoring these to catalyse landscape change for specific regional circumstances. Furthermore, rarely have policy measures been devised explicitly to generate or accelerate measurable progress towards regionally identified sustainability goals (Alexandra 2000) although this is becoming an important task in light of the regional delivery structure and guidelines of the NAP.

Deliberate landscape change is essentially a policy reform or implementation process which needs to identify the desired goals and means of achieving those goals. A central component of the project has been to evaluate current and future options for landscape change. However, while the project has a clear Goulburn Broken CMA focus it is important to note that the scale of such a reform process is likely to be national, or at least within the Murray Darling Basin. The Landmark Task 5 project "Analysis and Development of Policy Options to Promote Sustainable Land Use within Dryland Regions of the MDB" is testing the community support for various policy reforms via an extensive consultative process (Landmark 2002). Similarly, the Heartlands Project is assessing and developing some of the prospective landuse responses including multi purpose farm forestry (MBDC and CSIRO 2002).

It is clear that while there are many inter-related processes effecting NRM within the Goulburn Broken CMA region, not all of these will result in positive landscape change. The project's research has identified the importance of coherent reform processes if policy intent is to be achieved. Stated intentions in policy documents are not sufficient, there must be follow through in all aspects of government if complex sustainability goals are to be achieved (ANZECC 1992; Industry Commission 1999, Dovers and Mobbs 1999; Dovers 1996 and ACF 2000).

Much of the extensive literature on sustainable regional development and catchment management is relevant to designing landscape change strategies (see for example Dore and Woodhill 1999). It is clear from this that success depends on many factors including:

- Clear and coherent policy goals,
- Cooperation between the three spheres of government,
- Sound understanding of environmental processes, and
- A willingness to use an appropriate mix of policy instruments
- A capacity to harness and mobilise community enthusiasm, and
- Stimulation of the dynamic relationships between public policy processes and private enterprise decisions.

## 3.2 Types of policy instruments

Policy instruments can be defined as mechanisms used by governments to influence behaviour of individuals and businesses. Governments have a wide range of instruments available to them to address natural resource management problems although not all have been used widely in Australia for a range of reasons.

Policy instruments can be grouped into categories according to their modes of action. We have chosen four categories:

- Informative
- Incentive based
- Compliance based
- Market based.

Table 3.1 demonstrates the diversity of instruments available. It should be noted that that policy implementation processes usually use elements from across the categories.

Generally a suite or group of mechanisms are used to drive effective change – eg in response to the road toll a combination of mechanisms or instruments are used: new driver education; the graphic Transport Accident Commission advertisements; tighter design and engineering standards for vehicles and restraining devices; more resources for enforcement of road laws; changes to laws and increased penalties and funds for improved road design and construction.

Different mechanisms or instruments can be used to generate synergies by designing programs of policy implementation that combine different kinds of instruments.

It is too simplistic to think that one approach or mechanism will work to generate landscape change. It now generally accepted that individuals within communities are motivated by different goals and respond to different kinds of signals and that not all people will respond to information or incentives. Individuals and enterprise mangers have different perspectives on what is going on in a catchment and what represents “good land management”. They inevitability see things differently and take different types of advice or guidance on risks and opportunities. Therefore a range of approaches are required.

Furthermore, policy implementation is not simply a “set and forget” exercise but one which requires ongoing monitoring, review and adaptation. Dovers and Mobbs (1999) identify the importance of developing cost effective, policy implementation processes that have capacity for "policy learning". They outline the need for a policy equivalent of adaptive management which uses best available knowledge to design policy reforms and then monitors the impacts and effectiveness of various policy options so they can be adapted, as required, based on the feedback received.

**Table 3.1: Instruments to influence landscape change – landuse behaviour**

| Informative | Incentives and assistance | Legal compliance | Market-Based Mechanisms |
|---|---|---|---|
| Community education | Grants and subsidy to match private investments | Standards & penalties | Emission markets – eg carbon markets |
| Education and training | Incentives and subsidies | Regulation and Prohibition | Catchment or environmental levies – Brisbane City Council |
| Accreditation systems – EMS, QA etc | Stewardship payments | Conditional permits and licensing | Charges for resource use – eg pastoral leases |
| Rating standards systems (5 star appliances) | Low interest loans | Resource allocations & entitlements | Tradeable rights and permits – eg water rights |
| Research and development (R&D) | Investment tax concessions and preferential tax treatments | Covenants & management agreements | Tradeable development rights |
| Information provision (brochures, media, field days etc) | Tax deductibility | Contracts | Creation of new property rights |
| Best management practice guidelines (BMP) | Cost transfers | Land use and development planning – eg statutory planning | Performance bonds/refund – eg mining cleanup |
| Monitoring schemes (salt watch, stream watch) | Infrastructure provision | Regulatory arrangements | Offset schemes |
| Peer group learning eg landcare groups, prograze | Bush tenders | Clearing controls | Revolving funds |
| Industry codes – voluntary self regulation | Cost sharing contracts | Pollution licences | Clean-up levies |
| Demonstration projects and demonstration farms – eg sustainable grazing systems | Production subsidies | Taxes and charges | Industry self regulation |
| | Rebates – eg rate rebates | Codes of practice - mandatory | Competitive contracts |
| | Compensation | Fines and forfeiture of rights | Dedicated taxes – eg fuel taxes |
| | | Harvesting rights | Ambient pollution charges |

*Source: adapted from Young et al 1996; the Allen Consulting Group 2001 and Productivity Commission, 1997.*

## 3.3 Mixing types of instruments

*An optimal mix of policies, strategies and incentives is required including a regulatory safety net that prevents significant reversible decline.... (Young et al 1996)*

Binning and Young undertook detailed research into the range of instruments that can be used to implement policies for the management of native vegetation on private land (Binning and Young 1997, 1999a, 1999b, 1999c, 2000; Cripps, Binning and Young 2000). Binning also evaluated the application of these incentives to address both the economic and institutional impediments to agroforestry (Binning et al 2000).

A key finding of this work is that it is desirable to use a mixture of policy instruments available from the 'toolbox' that focus on the following:

- **People** – tools that can be used to motivate and retain landholder support.
- **Finance** – the incentives that share the costs.
- **Security** – regulatory, legal and voluntary property right instruments.

They argue that *"these categories provide a powerful framework for evaluating policy instruments because there is considerable evidence that mixes of policies that harness the synergies between educational (people), regulatory (security) and economic incentives (finance) are likely to be more effective both in terms of cost and environmental outcome than the use of single instruments (Young et.al, 1996; OECD, 1996, Binning and Young, 1997a, 2000)".*

This insight is critical because they claim that *"policy makers are generally biased to one type of instrument based on their disciplinary training and professional experience. For example, lawyers and planners tend to prefer regulation and land-use planning, economists incentive instruments, and social scientists education and participatory processes. A critical management issue in developing successful policy approaches is to bring these differing perspectives together and to seek out complementarity".*

They state that an effective approach to implementation of policy is based on an orderly use of the combined groups, typically in the following order:

1. **Raising awareness** through education is a critical first step, but recognising that this has little direct influence on short term behavioural change. ….

2. **Financial incentives** are only likely to be effective after awareness is raised and landholder attitudes shifted.

3. **Regulations** which require sufficient community support to work well.

However they also recognise that other ordering is desirable in different circumstances, for example using incentives to promote acceptance of new regulations required to secure large structural changes in a short period of time.

**Recommendation 1 - The CMA should work with State and Local Governments to introduce a package of new education, incentives, regulations and market measures designed to achieve the landscape change needed for salinity, biodiversity and catchment health targets within a prescribed time frame, eg a decade.**

**Recommendation 2 - That the package of landscape change reforms is designed so that wherever possible it generates social, environmental and economic benefits and is implemented efficiently, fairly and equitably.**

## 3.4 Market measures

Market measures are those instruments designed to create, stimulate or work with markets. For example, the creation of tradeable water rights in Australia has created markets for irrigation water where previously none existed. Likewise a carbon market is emerging around the world which is stimulating investment in reducing or sequestering atmospheric carbon dioxide[6]. There is considerable

[6] Standards Australia has released a new national carbon accounting standard, boosting the ability of forest managers and sequestration investors to quantify and compare the carbon removal capacities of areas of forest across the nation. The standard has been developed to support carbon trading under Kyoto or non-Kyoto carbon

interest in developing markets for a range of ecosystem services. If these emerge it is conceivable that in the future people will pay for generating, or maintaining an ecosystem service such as improving water quality or enhancing habitat.

Well developed markets for ecosystem services may seem a long way off. Yet the Commonwealth government is prepared to trial the potential use of market mechanisms in the NAP. Similarly the Victorian government is experimenting with the use of auction systems for changing the management of areas of native vegetation.

Furthermore it is important to note that any change in landuse on the slopes from rough grazing to dedicated production of ecosystems services only has to compete with the profitability of the grazing. Many landowners may be willing to shift their production from wool to water quality if assured of a comparable income. It may well be that landscape change is hindered not by the willingness of the landowner but a lack of "market structure". Binning (2000) proposed that for ecosystem markets to operate brokers are required to link buyers with sellers and to define, bundle or un-bundle ecosystem services as required.

**Recommendation 3 - That the Goulburn Broken CMA works to further develop structures and processes that will help establish markets for a range of ecosystem services in the Goulburn Broken Catchment..**

**Recommendation 4 - That the Goulburn Broken CMA pursues trials of market measures designed to generate positive landscape change in selected parts of the Goulburn Broken catchment, this may include establishing markets for land retirement from grazing, habitat enhancement, increased vegetation cover, riparian restoration, etc.**

## 3.5 Regulations, incentives and duty of care

A simplistic approach to landscape change would be to regulate landuse more heavily – eg prohibit grazing on all slopes greater than 15 degrees. Compensation could be paid for the grazing rights and aerial surveillance could be used to ensure compliance. The new regulations are unlikely to be popular, however they would be accepted over time and the regional economy would adapt. Sloping land would then only be available for other landuses such as forestry, conservation, recreation or firewood production. The latter may be a viable alternative business, particularly if governments induced scarcity by reducing access to native forests for firewood (VNPA 2000).

There are a range of reasons why Governments have been reluctant to use landuse regulation as a tool to help reduce the environmental impacts of agriculture. It is in due in part to the historic political

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trading markets as they emerge. Standards Australia Environment claim that the new standard provides a new approach to determining how much carbon a given patch of forest could be expected to remove from the atmosphere by taking into account factors such as the species of tree and how densely the trees were planted while using probability to take into account factors that could influence growth rates. Sampling and estimation techniques are used under the standard to gauge sequestration levels. The new standard, titled AS 4978.1(Int) carbon accounting for greenhouse sinks Part 1: Afforestation and Reforestation, can be downloaded from www.standards.com.au

power of the farm lobby, partly due to the physical vastness of the Australian land mass and partly due to the perceived difficulty of enforcement (Williams and Walcott 1998). While hard regulation is often considered unworkable, a wide range of voluntary and financial mechanisms can be used as alternatives. For example, management agreements, covenants and revolving funds can be used to protect high value or vulnerable land. Development of industry codes and definition of best or acceptable practice can also generate change by way of industry "self regulation".

Use of self regulation is promoted as an alternative to "hard regulation". In 1998 the Industry Commission called for greater self-regulation, applications of "duty of care" and the introduction and application of codes of practice due to the economic impacts of the environmental degradation caused by agriculture (Industry Commission 1998). Since then there has been a call to more clearly **define** *duty of care*.

The reason for needing the definition is clear - until the duty of care (or socially accepted practice) is defined how can incentives paid for by the public be targeted to those who are generating real social value? Furthermore, without a clear definition, how can regulation be designed and targeted to those operators that are generating unacceptably high social costs?

The Industry Commission (1998) recommended adoption of the principles of "duty of care" for environmental management, and that voluntary standards and codes of practice should be used to guide environmental management as far as possible.

This continues a long tradition of low or self regulation for rural industry - history shows that most Australian State and Local governments only reluctantly impose environmental controls or land use planning regimes in rural areas. The reluctance by the States to regulate rural landuse is contrary to numerous national inquiries recommending the introduction of landuse policies that would regulate agricultural businesses and is in direct contrast to urban landuse which is relatively heavily regulated (William and Wallcott 1998).

A key challenge for Governments is determining how they can support and enhance the capacity of businesses to sponsor and reward long-term environmental responsibility which is over and above the expected or regulated minimum. Furthermore the tailoring of this "regulation" to the diversity of agricultural businesses will require a focus on elegant and adaptable regulation or the use of voluntary systems such as EMS (Anderson et al 2000).

Environmental management systems (EMS) focus on embedding environmental responsibility in commercial operations but they work better when guided by clear policy and regulatory regimes. If governments intend using EMS they need to clearly define the responsibilities of the commercial operators (Alexandra 1998).

Regulation plays a key role in signalling to commercial operators what is expected in terms of societal responsibilities. Incentives should be used to support operators who exceed minimum standards, generate public goods or to assist business transition but should not be used as a continuing subsidy to businesses.

Differential local government rates can be a powerful incentive to support those operators who are exceeding minimum standards and generating positive environmental outcomes. Some shires are already offering these incentives to owners and managers of rural land who implement environment management programs.

## 3.6 Integrating NRM and other planning mechanisms

Regions consist of a matrix of land systems, uses and tenures. Infrastructure, markets and agronomic factors tend to concentrate certain rural land uses onto preferential land systems, eg intensive industries on preferred sites or soil types etc. Typically statutory planning has had limited involvement with rural areas. In contrast regional NRM planning has often been focused on prioritising the expenditure of public funds on landscape repair (eg NHT, NAP etc) rather than skilfully choosing and using a wider range of public policy instruments that have the effect of catalysing market forces, generating new investments and promoting innovation to achieve positive landscape change.

As catchment planning processes mature they are becoming more capable of providing frameworks for setting and applying policy directions and providing strategic guidance based on integrating multiple objectives and large quantities of information. However, responsibility for implementation of NRM plans is still diffuse, being spread across many agencies (Johnson et al 1999) and largely reliant on persuasive powers, publicly funded grants and voluntary efforts. Links to regulatory processes and statutory planning functions of governments have historically been poor.

Improvements in the integration of NRM, statutory planning and regional strategic planning are currently recognised as a priority in Victoria. As the regional catchment strategies and MSS are undergoing review it is an ideal opportunity to ensure greater alignment (RMIT 2001).

Planning in Victoria is multi-tiered with natural resource management (NRM) planning being primarily the role of NRE and the CMA's, while statutory planning responsibility rests primarily with DOI and local governments. It is widely recognised that many opportunities arise from closer alignment between NRM and the statutory planning system (RMIT 2001).

The scope of NRM programs, and related legislative and policy frameworks have expanded over the past two decades driven by the need to address emerging priorities - soil erosion, landcare, salinity, water and catchment issues, vegetation; biodiversity etc - and to resolve policy conflicts in water, forestry, vegetation and threatened species management (Industry Commission 1992, Commonwealth 1991, 1992, 1996; House of Representatives 2000).

Local government development control and land-use planning functions have evolved during the same period. These increase the potential for local government intervention in both the built (towns) and the rural environment, although many of the potential mechanisms are rarely used in rural areas.

The Victorian Government's Planning System provides a legislative framework that offers much potential for integrating the catchment (NRM) and the statutory planning regimes. The amalgamation of local governments in rural Victoria has elevated the physical area of local government to the sub-regional scale where, in theory, they are big enough to address regional economic, infrastructure and natural resource management issues. In theory, the planning framework provides strong linkages between statewide policies, regional or catchment planing and local decisions. MSSs aim to provide a strategic focus for statutory planning.

However in practice, local planning regimes tend to focus on the development approvals process rather than issues of regional strategic significance or those issues arising from the management practices of existing enterprises. Yet landscape sustainability issues are typically water at the catchment scale and vegetation and biodiversity at the bio-regional scale, both of which span all tenure systems. The landscape outcomes for water and biodiversity are the result (or often the by-

product) of all activity across all tenures, not just that which claims to be focused on water or biodiversity. Developing mechanisms which aim to manage the processes effecting biodiversity and water resources is a marked change from the traditional approaches to regulating new land uses and development proposals. However, statutory planning could play a key role in directing new landuse proposals into certain preferred parts of the landscape, eg those more suitable for a particular purpose. For this occur more spatially explicit landuse planning could provide a systematic framework for directing beneficial landscape change and for minimising environmental impacts.

Improvement of integrated NRM could be achieved by spatially explicit landuse planning based on the use of detailed subregional and local plans, backed by, and supported by the statutory planning processes. The resultant plans require greater detail, increased spatial resolution and the definition of different zones within each region. They should identify zones with clearly defined future uses and specify the intensity of use for each zone. For example, the plans may identify preferred areas for habitat reconnection or areas suitable for further intensification. Until sub-regional plans become more specific they will be unable to direct landscape change to the degree that is necessary. Opportunities for improving the existing statutory planning processes are reported in the next chapter.

## 3.7 Vegetation plans

The regional vegetation plans are an example of spatially explicit plans addressing a priority NRM and environmental issue by using both the Statutory Planning system and regional NRM plans. Victoria has had Native Vegetation Retention controls since 1989. More recently the Native Vegetation Management Framework (NRE 2002) was endorsed, accompanied by 10 Regional Native Vegetation Plans (1 for each CMA).

It is now generally accepted that increasing vegetation cover is central to improved salinity, biodiversity conservation and catchment health outcomes.

Native vegetation protection and management is now backed by a comprehensive set of legislation, policies, strategies and regional plans. A duty of care is made explicit in the Catchment and Land Protection Act 1994.

The framework and the plans adopt the “net gain” principle. Individual plans specify significant targets for increases in vegetation cover. Greening Australia Victoria has estimated that planned increases in vegetation cover per CMA region range from 13,000 (East Gippsland) to over 600,000 (North Central CMA) hectares. In total approximately 1.4 million hectares needs to be revegetated if all these targets are to be met. This represents revegetation on a scale never before undertaken in Australia.

The need for extensive protection and enhancement of native vegetation is recognised in the Goulburn Broken Native Vegetation Management Strategy. The Strategy's goals are as follows:

1. Maintain or increase the extent of all native vegetation types, using 1999 extent as the base, in keeping with the goal of Net Gain listed in Victoria's Biodiversity Strategy 1997.

2. Enhance the quality of existing native vegetation by managing 90% of native vegetation cover according to Best Management Practices by 2010.

3. Increase the cover of all 'Endangered' and applicable 'Vulnerable' Ecological Vegetation Classes (EVC) to at least 15% of their pre-European cover by 2030.

4. Increase the viability of threatened species and the extent and quality of threatened ecological communities.

### 3.7.1 Vegetation threats

Even with these comprehensive policy and regional plans on vegetation protection, native vegetation is threatened by a range of pressures and landscape processes. To meet the goals stated in the GB CMA Vegetation Strategy it will be necessary to address the systemic threats to many of the vegetation communities in the catchment. This is particularly important on the plains, where many already depleted communities are likely to be further threatened by rising water tables, logging and salinity.

Although Victoria aims for a net gain in the quality and extent of native vegetation, and acknowledging that significant progress has been made in protecting native vegetation, an estimated average of 2,500 hectares a year has been cleared since clearing controls were introduced in 1989 (DNRE pers com). However, broad scale clearing is not the only pressure. Other forces such as water logging, salt, invasions by weeds, depredation by feral animals, infections by pathogens such as *Phytophthora* and inappropriate landuses are all changing species compositions and leading to further degradation.

Furthermore, the quality of much remnant vegetation continues to decline. The loss of vegetation due to urban expansion and the continuing decline of wide-spaced, remnant, paddock trees in agricultural areas are of particular concern. The impacts of the multiple, causal factor, can be visualised when we consider the problems posed by the accelerated loss of that wonderful icon of rural Victoria, the magnificent, individualistic and stately paddock tree. There are millions of individual paddock trees - however on current trends, it is only a matter of time before they disappear, further changing the aesthetic nature and ecological functioning of many rural landscapes. This matter was first bought to attention by the landmark *Focus on Farm Trees Conference* in the 1970's [7] .

From a biodiversity conservation and landscape function perspective, meeting or exceeding the goals in the CMA vegetation strategy is an urgent priority and a range of suitable policy and technical approaches are required. Suitable techniques and incentives that sponsor natural regeneration and successional processes is one of the responses to vegetation decline with the greatest potential for landscape change and should be supported.

**Recommendation 5 - the CMA should explore suitable techniques and incentives for triggering natural regeneration of all EVC in the catchment as this is not only cost effective but also tends to ensure persistence of genotypes, species and communities.**

[7] The decline of native vegetation in the rural landscape only became a defined publicly policy issues in southern Australia in the early 1980s. The "*Focus on Farm Trees Conference"* placed the decline of farm trees in rural Victoria on the public policy agenda. At about same time there were growing concerns about dieback in regions like the New England Tablelands and the extent and potential impacts of salinisation in WA.

## 3.8 Subdivisions - threat or opportunity

Victoria adopted closer settlement as a rural development policy throughout much of the first half of last century. More recently there has been up to thirty years of rural subdivision leading to much fragmentation of farm scale titles in the mid and upper catchments of the Goulburn Broken. This has resulted in an "ad hoc" tenure system with large areas of small and medium lot sizes. Furthermore, there is considerable pressure to continue rural residential subdivision. Unless local government is prepared to adopt a different direction, it is unlikely that the statutory planning system will be used to drive or facilitate landscape change, other than that based on "lifestyle" properties.

The consequences of this history of small lot development are that there are many part time farmers, hobby blocks and/or farming enterprises operating across numerous titles. The small average title size represents an impediment to major investment in plantation forestry or other industrial scale land based activities. Other factors such as distance to ports also represent a handicap to efforts to attract large scale investment in plantation forestry.

There is considerable pressure to further subdivide rural land throughout much of the Goulburn Broken catchment as with many other parts of Victoria that are close to regional centres and or the Metropolitan region.

Many landscapes are increasingly more highly valued in the market for lifestyle and recreation purposes than for their value for agricultural production (see Barr 1999). This represents a shift in society's values and a change in the relative purchasing powers of "urban" values.

Hobby farms and recreation are significant contributors to the regions economy and given the size of, and relative affluence of Melbourne population and the ease of access via major roads this is likely to continue. The close proximity of the Goulburn-Broken Catchment to Melbourne has ensured that it is a favoured destination for recreational trips - skiing, camping, water sports, hunting and fishing - hobby farms, retirement etc.

The dryland parts of the Goulburn-Broken catchment are changing as a result of many people moving in for lifestyle reasons - these people are purchasing "lifestyle values" when they buy land and the right to occupy it. These buyers bring new financial capital, skills and values to the catchment. New enterprises are likely to emerge and many older enterprises are increasingly servicing this growth industry, eg retailing, building and construction etc. For example, more road materials are required to upgrade country lanes and build tracks into houses dispersed across former farm-land. Frequently, these new houses are located to take in inspirational views.

Healthy and beautiful landscapes are fundamental for much of the life style and recreation based industries. It is why many people want to live or holiday in the region.

In the dryland parts of Goulburn-Broken catchment a healthy landscape is critical to many industries - it underpins the real estate prices more than primary production. In fact due to the high aesthetic values much rural property is purchased for lifestyle reasons and therefore out-competes those wanting to purchase land for traditional forms of primary production like grazing (Neil Barr per com). People want to live or holiday in these landscapes because they like the landscape, the place, the sense of satisfaction they gain from the location.

The value of these services is increased by the ready access to Melbourne via the Hume, Melba and Maroondah Highways - for many of Melbourne's 3.8 million people the Goulburn-Broken Catchment is

a playground, a retirement dream or a holiday location. This shift can be seen as treat or opportunity for more sustainable landuse but outcomes will depend on how well policy and planning directs this landuse change.

One option is that farms are not subdivided into small blocks but that cluster or strata title developments are favoured. The project reviewed four examples of cluster title rural subdivision to identify the prospects for this kind of rural development:

- Village farms in the CMA region
- Fryers Forest in Central Victoria
- Ecoforests Pty Ltd in the Hunter Valley of NSW
- Crytal Waters in SE Queensland.

Each development demonstrated a higher than typical investment in planning and site design and a strong focus on environmental and natural resources management at the site scale.

In each case other factors like social and physical infrastructure, fire protection and water resource impacts need to be considered in the siting and viability of these kinds of developments and in determining their cost and benefits to a local or regional community.

In conclusion, there is no clear cut case that these forms of development represent a better or worse model as the environmental and social outcomes depend on the quality of both site and regional planning decisions. However, because of the capacity of these kinds of development to cluster housing and other infrastructure they are generally a better development model than simply dispersing low and medium density rural residential development across the landscape. Furthermore, given that these forms of development are typically subjected to more stringent planning reviews, it is possible for local authorities to put conditions on permits to ensure good NRM outcomes.

