Irrigation Futures of the Goulburn Broken Catchment

Final Report 3 – Perspectives of future irrigation
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Perspectives of future irrigation

This document was developed by the Irrigation Futures project team as a contribution to Goulburn-Murray Water’s irrigation reconfiguration processes. It has been included as a chapter in the Shepparton Regional Atlas as a part of Goulburn-Murray Water’s Strategic View of Assets and Service Needs. This document summarises the scenarios and their implications for irrigation infrastructure planning.
Perspectives of Future Irrigation

Prepared by
David Robertson, QJ Wang, Leon Soste, Robert Chaffe and Clive Lyle
on behalf of
Goulburn Broken Irrigation Futures Project

Contents
Introduction
Learning from the Scenarios
Scenario 1: Moving On
Scenario 2: New Frontiers
Scenario 3: Pendulum
Scenario 4: Drying Up
Introduction

It is critical that irrigation infrastructure planning considers the needs of future irrigated agriculture. However, it is difficult to predict the future for irrigated agriculture as it will be influenced by many uncertain factors. Scenario planning is an approach to deal with the uncertainty by considering a plausible range of futures, so that the planned irrigation infrastructure will be able to service the needs of the future.

This section contains four scenarios, describing alternative plausible futures for irrigated agriculture in the Goulburn Broken catchment, and their implications for irrigation water supply. Although the scenarios have been developed for the Goulburn Broken catchment, they are also relevant to other irrigation regions in northern Victoria.

The four scenarios, Moving On, New Frontiers, Pendulum, and Driving Up, summarise the external driving forces, the region’s response to those driving forces and the regional impacts that follow. The impacts focus on those factors relevant to irrigation infrastructure planning.

The four scenarios are not predictions of the future. They are intended to represent a range of possible opportunities and challenges that the Goulburn Broken catchment may face over the next 20 years. Many elements of the scenarios can be interpreted as metaphors or examples of possible events that may occur. For example, the outbreak of fire blight described in Scenario 2 has been used to depict a bio-security threat. Alternative bio-security threats such as foot and mouth disease or avian influenza could have been used. Similarly, government policies described in the scenarios should be considered as plausible, but should not be interpreted as a statement of future government policy or intent.

The four scenarios have been developed by the Goulburn Broken Irrigation Futures project. The project is a community initiative aiming to develop a shared vision for irrigated agriculture in the region. The project engaged the regional community and other key stakeholders through a series of 4 workshops held at 6 locations throughout the catchment. These workshops looked at the community’s aspirations, the possible evolution of external driving forces in the future, and strategies to achieve the aspirations. The outputs of the workshops were developed further by a Technical Working Group to assess implications of the external driving forces and regional strategies.

Each scenario is presented in two forms: a summary and a more detailed description. The scenario summary provides a snapshot of the driving forces, regional impacts and implications for the distribution of water, along with illustrative graphs of land use, irrigated area, water use and farm gate gross value of production for the Shapcott Irrigation Region. The detailed scenario description contains additional information about the driving forces and impacts on different irrigation-dependent industry groups.

The scenarios are intended to stimulate discussions on strategic approaches to irrigation infrastructure planning including reconfiguration by considering what the future may hold and how the region can ensure it is robust under a range of possible futures. Further work looking at the implications of the scenarios for environmental management and the community will be reported in subsequent publications.
Learning from the Scenarios

The four scenarios presented in this section describe alternative plausible futures for irrigated agriculture in the region and their implications for future irrigation water supply. Some of the drivers are common to all scenarios, for example, the emergence of new economic powers such as China and India providing both threats and opportunities for our industries. Other drivers diverge markedly, resulting in very different scenarios.

Scenario 1 "Moving on" depicts a steadily changing operating environment for the region. The industries in the region evolve successfully in response to international business conditions and moderate climate variability. In Scenario 2 "New Frontiers", agricultural production in the region declines over time because of a number of unfavourable conditions, most notably, the rise in synthetic food production. However, there is a sharp increase in the number of people living in rural areas and work remotely, bringing a new and significant income stream to the region. Scenario 3 "Pendulum" describes how large shifts in water policy can dramatically change the face of the region. Scenario 4 "Drying up" highlights the vulnerability of the region to global economic recession and natural disasters such as drought.

The four scenarios represent four very different futures, as highlighted by the graph below. Even though they are not predictions of the future, they provide useful test beds for examining the effectiveness of management strategies under a range of conditions. In the context of irrigation infrastructure planning, the four scenarios highlight a number of important issues.

Flexibility of irrigation infrastructure

There is great uncertainty in the size of the irrigated area and the amount of water use in the future. There may be periods of rapid contraction and expansion of irrigation. Thus there is a need to build flexibility into irrigation infrastructure, so that it is adaptable to future demands. Flexibility may be achieved through innovative system configurations, flexible distribution technologies, a mix of infrastructure ownership, and improved management systems.