**Recommendation 6 - That the CMA and local governments should further explore under what conditions the development of village farms and time-share recreation facilities is a suitable means of accommodating the growing population pressure in rural areas, and determine an appropriate set of conditions and controls on their development.**

**Recommendation 7 - That Local and State Governments should give in principle support to clustering as a form of rural development in certain areas, but subject individual proposals to appropriate levels of planning review to ensure satisfactory environmental and social outcomes.**

**Recommendation 8 - That Local and State Governments should consider on a case by case basis proposals for cluster title "village farms" and time share recreation "resorts" as a form of "subdivision" that can accommodate the changing demand for land while enhancing NRM outcomes and agricultural production.**

**Recommendation 9 - That biodiversity assessments are prioritised in areas likely to be subjected to subdivision, development and/or intensification of landuse.**

## 3.9 New businesses and new business models

Rural industries throughout Australia are in a period of rapid adjustment. Some estimates of a viable wool enterprise are one of 10000 DSE or more. This is far greater in scale than the capacity of most grazing properties in Northern and North Eastern Victoria.

The tenure system even before recent subdivision reflects the economics of agriculture of many decades past when families made good livings off what are today regarded as farms that are too small to be viable.

New rural businesses and business models are emerging. One response has been the continuing operation of low risk farm business combined with off farm income. Gleeson and Perkins (2001) estimate that over 70% of farms in Australia rely on off farm income. This should be seen as a sensible response to climate and market unpredictability and declining terms of trade for farmers.

There is also an increasing trend for grazing and cropping businesses to operate across numerous property titles, whilst this is generally achieved via leasing and other contracts there are also some other models emerging. For example in the northern tablelands of NSW a collective farm - the Tilbuster Commons – has combined five former farms into single collective management unit. This has permitted the resources of the farms into large more efficient operation. The larger area and greater number of paddocks has resulted in longer rotational grazing using the Holistic resource management principles developed by Alan Savory. It has released much of the owners' time and labour as fewer hours are required to manage the combined cattle herd.

In other areas syndicates have developed viticultural enterprises based on strata title. In other areas residential or hobby farms organised on strata title have permitted considerable capital investment to move into farming operations resulting in improved land management and greater production. With the application of "forest rights" it is now possible for forestry companies to operate without owning the land their trees are growing on. Opportunities exit for businesses that own forests but not land.

It is clear that one emerging trend is that the traditional owner operated farm based a single land title is becoming less of the defining feature of the kinds of rural businesses operating successfully across the rural landscape. In the future, a range of business models could emerge operating at scales appropriate to land class and capability. Some would operate at a landscape scale – for example, a large scale grazing collective operating across many titles, regional forestry cooperatives or companies that have plots on many separate farms. Other such as tourism and recreation facility would be sited to take advantage access public lands, views of well managed landscapes, water and other recreation

assets. Other developments may be strata title hobby farms mixing capital intensive viticulture enterprise on preferred sites with lifestyle and forestry on poorer slopes.

Governments could do a lot to facilitate and support the more innovative approaches to rural development. Firstly government agencies would need to abandon the concept that the family owned and operated farming is the dominant and most effective form of land tenure and agricultural business model.

**Recommendation 10 - That the CMA further investigates how to facilitate the development of a range of innovative rural business models that fit landscape change priorities and result in improved NRM.**

# 4. Using Statutory Planning for Landscape Change

## 4.1 Land use planning and catchment management

This section describes the current legislative, planning, policy and management arrangements operating in the natural resource (catchment) management and land use planning. The ways these arrangements can be improved to reinforce each other also will be described and analysed. It is widely recognised that closer connections need to be developed between the land management, and the land use planning systems in Victoria so that they can work more effectively together (RMIT 2000).

It is important to recognise that the Victorian planning system has recently shifted to one based on strategic guidance via the Municipal Strategic Statements (MSS). While history demonstrates that development controls are slow and ad-hoc, with only limited capacity to ensure regional outcomes are achieved, it is still too early to determine if the strategic approach will be any more capable. However we can be sure that unless these are guided by the framework provided by regional or catchment scale strategies they will almost certainly not deliver adequately on catchment health.

Local governments are obliged to ensure that their MSSs are consistent and give expression to the Regional Catchment Strategy and its sub strategies. Therefore, the CMA needs to identify those aspects or drivers of catchment health that can be usefully regulated or strategically directed by the landuse planning system and then apply sufficient pressure to ensure inclusion in the Local Planning Schemes through the State Planning Policy Framework, the Councils' MSS's and/or their Local Planning Provisions.

The Victorian land use planning system has inherent limitations as a means of achieving the objectives of catchment management. However, despite these limitations, the current planning system comprises a combination of tools with potential value for natural resource and environmental protection. The full use of these provisions would further the objectives of improved land and water management and biodiversity conservation. However, the use of these provisions relies on the actions of local government. Variable use is made of these provisions by municipal councils in the Goulburn-Broken catchment, with no council using the planning provisions to their full potential.

Similarly, the Goulburn-Broken Draft Regional Catchment Strategy does not contain sufficient reference to the provisions, techniques and associated measures of the land use planning system as a means of implementing catchment management objectives, policies and measures.

The CMA has proposed the development of specific appendices of the RCS to provide guidance and advice to each Local Government. This proposal may prove to be a useful way of ensuring a closer and more effective connection is developed between the natural resource management, and the land use planning systems.

### 4.1.1 Legislative framework

The *Planning and Environment Act 1987* provides the objectives and administrative structure for land use planning in Victoria. The Act contains a strong environmental focus. The objectives from the Act include:

- *"To provide for the fair, orderly, economic and sustainable use, and development of land.*
- *To provide for the protection of natural and man-made resources and the maintenance of ecological processes and genetic diversity".*

The objectives of the planning framework include the objective "to ensure that the effects on the environment are considered and provide for explicit consideration of social and economic effects when decisions are made about the use and development of land". The Act also seeks to achieve the integration of land use and development planning and policy with environmental, social, economic, conservation and resource management policies at State, regional and municipal levels. This has important implications for integrating land use planning and catchment management. The Act also provided that municipal planning schemes be the principal means of regulating land use. Environmental impacts must be considered in decisions on land use whether through the issuing of planning permits or in planning scheme amendments.

*The Catchment and Land Protection Act 1994* contains a number of explicit and implied references to land use planning. It provides that a regional catchment strategy (RCS) must "set a program of measures to promote improved use of land and water resources and to treat land degradation; and state the action necessary to implement the strategy and who should take it". An RCS may also provide for land use planning. These goals allow the use of land use planning measures to implement the objectives in the CALP Act aimed at the protection of the natural resource base, particularly land and water, and the maintenance of environmental processes.

The *Act* also provides a structural connection between the work of CMAs and the land use planning system in that:

> *"An Authority that prepares a regional catchment strategy may recommend to a planning authority under the Planning and Environment Act 1987 amendments to a planning scheme to give effect to the strategy, and*
>
> *'Without limiting the Environment Protection Act 1987, a regional catchment strategy may be incorporated in a State environment protection policy, in whole or in part, and with or without changes'.*

In addition, CMAs can initiate a Special Area Plan. Such a plan has the capacity to require, among other matters, the restoration of specified vegetation effectively to restore a habitat.

**Recommendation 11 - That the CMA should investigate the option of initiating Special Area Plans for those parts of the landscape known to have high catchment health and biodiversity significance, for example the CMA should consider preparation of Special Area Plans for the priority riparian zones given their ecological and natural resource management significance.**

### 4.1.2 The Victoria Planning Provisions (VPPs)

The introduction of the Victoria Planning Provisions (VPPs) into *The Planning and Environment Act* and then into planning schemes from 1996, added new tools with potential for assisting resource management and environmental protection. The VPPs include:

- the State Planning Policy Framework

- 25 standard zones
- 22 overlays
- 31 Particular Provisions
- 32 General Provisions.
- Local Planning Policy Framework

Councils were required to make a number of decisions in implementing the VPPs through the development of new format planning schemes. Councils were able to select the appropriate zones and apply them to land in the municipal district, make decisions on the content of schedules attached to some provisions, in particular overlays and subdivision controls in zones, whether to select from the suite of overlay controls and where to apply them, and the content of the Local Planning Policy Framework (LPPF) including the Municipal Strategic framework (MSS). The LPPF was intended to provide the policies which would form the basis for discretionary decisions on uses and developments when applications for permits were being considered. This section was intended therefore to provide a public strategic direction for council decision making.

However, there are important limitations to the ability of the new format planning schemes to deal adequately with environmental and resource conservation and management concerns.

#### 4.1.2.1 State Planning Policy Framework

The State Planning Policy Framework (SPPF) applies to all land in Victoria and sets the context for the consideration of land use decisions through permits and scheme amendments. A strong policy framework would also be a tool for assisting the relating of planning schemes and catchment management strategies, and promoting environmental protection and natural resource management. The SPPF should set a clear state direction which is applied through the planning scheme. It refers to the principles of Ecologically Sustainable Development, and catchment management. Section 15.01-2 provides that planning authorities must consider regional catchment strategies and associated implementation plans including special area plans, regional vegetation plans, landcare plans and management plans for a range of environmental values. Planning and Responsible authorities should consider the impacts of catchment management on water quality and environmental values, and coordinate their activities with those of the Catchment Management Authorities.

Similarly, they should minimise the impact of salinity and use the tools outlined in the VPPs and the Planning and Environment Act to promote vegetation retention and replanting in aquifer recharge areas, and prevent inappropriate development in areas affected by salinity.

Despite these explicit calls for consideration and coordination in line with catchment management objectives, the SPPF in its current form is of little use as an aid to protecting catchments, integrating local government planning and catchment planning and management, conserving biodiversity, or achieving other environmental outcomes. The content of the SPPF is too often vague, general, and difficult to apply to particular situations because of a lack of practical implementing measures or links to other parts of the VPP, is generally not mandatory, with limited use of the word “must” compared to the terms “should” or “have regard to”, omits key environmental provisions, and in parts is contradictory. In most cases it is difficult to apply.

#### 4.1.2.2 Local Planning Policy Framework

Local policies are intended to provide the criteria for assisting decisions on discretionary planning applications. They therefore only come into force in the case of permit applications and do not apply to Section 1 ("as of right" uses) or Section 3 uses (prohibitions). Local policies cannot contradict the terms of other provisions although they can develop vague or general statements in other provisions into more specific statements. In addition, the quality of local policies varies considerably. Much local policy is written in vague and general terms which are difficult to interpret and apply consistently and often fail to provide a clear policy basis for decision making. No council can develop a policy for every conceivable use. The number and breadth of discretionary uses is so large that it is difficult for local policy to adequately consider all environmental and natural resource issues. Although a statutory tool, local policy is often inconsistently applied by local government and the Victorian Civil and Administrative Appeals Tribunal even when it is relatively clear. Few local policies provide any explicit means of relating planning decisions to catchment management concerns. Local policy is also reactive. For example, it cannot ensure that large scale tree planting occurs, and can only provide for environmental trade-offs and limited tree planting through such techniques as conditions on permits if permits are sought.

#### 4.1.2.3 Zones

There are a number of difficulties in attempting to use the standardised zones:

1. The responsibility vested in municipal councils to select zones from the suite provided in the VPPs and to apply them to land has sometimes led to misapplication of zones. Gibson (1999:30) has pointed to initial reluctance of councils to use the Environmental Rural Zone, and the inconsistency in its use arguing that

   *"some councils refused to use [the zone], even in suitable locations…preferring to use the Rural Zone…the Rural Zone has been the most widely applied of the rural zones. It has been applied almost exclusively to all rural land other than recognised rural residential areas, with little regard to whether the land is used primarily for agriculture or residential purposes, or to the amount of vegetation cover or other physical or environmental constraints".*

2. There are only three rural zones, Rural Zone (RUZ), Environmental Rural Zone (ERZ) and Rural Living Zone (RLZ). The restricted number of rural zones limits the ability of councils to zone land to adequately reflect its physical and environmental characteristics. This restriction on the number of zones is partially offset by the capacity to specify varying minimum lot sizes created through subdivisions in a schedule to zones.

3. Zone provisions, particularly in the RUZ, limit the use of planning schemes as a means of promoting sustainable agriculture and land use. The RUZ contains only three prohibited uses - Brothel, Cinema based entertainment facility, and shop. This zone allows applications for retail, commercial, industrial and major tourism and recreation uses to be considered. The permissive nature of the provisions of the most commonly applied rural zone, the RUZ, allows the consideration of developments which are inconsistent with policies designed to retain rural land for agricultural purposes. Even though urban/residential development is prevented through the application of the minimum subdivision size, the RUZ can lead to developments which are township or urban related. The existence of lots under the minimum subdivision size, in certain locations, can facilitate attempts to introduce urban related uses into rural areas.

In addition, most agricultural uses including cropping and animal husbandry, and large cattle feedlots do not require a permit in the RUZ. This can limit the ability of a catchment management authority and a municipal council to seek to introduce more sustainable forms of land use. In particular, the fact that most agricultural uses are allowed without the need for a permit means that the LPPF cannot be used to develop policies affecting these uses.

4. The Environmental Rural Zone contains more prohibitions, including on intensive husbandry, industry and retail premises, but still allows the consideration of many major tourism and commercial premises.

***Residential and quasi-residential uses***

The use of the excision provision and the ability to create a separate lot for an existing house in the RUZ is leading to extensive creation of small lots in some rural areas in Victoria. These lots are often located near incompatible agricultural uses, and potentially lead to a loss of landscape and other environmental values, and pressures on councils for additional services in rural areas. The use of the RLZ could lead to the extensive introduction of rural residential development into rural and agricultural areas. The *New Format Scheme Panel Report* showed that rezoning requests for rural residential subdivision were the most prolific submissions which panels considered (Gibson, 1999).

Another form of subdivisional pressure on rural land near Melbourne is proposals for partial subdivision of large rural properties into rural-residential or residential lots. Unlike traditional rezoning applications, these new proposals advocate partial subdivision as a means of maintaining rural uses on the balance of the principal property. These applications usually propose that the returns to the landowner from partial subdivision will provide the capital required for the ongoing practice of agriculture. There are a number of problems associated from the application of this concept:

- The concept has been applied notably by companies which possess the capital to invest into new and innovative agricultural pursuits. Individual landowners would require the backing of a development company with capital, subdivision and marketing expertise.

- If carried out by individual landowners, the development would have to provide ongoing capital for agriculture and maintenance of rural lifestyles in perpetuity, or further applications for subdivision and development would inevitably arise on the same property. This would require wise investment in perpetuity. It is unlikely that for most properties, sufficient capital to guarantee such ongoing rural and agricultural practice could be generated.

- Municipal councils and the CMA would have to determine demand for small lots and relate this to land capability in order to avoid ad hoc incremental developments which would lead to an unplanned and reactive proliferation of rural subdivisions often in inappropriate locations. This would require studies into land capability, environmental values and demand, and other social and economic impacts.

- Subdivision and development of one portion of a property has usually created a precedent for the subdivision and development of other properties often in inappropriate locations and led to an intensification of speculation. Criteria which may have sought defined environmental, economic and social outcomes on one property are often difficult to apply generally, yet other landowners will seek a similar outcome regardless of particular circumstances.

- It is often difficult to measure environmental impacts with the result that some impacts are ignored in a performance based planning system. For example, the creation of rural or rural-residential lots in rural landscapes often leads to loss of landscape value which may not be rated sufficiently highly in the process of considering the application.

- The proliferation of rural and rural-residential allotments is often associated with other developments such as golf courses, tourist and recreational components and developments such as conference facilities and residential hotels. Even without these high traffic developments, the creation of small allotments in rural areas introduces uses which are incompatible with modern agricultural practices, and with many other rural pursuits, takes land out of potential production and could compromise the region's ability to adjust to new and innovative forms of investment.

- The relationship between property size and on-farm income in the dryland parts of the Goulburn-Broken region has been investigated by Curtis, Lockwood and MacKay (2001). They show that the median property size for properties reporting a profit over $50,000 was 1,090 hectares, with the smallest with this profit level at 278 hectares. Yet 53 per cent of respondent's properties were less than 150 hectares and 80 per cent less than 300 hectares. Consolidation of properties for grazing and cropping is a more viable long term option for rural investment than subdivision.

- The concept introduces the notion of "trade-offs" between environmental, social and economic values. It is difficult to provide comparative quantitative assessments of these values.

- The proliferation of small lot developments and other developments introduces a diffuse pattern of development in municipalities in the region. At present, urban development is highly concentrated in a few larger towns and a larger number of smaller townships. Most Municipal Strategic Statements contain strategic directions aimed at reinforcing the position of these commercial, economic and social centres. Diffuse development is incompatible with the principle of seeking township revitalisation through consolidation of economic activity.

- Diffuse development would also lead to demands for the provision of infrastructure. The larger towns are the only areas connected to sewerage and reticulated water, yet the proliferation of development outside townships is likely to lead to pressure for the extension of such services, road construction and maintenance and other services such as garbage collection.

- The concept is often justified on the grounds that many landowners report a small on-property profit, or no profit. Figures for net and gross rural earnings are complicated by Australia's taxation laws. Using the work of Rendell at al (1996), Curtis et al (2001) argue that $50,000 a year is required to sustain a household and the natural and capital resources of a property in the Goulburn Broken Catchment. Their survey shows that 62 per cent of respondents did not report an on-property profit for 1998/99, with the median profit being $15,000, and only 9 per cent reporting a profit over $15,000.

  However, 80 per cent had a positive pre-tax off property income, with their median off-property income of $25,000 a year. Total off-property income in the surveyed properties was $11.7 million a year compared to $3.3 million on-property income, a multiple of 3.5. Curtis et al (2001) also report that neither off-property nor total income was linked to investment in innovative forms of farming or the adoption of best farming practice. This reinforces the conclusion above that income from subdividing part of a property would not necessarily be used to sustain farming practice, lifestyle, or lead to new investment.

- Alleged hardship is sometimes used as an argument in favour of small lot subdivision. The concept of hardship is subjective. Its use establishes precedents without a comparative basis, and is connected to counter arguments based on broader environmental, economic and social public interest. For these reasons, its use is controversial in planning decisions.

#### 4.1.2.4 Overlays

The use of overlays is discretionary. There are 22 overlays available for use in the VPPs including three environment and landscape overlays:

- Environmental Significance
- Vegetation Protection
- Significant Landscape

There are seven land management overlays including overlays for:

- Erosion Management
- Salinity Management
- Floodway

Overlays contain purposes, permit requirements and decision guidelines, and provide a potentially significant addition to a responsible authority's ability to control developments.

However their use is constrained. Firstly, they do not include protection for the broad range of habitats and biodiversity concerns. There is no Wetlands Overlay, for example. Secondly, overlays vary in the strength of their control. The Vegetation Protection Overlay, for example, contains exemptions which significantly lessen the use of the overlay as a control mechanism. Thirdly, the use of overlays is discretionary, and they provide another level of discretionary control. This is a weaker form of control than a prohibition. Again, councils make decisions whether or not to apply overlays to land, and on the content of schedules. Many rural councils have not used the appropriate overlays, have used the wrong overlay, or have applied them inconsistently to land with similar characteristics. This is particularly the case in the reluctance to use, or the misuse of, Environmental Significance, and Significant Landscape Overlays.

The State Native Vegetation Framework and the Victorian Biodiversity Strategy also contain implications for planning schemes and Regional Catchment Strategies. The vegetation framework, for example, will eventually be given statutory implementation through amendments to the Victoria Planning Provisions.

#### 4.1.2.5 Particular provisions

Particular provisions apply to all land in addition to any selected provisions. They are therefore potentially a powerful land use tool to assist the achievement of catchment management objectives. However, of the 31 particular provisions, only one - the Native Vegetation provisions - can be classified as environmental, and this is a relatively weak control.

**Recommendation 12 - The CMA should work with NRE to provide Councils with the best available information to inform their application of appropriate overlays, particularly the biodiversity & salinity overlays.**

**Recommendation 13 - That the CMA recommended to DoI and relevant Councils that they limit further subdivision in sub-catchments which are known to at risk form rising water tables and which export significant quantities of salt per unit area until further detailed assessment of hydrogeology and the capacity to address these issues is undertaken.**

## 4.2 Planning Schemes and Catchment Management Strategies – interaction

Municipal councils can implement the objectives, principles, policies and measures outlined in a Catchment Management Strategy by concentrating on environmental and natural resource issues in the choice of overlays and schedules to overlays, choice of zones and schedules to zones, and through the LPPF.

The Department of Natural Resources and Environment (1997) has proposed a number of issues which could be considered in both planning schemes and catchment management strategies. These are:

- Floodplain management and prevention of development on floodplains
- Protection of native vegetation and biodiversity
- Irrigation and dryland salinity management including recognition of salinity recharge and discharge areas
- Identification of sustainable land management practices to reduce soil erosion and protect waterways
- Control of pests plans and animals
- Waterway management

In its review of planning schemes, Maunsell (2002: 29) argues that:

> *Some planning schemes do in fact incorporate elements of the relevant RCS while others make mention of the documents. However none of the planning schemes examined provide for the consistent development of catchment/natural resource management issues…Essentially consideration of catchment/natural resource management issues is patchy with no clear logical structure…In addition many schemes do not implement RCS actions in the zones and overlays.*

Similarly, RCSs do not adequately identify the means of implementing the RCS through planning tools. There should be supporting documents to the RCS such as the appendices being developed for each LGA and relevant sub strategies that identify issues, management and planning responses, specifying the type of land use tool, and the details of the measure required for each issue. It should also

develop connections between land use management and land use planning, showing how each can complement the other for specific issues. There is a need to identify planning responses for different land characteristics in all the areas of the region, including sub-catchments, and local areas. This will require the writing of specific area based policies matched to physical characteristics, and the specification of land use planning responses by identifying the appropriate planning provisions and the content of local policy. These planning provisions would be related to specific catchment management policies and measures. Greater consistency could be sought between local policies of each municipal planning scheme. This kind of strategic and outcome focused work would progress the relationship between catchment and planning well beyond general cross references to both processes in RCSs and planning schemes. It would also require much closer interaction between the Catchment Management Authority and the planning departments of all councils in the region.

**Recommendation 14 - That the Goulburn-Broken Catchment Management Authority include specific area based policies in the RCS matched to physical characteristics, and the specification of land use planning responses by identifying the appropriate planning provisions and the content of local policy.**

## 4.3 Analysis of planning schemes in the Goulburn-Broken region in relation to the Victoria Planning Provisions

### 4.3.1 Use of zones and overlays

Municipal councils have discretion over their choice of zones and overlays, and in the content of their Local Planning Policy Framework (including the Municipal Strategic Statement). Choices over the use of these provisions strongly influence the ability of planning schemes to respond to catchment management and environmental concerns. Schedules to zones and overlays also add further detail to controls, for example, on varying subdivision minimums within a zone, or responses to different areas through numbered schedules to overlays.

Of the seven main councils of the catchment, Campaspe, Delatite, Mitchell, Moira, Murrindindi, Shepparton and Strathbogie, all used the rural zone (RUZ), four the Environmental Rural Zone (ERZ), and six the Rural Living Zone (RLZ). However, the ERZ was generally sparsely used. In Murrindindi and Delatite, for example, the zone was used only in two small areas each and in Strathbogie not at all. The Rural Living Zone was used more extensively in both shires, accounting in Delatite, for example, for a large area of land around Mansfield.

Some councils such as Campaspe, Greater Shepparton, Mitchell, and Moira used the schedule to the Rural Zone to provide varying subdivisional minimums, attempting to match subdivision size to land characteristics. Others provided one minimum subdivision size for the entire zone. Generally, intensive agricultural zones were given minimum subdivision sizes of between 10-20 hectares, broadscale farming areas sizes of between 40-100 hectares, and Rural Living Zone subdivision minimums of between 2-8 hectares.

Use of overlay controls was limited. Five councils used the Environmental Significance overlay and four the Vegetation Protection and Significant Landscape Overlays. Use of other environmental overlays was rare, with only two councils using the Erosion Management, and three the Salinity Management overlays. Only two councils used the Restructure Overlay, a significant omission given the number of old crown allotments in some municipalities. Again, even when environmental overlays were used,

their use was applied sparsely to land. Some Councils used schedules to overlays to refine responses to particular areas.

Table 4.1 summarises the zones used by the councils in the region

**Table 4.1: Planning scheme use of rural zones and overlays**

| | Campaspe | Delatite | Mitchell | Moira | Murrindindi | Shepparton | Strathbogie |
|---|---|---|---|---|---|---|---|
| Zones: | | | | | | | |
| Rural Zone | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Environmental Rural Zone | | 1 | 1 | 1 | 1 | | |
| Rural Living Zone | 1 | 1 | 1 | 1 | 1 | 1 | |
| **Overlays:** | | | | | | | |
| Environmental Significance | | 1 (3) | 1 (4) | | 1 (2) | 1 (5) | 1 |
| Vegetation Protection | | 1 (4) | 1 (2) | | 1 (2) | 1 (2) | |
| Significant Landscape | | 1 (3) | 1 (3) | 1 | 1 (2) | | |
| Heritage | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Design and Development | 1 | 1 | | | 1 (5) | 1 | |
| Development Plan | 1 | 1 | 1 (7) | 1 (2) | 1 (2) | 1 | |
| Erosion Management | | | 1 | | | 1 | 1 |
| Salinity Management | 1 | | 1 | | | 1 | |
| Floodway | 1 | 1 | 1 | 1 | | 1 | 1 |
| Land Subject to Inundation | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Wildfire Management | 1 | | 1 | | 1 | 1 | 1 |
| Public Acquisition | | | 1 | | | 1 | 1 |
| Airport Environs | | | | | | 1 | 1 |
| Environmental Audit | 1 | 1 | 1 | | 1 | 1 | |
| Road Closure | 1 | | 1 | | | | |
| Restructure | 1 | | 1 | | | | |
| **Total number of overlays** | **10** | **9** | **14** | **5** | **9** | **13** | **8** |

**Note:** Schedule numbers to overlays are listed in brackets.

## 4.4 Local policy - case studies

Local policy provisions, including MSSs, were examined in three municipal planning schemes for the inclusion of clauses which were relevant to catchment management. The planning schemes are Strathbogie, Delatite and Murrindindi. The most comprehensive provision is the Strathbogie MSS. In all, the local policies were more general and not as extensive as the strategic statements in the MSS.

### 4.4.1 Common themes

All three planning schemes refer to:

- the need to protect agricultural land,
- the pressure for rural subdivision into rural residential or residential lots,
- the importance of innovative rural investment

- the maintenance of rural land to protect future opportunities for investment, and
- the need to protect the environmental and natural resource base.

New rural industries evident in Strathbogie include:

- mushroom growing,
- poultry production,
- vineyards and wineries,
- equine industry (horse studs etc),
- hydroponics and agribusiness and
- home based businesses;

While in Delatite new industries include:

- hemp production,
- viticulture and
- plantation and farm forestry.

None of the LPPFs satisfactorily reconcile the need to protect agricultural land from fragmentation with policies aimed at extending opportunities for creating more rural residential lots.

### 4.4.2 Planning and Catchment Management

The Strathbogie MSS attempted to establish a connection between land use planning provisions in the LPPF and catchment management. Section 21.12-2 Regional context, refers to the Goulburn-Broken RCS as a major natural resource management document. Section 21.02 the Municipal overview identifies the Shire with the catchment. It lists the main land and water management issues and strategies of the RCS and argues that "*the long term sustainable use and development of the Shire's natural resource base is critical to the prosperity of rural townships and community*". It also refers to the need to manage each sub-catchment, and to address catchment issues such as erosion, dryland salinity, vegetation retention and bio-diversity through planning mechanisms. These issues, it states in 21.05-4,

> *will be addressed in the Scheme through applications of relevant zones, overlays and local policies that address the issue of integrated catchment management. Additional resource mapping and investigations are required in conjunction with the Department of Natural Resources and Environment to identify further environmental areas of significance in the Shire.*

As shown above, the planning scheme does not achieve this objective, however, this statement is a clear outline of the task required if planning schemes are to play their part in helping implement the principles of catchment management, and be more closely related to the catchment management strategy.

Similarly, the Murrindindi LPPF in 22.04-1 "Catchment management and landcare" contains a strong statement on the need for the long term sustainable management of the natural resource base. It argues that new uses and developments in rural areas should not lessen the ability of agricultural, horticultural and other rural uses to continue to operate. This section is a clear statement of the way

land use planning decisions should help protect the natural resource base and of the need to apply the RCS to planning decisions.

In contrast, the Delatite planning scheme did not refer to the RCS, to catchment management, or the ways in which planning schemes can use the provisions of the VPPs to reinforce and implement the RCS, and protect the natural resource and environmental values of the region. It does, however, refer to the need for environmental protection and contains general policies on landscape, flora and fauna, land degradation, water quality, and flooding.

### 4.4.3 Protection of agricultural land

The Murrindindi LPPF states that "the retention of rural land for agricultural production is important to the economy for the region", and points to the *"possible incremental effect or rural subdivision and housing on productive agricultural land, the use of agricultural land for non agricultural, rural living or hobby farming purposes that may conflict with established or future agricultural and horticultural land uses [and] the need for diversification of the agricultural economy.*" (21.04). Main activities included beef and wool production, vegetable and strawberry growing, dairying, viticulture, fruit, and aquaculture. The Delatite LPPF also refers to the need to protect agriculturally productive land (21.05).

The Strathbogie LPPF repeatedly referred to the need for land use planning to protect high quality agricultural land and seek to strengthen and diversify the agricultural base by promoting a range of new rural industries. The municipal overview, 21,03 shows that agriculture and land based industries, mainly cropping, sheep and cattle, horses and vineyards are the predominant economic activities in the shire. Agriculture accounts for 72 per cent of businesses, and although significant new industries are being developed, 70 per cent of total agricultural production derives from sheep and cattle. Council's broadscale subdivision policies recognise that traditionally the plains to the north of the shire, and the Strathbogie ranges have been sheep and cattle raising areas, although diversification into crop production is occurring.

The Shire's key land use themes, 21.04-2, reflect this orientation being primarily concerned with protecting the environmental and natural resource base, and high quality agricultural land, and ensuring that new dwellings in rural areas are associated with agricultural activity. Section 21.05-3 argues that:

> *"the productive capacity of the Shire's rural land represents the municipality's greatest resource…Council's strategy is to promote and support new housing in the Rural Zone only when it is in association with an agricultural use of the land…the Shire has provided for a range of minimum lot sizes for new subdivisions in the rural areas relating to the agricultural land type, capacity to diversify the productive base and the environmental constraints…Council's overall strategic approach is to rigorously apply its policies in respect to rural land development and subdivision."*

### 4.4.4 Rural living

However, elsewhere in sections 21.05-2 and 21.05-3, the Strathbogie LPPF refers to opportunities for low density residential development and the need to identify and rezone areas suitable for rural living development, particularly south of the Hume Highway (essentially into the foothills and ranges rather than north which is on the plain).

The Delatite LPPF repeatedly refers to the continuing demand for rural living development particularly in the Benalla, Tolmie, Lake Eildon and Mansfield areas, and on the fringes of towns, and the *"potential impact of rural housing being developed on rural allotments, without due regard to orderly planning, services, environmental impacts and the loss of land from rural production"* (section 21.05). The Murrindindi LPPF also allows the number of small lots to reach a 10 years supply consistent with general agricultural and environmental provisions.

### 4.4.5 Environmental and natural resource provisions

Each of the three LPPFs refers to the underlying economic importance of protecting environmental values and maintaining the natural resource base. To varying extents, policies are developed for particular issues, through these are usually general and difficult to apply. Only the Strathbogie LPPF attempts to apply these in specific ways to land and to outline detailed further investigations aimed specifically at relating planning to catchment management, for example by identifying high quality agricultural land for possible inclusion with an Environmental Significance Overlay (21.05-3), and ensuring that all use and development of land in catchment areas accords with proper land management practices for revegetation, erosion control, salinity and flooding and for water conservation (21.05-4).

## 4.5 Conclusion and recommendations

This part of the report has evaluated and investigated options for achieving NRM outcomes through landscape change. It examined the need for landscape change and reviewed the various types of change and change mechanisms, looking at current and possible future ways to facilitate landscape change, including a detailed investigated of the Statutory Planning System because this is meant to give spatial and regulatory expression to policies and strategies at the local scale.

The Statutory Planning System can be used to ensure that it effectively addresses the RCS objectives. If this occurred we could be assured that it would be effective at biodiversity and NRM protection and enhancement, by developing effective local policies and plans that would result in the rejection of inappropriate (or inappropriately sited) development proposals, or by accepting proposals and imposing conditions that result in effective biodiversity and NRM protection or enhancement.

**Recommendation 15 - That the Goulburn-Broken Catchment Management Authority seeks to include the full extent of the Victoria Planning Provisions into planning schemes as measures aimed at the implementation of the RCS.**

**Recommendation 16 - That the Goulburn-Broken Catchment Management Authority liaise with local councils on the rewriting and strengthening of local planning policies aimed at implementing the objectives of improved land and water management and environmental protection, with reference to different area types including the characteristics of sub-catchments, to improve implementation of the RCS**

**Recommendation 17 - That the Goulburn-Broken Catchment Management Authority ensure that the RCS develops policies and measures aimed at implementing the objectives of improved land and water management and environmental protection which are clear enough for local governments to interpret and apply within the areas of responsibility.**

**Recommendation 18 - That the Goulburn-Broken Catchment Management Authority liaise with local government on limiting the use of the Rural Living Zone, and on preventing the ad-hoc conversion of rural land into part rural-residential, residential uses or other developments.**

**Recommendation 19 - That the CMA advise Councils that it supports the use of a wider range of zonings, such as targeted use of environmental, rural living and landscape significance zones in appropriate parts of the catchment. Each zone should be supported by appropriate local policies in rural areas in order to facilitate positive landscape change.**

**Recommendation 20 - Local governments should specify landuse preferences in local planning schemes more accurately which identify preferred areas for intensification and those requiring protection from inappropriate developments**

**Recommendation 21 - The CMA should use its capacity to develop SAPs to drive systemic improvement in the detail and resolution of sub-regional and local government plans relevant to landscape change.**

**Recommendation 22 - The CMA to investigate options for ensuring that detailed sub-regional and issue specific plans are incorporated into or given expression by the MSS and local government planning schemes wherever possible**

**Recommendation 23 - That the CMA work to ensure that Councils recognise the catchment imperatives for increased vegetation cover including the establishment of new forests and ensure that local plans and policies do not impede these forms of landuse**

**Recommendation 24 - That the CMA request DoI to undertake a regional assessment of land availability within the catchment to determine supply and demand of rural land in a variety of lot sizes with regard to tenement, lot size and future industry development.**

**Recommendation 25 - That the State and Local Governments should develop policies which facilitate appropriate realignment and amalgamation of titles where this supports positive landscape change particularly increased vegetation cover.**

**Recommendation 26 - Local Government should introduce specific overlays to protect or enhance areas of high environmental significance and high environmental risk, for example, steep slopes and salinity risk areas, supported by appropriate local policies especially riparian zones and other areas of ecological significance.**

**Recommendation 27 - Local government should adopt Local Planning Schemes which identify habitat enhancement and revegetation priorities for areas identified as a regional catchment priority such as riparian zones and areas suitable for reconnecting fragmented vegetation.**

**Recommendation 28 - Local Governments should adopt positively biased differential rating systems (discounts) which recognise the public good nature of land managed explicitly for conservation.**

**Recommendation 29 - That the Goulburn-Broken Catchment Management Authority liaises with local government on implementing clear environmental and natural resource policies formulated in the Regional Catchment Strategy through planning schemes.**

# PART 2 - INVESTING IN LANDSCAPE CHANGE

Part 2 of the project investigated investment options for landscape change. A conceptual framework for attracting major investments to the challenges of landscape change was developed. It addresses the requirement of the project brief to design a "vegetation investment bank" for the region.

As what is being proposed is clearly not a bank we prefer to use the name "Catchment Restoration Investment Scheme" (CRIS). When the project advances to implementation we recommend the use of the term Catchment Restoration Investment Scheme Implementation System (CRISIS).

The proposed framework has the potential for stimulating and assisting in the coordination significant investments in landscape change to address salinity and water quality, enhance habitat and create greenhouse offsets (carbon credits) and to produce plantation timber.

Chapter 5 provides a background for the concept of investing in landscape change. Chapter 6 provides an overview of recent plantation policy in Australia and the wide range of landscape related issues. It calls for a broadening of the focus of forestry to address the substantial opportunities arising from multi purpose reafforestation in the medium and lower rainfall areas of Australia. Chapter 7 presents and explains the catchment restoration investment model. Chapter 8 explains the financial modelling used to develop estimates of the scale of costs and benefits. Chapter 9 provides a "story from the future" about the way it might work and impacts of the proposal.

Major regional programs are required to focus the investment, apply and refine R&D, develop contracting and service industries, support development of downstream processing and ensure effective linkages to regional community and land holder aspirations.

A National Pilot Project to further develop and test the ideas generated during this project is required.

# 5. Investing in Landscape Change

## 5.1 Summary

Victoria's regions and rural industries are vital to regional and State-wide economies, producing billions of dollars of exports per year. Their future and the future sustainability of Victoria's economic capacity depend on healthy ecosystems and natural resources. Dryland salinity is a major threat to many of Victoria's catchments and their environment and natural resources. These well documented risks require immediate and large scale landuse changes. Fragmented and incremental approaches will not achieve the changes required.

This project has been investigating a partnership between superannuation funds, landholders, regional communities, the Goulburn Broken CMA and Government to establish a proposed 100,000 hectares of revegetation over a decade. This large integrated project aims to stimulate reafforestation/revegetation by private investments in timber production and carbon sequestration supplemented by government funding of public-good outcomes like salinity mitigation, habitat and water quality improvements. The proposal is based on a coordinated approach to Government investment in order to leverage significant private investment back into a strategic approach to catchment repair.

Leveraging private investments represents a major opportunity to generate the scale of activity required to improve catchment health and to sponsor employment, innovation and industry development. Work could proceed immediately as priority areas for reafforestation are mapped and investors and service industries are available to implement the plantings.

Participation by landholders would be voluntary, with a range of flexible mechanisms used including lease, annuity and use of Victoria's Forest Rights legislation. Incentives would be allocated to landholders and forestry companies to undertake cost-effective and innovative revegetation/reafforestation using contractors on a competitive basis. Incentive payments should only be available for measurable public good outcomes, in locations identified as a priority and based on performance of specific contracts.

The benefits of the proposed framework are:

- Reinvestment of capital in regional Victoria for industry development and environmental repair;
- Protection and enhancement of important biodiversity, habitat and land and water resources;
- Maintenance of high value agriculture so vital to Victoria's economy;
- Enlargement of Victoria's plantations and growth of future timber resources;
- Stimulation of regional economies and generation of regional employment;
- Growth in greenhouse offsets (carbon credits); and
- The tackling of the salinity threat strategically and on the scale required.

## 5.2 Method

The project sought to identify opportunities for attracting private sector investment in landscape change. The consultants assessed a range of types of investment options. The types of investment currently occurring in the catchment can be defined as:

- Agricultural commodity production – typically intensification of high input, high output production systems such as dairying, horticulture, viticulture etc;
- Lifestyle investment in rural real estate and property development;
- Industrial type plantation forestry (approximately 1000 hectares per year for the last few years); and
- Public sector investment in NRM – eg revegetation and other funding programs.

A variety of potential forestry and revegetation options were more fully investigated due to the priority for large scale revegetation and the need to reduce leakage to control salinity via dramatically increasing plant water use across the landscape (Alexandra 1992; Stirzacker et al 2000, MDBC 1999, MDBC 2000, Walker et al 1999).

The options investigated include "traditional" eucalypt plantations in suitable higher rainfall areas, along with other forms of environmental and multi-purpose forestry (for example see Bioenergy Australia 2000; JVAP 2000 and 2001a). These options are particularly important in those parts of the landscape often deemed unsuitable for traditional plantations. Multiple benefit, semi-commercial forestry has been a focus of the work.

The project reviewed recent publications on ecosystem services, leveraging private investment and on bringing greater investment to semi-commercial forestry (for example the excellent publication "The Contribution of Mid to Low Rainfall Forestry and Agroforestry to Greenhouse and Natural Resource Management Outcomes" by CSIRO et al, 2001; JVAP 2002; and Productivity Commission, 2002). JVAP (2002) argues for regional scale pilot programs to advance the design of investment models along the lines proposed in this document.

The consultants prepared a preliminary "prospectus" for a Catchment Revegetation Investment Scheme (CRIS). This proposed a simple structure and the linking of several currently separate financial mechanisms. It focussed on those aspects of landscape change that have the potential for generating medium to long term returns from:

- Future timber;
- Catchment health outcomes; and
- Future carbon credits.

The concepts and financing structure advocated in the preliminary prospectus was tested in meetings with government officials, foresters, economists and funds managers in Melbourne and Sydney. The overall concepts and approach were well received and a series of refinements undertaken. A revised investment model was developed and discussed with a wider range of relevant parties.

The refined investment framework was documented in the Stage 2 Project Report – *A Proposed Catchment Revegetation Investment Model.* This is reproduced in Chapter 7.

## 5.3 Finding investors

The Federal and State Governments are the major public sector funders of NRM activities through program like the NAP and NHT but, due to the scale of change required, additional sources of investment are needed to accelerate rates of landscape change.

By taking a hard look at the revegetation requirements of some of the NAP regions it is clear that the required investment can not come from the NAP or state government alone. We must get new woody industries and new investors if we are to achieve salinity mitigation targets. Estimates of the area required to reduce salinity vary, but in some catchments between one and two thirds of the cleared land may need to be revegetated

The ACF and the Business Leaders' round-table commissioned the Allen Consulting Group to report on how to leverage greater private sector investment into NRM (Allen 2000). They proposed innovative investment and financing models to broker public and private funds. These aim to build on the considerable public investment in environmental/NRM programs and community involvement in projects like riparian zone restoration, remnant vegetation protection and revegetation. Several other options for attracting investment in revegetation have been widely proposed:

**New woody industries** - Some investment may come from commercial investors in farm forestry crops like blue mallee - if and when the necessary industry development and commercialisation steps are taken. JVAP has an established approach to supporting the development of this kind of farm forestry industry but so far few new commercial woody industries are in the late stages of commercialisation (JVAP 2000 & 2001).

**Carbon forests -** Major investment might come from selling carbon credits to Japanese or Australian power companies[8]. So far there is a limited market in carbon credits but a rapidly expanding interest in them from the corporate world. Surveys of actual transactions by energy companies in the Northern hemisphere establish a current price of A$20 per tonne. Carbon sequestration would underwrite major investment if this price can be sustained.

**Public or private investment in environmental restoration**– if we are to overcome the imminent threats of extinction of up to 50% of small woodland birds it is clear that many parts of the Australian landscape need major restoration efforts (Seddon et al 2001). The community clearly supports the idea of restoring rural environments. Work by Sherwin (1993) has identified options for creating a "green web" in order to enhance habitat. Furthermore, it is easy to image future forests that have multiple objectives including well defined biodiversity objectives and that the costs of these are shared equitably (Productivity Commission 2001).

[8] According to a recent posting on environmental information - Rothschild Australia and E3 International have announced there intention to become key players in the international carbon credit trading market, an emerging commodity market that analysts estimate could be worth up to US$150 billion by 2012. Rothschild Australia and E3 International have announced that they will launch the Carbon Ring Consortium - an investment vehicle that will provide companies with an innovative way of learning about and understanding their risks in the new carbon market. The Carbon Ring Consortium allows companies, with a future carbon liability, to purchase a range of carbon credits and obtain a practical insight into the operation of this new market. For further details contact Richard Martin on (02) 9323 2000. Source EnviroInfo Email: hallmark@halledit.com.au

Local, State and Commonwealth governments could be either major investors into a "vegetation bank", or perhaps a better option is that they could use their low risk to attract commercial investors into reafforestation. The Allen Group identified that over $68 billion of new investment funds are looking to find suitable investments each year in Australia (Allen 2000 and JVAP 2002). Part of the challenge is to develop investment pathways suitable for institutional investment. Chapter 7 details how we have proposed doing this.

# 6. New Directions for Forestry

This section articulates the challenges of multi-purpose reafforestation in the Goulburn Broken Catchment[9].

## 6.1 Vision of future landscapes

Rob Youl – a distinguished (at least within the landcare movement) Australian forester – has articulated a bold, big-picture vision of forestry's part in creating Australia's future landscapes. Here is an extract from his recent feature in the *Australian Forest Grower* where, looking back from 2050, he describes Australasian forestry and its contribution to reshaping and restoring the landscape in the first half of the 21st century (Youl 2002).

> As farming became much more intensive, forestry's supporting role grew. The community now sees the regenerated foothills from the Grampians to southern Queensland as a giant belt of forest protecting the high-production agricultural zones in the Murray, Murrumbidgee and other catchments of the Murray-Darling Basin.
>
> From Stawell through Wagga Wagga and Canberra to Tamworth, a substantially complete belt of foothill box-ironbark forest exists, studded with residential clusters of environmentally friendly housing, pockets of intensive agriculture, especially vineyards, and small, not always serious, rural enterprises. Vineyards and other intensively managed sites are inevitably well protected by very wide zones of trees to their rear and flanks, with man-made wetlands down slope to modify run off. In the south there are also extensive well-managed plantations of sugar gum, utilised for firewood, charcoal, biomass energy and utility timber production, as are many commercial stands of box-ironbark forest.
>
> The scene was different at the turn of the century, with wool production expiring on steeper country, and the region suffering from overclearing, salinity, erosion, fragmentation of bushland reserves and opportunistic and badly planned subdivision.
>
> Revolutionary landcare plans, developed by the regional community with technical help from government and industry, recognised that the landscape was in transition from farming to farm forestry, recreation, residential opportunities, conservation, tourism, and niche farming. The community seized on the changing rural economy, the influx of city-based landowners with their capital reserves and altruism, and the nation's realisation in the early 2000s that, only by facilitating massive adoption of perennial crops, could we conquer salinity.
>
> National and regional government, with catchment management authorities, provided seeding funds, with generous investments from several philanthropists, to develop new community enterprises. Municipalities played their part, enforcing concomitant environmental protection wherever intensive industries established, and ensuring subdivision for recreation and rural-residential developments included substantial direct-seeding with indigenous tree species.
>
> Over the next decade, the initially reluctant forestry investment industry changed tune, and, in conjunction with some leading global finance houses and ethical

[9] Parts of this section are drawn from a paper "Reafforestation and New Directions for Forestry and Plantations" for the national conference Prospects for Australia's Plantations on behalf of Land and Water Australia.

investors, joined the community businesses. Together they initiated an environmental forestry program that led the world for a decade, making the most of emerging markets for greenhouse credits and biodiversity, salinity and water catchment bonds....

People smile recalling Benalla's early Regent Honeyeater program, initiated by ... Ray Thomas. Regent honeyeater numbers in this beautiful landscape have risen manifold, as has the population of grey-crowned babblers. The secret: numerous new farm forests, with understorey, have linked bushland fragments and waterways and multiplied bird habitat.

## 6.2 From vision to reality

Much of what Rob Youl describes is occurring – individuals and communities are mobilising, catchment committees and local authorities are planning, and agriculture is changing fundamentally. There is considerable innovation and integration in revegetation and farm forestry which has been happening alongside the growth in industrial plantations, and outside most of the established forestry research and education processes. This chapter describes some of the promising signs.

### 6.2.1 Education and innovation

Developing innovation and education systems capable of engaging the diversity of industry and community stakeholders and enabling them to work with the 'elite' researchers and educators is critical. Melbourne University's Master Tree Grower Courses exemplifies a new "adult learning" approach that has now been run in nearly every tree growing region of Australia (Reid and Stephens 2000). These courses are catalysing the formation of "dynamic networks" of research, education and industry innovation that operate in direct contrast with the linear technology transfer models that have proven so inadequate for complex issues such as sustainability at a landscape scale (Industry Commission 1994).

Enhancing delivery of landscape change is a major prospect for Australia's new forms of plantations. Research funded by Land & Water Australia has been instrumental in advancing understanding of the nature of leakage from conventional agricultural systems based on annual species of crops and pastures.

The Redesigning Agriculture for Australian Landscapes (RAAL) Program has quantified leakage from agricultural systems in comparison with native vegetation (Price and Williams 2001). It is now widely accepted that control of dryland salinity requires significant reduction in leakage by increasing plant water use across the sheep wheat belt (Stirzaker et al 2000, MDBC 1999, MDBC 2000, Walker et al 1999).

In most of the sheep wheat belt, pasture and grain systems are simply not able to utilise the available water. In many situations the revolution will therefore require using the "heavy artillery" of deep-rooted woody vegetation to effectively increase water use. The same trees could provide environmental services liking storing atmospheric carbon and producing high value structural and furniture timbers (Alexandra 1989, 1992 and 1993, CSIRO et al 2001).

Plantation systems are required that can cost effectively deliver multiple environmental and production outcomes. Developing integrated agro-industrial systems capable of generating multiple products and services will involve detailed catchment planning, sound knowledge of environmental processes, new silvicultural systems, new technologies and new approaches to financing, establishing and managing multi-purpose "forests". New processing and harvesting technology will play critical roles in creating

viable industries. Much more work needs to be focused on new conversion systems for solid wood, like Andy Knorr's radial sawing technology. We also require efficient machines for harvesting thinnings for firewood and ongoing work on sustainable biomass energy options.

### 6.2.2 Understanding and designing for complexity

Plantations have many complex and site specific relationships to other landscape features and processes like remnant native vegetation management, fauna, catchment hydrology, stream-flows and water quality (see for example Nambiar and Brown 2001). Therefore working out how plantations can generate positive landscape change in specific catchments is challenging. A decade of high quality strategic R&D provides us with indications of the scale and complexity of these relationships and has begun to provide guidance on intelligent design options (Stirzaker et al 2000 and 2002, JVAP 2000a).

Achieving multiple outcomes from plantations is dependent on design capacity which can address complex landscape relationships and interactions. For example, not all trees or locations generate similar catchment health benefits. Understanding of where to place trees in the landscape is required if salinity mitigation or other outcomes are to be achieved (Stirzaker et al 2002). We stress that we are not suggesting a future in which experts 'design' landscapes remotely. Landscapes will continue to be socially constructed as individuals, families, firms and industries respond to signals – especially those of public policy and markets. However at least one, and possibly both, of these great drivers can and should be informed by science linking the placement of vegetation in various configurations in the landscape to different landscape outcomes. The JVAP design guidelines provide a synthesis of general design principles, but catchment and site specific planning is still required (JVAP 2000a).

### 6.2.3 R&D for new reafforestation options

Commercial and semi-commercial plantations are now understood to be a critically important part of the landscape change "tool-box", particularly in the 450 to 700 mm rainfall zones (CSIRO et al 2001). JVAP has funded R&D investigating large scale revegetation options for the sheep-wheat belt. Options being investigated include numerous plantation species and systems suited to different climate zones, traditional and new products such as oil mallees, and short rotation crops for energy (Bioenergy Australia 2000; JVAP 2000 &2002, CSIRO et al 2001). Finding new options is particularly important in landscapes generally deemed too dry for traditional plantations (eg less than 700 mm per annum).

1. JVAP has supported investigation into potential forestry and revegetation options but much more work is needed if we are to create commercial drivers for reafforestation in the low and medium rainfall zones (JVAP 2000b, JVAP 2001, CSIRO et al 2001). Integrated systems are needed which generate returns from: timber and fibre products; non-timber products – like energy and oil; catchment and environmental health outcomes; carbon-credits or combinations of all of the above.

## 6.3 Innovations in low cost revegetation

Increasing vegetation cover is a recognised priority for much of rural Victoria and the MBD and much work is underway explore how this can be achieved (eg NRE 2000, MBDC 2002, MDBC and CSIRO 2002, Nambiar et al 2000). The project identifies a number of different options for achieving this. These can be considered as occurring on a spectrum from fully environmental - for example, riparian zone restoration - to fully commercial – eg hardwood plantations on commercial sites.

Any rudimentary financial modelling demonstrates the importance of cost-effective revegetation, especially where there are limited prospects of commercial outcomes. Further innovation in reafforestation is required to develop low cost, low risk reafforestation techniques suited to the range of conditions. For example, in the Goulburn Broken Catchment there are over 30,000 hectares of cleared land over 18 degrees slope and above 700mm rainfall (Robb, B. pers com). This is clearly unsuited to traditional plantation establishment and management techniques. More R&D should focus on opportunities such as:

1. Improving direct seeding in arable landscapes
2. Mixing direct seeding of pioneer species with precision planting of preferred plantation species in alternate rows or blocks to lower the costs of plantations in low rainfall areas
3. Improving techniques for enhancing natural regeneration
4. Aerial seeding of steeper slopes
5. Aerial "bombardment" of seedling spear-tubes using technology pioneered by Lockheed Aerospace
6. Combinations of the above eg: natural regeneration plus enrichment seeding

## 6.4 A Hierarchy of Cost Effective Reafforestation Investments

A clearer set of criteria for determining cost effectiveness of investment is required to target NRM funds to priority locations. It seems that a logical hierarchy is based on the principle that the most cost-effective investments are those that protect functional ecosystems and the productive capacity of natural resources by preventing further decline, while the least cost effective are investments in restoring badly degraded systems. This hierarchy is illustrated in Table 6.1, with cost effectiveness and chances of success decreasing down the table, and cost and associated risks increasing down the table. There are complex sets of scale issues involved, and in general the principle can be applied across a range of scales from a clump of trees, to a river system.

**Table 6.1: A Hierarchy of Outcomes based on Cost-Effectiveness**

| Focus of projects | Example of project | Project costs |
|---|---|---|
| Protection of functional ecosystems | Proto-type projects which demonstrate BMP. Support for effective planning and regulatory arrangements which protect wetlands and remnant vegetation. | Cost of developing effective planning policies under existing legislation. |
| Changes in management to protect functional systems | Reduction in grazing pressure to a level which sponsors episodic regeneration of floodplain wetland fringes and woodland trees. | Cost of understanding and communicating regeneration processes. |
| Interventions to stimulate regeneration | Direct seeding of pioneer species to encourage forest regrowth along forest or wetland fringes and riparian zones. | Cost of direct seeding. The rest is triggered by natural regeneration processes. |
| Repair | Modify structures that regulate water inflows to allow for periodic flooding. | Moderate costs of works eg: replanting. |
| Restoration / re-creation | Attempt to recreate a wetland and wetland fringing forests by intensive engineering and landscaping. | Very costly – equates to cost of complete restoration if possible. |

**Recommendation 30 - It is recommended that the CMA develop a set of clear criteria for determining the likely cost effectiveness of revegetation options.**

**Recommendation 31 - The CMA should pursue research and development opportunities for developing least cost reafforestation/revegetation techniques with funding agencies and research providers.**

## 6.5 Growth Rates

Much of the financial calculations on the value of plantations and other reafforestation options depends on being able to put financial values on environmental benefits of changing landuses on specific sites and on being able to estimate with some degree of accuracy the rates of growth over the life of rotation as this determines both carbon and timber values.

Unfortunately it proved quite difficult to obtain reliable figures of growth rates for lesser researched species on lower rainfall sites.

Provenance trials have shown significant variation, for example in sugar gum. The best provenances of sugar gum consistently out-perform the others by more than 20% on a range of sites. Selected provenances of species suitable to the medium and low rainfall areas are becoming increasingly available with most of the species mentioned in the attached table currently available.

A formal review of available information would be useful as it is particularly difficult to get reliable information on what should be a basic aspect of land productivity and NRM. Previous R&D investments by JVAP fail to deliver this information in a readily accessible form.

Below is an indicative table (Table 6.2) based on figures supplied by Des Stackpole is from the Forest Science Centre and the ALRTIG steering committee.

**Table 6.2: Indicative Growth Rates**

| | Site Quality | | | Suitable species |
|---|---|---|---|---|
| **Rainfall** | **Good*** | **Average*** | **Poor*** | |
| 400-600 | 7 | 5 | 3 | Sites naturally suited to redgum |
| 500-600 | 4 | 3 | 2 | Below 650mm typical preferred species include redgum, sugar gum, ironbark and spotted gum |
| 600-650 | 6 | 4 | 3 | |
| 650-700 | 8 | 6 | 4 | Above 650mm typical preferred species include redgum, sugar gum, ironbark as well as Victorian and Sydney bluegums |
| 700-750 | 12 | 8 | 5 | |
| 750-800 | 12 | 10 | 6 | |
| 800+ | 18 | 12 | 8 | |

* Typical solid wood MAI ($m^3$/ha/yr)

*Based on indicative figures from Des Stackpole of ALRTIG and various other unpublished sources.*

## 6.6 Protecting biodiversity

Public or private investment in environmental restoration plantings is required not only for salinity but also for species conservation. If we are to overcome the imminent threats of extinction of up to 50% of small woodland birds many parts of the Australian landscape need major restoration efforts (Seddon et al 2001). While we have little opportunity to undo the clearing of the past we can reduce the impacts by major reafforestation efforts. However if this is done insensitively, it could also threaten important species, communities or habitats. New, more sensitive approaches to designing revegetation and plantations are required.

Assuming that plantations start to play a bigger role in the medium and lower rainfall agricultural landscapes those designing and siting them will confront many issues with regard to the relationships to existing vegetation.

Multiple-purpose forestry will need to be more sensitive to value of remnants as even small patches as well as individual remnant trees have proven to be valuable as habitat (Lindenmayer 2001).

Secondly, the issues of "weed trees" and genetic pollution must be confronted. The very features of preferred plantation species – vigour, resilience and adaptation to conditions - are what make them potential weeds.

Thirdly, it is important to recognise that the new plantations will be growing in already stressed landscapes and that there are decline trends which are frightening in their magnitude and implications – rising water tables and the loss of species of immeasurable value. The extinction debt in the sheep wheat belt is huge, with some ecologists predicting the extinction of up to 50% of the woodland birds (Seddon et al 2001, Reid 2001). Loss of plant species due to salinity is also predicted to increase dramatically and many small mammals are already extinct or threatened. The medium rainfall woodlands that remain are some of the rarest and most vulnerable vegetation communities in Australia (Hobbs and Yates 2000).

## 6.7 Making choices – burning heirlooms of evolution?

Each autumn and winter, in wood yards throughout Australia, great stacks of dried and split billets await eager consumers preparing for their cosy winter fires. Few people realise as they sit by a fire - perhaps with a glass of red and a good book - that their warming fuel is the dismembered bodies of ancient woodland trees, the habitat of rare and endangered species, or the icons of the inland - the paddock tree. Even a cursory effort to identify the source would reveal the pitiful state of much of the temperate woodlands and their unique flora. This wood is currently gleaned from up to 400 kilometres from the Southern cities by wood cutters and merchants who would willingly supply firewood from plantations – if it were there.

Fuel-wood consumption by Australian households is estimated at about 5 millions tonnes per annum (Bhati 2002). Currently plantation sourced fuelwood is almost negligible, yet throughout the world Australian tree species are being used as preferred species for fuelwood. A deeper irony is that the harvesting of fuel wood from public lands is sanctioned by government agencies many of whom are responsible for salinity and other landscape conservation efforts, while they invested little effort in establishing or promoting a plantation based firewood industry. However, if governments induced scarcity by reducing access to native woodlands (VNPA 2000) then we may encourage industry to grow fuelwood, producing a carbon neutral heating fuel and creating a demand for thinnings from new salinity mitigation plantations.

Informed policy choice could create a demand for thinnings from lower rainfall plantations or from dedicated firewood plantations in the drier more salinity prone areas that desperately need economic drivers of revegetation. The nature of the conflicting relationships between Government as supplier and regulator in the industry have been observed repeatedly, for example: *If the royalties from native forests (particularly slow growing durable species) reflected their replacement value (or even approached it), plantations and privately grown forests would be far more attractive to growers. Private forest establishment would be stimulated on small and large scales (Campbell 1990).*

The explosion in *E. globulus* plantations in south-west WA and western Victoria is a graphic illustration of the power of public policy to change landscapes. Tax rulings on plantations have been very effective at priming the pump to expand plantation resources. New targeted incentives could as easily be used to shift investment into the medium and lower rainfall zone on the basis of public benefits that could be achieved. A cynic might observe that "if we are to have tax expenditures delivering corporate welfare, then let's make sure these public investments deliver the outcomes society wants..."

**Recommendation 32 - A plantation based firewood industry should be encouraged by the CMA as it would play a vital role in the viability of medium rainfall plantation by providing a market for thinnings and other plantation wastes. This should include a detailed assessment of the VNPA Firewood Business Plan and NRE's Box Ironbark Firewood Plans.**

## 6.8 Shifting our sights up and out

Sustainability demands that we shift our sights up and out – to the global, the long term – to the big picture. Australian forestry has much to offer the world.

Australia's gifts to the world include trees that grow prolifically on soils like mine overburden, withstanding fire and drought and producing timbers hard and strong like steel; that burn like coal; and are durable like concrete. As if this is not enough, they are also rich, colourful and well endowed with features (Alexandra 2001). Evolving out of countless millennia of fire stick farming, and growing on the least fertile and driest continent, the Eucalypts, Acacias and Casuarinas are a treasure trove of forest tree genetics - the genetic basis for the most widely planted forestry species. Planted across millions of hectares of each of the inhabited continents: the new forests of the world.

There is still much to be learnt about the trees of the great southern land and the numerous ways of utilising their productivity. Apart from the few species favoured for industrial plantations, there is much inherent potential in those species yet to be commercially exploited. New and emerging technologies can fundamentally alter the conversion of trees into products and the kinds of products produced. Emerging understandings could lead to potential important non-wood products such as biodegradable pesticides and industrial solvents. There is scope for delivering many ecological benefits in terms of salinity and catchment health.

Sustainability science can help to expand Australia's expertise in land repair, environmental restoration and natural resources planning and management. As a nation, we must lift our sights out of the quagmire of conflicts over public native forest policy that has dominated environmental policy for the past decade, and beyond simple obsessions with fast growth. Australian plantation forestry has the opportunity to mature and consolidate its reputation for excellence and innovation in natural resource

management. This is potentially a big earner for us because many of the challenges we face domestically have global dimensions and relevance.

**Recommendation 33 - That given the recent history of plantation policy and plantation development in Australia it is important that the Catchment Revegetation initiative is not "captured" by narrowly defined professional or commercial forestry interests. Therefore the CMA should ensure that the initiative is managed to maintain its core focus on generating multiple benefits and multiple outcomes - primarily catchment health and biodiversity enhancement.**

# 7. The Catchment Restoration Investment Model

## 7.1 Introduction

This chapter proposes an investment model which, if successful, would leverage public expenditure on rural environmental repair with substantial private investment.

The Catchment Restoration Investment Model (CRIM) is proposed as a structured way of attracting and delivering major new investments into multi-purpose reafforestation and revegetation designed to result in numerous beneficial outcomes – salinity mitigation and improvement in water quality, biodiversity protection and enhancement, new rural industry development and carbon sequestration.

In a parallel but independent arrangement we also propose a separate structure for attracting philanthropic funds into environment activities thus clearly providing separately for either donations or investment.

The Scheme focuses on reafforestation in all its forms because increasing vegetation cover is now recognised as critical to restoring landscape health. Terms such as reafforestation, forestry or plantation should be interpreted in the broadest sense rather than using reference to limited forms of industrial plantation forestry common to the late 20th century.

We acknowledge that many parties are currently making efforts to improve the catchment. This proposal aims to compliment these by creating an institutional framework for bringing together public and private investment in landscape change on a scale never before attempted in Australia. It lays out a schematic architecture for major public private partnerships to address landscape renovation.

Pursuing this represents an important opportunity to pilot new approaches to financing landscape change. We believe that the model could be replicated or extended to the many parts of Australia requiring investment in salinity mitigation and other forms of landscape repair.

The model has been developed and refined in conjunction with the CMA, Government Agencies, and prospective Investors. Assistance and advice has been received from researchers, farm foresters and other consultants[10].

The proposed investment is presented in a schematic form and is by necessity brief. It presupposes ongoing work investigating and refining the business model and its components. It is assumed that negotiations will continue and that detailed business planning will be undertaken for each of the components.

## 7.2 The opportunity - leveraging private investments

Australia faces major challenges in rural landscape repair and in greenhouse gas reduction. The scale and nature of the problems has been well documented and Australian Governments have responded

[10] In particular I would like to acknowledge the valuable contributions of the Allen Consulting Group, Barry Buffier, David Brand of Hancocks Pty Ltd, and Angus Howell of the FFORN Co-op.

with major funding programs demonstrating a willingness to invest public funds. Funding programs relevant to the model include those focused on salinity management, habitat protection and enhancement, regional development and greenhouse gas reduction and sequestration.

Governments also continue to invest in forest and agricultural industry restructuring, regional development and other related strategies.

Leveraging private investments represents a major opportunity to increase the total investment, to sponsor employment, innovation and industry development and to convert public funds focused on fixing problems to opportunities for sustainable economic development.

## 7.3 The Goulburn Broken catchment

The Goulburn Broken catchment covers 2.5 million hectares in the north of Victoria. It produces approximately $7.8 billion across all sectors of its economy per year. The majority is generated by high value irrigation industries in the north of the catchment. The extent of land clearing for agriculture and grazing is predicted to take a chronic toll on the land - catchment health is threatened by dryland salinity, declining water quality and loss of species. If unchecked, salinity will not only impact on the quality of water used for irrigation and in-stream health but will also impact on many minor streams, wetlands and native vegetation critical to the habitat of many native species.

A concerted and comprehensive program of catchment repair is required which addresses environmental and natural resource issues in an integrated fashion.

There is overwhelming evidence of the need to increase vegetation cover. The Goulburn Broken CMA and DNRE have estimated that to stabilise salinity at acceptable levels between 150,000 and 300,000 hectares of land needs to be revegetated in the next 20 years. For the long-term social, economic and environmental viability of the region, a major program of landscape change is needed.

Strategic and targeted reafforestation has the capacity to achieve catchment-wide environmental benefits including improved biodiversity protection and habitat enhancement, carbon sequestration, improved water quality and salinity mitigation through reduced groundwater recharge.

The CSIRO recently called for a “Revolution in Landuse” to control dryland salinity (CSIRO 2000). The revolution will involve creating landscapes that use more water by using more woody vegetation – trees and shrubs. In suitable locations the same trees can be used to store atmospheric carbon and to produce high value products like furniture timbers. Bringing together these benefits involves detailed catchment planning, knowledge of environmental processes and new approaches to establishing and managing multi-purpose forests for environmental and production goals. Fortunately, a decade of high quality R&D has been focused on these issues thus significantly reducing the technical risks in relation to tree growing for commercial and environmental outcomes.

Using Tree100 mapping data, in the Goulburn Broken CMA region there is:

- 820,000ha of arable land already cleared of remnant trees (may still be native grasses there) with rainfall ranging from 400mm to over 1000mm
- of this 300,000ha has over 700mm average rainfall.

Throughout much of the catchment it is accepted that investments in vegetation must generate a range of benefits in addition to production of forestry products – eg water quality, salinity mitigation, habitat enhancement etc - and these benefits must be captured by investors to make the business viable.

## 7.4 Revegetation options

A number of commercial, semi commercial and non-commercial opportunities could support the revegetation targets:

1. Expanding the range and extent of existing plantation based industries – eg blue gum (*E. globulus*) in the limited areas identified as suitable.

2. Developing new forms of commercial and semi-commercial forestry using a wider range of species such as spotted gum and sugar gum.

3. Developing new woody landuses – eg oil and biomass energy crops (see Foran and Crane 2002).

4. Reviving or expanding traditional forest industries – eg firewood.

5. Environmental or new forests - establishing new multi purposes forests by revegetating and encouraging natural regeneration.

Traditional product driven plantations (pulp wood, sawn timber) are likely to be a viable investment in a few selected areas of the region with the recommended high rainfall, favourable slopes and soils. In addition, a range of newer plantation species and non-traditional environmental forestry could prove successful in the region.

## 7.5 Producing Multiple Benefits – Finding Multiple Investors

The new forests are based on the premise that multiple and separate investors with different goals will invest in different outcomes and that depending on location and design the forests will generate a different mix of benefits. Some will be almost entirely environmental while other will be almost all wood production while some will designed and located to generate multiple benefits.

The challenge this document responds to is to design a system that can equitably share of public and private benefits generated by the planned “new forests”.

In order to do this it will be necessary to “package” or broker deals between the various parties who wish to buy/invest in aspects of the new forests. It will be necessary to define and market the new bundles of “property” rights – future wood, carbon, water quality, catchment health, habitat or salt storage etc and to create or attach commercial values for these.

It will also be necessary to ensure that new and existing landholders have suitable ways of participating and sharing in the benefits. Support from local governments may also be required.

In principle, the rate of public investment will be based on a reasonable assessment of the public benefits to be generated.

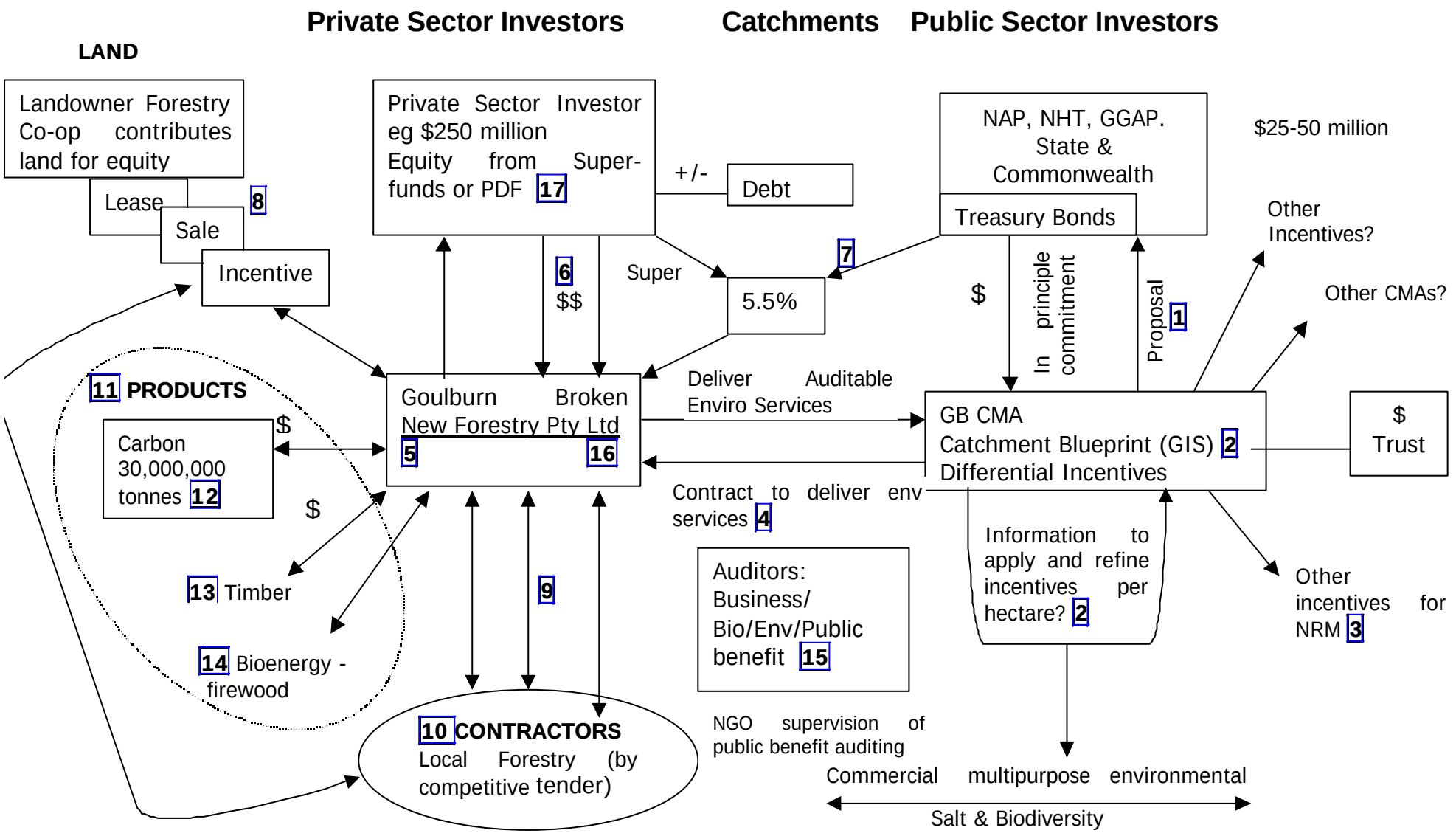
The model is designed on the assumption that the CMA will be investing in positive environmental or catchment outcomes on behalf of the regional and national community. Furthermore the system aims to achieve these outcomes in a cost effective and transparent fashion.

It is designed to clearly separate the providers of capital (public or private) and the supplier of the goods or services. (see Figure 7.1 over page)

Other investors may include: water authorities; investors in future forest products; carbon credit "speculators" and biomass fuel companies.

| Products/benefits | Potential Investors |
|---|---|
| Biodiversity | Gov't |
| Water quality | Gov't |
| Reduced salt | Gov't |
| Future wood/firewood | Forest investors, processors |
| Carbon | carbon investors - buyers |
| Biomass energy | Energy companies |

**Figure 7.1: A Catchment Revegetation Investment Model**



## 7.6 Model components

1. The CMA puts a proposal to State and federal government and receives in principle support to pool a proportion of grant funds anticipated over the next 3 to five years and use these to attract private investment to the tasks of delivering salinity and catchment health services. These funds are held and dedicated to the Scheme by way of contract with Governments and/or in a dedicated CMA trust account. Payment to private sector providers is made according to a contract schedule and therefore if a provider fails to perform no funds are paid and penalty clauses invoked.

2. The CMA develops a catchment "blueprint" which clearly specifies the priority locations for reafforestation and develops suite of differential incentives (dollars per hectare) based on the nature of the priorities. The CMA retains the right to review and revise the "blueprint" at regular intervals as more information comes to light. The scheme obliges the CMA to transparently publish its priorities and the incentive attached to them. An offer of an incentive/environmental service contract would remain in force for specified contract period.

3. The CMA maintains capacity to deliver other NRM incentives directly to land managers and also continues to offer some direct incentives for vegetation as an alternative incentive pathway.

4. The CMA calls for tenders to parties interested in delivering environmental services within the catchment over a specified period – eg five years and subject to successful negotiations enters into a contract with "New Forests Pty Ltd" to deliver environmental services within the catchment. The contract would specify not only the nature of the services but also the monitoring, auditing and accountability processes, non performance penalties and performance bonuses etc

5. "New Forests Pty Ltd" would be established as a legal entity completely independent of the CMA. It would be owned by the investors but no member of the Board of the CMA could hold shares in the company.

6. "New Forests Pty Ltd" would attract private sector investor on the strength of its contract with the CMA and its capacity to deliver environmental services, carbon credits and future forest products.

7. Victorian Government chooses to underwrite a bond rate (5.5%) return on a percentage of the investment in respect of the pilot nature of the scheme and the long term, wider public benefits that accrue to Victoria from the scheme succeeding. The underwriting is reviewed at predetermined periods with set opt out agreements. The underwriting may be backed by options on given percentage of the Carbon credits.

8. Land owners are given a wide range of potential agreements to participate from land for equity to land lease agreements. Novel financing agreements can be structured to suit all parties.

9. New Forests Pty Ltd delivers reafforestation establishment and management by way of competitive tenders and contracts. It does not undertake works or operate machinery unless necessary. Its primary role is to ensure that effective business systems operate which challenge investment into cost effective and appropriate reafforestation activities. To do this it must negotiate capital, ensure contractual obligations are met and negotiate with landowners and

contractors. It is involved in detailed site and sub catchment design which targets appropriate species, methods and systems to the reafforestation sites. The contractual system and performance bonuses ensure active pursuit of innovation at all stages of the scheme.

10. A pool of skilled contractors and their employee emerge to deliver the reafforestation and silviculture requirements in the region. Some of these would be eligible to receive government structural adjustment support as part of the package designed to ease those displaced by reform of native forest harvesting allocations.

11. On behalf of its investors New Forests Pty Ltd manages and aims to generate a profit from its:

- forestry estate
- sale of biomass, fuel woods, solid woods or other forestry products
- pool of carbon credits
- environmental services contracts.

12. Carbon credits are managed as a pool and traded on world carbon markets. The 100,000 hectares is estimated to sequester 38.5 million tonnes over a 30 year period. At current (2002) prices of A$20/tonne for carbon this would be valued at $770,000,000. This is anticipated to rise in the future.

13. The majority of the new forests are established to produce high quality hard woods. The future market prospects for these are sound due to declining global availability of high quality hardwoods. The reafforestation of 100000 hectares would produce an estimated 12.6 million cubic metres of standing timber over 30 years. On current timber values this would be worth over $675 million. This is probably conservative with the World bank predicting hardwood timber prices rising at real rates of over 1.8% per annum until 2015 (Bhati 2001).

14. Bio-energy including fire wood will form part of the market for thinnings or will be sourced from dedicated forestry plantings. There is global interest in many existing, new and emerging technologies capable of converting biomass to electricity and liquid fuels due to the capacity produce carbon neutral energy (www.users.bigpond.net.au/bioenergyaustralia).

15. The business, forestry and environmental services components of the model are independently audited in rigorous and transparent manner. The public good environmental aspects of the contracts would be audited. These audits could be supervised by a steering committee that consists of the key environmental NGO's eg WWF; Environment Victoria or the ACF to ensure full accountability for the contractual environmental outcomes.

16. The model is not limited to a single New Forests Pty Ltd nor is any new commercial entity limited to working with a single CMA. It is highly likely that if the model works a variation on the environmental services contract would be developed for many of the NAP and other regions in Australia.

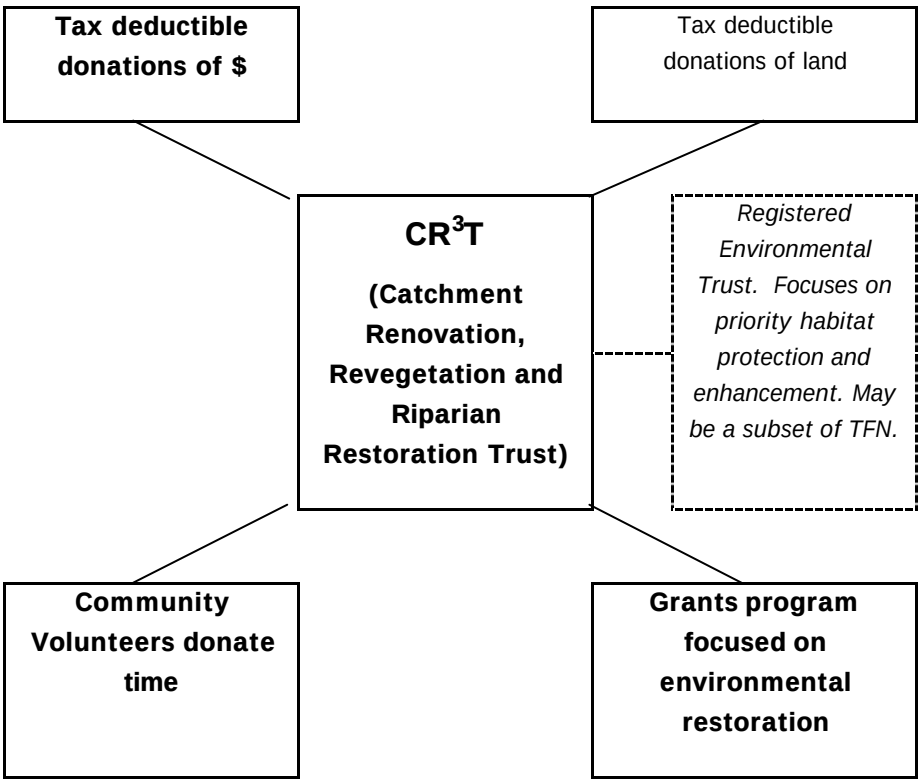
17. A range of variations on the model are easily conceived, for example a group of investors could form a Pooled Development Fund (PDF) and invest in several new Forest Companies operating in competition or cooperation in the same or different regions etc.

## 7.7 A pathway for philanthropic funds

In addition to the commercial arrangements outlined above a not for profit trust should be formed as a channel for philanthropic funds, the donation of land and donation of time and other resources to activities which are purely in the community interest. In this way the commercial and semi commercial activities described above can be operated separately.

The trust could be a subsidiary of the Trust for Nature thus using the existing legal framework established in Victoria. However TFN don't currently get involved in revegetation or other catchment restoration works so a new dedicated trust may need to be formed. Either way it is important that donators of money and land to the trust are eligible for tax deductions.

**Figure 8.2: $CR^3T$ - Catchment Revegetation and Riparian Restoration Trust**




**Recommendation 34 - That the CMA pursues opportunities to advance the directions outlined in the Catchment Revegetation investment model, in particular seek support for a pilot from the State and Commonwealth Government.**

**Recommendation 35 - That the CMA commission two additional projects that will build its case for substantial private investments – one a study into the regional economic impacts of the planned landscape change and another**

**to further refine the design of the public-private partnership framework in order to bring the proposal up to the point of "investment readiness".**

**Recommendation 36 - That the CMA identify, document and promote to philanthropists those activities that it believes are likely to attract funds, for example a program to protect and enhance the habitat of rare and threatened species such as woodland birds.**

# 8. Financial Model

## 8.1 Calculating reafforestation costs and benefits - merge

In order to determine the potential cost and benefits of changing landuse in large areas of the catchment a crude financial model – The Reafforestation Calculator[11] - was constructed and used to generate 24 different scenarios. The calculator makes all assumptions about growth rates and future markets transparent and these can be changed as required. The scenarios generated demonstrate the importance of either carbon credits or catchment health incentives in terms of attracting significant private investment to reafforestation.

To simplify the inherent complexity of the various land systems and climatic factors the landscapes of the mid and upper catchments were over-simply categorised according to their prospective productivity under several forestry options. This drew on the recent work of Bernie Robb of DNRE in "Assessing Potential for Farm Forestry in the mid Goulburn Broken Catchment". The calculator was designed to provide an overview of the wholesale costs and benefits of investing in reafforestation and is not intended as a tool for detailed site planning or investment analysis.

After using the calculator it became obvious that in medium or lower rainfall (drier) landscapes the costs of establishment become critical to the long-term cost structure of reafforestation projects. Consideration was then given to the potential for using natural regeneration as a major component of a revegetation plan. In many case incentives to remove livestock and control rabbits for a sufficient time may be enough to stimulate reafforestation by natural regeneration in many areas of the catchment where sufficient seed trees remain. This approach contributed to the design of the market based instruments trial in conjunction with DNRE. This proposed trial aims to extend the BushTender methods into a tender system for multi-benefit landscape change. It is expected that landholders will tender for incentive payments to de-stock and stimulate natural regeneration in rougher grazing paddocks. The tendering or auctioning system is intended to "discover" the market price of changing from grazing to regeneration on a range of sites.

This approach can be used to try to determine the "opportunity cost" of transferring land from rough grazing to natural regeneration. We were advised that because much of the landscape in which change is required currently generates a low return on capital, the predominantly grazing based businesses have little internal capacity to invest in change. However, the low rates of return mean that alternative land uses, such as regeneration of native forests and woodlands, have a low return hurdle, or grazing opportunity cost to overcome. Therefore, there may be potentially many opportunities for generating income via many combinations of conventional products – eg livestock and forestry products – plus ecosystem services such as carbon sequestration, habitat and improved water quality. This combined or multi-purpose revegetating landscape could then operate in areas that are currently regarded as sub-commercial for 'traditional" plantations. By using leases and other

[11] The Reafforestation Calculator has been provided in digital form so that the assumptions and key variables can be changed. An example of the graphed outputs of the scenarios is presented in Section 9.3 (Figure 9.1) of this report.

land access contracts or "forestry rights" a forestry and ecosystem services company could operate over large areas without using capital to buy land (see Alexandra and Hall 1998).

However, in the design of the incentive or ecosystem benefits payments it is important to recognise that not all trees will generate the same catchment health benefits and that a detailed understanding of where to place trees in the landscape will be required (Stirzaker et al 2002). It is assumed that the CMA can, or will soon be able to, specify in detail those areas of the catchment that are priorities and therefore deserving of salinity mitigation or water quality investment.

Similarly the value of certain parts of the landscape for habitat enhancement must be specified if contracts are going to be let for habitat enhancement plantings – eg along riparian corridors. These priorities are continually being refined through projects such as Biodiversity Action Planning, Waterway Implementation Plans and Jenny Wilson and Kim Lowe's work for DNRE. There is a strong argument for these ideas being advanced via a regional scale pilot program which is capable of testing the market for alternative landuse.

The Reafforestation Calculator focuses on those aspects of landscape change that have the potential for generating medium to long term returns from:

- Future timber, posts, poles, fuel wood or biomass;
- Improvements in catchment health (salinity, water quality, biodiversity); and
- Future carbon credits.

The landscapes of the mid and upper catchments were broadly categorised according to their prospective productivity under six different reafforestation/plantation forestry options. These forestry options are:

- Steep slopes (>18$^{o}$) above 700 mm average rainfall;
- Dry area plantation rainfall (typically 500-700 mm average);
- Additional Hardwood Plantations above 700mm rainfall;
- Environmental/Streamside etc;
- Natural regeneration above 700 mm; and
- Natural regeneration 500-700mm.

Growth rates were based on recent work for the Australian Low Rainfall Tree Breeding Scheme and advice from Stackpole and others in DNRE and CSIRO. Carbon sequestration was based on recent published work from CSIRO and checked by Professor Barlow - Deputy Head of the CRC for Carbon Accounting.

The Reafforestation Calculator has been developed to trial the investment and policy options selected which we believe are capable of generating landscape change on the scale required. The modelling with GIS in Part 3 of this report aims to provide insights into the potentia areas suitable for using the investment and other instruments to catalyse beneficial change.

## 8.2 Financial Model Format

The financial model can be used to calculate costs, income and accumulated cashflow for each of the 6 forest types over a 30 year period. It is in the form of an Excel spreadsheet. All assumptions about growth rates, incentives and future markets are transparent and can be changed as required. Data for each of the 6 forest types can be entered into the first worksheet which is entitled 'variables'.

The variables are:

- Total Area (hectares) – the total area to be reafforested for each of the broad types

**Carbon**

Data that can be entered into the model to calculate potential sequestered carbon and its value includes:

- Tonnes of Carbon per hectare per 30yrs – tonnes of carbon that would be sequestered per hectare by revegetation over a period of 30 years.
- Current Carbon price per tonne (predicted high carbon value)
- Current Carbon price per tonne (predicted low carbon value)

**Catchment Health (mention this needs refinement to address specific issues)**

- Potential Value of reafforestation to Catchment Health - High
- Potential Value of reafforestation to Catchment Health Low

The concept of catchment health incorporates salinity, water quality and biodiversity. Implementation of the CRIM would require further development and investigation of all components of the model, but particular attention should be paid to the refinement of the specific issues here represented by the term "catchment health".

**TIMBER**

- harvestable $m^3$ timber per hectare per 30yrs
- Current price per $m^3$
- expected mean annual increment (MAI) ($m^3$)

**COSTS**

- Establishment cost per hectare
- annuity rate (or lease rate based on opportunity cost of taking land from grazing)
- average annual management costs
- Interest rate

Adjacent to the 'variables' worksheet is another titled 'overview'. This worksheet calculates costs and values for each of the 6 forest types based on the data entered into the 'variables' worksheet.

The data generated is transposed to one worksheet for each forest type which calculates accumulated cashflow. A graph is automatically generated of the cashflow accumulated over a 30 year period for each forest type. This enables a viewer to compare when and how cost and returns vary depending on the different values entered into the 'variables' worksheet.

**Table 8.1: Variables entered into Reafforestation Calculator**

| INPUTS | Steep (>18$^{o}$) | Natural regen above 700mm | Additional Plantation above 700mm | Environmental/ Stream side etc | Natural regen below 700 mm | Dry area plantation 500-700mm |
|---|---|---|---|---|---|---|
| Total Area (ha) | 20,000 | 10,000 | 30,000 | 10,000 | 10,000 | 20,000 |
| **CARBON** | | | | | | |
| Tonnes of Carbon per hectare per 30yrs | 350 | 400 | 450 | 400 | 300 | 350 |
| Current Carbon price per tonne (high carbon value) | $20 | $20 | $20 | $20 | $20 | $20 |
| Current Carbon price per tonne (low carbon value) | $5 | $5 | $5 | $5 | $5 | $5 |
| **CATCHMENT HEALTH** | | | | | | |
| High Value Catchment Health | 40 | 40 | 50 | 70 | 40 | 40 |
| Low Value Catchment Health | 30 | 30 | 25 | 35 | 25 | 20 |
| **TIMBER** | | | | | | |
| harvestable $m^3$ timber per hectare per 30yrs | 30 | 50 | 240 | 0 | 30 | 150 |
| Current price per $m^3$ | $50 | $50 | $50 | $0 | $60 | $60 |
| mean annual increment (MAI) ($m^3$) | 5 | 5 | 12 | 0 | 3 | 7 |
| **COSTS** | | | | | | |
| Establishment per hectare | $600 | $10 | $1,000 | $1,000 | $10 | $800 |
| annuity rate | $50 | $70 | $150 | $80 | $50 | $80 |
| average annual management | $20 | $0 | $40 | $20 | $0 | $30 |
| Interest rate | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 |

## 8.3 Financial Model Scenarios

The model generates 24 different scenarios. These scenarios are the 24 permutations and combinations arising from the following income variables:

### Catchment health

For comparative purposes, it is possible to enter two different catchment health values into the model:

- A1 High Value Catchment Health
- A2 Low Value Catchment Health

These have been originally entered as generating $70 (high value) and $35 (low value) income per annum. These figures have been based on actual and expected expenditure for NRM grants in the dryland parts of the catchment. We simply took this assumed level of public expenditure and converted it to a notional per hectare per annum payment.

**Carbon credits**

- B1 High Price, medium market
- B2 Low Price, medium market
- B3 High Price, slow market
- B4 Low Price, slow market

There are 4 possible income types generated from 2 carbon credit values entered into the 'variables' worksheet. The high price has been entered as $20 per tonne of carbon sequestered and the low value as $5 per tonne of carbon.

The model allows for two possibilities of carbon market type – slow or medium. The medium market generates income from sequestered carbon at 10 years, whereas the slow market generates income from sequestered carbon at 15 years after planting.

**Timber value**

- C1 Current Stumpage Rates
- C2 High Market Rates (double)
- C3 Booming Market Rates (triple)

Entering one timber value into the 'variables' worksheet generates 3 comparisons – 1, 2 and 3 times the entered value.

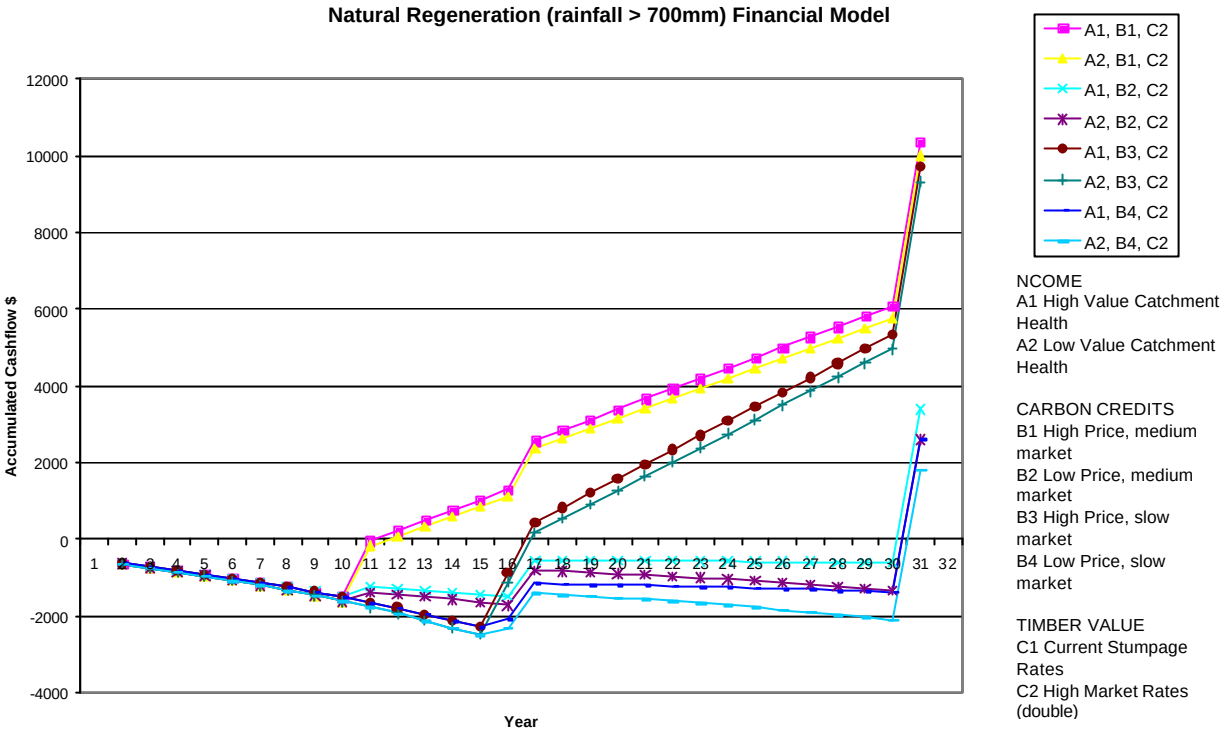
**Scenarios**

There are 24 permutations and combinations of the 9 income streams outlined above. These are represented throughout the model as follows.

| | | | |
|---|---|---|---|
| **1.** A1, B1, C1 | **7.** A1, B2, C1 | **13.** A1, B3, C1 | **19.** A1, B4, C1 |
| **2.** A1, B1, C2 | **8.** A1, B2, C2 | **14.** A1, B3, C2 | **20.** A1, B4, C2 |
| **3.** A1, B1, C3 | **9.** A1, B2, C3 | **15.** A1, B3, C3 | **21.** A1, B4, C3 |
| **4.** A2, B1, C1 | **10.** A2, B2, C1 | **16.** A2, B3, C1 | **22.** A2, B4, C1 |
| **5.** A2, B1, C2 | **11.** A2, B2, C2 | **17.** A2, B3, C2 | **23.** A2, B4, C2 |
| **6.** A2, B1, C3 | **12.** A2, B2, C3 | **18.** A2, B3, C3 | **24.** A2, B4, C3 |

For example, Number 1, A1, B1, C1 represents high value catchment health (A1), high price, medium carbon market (B1) and current stumpage rates (C2). In this way, the model calculates accumulated cashflow for 24 scenarios for each of the 6 forest types depicted. Figure 8.1 is an example of the graphed outputs of the calculator for natural regeneration above 700 mm.

**Figure 8.1: Example of the graphed outputs of the financial calculator**




## 8.4 Findings of the model

The financial modelling demonstrates the importance of cost-effective, or least cost revegetation, especially where there are no, or limited, prospects of commercial outcomes.

The scenarios demonstrate the importance of either carbon credits or catchment health incentives in terms of attracting significant investment to land use change.

Cashflow accumulated increases significantly in proportion to timber values. This indicates that if the trees were planted for restorative, rather than commercial reasons, it would be unlikely to result in a profit solely from catchment health and carbon credits.

That being said, however, a sharp increase in cashflow can be seen in each of the graphs at 10 years and at 15 years, representing the income generated from sequestered carbon over those times. Reafforestation projects are sensitive to both price and the timing of when a carbon market is established.

# 9. A story from the future

This section is a story which is used to illustrate how the results and influence of the landscape change initiative put in place in the first years of the millennium. It is unashamedly fiction....

**Box 1: A scenario - the 2020 review of catchment renovation**

In 2020 the delegation reviewing Australia catchment renovation was being shown over the Goulburn Broken.

Flying low over the Catchment a keen observer would notice many changes in the physical landscape which are in marked contrast to the first years of the millennium. Large areas of young plantations and regrowth are common on both the plains and the scrubby, rugged rises of the hills. From the south where the blue haze hovers over the mountain forests to the northern drier woodlands and "riverine plain savannah" young trees are a dominant feature. Streams snake over the riverine plains buffered by wide riparian forests amongst a patch work of plantations, short rotation bioenergy forests and irrigated horticulture and viticulture.

Rising in the forested mountains of the Victorian dividing range the Goulburn River remains a major contributor of fresh water to the profitable irrigation based industries (and also to the Murray downstream), despite some reductions in extractions due to environmental flow allocations, native title claims and climate change.

Benalla, Mansfield and Shepparton continue to act as the main service centres but the economy has changed too: tourism, retirement, education and research, bioenergy technology and lifestyles are the dominant industries but dryland and irrigated agriculture, manufacturing, food processing sectors remain important. There are still sizeable dairy, cropping, horticulture and timber industries in the region but these tend to be distributed in much more complex patchwork or landscape matrix unlike in the past when they tended to be partitioned in a kind of landscape apartheid.

The region has a long and successful history of State and Commonwealth environmental investment and is often used as a show piece to demonstrate Australia's environment industry expertise. In particular, there is a long history of salinity and biodiversity management which now provides more than three decades of result from major adaptive management programs. These linked NRM research and implementation and populated loose conceptual frameworks based on resilience, sustainability and ecosystems services. After the decades of salinity and revegetation the 6R's of local government are:

- Roads,
- Rates,
- Rubbish,
- Revegetation,
- Riparian restoration and
- Resilient regional communities.

**The 2002 RCS**

In 2002 the Goulburn Broken CMA released a Regional Catchment Strategy (RCS), a descriptive and elegant document that provided an overview of the planned approach to addressing the range of NRM issues in the region. It boldly proposed doubling the value of agricultural output off half the land.

The RCS strategy sat within the broader processes of NRM and catchment management in Victorian, as well as the MDBC ICM planning process, and the NAP requirements. It aimed to integrate environmental, social and economic planning and

implementation by addressing priorities of vegetation, wildlife, water, salinity, primary industries, and pest plants and animals.

The RCS boldly attempted to link the catchment plans, to a plethora of related NRM policies and to the statutory planning functions of local governments. Despite this effort many remained fearful that the regions economic and ecological health remained seriously threatened by salinity and declining water quality, loss of remnant vegetation and further species extinctions unless major landscape reforms were implemented.

**The Catchment Revegetation Investment Scheme Implementation System (CRISIS)**

In 2003 the Catchment Revegetation Investment Scheme Implementation System (CRISIS) was established as a pilot program. It was initiated to leverage private sector investment with investment from the NHT, NAP and catchment funds in order to deliver major multi-objective projects with public and private benefits.

The scheme aimed to achieve cost effective NRM delivery by approaching the challenges and opportunities in more *strategic* and *tactical* ways and to get governments to become *"smart purchasers*." Strategic in the sense that it focused on protecting the most value environmental assets by planning a green web which utilised much low value and "wasted land" otherwise viewed in terms of the cost of managing problems like weeds, acidification and salinity, reduced water quality and erosion. Tactical, in terms of trialing and refining the most cost-effective regeneration techniques available.

The scheme was designed to create a learning experiment – a dynamic process – so that improvements and innovation could be incorporated as soon as possible and so other regions could learn from the pilot.

**What the CRISIS did**

A major landscape scale program of vegetation management and enhancement, riparian, floodplain and wetland restoration was initiated by using an innovative public private partnership model which treated landscape renovation as a major infrastructure project. While most environmental vegetation establishment in the past had focused on the hand planting of seedling trees funded from small grants this program adopted the most cost effective methods for a given site and a given purpose. Direct seeding, aerial seeding and the triggering natural regeneration proved cost-effective in the program to protect and enhance the rivers and the water quality in the Goulburn Broken region.

Traditional plantations, direct seeding plus enrichment plantings and natural regeneration was used to establish vast areas of forestry and riparian vegetation. Each site and sub catchment was planned to include:

- improved habitat and wildlife corridors, and consequent improved biodiversity conservation and bio-links;
- reduced sedimentation and erosion, and consequent water quality enhancement;
- raw materials for future industries; and
- where suitable low cost triggered-regeneration of the endemic species rather than strict plantation forestry or "revegetation landscaping".

Industries that derived materials from the new extensive timber resource included:

- Biomass energy, which supplements existing sources such as food waste and sawmill co-generation capacity using waste;
- Wood fibre or pulp, for paper, charcoal and/or energy or industrial products;
- Fuel wood to substitute native forest sources and generate carbon neutral fuel; and
- Structural and Furniture timber.

The scheme was based on clearly specifying the distinct or intermingled conservation

and production goals for each site or sub-catchment. In order to get the government to act as a clear purchaser it required greater integration between those agencies, programs and activities that currently address aspects of the same ecosystems independently, viz: water, wildlife, plantation forestry and revegetation.

The CRISIS:

- Harnessed market dynamism so that this drives environmental restoration where possible.
- Catalysed market dynamics to realise the NHT objective of "providing a framework of strategic capital investment, to stimulate additional investment in the natural environment".
- Overcome an input focus (relying on Governments grants) and focused more on outcomes;
- Ensured a multi-objective approach to NRM and regional development;
- Improved the ecological knowledge used as the basis for planning and revegetation;
- Developed a best practice guide for regeneration using an understanding of forest ecology and the role of pioneers;
- Focused efforts on cost effective techniques and operations;
- Ensured that planned interventions had a strong ecological underpinning;
- Ensured NRM became more integrated, strategic and tactical in design and delivery;
- Stopped separate programs focusing on tree planting, water, biodiversity and salt and encouraged a total landscape management approach.

**CRISIS - implementation arrangements**

CRISIS was implemented in a way that marked a fundamental change to revegetation and NRM incentive delivery of the late 1990's – the landcare era. The CRISIS Board delivers the entire program as a suite of incentive and/or contract payments that are paid on delivery of results. Milestones and measurable outcomes, penalties and performance bonuses are written into all environmental service contracts. These are staged to cover early establishment costs and on going site maintenance. Innovative financial engineering has sponsored the creation of a wide range of business and related structures. The prices for land and revegetation costs have been ruthlessly worked out based on sophisticated cost sharing formulas and on testing the market by way of auctioning and other competitive processes.

Competition for the contracts is now mostly between three large private sector companies competing for the right to renovate, and lease land as a part of their environmental services business. The three companies that now operate across much of Australia and in several other continents are all publicly co-listed in Berlin and Melbourne Stock exchange. They are performing spectacularly on the new MESBI (Melbourne Enviro-Services Businesses Index) because of their rapid expansion and profitability.

In the Goulburn Broken CMA these companies combine future forestry rights, carbon rights, water quality bonds and biodiversity bonds (including the Trout and Murray Cod Bond) to form highly profitable businesses. They receive a clean water incentive payment from Goulburn Broken CMA when they achieve canopy closure over nominated paddocks, drains or streams. On the sugar coast of Queensland they are active in rainforest timber and coral reef futures contracts.

A philanthropic trust established from a bequest of a wealthy local business person is administered by "CR-cubed", the Community for Resilience, Reafforestation, and Riparian Restoration. The Trust funds buy outs of priority conservation areas and offers generous incentives for specific corridors that conform to biodiversity design

guidelines – especially along the riparian corridors and floodplains.

Cod-bonds were added to the novel incentive mix when some wealthy retired grazier and dairy farmers (who had sold their land for rural residential subdivision) the MDBC and EA joined together to increase cod (Murray and Trout Cod) populations and the fresh water habitats they depend on. The companies and individual farmers are now competing for next year's riparian corridors plantings in the hope that they will win the prestigious Snag Award.

Each of the Enviro-Services Companies (ESC) has huge backlogs of planting sites and are gearing up to increase their operational capacity. The CRISIS incentives are based on a formula which varies according to the priority assigned to the particular section of catchment. It is based on contributing a predefined fraction to the most cost-effective method of regenerating forest on the site. Farmers are competing by offering generous perpetual forestry lease agreements in exchange for equity in the Enviro-Services Companies, after those that got in early saw their fortunes improve dramatically as the value of the ESC rose spectacularly on the share market in a boom reminiscent of the hi-tech boom of 2000.

In an efficiency spiral the Companies and the RIS board have jointly engaged a Melbourne University Forestry Team based at the Dookie Campus to help formulate the annual benchmarks for costs and to refine the methods of establishment. The companies sub-contract most of the establishment work to a range of specialist local forest regeneration contractors who themselves sub-contract most of the seed gathering and site preparation to former logging contractors displaced by the big native forest allocation cut backs in 2002 and 2004.

Within three years of moving from the old input and employment focused revegetation program the CRISIS exceeded all expectations and was awarded the Nations Highest award for excellence in privatisation, the "Kennett" trophy which adorns the prestigious offices of the CMA Board room along side numerous UNEP, Global 2000, River- prizes and Banksia awards.

With the continuing flood of cheap synthetic fibre onto the market, it is rumoured that leading wool growers are considering converting their entire properties to forestry for cabinet timber production, receiving the annuity payments, and concentrating on their real passions – gambling, fine furniture making and fishing for native fish.

# PART 3 – CASE STUDY: LANDSCAPE CHANGE IN THE STRATHBOGIE RANGES

## 10. Summary and introduction

Part 1 of the project reviewed current drivers of change and options for accelerating landscape change. This provided us with an overview of what is currently occurring, the theory of policy reform and the application of policy instruments. The application of statutory planning to landscape change was also examined. It was established that the statutory planning system addresses those aspects of landuse change that are currently or can potentially be regulated – eg subdivision. However it is probable that much of the likely landscape change will sit outside the statutory planning system as it will be driven by changes in rural landuses or changes in land management, for example changing from grazing to natural revegetation or forests.

To support an improved understanding of this, Part 2 outlined the development and application of a reafforestation calculator as well as a schematic or conceptual framework of how to bring increased investment to the task of changing landuses and repairing the landscape.

Part 3 investigates changing the catchment through a case study based on the production of a series of GIS based maps. This section starts by looking at those instruments that could potentially be used, followed by a description of those that were used in the GIS based modelling. The GIS modelling aims to provide information on the likely impacts and potential extent and scope of major investment in increased vegetation cover via reafforestation and natural regeneration as well as other changes that have the potential to change landuse.

It identifies which options, or combinations of options, are recommended for trial. It looks at the Goulburn Broken Catchment generally, but focuses more specifically on a case study area in the Strathbogie Ranges. This case study area is identified in Figure 10.1, below.

The project brief specified that the case study area be located in the Strathbogie Ranges. Its boundaries were set by the consultants, ensuring that a representative range of areas of the catchment were included. The Hume Freeway passes South West to North East through the area, and both the Goulburn and the Broken Rivers lie within its boundaries. The case study area includes the towns Seymour, Euroa, Benalla and Nagambie, and includes a wide range of vegetation, topography, climates and land uses.

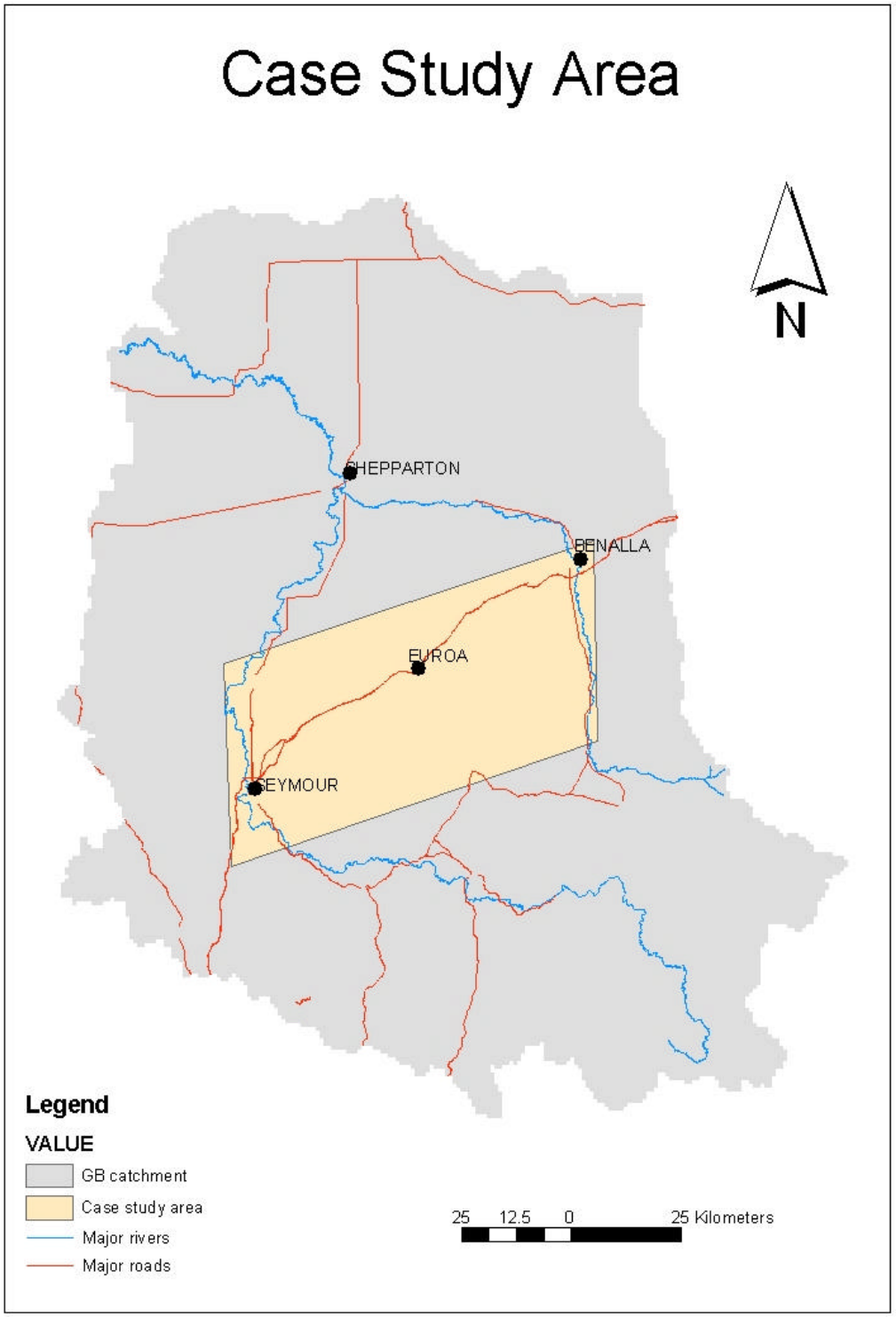



**Figure 10.1: Case Study Area**

# 11. Assessment of policy instruments and options

Chapter 3 of this report looked broadly at landscape change as a policy implementation process. In this chapter of the report we explore in more detail how we could use a range of policy instruments to generate positive or beneficial landscape change via markets, incentives and regulation.

In order to select a recommended shortlist of policy instruments for trialling in this Study a wide variety of policy instruments[12] were reviewed and assessed. The assessment was based on the judgement of the consultancy team and it is recognised that more comprehensive assessments should be undertaken, particularly if relevant settings change at the wider scale – eg Victorian, MDB. Based on this assessment a limited number of instruments were recommended for trialling in Part 3 of the project (see Tables 11.1 – 11.4 below). The tables provide an assessment of the potential use of each mechanism assessed against three primary criteria:

- effectiveness and efficiency
- potential for targeting to specific issues or areas within a catchment
- application and resources required for trial application within the Goulburn Broken.

**Effectiveness and efficiency criteria** used were:

- cost effectiveness,
- potential for a catalytic impact,
- feasibility,
- transaction cost,
- likely reliability in generating desired outcomes,
- potential for market distortions etc.

The **capacity to target criteria** is based on consideration of whether there are specific means for targeting the instruments to different areas or issues in the catchment.

**Suitability for use** in a trial in the Goulburn Broken Catchment is based on an assessment of whether these particular instruments can be applied at a local or regional scale. For example, taxed based instruments are not suitable due to their scale of application. If considered suitable, consideration was given to the resources required for potential application of each of the mechanisms and the technical or financial resources required for trialling them: eg information resolution, level of technical support, cost etc.

Those instruments considered worthy of trialling have been bolded in the table. While each instrument has been assessed individually, consideration has been given to how to apply them in a complementary fashion within an integrated approach. For example, the recommended approaches

[12] Twelve informative, ten types of incentives, thirteen regulatory, ten market based

aim to result in incentives that complement market measures, regulatory processes that facilitate positive change and rights to further develop land that would be conditional on meeting environmental improvement targets.

**Table 11.1: addresses the informative instruments which by their nature rely on voluntary involvement of participants. This is both their greatest strength and weakness.**

| Informative instruments | Effectiveness and efficiency | Capacity to target | Resources required for potential applicationin GB CMA |
|---|---|---|---|
| Community awareness and education | Has been used extensively in NRM and is recognised as an important component of an integrated program of community change | Useful for lifting profile of issues but generally has limited capacity to target tends to be generalised and dependent on voluntary adoption | Established programs underway Moderate resources |
| Education and training | Has been used extensively in NRM and is recognised as an important component of an integrated program | Can be targeted to specific industries and circumstances for example the Master Tree grower is targeted to improving farm forestry skills amongst already involved people within a region | Well establish education and training providers are best placed to design and deliver courses etc |
| Information provision (brochures, media, field days etc) | As per community education an important part of information exchange and adult or industry learning | Limited capacity to target tends to be generalised and based on interested party inquiry | various |
| **Accreditation systems – EMS, QA etc** | Useful for informing markets | Can be targeted to specific enterprises – see Lowe et al, AFFA EMS navigator | Various trials in use throughout Australia. AFFA interested in supporting more work. Useful if linked to standards and BMP. May be possible to develop an EMS for "hill grazing" |
| **Rating standards systems (eg 5 star appliances)** | Useful for informing markets | Could be used for habitat value of revegetation | Requires objective standards and means of testing "products" against specific criteria |
| **Best management practice guidelines** (BMP) | Can be highly effective but best uptake tends to occur when used in conjunction with regulatory instruments – eg cotton pesticide BMP | Can be very targeted but best when generated from within Industry – currently there are many BMP developed for NRM and agriculture | Could be applicable to grazing management, revegetation and veg management |
| **Industry codes** – voluntary self regulation | Cost effective but best used in conjunction with regulatory safety net or back stop – similar to BMP | Is by nature targeted to specific industry conditions | A code of practice for grazing steep land may be useful |
| Monitoring schemes (salt watch, stream watch) | Has been used extensively in NRM and is recognised as an important component of an integrated program | Limited capacity to target tends to be generalised | No justification for further trials in Goulburn Broken CMA |
| Peer group learning eg landcare groups, prograze | Generally regarded as cost effective due to community learning model and in some cases strong industry and production links | Useful for those that participate but possible that saturation has been achieved | No justification for further trials in Goulburn Broken CMA as sufficient are underway |
| **Research and development (R&D)** | Generally regarded as highly cost-effective but requires specialist management if investments are to result in high quality knowledge or application of knowledge | Can be targeted to specific problems and issues depending on design of programs and projects | Can be very resource intensive – best to work with establish R&D funders and providers |
| Demonstration projects and demonstration farms – eg sustainable grazing systems | Regraded as useful for farmer to farming learning | Tends to be location and industry specific | No justification for establishing dedicated demonstration farms but it may useful to consider establishing a network of properties involved in "new management" approaches |

**Table 11.2: Incentives and assistance instruments**

| Incentives | Effectiveness and efficiency | Capacity to target | Resources required for potential application |
|---|---|---|---|
| Grants and subsidy to match private investments | Need to be focused on public good outcomes | Can be specifically targeted to priority activity or parts of the region depending on criteria. Establishment of priority zones or EVC etc useful | Already widely used for NRM by the Goulburn Broken CMA |
| Direct incentives and subsidies | Depends on how they are delivered tend be out of favour with economists particularly production subsidies, however direct subsidies to industry remain a feature of Australian industry policy (ABC RN Background Briefing 2002) | As above | Depends on size of trial and what change or service is being subsidised |
| **Stewardship payments** | Effective if linked to specific management agreements | Can be targeted to specific vegetation communities or locations – The NRE Auction system is a form of stewardship payment | Could be usefully applied to specific priorities eg certain veg communities |
| **Low interest loans** | Have been used extensively in the past to promote plantation development and to distribute drought relief etc | Can be targeted to specific actions if criteria clearly defined. Governments have capacity to borrow at low rates due to risk profile so can be very effective way of directing private sector investments | Access to low interest capital may be a key plank of the veg bank |
| Preferential tax treatments | Investment tax concessions and preferential tax treatments are used extensively to promote "preferred investments" but can result in "tax driven" investment schemes | Tends to be blunt | Limited capacity to target as generally available Australia wide |
| Tax deductibility | Used extensively in relation to business expenses, environment and charities and is instrumental in directing business investment and private donations | Tends to be blunt and applied nationally | Limited capacity to target as generally available Australia wide but registered local environment groups can receive tax deductibility status |
| Cost transfers – cross subsidies | Used by utilities under government direction but out of favour | Is by nature targeted to those areas where cross subsidies are taken from or distributed to | Not applicable |
| Infrastructure provision | Traditionally regarded as key role for Government investment although increasingly public private partnerships and private infrastructure projects are being used | Can be targeted | Not generally applicable but very relevant to changes in local government planning |
| **Bush tenders - auctions** | Intended to be efficient and cost effective way of generating change in management of bush on private land – based on discovery of "market prices" via auction | By nature is selective and targeted. All manner of differential factors can be included in pricing offers for changed management options by land holders | A trial involving a modified bush tender is worth considering for major revegetation work in the Goulburn Broken CMA region and could form part of the CRIS |
| **Cost sharing contracts** | Effective framework for negotiating contributions form various public and private stakeholders/investors | Can be very well targeted depending on negotiations | A trial involving a modified bush tender is worth considering for major revegetation work in the Goulburn Broken CMA region and could form part of the CRIS investment strategy |
| Production subsidies | Regarded as highly inefficient in Australia and out of favour | Can be targeted to specific commodities but tends to distort markets | Not applicable |
| **Rebates – eg rate rebates** | Another effective way of signalling that there public benefits to be derived form specific land management actions/systems | Can be targeted to priorities areas within catchment | Worth considering however question of impacts on local government needs to be looked into |
| Compensation - Adjustment funding | Often used when policy impact on specific business eg. Dairy or Forestry reforms.<br>Important for sweetening reforms and making them acceptable. | Can be targeted to those industries directly and adversely effected by policies | Only worth trialling in the sense of "buying" out grazing or other production rights in the most vulnerable lands |

## Table 11.3: Regulatory Mechanisms

| Legal compliance | Effectiveness and efficiency | Capacity to target | Resources required for potential application in GB CMA |
|---|---|---|---|
| Standards & penalties | Efficiency depends on enforcement effort – used for animal welfare, OHS etc | Can be targeted to specific industries but not much application in NRM | Unlikely to be applied in NRM in foreseeable future |
| Regulation and Prohibition | Used effectively to prohibit certain land uses via the planning system or prohibit certain inputs eg various chemicals or management of certain pest and weeds | Can be targeted | Statutory planning is resource intensive and the more restrictions applied the more resources used to administer system |
| **Conditional permits and licenses** | Conditional permits are used within the statutory planning system to good effect | Highly specific and varied depending on circumstances | Worth considering with cooperation of local governments |
| Resource allocations & Entitlements | Generally applied to common property resources – eg water and forests | Provides a framework for private use of common resources | |
| **Covenants** | Seen as key component of flexible management arrangements by Binning and Young. Trust for nature covenants provide established legal framework for covenanting in Victoria | High capacity to target | Depends on basis of agreements |
| **Contracts & management agreements** | Central to effective commercial arrangements and outcome based payments | High capacity to target | Depends on basis of agreements |
| **Land use and development planning – eg statutory planning** | Provides a framework for determining socially acceptable use and development of land – tends be focused on new or changes in landuse rather than land management | Can be targeted particularly where there is pressure to change land use from rural to urban. Effective at controlling scale and scope of subdivisions | Central to trialling landscape change concept by creating new kinds of "development rights" and attaching obligations or conditions to these. Requires cooperation of local governments |
| Clearing controls | Applied effectively via the planning system since 1989 | Targeted to specific threat to landscape health | Vegetation offsets via habitat hectares may be a useful instrument in region |
| Pollution licences | Not applicable unless salt export licence issued – eg end of valley targets | Tends to require enforcement effort to manage well | May be part of overall region wide strategies to mange salt or nutrient exports |
| Taxes and charges | A catchment levy is effectively a new charge or tax and has been abolished | User charges are generally by nature well targeted, while taxes tend be levied broadly | Not likely to be applicable in trial |
| Codes of practice - mandatory | Forest and plantation management codes could be used effectively to minimise risks to water quality of activity on steeper lands especially for private forestry but unlikely to be politically acceptable for grazing | Can be well targeted to industry specific activity | Important context if plantation and forest areas expand but not likely to be applicable in trial |
| Fines and forfeiture of rights | Not likely to be applicable to private land but could be used for say grazing rights in multi purpose reserves or on leasehold | Can be well targeted | Not likely to be applicable in trial |
| **Harvesting rights** | May be necessary to define forest harvesting rights to secure future investments | Definition of rights can be well targeted and has a large bearing on confidence of investors | Important context if plantation and forest areas expand but not likely to be applicable in trial |

## Table 11.4: Market-Based Mechanisms

| Market-Based Mechanisms | Effectiveness and efficiency | Capacity to target | Resources required for potential application in Goulburn Broken CMA |
|---|---|---|---|
| **Emission markets – eg carbon markets** | Markets are favoured by economists as being efficient ways of allocating resources etc | Can be targeted to specific emission eg carbon | A speculative element of investment in forestry is likely to be carbon markets and therefore definitely worth pursuing |
| Catchment or environmental levies – Brisbane City Council | Effective way of pooling and hypothecating charges to undertake common good environmental work | Can be used to address high priority issues | Unlikely to be applicable in the Goulburn Broken CMA for the foreseeable future. A levy on water users/irrigators may be used to repair upper catchments |
| Charges for resource use – eg pastoral leases | Direct charges for resources use can be effective at internalising costs within a natural resource using industry | Charges are hard target to catchment health processes due to their diffuse nature and difficulty in measuring impacts | |
| Tradeable rights and permits – eg water rights | Where there sufficient large and deep markets tradeable property rights can be very efficient means of generating changes. The establishment of the trading rules and the markets often takes time and requires regulatory support, sufficient certainty etc, see Productivity Commission Report – Creating Markets for Ecosystem Services (June, 2002). | Tradeable systems have limited capacity to be targeted to specific areas as markets tend to seek out the best opportunities first – thus a carbon market may result in the shutting down of dirty power stations more rapidly than investments in plantations, or in plantations where the moist carbon can be stored the most cheaply. They require coupling to other instruments to be targeted | Establishing a framework for competitive markets to generate catchment health outcomes should be one of the main foci of trials. These markets guided by policy appropriate frameworks may result in significant public good outcomes at minimal costs |
| Tradeable development rights | These are generally used to limit development and can be effective at rationing scarce rights eg new house sites in drinking water catchments where the total number needs to be limited | Is used in some specific circumstances where development needs to be allocated within a scarce environment - eg snowfields or water catchments | May be part of the trial I pressure to develop certain parts of the catchment exceed capacity |
| **Creation of new property rights** | Forest rights, water rights, salinity credits, fishing rights, pollution and carbon rights are all examples of "new property rights" that are operating in ways liberated from land tenure | Can be focused on specific issues but tend to required detailed management information | Creative use of existing rights is most likely way of achieving land scape outcomes |
| Performance bonds/refund – eg mining cleanup | Revegetation and site repair bonds are increasingly used to secure guarantees of performance | Specifically targeted to high impact activity | Most suitable for mining or other site specific operations |
| Offset schemes | Offsets are based on the principle that damage to one part of the environment is offset some where else. Victoria habitat hectares is an offset scheme | Transfer and transaction cost as well as high information requirements due to the need to measure offset values | May be useful part of regional trial and may generate significant revegetation or improved management of bush |
| **Revolving funds** | An efficient way to maximise the use of a capital fund in securing changes to land management. | Especially valuable for targeting to high priority sites of interest to "private' conservation | Should be trailed in conjunction with covenants and management agreements |
| Clean-up levies | Like performance bonds | | |

# 12. Potential Policy Instruments

As outlined in the previous chapter, a wide range of instruments can be applied to achieve landscape change. These include informative, regulatory, incentive and market based mechanisms. In sections 12.1-12.4 we describe the instruments that we selected and recommend to the CMA for consideration for use in the case study trial in the Goulburn Broken Catchment.

It is clear that in some cases, a combination of instruments should be applied to achieve the best results. Table 12.1 depicts potential alignment and complementarity of proposed instruments. Instruments can be combined in a complementary fashion depending on the design of a landscape change trial. Table 12.1 is an attempt to determine if there is inherent complementarity between the instruments.

## 12.1 Informative Instruments

*Accreditation systems – EMS, QA etc*

Many systems of certification and accreditation exist and are currently in use in agriculture. Most are focussed on product quality however, incorporating NRM standards and criteria can be quite simple. Specific criteria could be developed for natural resource based industries within the Goulburn Broken CMA and linked to incentives or sanctions if required.

*Rating standards systems (eg 5 star appliances)*

A rating standards system is based on providing an objective set of measurable standards useful for comparison. Traditionally these have been applied in manufacturing and construction however there is no reason why they cannot be applied in NRM. For example, a habitat quality rating could be applied to revegetation and plantations based on simple criteria such as the diversity of species, structural components, protection of prior habitat and feral animal control.

*Best management practice guidelines (BMP)*

BMPs are currently extensively used in agriculture to provide guidance on better practice. By necessity, they require regular revision. Effective adoption pathways are critically important to the effectiveness of BMPs.

*Industry codes – voluntary self regulation*

Industry codes are similar to BMPs in that they provide guidance on acceptable practice.

*Research and development (R&D)*

Given the dynamic nature of our relationships to the Australian landscape ongoing R&D about both biophysical processes and socio-economic relationships is critical. By applying an adaptive management approach all NRM should be part R&D. R&D on the effective design and application of policy instruments has proven highly cost-effective.

## 12.2 Incentives

*Stewardship payments*

Payments made for the stewardship of land and/or other natural resources (eg wetlands), usually linked to some kind of management agreement.

*Low interest loans*

Low interest loans provided by governments have historically been used to promote certain kinds of industry development and/or as parts of assistance packages such as drought or disaster relief.

*Bush tenders – auctions*

The bush tenders are an auction based system for determining the appropriate rates to grant stewardship payments.

*Cost sharing contracts*

Many existing NRM grants are based notionally on cost-sharing with recipients contributing in cash or kind. Cost-sharing simply provides a negotiating framework for apportioning costs in accordance with anticipated benefits.

*Rebates – eg rate rebates*

Both tax and rate rebates are used extensively in Australia. Being rather blunt, the main issues are compliance, cost-effectiveness and difficulty in linking directly to outcomes.

## 12.3 Regulatory Mechanisms

*Conditional permits and licenses*

Development approvals are often granted with specific conditions attached. Rights to harvest have been linked to maintaining adherence to codes such as the Code of Forest Practice. Water and pollution licenses are usually conditional.

*Covenants*

Covenants are conditions or restrictions attached to land titles.

*Contracts & management agreements*

Contracts and management agreements are negotiated agreements between parties based on the principles of contract law. Contractual agreements between parties take many different forms.

*Land use and development planning – eg statutory planning*

The statutory planning system provides a framework for determining and directing land use and development. It is primarily focussed on the development approvals processes and thus inherently reactive. It is focussed on land use rather than land management. Increasingly, Victoria's approach to planning is required to be strategic and facilitating rather than spatial, reactive and restrictive of economic activity.

*Harvesting rights*

Harvesting rights can be used to specify the future right to harvest a managed forest or plantation. They provide certainty to investors and ensure that plantations developed for economic purposes are clearly defined.

## 12.4 Market Mechanisms

*Emission markets – eg carbon markets*

Emissions markets are usually based on establishing a "cap and trade" framework. Capping limits the total emissions permitted at a specified scale (eg a river basin, estuary or air-shed) while trading encourages the most cost-effective and economically efficient emitters to secure the available quotas. The Kyoto Protocol and the resulting carbon markets are essentially a global "cap and trade" framework for greenhouse gas emissions and carbon sequestration.

*Creation of new property rights*

Tradeable water rights, transferable fishing or forest harvesting quotas, carbon credits or development rights are all examples of recently created property rights. In theory they work to introduce market-based efficiencies to the allocation of natural resources. In the purest sense, the right merely needs to be recognised by a buyer and a seller to exist. However, generally the existence of the right needs to be codified or legitimised by governments to provide confidence to markets or to lift legislative restrictions to trade. In the future, recharge rights may be defined and be traded within the Murray-Darling Basin.

| **Table 12.1: Potential Alignment and Complementarity of proposed instruments** | Accreditation Systems | Rating standards systems | BMP | Industry codes – voluntary | R&D | Stewardship payments | Low interest loans | Bush tenders – auctions | Cost sharing contracts | Rebates – eg rate rebates | Conditional permits | Covenants & management agreements | Contracts | Statutory planning | Harvesting rights | Emission markets | New property rights | Revolving funds |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Informative (INF)** | | | | | | | | | | | | | | | | | | |
| Accreditation systems | * | H | H | H | M | H | L | | ? | H | M | L | | | M | M | | |
| Rating standards systems | H | * | H | H | L | L | ? | | M | M | | | | | M | | | |
| BMP | H | H | * | H | H | H | | M | M | M | L | L | | | L | | | |
| Industry codes – voluntary | H | H | H | * | H | | | | | | | | | | | | | |
| R&D[13] | M | L | H | H | * | M | M | M | M | L | L | M | | M | M | M | M | L |
| **Incentives (INC)** | | | | | | | | | | | | | | | | | | |
| Stewardship payments | H | L | H | | M | * | | H | M | H | | H | H | | | | | |
| Low interest loans | L | ? | | | M | | * | | H | | | H | | | | | | ? |
| Bush tenders – auctions | | | M | | M | | H | * | H | | | H | H | | | | | |
| Cost sharing contracts | ? | M | M | | M | M | H | H | * | H | | H | H | | | | | |
| Rebates – eg rate rebates | H | M | M | | L | H | | | | * | | | | H | | | | |
| **Regulatory (R)** | | | | | | | | | | | | | | | | | | |
| Conditional permits | M | | L | | L | | | | | | * | H | H | H | M | M | L | |
| Covenants & management agreements | L | | L | | M | H | H | H | H | | H | * | H | H | M | | | H |
| Contracts | | | | | | H | | H | H | | H | H | * | H | ? | H | H | |
| Statutory planning | | | | | M | | | | | H | H | H | H | * | H | | L | |
| Harvesting rights | M | M | L | | M | | | | | | M | M | ? | H | * | H | H | |
| **Market Mechanisms (MM)** | | | | | | | | | | | | | | | | | | |
| Emission markets | M | | | | M | | | | | | M | | H | | H | * | H | |
| New property rights | | | | | M | | | | | | L | | H | L | H | H | * | |
| Revolving funds | | | | | L | | ? | | | | | H | | | | | | * |

**Key:** H - High complementarity between instruments L - Low complementarity between instruments * - N/A

M - Medium complementarity between instruments ? – Uncertain complementarity

[13] R&D is highly complementary to all proposed instruments because at the lease, it is all ways possible to do R&D into effective design and application of the instrument

# 13. Proposed options for trial by the GB CMA

This section outlines options for achieving landscape change in the catchment and the instrument or combination of instruments that could be used to achieve the desired change. The specific instruments for each option are depicted in bold type, and these correspond to those in Table 12.1 in the previous chapter. These options were proposed to the CMA for their consideration. They are not necessarily what we attempted to map using the GIS, as not all can be depicted spatially.

Many of the proposed options combine various instruments and are based on the assumption that there will be significantly improved spatial planning techniques in use in the near future. These will permit incorporation of information relevant to catchment health within the catchment management and statutory planning systems and allow the specific instruments to be applied where relevant and effective.

The commercial landscape change drivers have been grouped into those which typically require planning permits and those which do not. The major changes occurring throughout the catchment can be categorised as those kinds of "intensification" which typically trigger the development approval process from local government eg:

- Expansion of the equine, viticulture and intensive animal industries;
- Subdivision and the increasing numbers of "hobby" or lifestyle blocks;
- Proposals for tourism and/or cluster title or "village farm" developments etc.

**Option 1 – Grazing BMP**

A grazing BMP (Best Management Practice) is an informing incentive that could be applied to vulnerable country.

Purpose: This option aims to determine the effectiveness of various incentives in improving grazing management and vegetation cover on vulnerable lands, particularly steep slopes.

Requirements:

- an accepted **BMP** or **industry code**
- an ability to measure adherence and benchmarks cost effectively – **star rating**
- One or more **direct financial incentives**, preferably **rate rebates**, possibly access to weed and pest control subsidies
- stewardship payments
- Accompanied by information provision

**Option 2 – Landscape Change Tender**

Multi purpose landscape change tender (MBI Trial).

Purpose: This option aims to determine the nature of competitive markets for stewardship payments that promote natural regeneration of native vegetation. This trial expands the BushTender (see MBI application).

Requirements:

- Sufficient funds
- **Tender** based delivery methods
- Information on priority areas for natural regeneration
- Multiple benefit outcomes
- Standard **contracts** linked to title
- Capacity to deliver annuities over sufficient time-span (10 years?) in accordance with a **management agreements**
- May require incorporation of future **harvest rights**

**Option 3 – Regional Revolving Fund and Covenants**[14]

Protecting high value off-reserve conservation assets.

Purpose: To protect via purchasing and covenanting high value conservation assets on freehold land.

Requirements:

- Established capital pool for property purchase
- Review **standardised covenanting arrangements** for adequacy (eg TFN)
- Identification of priority properties
- Properties sold with **covenants** may also have **management agreements, stewardship payments** and/or other incentives attached.

**Option 4 – Incentives for Recharge or Multi-Purpose Forestry**

Purpose: To attract investment to specified priority zones within the catchment including low and medium rainfall.

14 Trust for Nature already does this– but what is being proposed is a regional rather than statewide initiative.

Requirements:

- Definitions of priority zones for reafforestation
- Structuring of differential **incentives** depending on nature of priority
- **Tendering** to determine size of top-up required
- Further **R&D** to reduce risks for new forestry systems
- Access to low-interest loans/bonds to stimulate investment
- Long-term **cost-sharing contracts**
- Future **harvesting rights** defined
- Predefined shares of future **carbon credits** reflecting investment
- Potential use of rate **rebates** for high priority reafforestation zones

**Option 5 – Conditional Development Permits**

Linking rights to capitalise rural land via subdivision or other forms of development to obligations to improve NRM.

Purpose: To redefine expectations of rights to subdivide rural land.

Requirements:

- Using **statutory planning** for regional strategic outcomes
- Use of **conditional permits** to regulate development impacts

**Option 6 – Cluster Titles**

Accommodate population pressure using new business structures.

Purpose: To facilitate designed settlements and recreation facilities which enhance environmental and NRM outcomes and support new rural business models – provides alternatives to traditional rural subdivision patterns.

Requirements:

- Using statutory planning for regional strategic outcomes
- Use of **conditional permits** to regulate development impacts
- Has major implications for infrastructure and service provision
- Developments can be linked to other **incentives** and **market-based processes**

**Option 7 – Vegetation Rate Rebate**

Purpose: To provide incentives to landowners to increase vegetation cover.

Requirements:

- Councils introduce differential **rate rebates** in rural zones based on percentage classes of vegetation cover
- Using statutory planning for regional strategic outcomes
- Establishment of environmental and landscape significance zones
- Introduce transferable development rights designed to concentrate future housing development in designed locations, preferably clusters
- Use **rate rebates** and other incentives to encourage NRM outcomes
- Provide stewardship payments for specific management
- Ensure all development approvals have appropriate **conditions**

**Option 8 – Environmental Improvement Plans and Overlays**

Purpose: To identify and improve priority areas for environmental management including habitat enhancement, vegetation connectivity, salinity and water quality. This will focus future planning and incentive decisions on those landscape components that will generate the greatest environmental improvement.

Requirements:

- Habitat enhancement and revegetation priority overlays introduced into local planning schemes
- Using **statutory planning** for regional strategic outcomes
- **Conditional permits**
- Potential links to rate **rebates** and other incentives
- Priority areas for **stewardship payments** and **management agreements**

**Option 9 – Acquisition or covenanting of Priority vegetation patches and corridors**

Purpose: To protect vegetation patches of priority ecological communities and vegetation corridors.

Requirements:

- Identification of highest priorities for protection
- Attempt to protect using other instruments – eg: covenants, management agreements

- Willingness to use compulsory acquisition powers as required
- Protection with statutory planning scheme

**Option 10 – Centre for Multi-Purpose Forestry R&D**

Purpose: To develop critical mass of R&D capacity in low to medium rainfall areas.

Requirements:

- Focus direction of departmental and university **R&D** to high water use, woody agroforestry systems for low to medium rainfall areas
- Identify ways to achieve biodiversity benefits from plantations
- Improve education and training capacity within the region
- Formalise and accelerate peer group learning
- Document and develop demonstration projects

**Option 11 - Biomass Industry Cluster**

Purpose: To explore comprehensive array of initiatives that would facilitate development of biomass energy industries including short rotation and plantation biomass to electricity

Requirements:

- Regional feasibility studies
- Industry development incentives
- "Green electricity" markets.

**Option 12 – Regional Infrastructure Coordination**

Purpose: Rationalising infrastructure provision, landuse planning and industry development

Requirements:

- Using **statutory planning** for regional strategic outcomes
- Creation of new development rights to facilitate clustering
- High complementarity between instruments

# 14. Modelling Landscape Change

## 14.1 Introduction

Chapters 12 and 13 of the project identified instruments and combinations of instruments which could bring about landscape change in the Goulburn Broken Catchment. Following an assessment of their feasibility and applicability, and subject to availability of data[15], some of the proposed Options for Trial have been modelled using a GIS system with a view to case-testing them in the biophysical setting of the catchment. Where possible, these GIS trials have been linked to the categories used in the financial calculator. These trials have been applied to the case study area in the Strathbogie Ranges identified in Chapter 10.

Data provided by the Goulburn Broken CMA and DNRE enabled the consultants to generate GIS based maps spatially which depict various land characteristics in the area as well as identify areas with potential for a range of changes to landuse, depending on a variety of commercial or policy drivers.

For each of the trials, protocols for their spatial representation were prepared. This involved three main steps.

1. A statement of the geographic OBJECTIVE of the trial (with reference to NRM objectives).
2. From the objective, a list of the SPATIAL INPUTS that would be affected. There are two parts to this. The first is the set of spatial inputs which *define the area of interest*. The second is the spatial data which represents the *fulfilment of the objective*. For example; if the objective was to revegetate currently cleared areas on a certain slope and rainfall pattern, then the data to define the area of interest would be the spatial intersection of specified categories of land cover, slope and rainfall. The data representing the fulfilment of the objective would be the areas defined by the intersection now vegetated to a certain community, at certain density etc.
3. Generate the capacity to describe the SPATIAL OUTCOMES. The spatial output will be the sum of the spatial inputs. However, the spatial *outcome* from this output will be its effect or impact on other related data sets (ratio of land values to production value; biodiversity values; carbon sequestration; vegetation strategy targets; watershed values) and which requires further analysis to generate. The measurement of the spatial outcome if and when it were achieved in the real landscape provides the monitoring and evaluation methods suitable to assess the options.

The GIS project files are included on the CD in the folder titled “GBGIS”. To view these projects in Arcview, this folder must be saved to the c drive of the user’s computer (eg: c:\GBGIS). Each trial is included as a subfolder containing the Arcview project files. There is one “view” for each which contains all the layers for that trial. These layers can be modified using the Arcview software. The project file for each trial also contains a “layout”, which is the GIS format map produced. These maps are also supplied digitally in the form of a Microsoft PowerPoint presentation, to enable easy viewing. Selecting the "Notes Page" view provides information on each of the maps.

[15] No attempt has been made within the project to determine the quality or reliability of the data for these purposes, the project has used the data provided to try to model prospective changes at landscape scale.

## 14.2 GIS Modelling in the entire Goulburn Broken Catchment

### 14.2.1 Mapping natural regeneration potential

The first GIS output required was the identification of areas of the catchment with potential for natural regeneration – this information was intended to provide information for option two, the landscape change tender, which was described in the previous chapter. This provided a basis for determining areas that could be targeted for landscape change in the various trials. Identification of these areas required identification of areas of the catchment without existing forest, woodland or plantation cover but located close to sufficient seed trees.

The quality of all the maps produced is highly dependent on the quality of the data set provided and the machine rules used.

Maps generated for trials 1 and 2 are still relatively coarse, and may seriously underestimate this potential. However given the quality of data they indicate great potential (up to tens of thousands of hectares) for applying incentive mechanisms for natural regeneration in many parts of the catchment. Clearly further work is required on refining the incentive mechanisms and developing the catchment blueprint which specifies priority areas for natural regeneration. A first step would be to overlay CMA Vegetation Strategy priority EVC's (less than 15% of 1750) with high quality information on prospective seed sources. In addition testing the willingness of landholders to accept these kinds of incentives would be useful and could be part of the Market Based Instrument project.

Refining the resolution of the GIS data used would result in more accurate maps and therefore improved targeting of incentives. Discussions with DOI identified that this approach could be undertaken more comprehensively using data obtained from aerial photography as this would provide a higher resolution census of prospective seed trees. In practice incentive contracts – stewardship contracts or regeneration milestone payments will require site inspections.

#### Trial 1- Natural Regeneration on steep lands

The objective of Trial 1 was to identify the amount of natural regeneration possible on slopes in the absence of grazing pressure. For comparative purposes, the same method was applied to slopes greater than $15^{o}$ (Trial 1a) and also to slopes greater than $18^{o}$ (Trial 1b).

Natural revegetation is dependent on a number of factors. The main ones relate to the availability of seed trees and a lack of grazing pressure for establishment. Both can be spatially represented by the density and occurrences of existing vegetation. It is assumed that either land adjoining remnant vegetation or with tree density of at least 5-10 trees/ha would be the minimum requirement for natural revegetation in these conditions. The presence of an area of forest vegetation at this minimum density would therefore be needed to ensure successful natural regeneration over a given area.

The area identified in this trial can be input into the "steep" forest type section of the Financial Calculator in order to determine associated costs and benefits possible from implementation of this trial.

#### Trial 2 - Natural Revegetation on land below $15^{o}$ slope

The objective of Trial 2 was to identify the amount of natural revegetation possible on slopes below $15^{o}$ in the absence of grazing pressure. This trial has been divided into two components - areas with rainfall between 700-800 mm (Trial 2a) and areas with rainfall below 700mm (Trial 2b). Areas with

rainfall above 800mm were excluded because many of these lie in the high rainfall valleys, where multi purpose reafforestation is not regarded as a high priority for catchment health.

### Trial 9 - Dry Area Plantation

The objective of Trial 9 was to identify areas of the catchment with low rainfall and existing vegetation cover suitable for revegetation through the establishment of "dry area plantations". The area has been identified by locating areas with rainfall between 500-700mm and less than 20% existing vegetation cover. Optimally, irrigated land, towns and roads would be excluded from the area also, if the data was available for input into the GIS system.

The area identified as having potential for revegetation in this trial can be input into the "Dry area plantation" forest type section of the Financial Calculator in order to determine associated costs and benefits possible from implementation of this trial.

### Intensification of Agriculture

The purpose of this trial was to identify locations in the catchment likely to be subjected to intensification of agriculture – either raised bed cereal cropping, horticulture or establishment of intensive animal industries. For the purposes of this trial, these areas were defined to be those with slope between $0^o$ and $5^o$ and with less than 20% existing vegetation cover.

Land above 300 metres has been marked on the maps as “land suitable for cool climate horticulture", but its application is subject to water supply and drainage conditions.

Table 14.1 summarises the areas identified in each of the catchment wide trials described above and identifies the name of the folder for each trial provided on the CD.

**Table 14.1: Summary of catchment wide GIS Trials**

**Total catchment area = 2,485,228 hectares**

| Trial | Conditions | Potential Area (hectares) | % Of catchment area | CD Folder Name |
|---|---|---|---|---|
| 1a – natural regeneration | Slope $>15^o$ | 18,270 | 1% | Trial1a |
| 1b – natural regeneration | Slope $>18^o$ | 8,775 | 0.4% | Trial1b |
| 2a – natural regeneration | Slope $<15^o$, rainfall 700-800mm | 70,367 | 3% | Trial2 |
| 2b – natural regeneration | Slope $<15^o$, rainfall <700mm | 367,759 | 15% | Trial2 |
| 9a - Dry Area Plantation | rainfall 500-600mm excluding existing | 259,036 | 10% | Trial9 |

| Trial | Conditions | Potential Area (hectares) | % Of catchment area | CD Folder Name |
|---|---|---|---|---|
| | vegetation cover | | | |
| 9b - Dry Area Plantation | rainfall 600-700 mm, vegetation cover <20% | 416,303 | 17% | Trial9 |
| Intensification of Agriculture A | All elevations | 1,655,183 | 67% | IntAgric |
| Intensification of Agriculture B | Above 300m | 281,893 | 11% | IntAgric |

## 14.3 GIS Modelling in the Case Study Area

### 14.3.1 Geographic Context Maps

The first phase of the GIS modelling in the case study area involved the mapping of a number of general geographic data sets to establish the existing condition of the area and to set the context for the case study. These maps (also supplied digitally) depicted the following:

**Table 14.2: Geographic Context Maps**

| Map | Map file name |
|---|---|
| Existing vegetation cover | VegCover_SA.jpg |
| Location of threatened species | SAflofau.jpg |
| Location of roads | SAroads.jpg |
| Location of waterways | SAwaterways.jpg |
| Landuse | SA_landuse.jpg |

Once the existing conditions of the case study area had been identified, GIS modelling for a number of landscape change options was performed. These are described in the following section.

### 14.3.2 GIS Models

**Natural regeneration**

The parts of the case study area suitable for encouragement of natural regeneration were identified in the same way as for the entire catchment, described previously for the catchment wide Trials 1 and 2.

**Acquisition of priority ecological communities and corridors**

The purpose of this trial was to identify priority ecological areas to protect and enhance via acquisition via rotating funds, public funds or other protection instruments. The area of interest was limited to locations of threatened flora and fauna species in areas with greater than 20% vegetation density. For comparative purposes, both a 100m and a 200m buffer around these locations were used to identify priority land for compulsory acquisition.

**Intensification of Agriculture/cropping**

This trial was applied both catchment wide and to the case study area. The variables are the same in each.

**Potential Equine Areas**

The purpose of this trial was to identify areas likely to be subjected to further expansion of the equine industry. The equine industry prefers land in the gently sloping foothills or free draining land on the plains (the latter is difficult to map at this scale). The areas identified were therefore limited to slopes between $0^o$ and $15^o$, and also $5^o$ to $15^o$ slope for comparison, in areas with elevation less than 300m above sea level and with less than 20% or 50% existing vegetation cover. The areas identified on the map generated are subject to suitable drainage conditions.

**Potential Viticulture Areas**

The purpose of this trial was to identify areas likely to be subjected to further expansion of the viticulture industry. This has been defined as areas with slopes between $5^o$ and $15^o$, less than 20% existing vegetation cover. This has been split into three categories and (a) less than 300m elevation or (b) greater than 300m elevation and (c), a 2 km wide "viticulture buffer" along the Goulburn River has been included here as soils and drainage are known to suit viticulture. All areas identified in the map generated are subject water availability and to suitable drainage conditions.

**Cluster Titles**

This trial involved identifying priority areas in which to locate cluster titles/lifestyle properties for future development in the catchment. Any new development should be located close to existing service centres (15km radius) to minimise infrastructure demand. These areas should not currently be densely vegetated, so as to minimise vegetation loss from development, therefore areas with vegetation density greater than 50% have been excluded. A further requirement for selection of priority areas for cluster titles is land with slopes between $10\text{-}20^o$, in order to maximise the appeal of the area through inclusion of good views and privacy.

**Additional plantation above 700mm rainfall**

Rather than duplicate studies that have already been completed, comprehensive identification of areas with rainfall above 700mm suitable for plantations can be sourced from the work of Bernard Robb of DNRE. For the purposes of this study however, areas with rainfall over 700mm per annum, less than $18^o$ slope, less than 20% existing vegetation cover and without significant habitat have been used to generate an indicative map of potential areas for new plantations.

The area identified in this trial can be input into the "Additional plantation above 700mm" forest type section of the Financial Calculator in order to determine associated costs and benefits possible from implementation of this trial.

**Potential Development Zones**

Potential development zones in the case study area have been identified as the intersection of the areas identified in the trials for intensification of cropping, equine industry, viticulture, cluster titles and additional plantations. Of course, these areas combined constitute a significant proportion of the case study area. It is not recommended that all these areas be ear-marked for development, the trial merely points out the extent of the case study area that could be subjected to further development given sufficient demand in the wider economy for these kinds of landuses.

A map has not been produced for this trial, as there is a significant proportion of the case study area that would be suitable for a variety of uses. Opening the subfolder on the CD called “DevtZones” and selecting the layout view of the project file enables the user to see any combination of potential land uses.

**Trial 8 - Priorities for riparian restoration investment**

The purpose of this trial is to identify the extent of remnant vegetation riparian areas and how much revegetation would be necessary to achieve a 100m buffer along rivers and a 50m buffer along major streams. This trial also identifies opportunities for linking existing remnants in riparian zones through natural regeneration or revegetation processes. This was based on Wilson and Lowe’s (2002) GIS machine rules pertaining to riparian and riverside remnant vegetation to rivers in the case study area to identify buffers.

The area identified requiring revegetation in this trial can be input into the "environmental / streamside" forest type section of the Financial Calculator in order to determine associated costs and benefits possible from implementation of this trial.

**Bio-enhancement**

This aim of this trial was to identify areas suitable for the issuing of conditional development permits. It shows streams and rivers and existing vegetation cover. If a permit application was lodged for an area with native vegetation, or along a waterway, a condition of the permit should be that restorative revegetation works been undertaken so as to protect and enhance streams and vegetation. This trial identifies areas 50m either side of streams or with vegetation cover greater than 20% as priority areas for enhancement.

**Biomass Industry Areas**

In order for a biomass industry to be viable, it must be located close to road or rail in order to minimise transportation costs. To minimise transmission losses the plant should be located in close proximity to high voltage transmission lines. The GIS modelling has produced a map based on the assumption that any new biomass industry would be located within 20km of the major centres of Benalla, Seymour or Euroa. Fuel source areas with rainfall less than 700mm would be suitable for coppice harvesting and areas with rainfall greater than 700mm would be suitable for supply of fuelwood from plantation thinnings.

Table 14.3 below summarises the areas identified for each GIS trial applied to the case study area

**Table 14.3: Summary of case study GIS Trials**

**Total case study area = 387,438**

| Trial | Conditions | Potential Area (hectares)* | % Of case study area | Folder Name |
|---|---|---|---|---|
| 1a – natural regeneration | Slope >15$^{o}$, | 6,174 | 2% | Tria1aSA |
| 1b – natural regeneration | Slope >18$^{o}$, | **2,637** | 1% | Trial1bSA |
| 2a – natural regeneration | Slope <15$^{o}$, rainfall 700-800mm, cleared areas veg <20% | **25,626** | 7% | Trial2aSA |
| 2b – natural regeneration | Slope <15$^{o}$, rainfall <700mm, cleared areas veg <20% | **93,712** | 24% | Trial2bSA |
| 5a - Acquisition of priority ecological communities and corridors | 100m buffer | 478 | 0.1% | Trial5 |
| 5b - Acquisition of priority ecological communities and corridors | 200m buffer | 1,612 | 0.4% | Trial5 |
| Intensification of Agriculture A | All elevations | 309,498 | 80% | IntAgricSA |
| Intensification of Agriculture B | Above 300m | 91,854 | 24% | IntAgricSA |
| Potential Equine Area A | 0-15$^{o}$ slope, below 300m elevation, <20% veg cover | 13,769 | 4% | Equine |
| Potential Equine Area B | 0-15$^{o}$ slope, below 300m elevation, <50% veg cover | 12,435 | 3% | Equine |
| Potential Equine Area C | 5-15$^{o}$ slope, below 300m elevation, <20% veg cover | 15,043 | 4% | Equine |

| Trial | Conditions | Potential Area (hectares)* | % Of case study area | Folder Name |
|---|---|---|---|---|
| Potential Equine Area D | 5-15$^{o}$ slope, below 300m elevation, <50% veg cover | 15,402 | 4% | Equine |
| Potential Viticulture A | 5-15$^{o}$ slope, <20% veg cover, under 300m elevation | 15,043 | 4% | Viticulture |
| Potential Viticulture B | 5-15$^{o}$ slope, <20% veg cover, over 300 elevation | 45,357 | 12% | Viticulture |
| Potential Viticulture C | 5-15$^{o}$ slope, <20% veg cover, 2km from Goulburn River | 1,754 | 0.5% | Viticulture |
| Cluster titles | 15km from service centres, vegetation cover <50%, slopes between 10-20$^{o}$ | 8,890 | 2% | Cluster |
| Additional Plantations >700mm rainfall | <18$^{o}$ slope, <20% vegetation cover, excluding habitat areas (100m radius from flora and fauna locations) | **133,497** | 34% | Addplantation |
| Trial 8 – riparian restoration | Based on Wilson & Lowe's biodiversity enhancement rules (riparian areas only) | **14,836** | 4% | Trial8 |
| Bio-enhancement | Veg >20%,<br><br>50m either side of streams | 62,285<br><br>9,883 | 16%<br><br>3% | Bioenhancement |
| Potential Biomass Industry | 20km from service centres, > 700mm rainfall and 0-15$^{o}$ slope | 76,498 | 20% | Biomass |
| Potential Development Zones | Combination of all trials | n/a | n/a | DevtZones |

* Highlighted figures can be input in variables sheet in financial calculator provided.

## 14.4 Conclusion

The GIS modelling performed shows the spatial impact of each of the trials by identifying potential areas suitable for each. It is important to note however, that identification of potential areas for a particular use does not tell the whole story. It is necessary to look at the maps considering the wider context of community values and existing conditions. It is possible to further assess the findings of these GIS models against the degree to which they satisfy other NRM goals using the financial model outlines in Chapter 8 and provided on the attached CD.

Additionally, the landscape change represented by the trial of any of the revegetation initiatives may be assessed against NRM and commercial objectives/principles to contribute to an evaluation of the merits of each option. The NRM and commercial objectives which might be used include:

- biodiversity values (does the landscape change result in enhanced biodiversity values?)
- vegetation strategy goals (does the landscape change contribute to meeting these goals?)
- watershed quality (does the landscape change result in enhanced watershed functions?)
- greenhouse (how much extra carbon sequestration (or carbon credits) has been achieved?)
- opportunity cost of the landuse (what impact does the landscape change have on production values/unit area?)

A demonstration of how these assessments might be applied to an area which could be revegetated by the application of one of the trials is set out in the following table:

**Table 14.4: Assessment of Trials**

| **Outcome Assessment** | **GIS Output** | **Report On** |
|---|---|---|
| Biodiversity Values | Intersection of revegetated areas with biodiversity enhancement areas (from NRE) | Achievement of biodiversity goals (as increase in area) |
| Vegetation Strategy goals | Intersection of reforested areas with pre European settlement vegetation ("evc1750c") | Additional areas of each pre European settlement vegetation type achieved. Calculate % representation before and after in case study area. |
| Watershed Quality | Area of additional vegetation (i.e. total of all reforested areas) | % increase in forested portion of case study area. |
| Greenhouse gases | Area of additional vegetation (i.e. total of all reforested areas) | % increase in potential $CO_2$ sequestered in case study area.<br><br>Value of carbon credits represented by revegetated area. |
| Opportunity Cost | Area of additional vegetation (i.e. total of all reforested areas) | Loss of other farming production value in the total of the reforested areas.<br><br>Recalculation of production cost/land cost ratio for the case study area. |

The results will add value to the assessment of landscape change outcomes because they will be both quantitative and geographical in nature.

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# APPENDICES

# Appendix 1. Addressing the project brief

This project has been implemented in 3 stages, culminating in separate reports for each stage, as per the project brief. For ease of use, however, the Part 3 report comprises three sections. The first incorporates an updated consolidation of the Part 1 reports and the second section is the original Part 2 report. The final report incorporates the outputs of Part 3 and serves as a stand alone report covering the entire project, offering a single project reference. A CD Rom is provided which includes:

- A PDF file of the report – Adobe Reader is necessary for viewing this file
- Financial calculator (Excel file)
- GIS based maps and explanations (Microsoft PowerPoint file)
- GIS project files (Arcview format)

**Part 1 – Evaluate current and investigate alternative viable options for achieving natural resource management outcomes through landscape change.**

The Part 1 Report consisted of 4 stand alone sections:

1. Evaluation of Options;
2. Options Discussion Paper;
3. Preliminary Investment "Prospectus"; and
4. An annotated literature Review

| Task as per brief | Output | Chapter |
|---|---|---|
| Report outlining: | | |
| a) The nature and extent of landuse change occurring in the catchment. Identify drivers and impacts on natural resources, negative or positive; | Part 1 Report – Exploring Landscape Change Options | 1, 2 |
| b) Existing mechanisms operating in the Catchment for achieving natural resource management outcomes and the ability of these mechanisms to achieve landscape change. An example is the Victoria Planning Provisions (including Municipal Strategic Statements). | Part 1 Report – Exploring Landscape Change Options | 2 |
| c) Potential use of other mechanisms. Examples include but are not restricted to:<br>• Body corporate<br>• Vegetation bank<br>• Management payments<br>• BushTender<br>• Communal grazing | Reviewed in the options paper reported in part 1,2 & 3 | 3, 4 |
| d) Identification of areas of the Catchment to target for landscape change and which mechanisms will be most appropriate in which areas. | Part 3 report | |

| Task as per brief | Output | Chapter |
|---|---|---|
| e) Prospectus to be used to attract significant public and private investment into the Goulburn Broken Catchment. | Preliminary prospectus and final as per Part 2 Report - Part 2, Investing in Landscape change | 7 |
| f) Summary for inclusion in the Regional Catchment Strategy. | Various reports sent to Danny O'Neil | |

**Part 2 - Develop mechanics of the "Vegetation Bank" i.e. how it would operate.**

The concept of a 'Vegetation Bank' has been superseded by the more detailed 'Catchment Revegetation Investment Model' due to considerable early interest in investment by both private and public sectors. Consequently, the Part 2 report details this investment model.

| Task | Output | Chapter |
|---|---|---|
| Report outlining operating mechanisms for a Vegetation Bank in the Catchment. The report will look at options for payment including annuities, grants, subsidy, leasing. | Concept of a vegetation bank explored in Part 1 Report - Options Discussion Paper. Preliminary prospectus prepared. Detailed investment model developed and refined | 7 |
| | Part 2 Report - Catchment Revegetation Investment Model | 7 |

**Part 3 - Case Study: Landscape Change in the Strathbogie Ranges**

Given that data obtained was in GIS format and was as equally available and as easily applicable for the entire catchment as the Case Study area, modelling of options has been applied to the entire catchment as per discussions with the project manager. This has extended the scope of the investigation considerably in geographic terms rather than conceptually.

| Task | Output | Chapter |
|---|---|---|
| Report focussing on landscape change in the Strathbogie ranges. Report must show: | | |
| The study area in the context of the Goulburn Broken Catchment | GIS based map | 10 |
| Distribution of ecological vegetation classes, identification and location of significant species, communities, habitats, sites and/or key ecological resources and if available, vegetation condition and native grass mapping | As per DNRE provided GIS data | 14, CD Rom |

| Task | Output | Chapter |
|---|---|---|
| Location of waterways, major roads, towns, salinity priority areas, pest plant and animal priority areas, suitable areas for farm forestry | As per DNRE provided GIS data | 14, CD Rom |
| Analysis of suitable options for landscape change | Assessment of policy instruments and recommendation of options for trial by GB CMA | 11, 12 |
| Trial application of a suite of suitable options for landscape change including the development of monitoring and evaluation component to test how the landscape actually responds when these options are implemented. | | 13, 14 |

# Appendix 2. Reafforestation and New Directions for Forestry and Plantations[16]

## Introduction

In this section we aim to convey the importance of understanding that the new kinds of forestry, plantations and multi purpose reafforestation will be a major departure from conventional or accepted plantation forestry practiced in Australia. The success of the "new forestry[17]" will depend on how well catchment managers and the forestry industry and profession handles a series of critical relationships including:

- relationships between vegetation management at a landscape scale, catchment hydrology, streamflows and water quality;
- relationships between site and sub catchment planning and forest and plantation design and management in terms of delivery of environmental services (salinity mitigation, habitat, carbon, run-off, recharge);
- relationships between reafforestation and plantation design and management, industry structures and regional development (planning, demography, rating, roads, schools and services etc);
- relationships between sources and modes of investment in plantations, and community engagement in and acceptance of large scale reafforestation plantation developments; and
- engagement on the part of the catchment managers, forestry professionals and forest industries with other sectors of society.

Drawing on the R&D funded by Land & Water Australia and other R&D Corporations through the Joint Venture Agroforestry Program (JVAP) and other initiatives over the past decade we argue that the prospects for reafforestation will be abundantly improved if plantation and vegetation -related policies support landscape restoration through multi-functional forestry. The research funded through JVAP integrates environmental and commercial drivers of revegetation.

## Perceiving - landuse choices are symbolic and political

All Australian landscapes are cultural – in that they have been fashioned by the numerous choices of countless generations, including ours. These landscapes are interpreted and reinterpreted through the lens of our culture. Both belief and physical landscapes are formed by cultures working on or with nature (and nature working on culture) and understood through frameworks of belief and cultural understanding which continue to evolve and adapt.

[17] "New forestry" is not strictly new and used in inverted comers here because forestry's role in dry areas, in achieving multiple social objectives and environmental outcomes and in making contributions to catchment management and protection is definitely not new.

Australia's vegetation, our landscapes and our creatures are defining features of our sense of national identity, our culture and our values. They figure prominently in our history, our dreaming, and our stories. Even our national symbols – our money and coat of arms – display them. But it is in our visual arts that Australian landscapes are most powerfully displayed, from ancient rock galleries at least 40,000 years old to the central desert dot painting; through Bouvelet and Von Guerard celebrations of nature's awesome grandeur, to the impressionists capturing fleeting moments of Australia's changing and brilliant light. Albert Namatjira immortalised the outback. Boyd, Tucker, Nolan, Williams and Olsen et al helped to reinterpret our myths and our landscapes after World War 2. Recent international interest in aboriginal art emphasises the importance of art instilled with meaning - symbols connected to nature and culture. In September 2000 the world watched, literally, as our landscapes and its potent symbols featured in the Olympic ceremonies.

Given that plantation forestry powerfully reshapes landscapes we should be giving more deliberation to the community, cultural and ecological impacts, as well as efficient commodity production. Yet are the cultural and landscape contexts adequately taken into account in plantation site selection, design or layout? Why are these not considered as serious features of plantation planning today?

In our complex, multi-cultural, post-modern Australia, culture, belief and values and therefore understandings of landscape are far from homogeneous. Landscapes and the choices made about them are experienced in different, distinctly personal ways. The diverse relationships people have with landscapes - what they see, understand, interpret and value - are not only dynamic, but culturally, historically and privately determined by a combination of belief, values, understanding and political and economic ideologies (Alexandra 2001).

Any given landscape can be a confusion of moral universes, clashing ideologies and conflicting perceptions – *"economic erotica to some, ecological pornography to others".* Little wonder then, that there is community outrage and conflict over major landuse choices, such as the wholesale transformation of regions with plantation developments. While some people simply don't like change, it is important to understand that there are better ways of informing public debate.

## Informing debate – making informed choices

Most Australians live in the temperate forest and woodland zones close to the coast, because, according to Griffith Taylor (1940), Australia's settlement patterns are determined by environmental constraints, including the discomfort experienced in the vast, inhospitable hot, dry bulk of the continent. The temperate forests and woodlands zones are by comparison, relatively well watered and amenable to European-style settlement. Most of the country's agricultural development has occurred here, and in the wetter margins the recent expansion of hardwood plantations has been spectacular.

Both these waves of land development – the removal of vast tracks of "scruffy", idiosyncratic native vegetation and the instigation of parcels of vigorous, uniform fibre farms – has been sponsored by Government decisions to provide favourable taxation treatment to primary production. Agricultural development was supported by generous taxation deductions for clearing. Likewise, increasing plantations was also deemed in the "national interest" but the massive investments in plantation expansion have occurred because of the tax effective nature of plantation schemes, with most specifically designed to reduce tax liabilities by achieving *primary producer* status for the investors (JVAP 2002). The significant

influence of tax is demonstrated by a reduction of two thirds in the area planted after the abolition of the 13 month rule[18].

Clearing throughout much of the 20th century and plantation development in the 1990s are examples of choices Australian society has made to support and to allocate financial resources to specific activities and their resultant impacts in the landscape.

Society defines and allocates resources and places differential value on different land-uses and industries through political processes. Despite rhetoric about free markets, Australian Governments continue to allocate substantial subsidies either directly, via tax foregone or through subsidised use of environmental and natural resources (ABC RN 2002, EA 1996; Industry Commission 1994). "Corporate welfare" is estimated at many billions of dollars and only rarely are the choices and the criteria for making them made explicit and transparent (ABC RN 2002).

Perhaps the closest Australia has come to well-informed and well-structured processes, where the range of values at stake is transparently on the table, are the Regional Forest Agreement (RFA) process and Victoria's Land Conservation Council (LCC) Both of these processes focused overwhelmingly on public land, and informed decisions about allocation and management of publicly owned resources. The LCC and the RFA processes were both established after politically damaging conflicts - the LCC after disputes about clearing Victoria's Little Desert; and the RFA after loggers blockaded federal parliament (Watson 2002). Choices about land use and the where, how, what of plantations, and who pays for them, continue to be inherently political.

Some people argue that politics gets in the way of rational decisions, but when it comes to making choices about landscapes, more politics, not less, is needed to sort out the contested, long-term values. To ensure that knowledge guides policy towards informed decisions we need more well structured, informing or umpiring processes like the LCC or the RFA process. If we are to see sustainability science at work informing policy, and policy changing landscapes, we must equip the informing processes - establish effective institutions capable of proper consultation, quality research and excellence in knowledge management.

As a nation we need better political processes, broader more structured debates about the kinds of landscape and land use policy choices we make (ACF 2000). We need to organise explicit and transparent choice-making processes that are informed by the best available science because sustainability is fundamentally about the values and choices society makes, and the fortitude to implement them (Industry Commission 1999). Sustainability is inherently political, in the sense that politics is where the big debates and choices about values occur or should occur (Watson 2002).

Sustainability science is far more than developing technical fixes or technological innovations, because it demands integrated and at times radical approaches to complex problems. Sustainability science plays critical roles in articulating preferred futures and in developing smart ways to create these futures. It can inform us of the impacts and trade offs inherent in the policies and technologies we adopt.

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[18] In 2000 125,000 hectares were planted while 2001 planting are estimated at between 30 and 40 thousand hectares (JVAP 2002).

## Recent plantation policy choices

An examination of recent history in Australia makes it is clear that much has happened since the 1989 National Conference "*Prospects for Australian Forest Plantations*" (Dargavel and Semple 1990). In the years following the conference, there was a flourish of activity in the form of Commonwealth inquiries and strategies, such as the National Plantation Advisory Committee (1991) and the National Forest Policy Statement (1992a) the Resource Assessment Commission Inquiry (1992b) and the Industry Commission Inquiry (1993). These were followed by a range of initiatives including the Wood and Paper Industry Strategy (Commonwealth 1995) the 2020 Vision (DPIE 1997) and Farm Forestry Program which pumped $63 million into facilitating farm forestry (JVAP 2002) including establishing the Regional Plantations Committees, and numerous related State initiatives. There have been changes in international markets for wood and fibre products - including a declining Australian dollar. By the late 1990s the trade deficit in wood products equalled the value of the entire wool clip. There have also been innovations and refinements in plantation genetics and technology. However, the most potent innovation has been creative investment arrangements which turned plantations into very tax effective investments (JVAP 2002).

The last decade has seen a huge increase in industrial plantations - well above any predictions of the late 1980's - mostly eucalypts for pulpwood in wetter margins of Southern Australia. Since 1994, plantation area has expanded by an average of 70,000 hectares per year ranging from 30,000 in 1994 to 125,000 hectares in 2000 (JVAP 2002). Apparently, in 1989 no one was predicting this, so with the benefit of 2020 hindsight we briefly review the two contrasting "industry plans" presented in 1989 (Dargavel and Semple 1990).

In the "*Wood and the Trees*" (Cameron and Penna 1988) the Australian Conservation Foundation (ACF) proposed a phased reduction in native forest logging and a marked increase in hardwood plantations. They called for a total of 17,000 hectares of Eucalypts to be planted per annum on cleared land using a combination of leases, joint ventures etc. On the other hand, the Forest and Forest Products Industry Council (FAFPIC) plan proposed adding a total of more that 500,000 hectares of Radiata Pine to the existing pine estate of 857,000 hectares, adding 65,000 hectares of Eucalypts and to continue using all the existing area of native forests to supply 55 new "world class" mills – 9 pulp and paper, 12 panel and 34 saw mills requiring 11 billion dollars of additional investment (Dargavel and Semple 1989). History shows that both plans contributed to a vital ongoing debate. Both have been proven to be way off the mark. *"ACF's bold plantation plan"* (Toyne 1990) has turned out to be surprisingly modest. It picked the right directions – growth in hardwood plantations on cleared, private land – but it severely underestimated their scale. FAFPIC clearly failed to interpret community sentiment and international markets or was making an ambit claim on Australia's forests; to achieve the industry's oft stated desired for "resource security". Neither predicted the importance of tax incentives in accelerating rates of plantation investment (JVAP 2002).

While the importance of tax minimisation as a motivator cannot be overstated, the underlying merit of the policies is clearly questionable. The justification for these distortional public subsidies is doubtful, on both environmental and economic grounds. For example, *The Financial Review* (July 20, 2002) raises doubts about the environmental and financial sustainability of pulpwood plantations.

The *Plantations 2020 Vision* (1997) called for an (apparently arbitrary) tripling of plantation area. Policies supporting this goal have facilitated rapid expansion of plantations in regions with high and reliable rainfall, relatively cheap land and access to ports. However, this expansion - fuelled by the taxation rulings – has also generated a litany of criticism. It has resulted in inappropriate clearing, including the destruction of the habitat in Western Victoria of the beautiful, iconic and endangered red tailed black cockatoo. Other criticisms include:

- that plantations have been poorly sited and are based on large-scale monocultures;
- that they have mostly displaced rather than been integrated with agriculture; that growth rates and income projections have been overstated; and
- that they have impacted on rural communities, reducing school and community viability.
- ongoing concerns about stream flows and ground-water systems, pesticides and the use of 1080 to poison wildlife (AFR 2002).

Now that the public has experienced the plantation boom, it is clear that we are rapidly moving out of an era where planting lots of trees is viewed uncritically as "a good thing".

Blunt taxation incentives have been unable to maximise sustainability outcomes. We need new approaches to sponsoring plantations that better integrate environmental and economic outcomes and stimulate new kinds of forestry where Australia most needs reafforestation. A decade of plantation expansion has had a minuscule impact in the vast areas of medium and low rainfall country that desperately requires reafforestation to reduce salinisation and restore landscapes (MDBC 1999, 2000, 2001 and Nambiar et al 2000).

More than a decade ago, Campbell (1990) challenged the Australian forestry profession to, *"shift our sights down the rainfall scale, away from public land, and towards slower growing, more durable, higher value species. Tackling land degradation with a significant reforestation effort on hungry sites is the best way to do this."*

With an estimated 17 million hectares at risk from salinity (NLWRA 2001), now more than ever, foresters need to turn their professional skills to the pressing national need for reafforestation in the medium and low rainfall regions. We must work out how to direct billions of dollars of investment and forestry expertise to the big picture challenges of salinity mitigation and landscape restoration. Not only is this a professional responsibility, but also a growth frontier for the profession. Landscape restoration will almost certainly be employing the next generation of forestry graduates – but only if they are equipped to operate away from the wetter margins of the continent, and to deal with complex community and environmental relationships. Unless foresters move into tackling the big sustainability challenges – they risk becoming ever more irrelevant (Campbell 1990).

Today's foresters have choices about the scope and direction of Australian forestry and its contribution to society. They can choose to serve narrowly defined needs – satisfying the demand for cheap and abundant wood fibre – or they can play a wider role in helping to reshape how we live and work in Australia's magnificent and diverse landscapes as part of the ongoing quest for sustainability (Dargavel 1995, ACF 2000).