Irrigation service level requirements

One of the themes that emerged strongly from the scenario is the competitiveness of the agricultural industries in the region will depend on generating and marketing differentiated products. The industries are thus likely to demand greater levels of service in water supply than today. On the other hand, service requirements for water use on lifestyle properties are likely to be quite varied. Water supply to lifestyle properties may become more significant in the future as indicated by Scenario 3 "New Frontiers".

Integration with land use and environmental planning

The scenarios describe significant changes in land use over the next 30 years, within and between agricultural, lifestyle and environmental uses. These land use changes can radically alter the viability and requirements of irrigation infrastructure. Irrigation infrastructure planning needs to be closely linked with land use and environmental planning. This calls for a collaborative approach to planning by agencies, industry groups and the community.

Social and economic responsibility

The scenarios highlight the complexity of issues surrounding irrigation and the importance of involving stakeholders, including the community, in decision making. Changes to irrigation infrastructure and irrigation business viability can potentially have wide social consequences. Equity and social adjustment need to be carefully managed during periods of infrastructure change. Likewise, financial planning for infrastructure needs to take provision for industry downturns.

Large shifts in government policy on water can dramatically change the face of the region, as indicated by Scenario 3 "Pendulum". It is critical that the region actively influences all levels of government to ensure regional concerns and issues are addressed in policy development.

Planning for changes

The scenarios also point to some of the potential weaknesses of the region. For example, the relatively small size of irrigated land parcels makes the region uncompetitive when the market demands large-scale production systems, as indicated in Scenario 2 "New Frontiers". Significant restructuring will be required to overcome some of these weaknesses, but it should be done under the right conditions so that changes can be made smoothly. The scenarios suggest that there are only a limited number of windows of opportunity for large-scale restructuring. In Scenario 3 "Pendulum" for example, government may be lobbied to assist in land amalgamation during periods of major water policy shifts. To seize these opportunities, there is a need for having plans and options prepared in anticipation of future conditions.

The issues highlighted above represent the learnings from the scenarios by the Goulburn Broken Irrigation Futures Project. The scenarios are intended to stimulate discussions on strategic approaches to irrigation infrastructure planning including reconfiguration. Therefore, readers are encouraged to use the scenarios to develop their own thoughts and ideas.

Comparing the Scenarios - Irrigated Area

![Graphs comparing irrigation scenarios](image_url)
Summary of Scenario 1: Moving On

Driving Forces
2005-2020
- Free trade agreements signed with USA and ASEAN create demand for all agricultural products.
- Use of genetically modified organisms permitted for agriculture.
- Climate change results in a long period with no medium reliability water and hotter, wetter summers.
- 10% of irrigation water is traded to Sunraysia.
- Demand for lifestyle properties remains high.

2020-2035
- India and China become a significant market for agricultural products.
- Affluent consumers are becoming increasing conscious of health and animal welfare issues.
- Climate remains relatively dry with only 25% of medium reliability water available.
- Water trade outside the region reduces.
- G-MW sold to Macquarie Infrastructure, prices increase and cross-subsidisation of infrastructure costs is reduced.
- Demand for lifestyle properties declines.

Impacts
- Regional economy continues to prosper despite global competition.
- Agricultural businesses become larger, more intense and have a greater diversity of products. Larger farms employ people who live in towns. Few small farms remain. Some small towns decline.
- Intensification of agriculture increases the necessity for nutrient management.
- More water in the Goulburn River due to government policy and downstream trade.
- Irrigators move toward the river and the upper reaches of the irrigation system (cheaper water).
- In preparation for privatisation, infrastructure condition and operations are modified to maximise the sale price.

Implications
- Water demand pattern changes as farming systems move toward more annual species.
- Area under irrigation decreases (10%) then increases (30%) as more water becomes available.
- Irrigation water use initially decreases (10%) due to trade and then increases as some (25%) medium reliability water becomes available.
Description of Scenario 1: Moving On

**WATER RELATED DRIVERS**

**GOVERNMENT POLICY**
- Water reform white paper is progressively implemented, enhancing co-ordination of water rights, installing a process for infrastructure recapitalisation, making “takers” pay more into an independent entitlement and returning 30% of “takers” water to the environment.
- Water tariffs increase at inflation rate.
- Eventual: rainfall decreases by 5% with greater rainfall in summer. Runoff decreases by 25%.
- High-reliaability water not affected, but no medium-reliability water available.
- Temperature increases, reduce the chill hours.

**WATER TRADE**
- 10% of irrigation water is traded to Baragula.
- Increase in water trade is introduced with little impact.

**OTHER**
- No significant impact envisaged from natural development in the region.

While ‘Melbourne water users acquire some water from the region, this volume will be relatively small and have no significant impact.

**NON-WATER RELATED DRIVERS**

**GENERAL**
- Free trade agreements with USA and AUS result in lower tariffs, increasing potential opportunities for exports.
- More market access for domestic and international markets.
- Imports increase, reducing competition.
- Consumer take-up increases.
- No change in prices.

**INDUSTRY IMPACTS**

**DAIRY**
- Milk production increases by 30%.
- Area of dairy farms land decreases 10%.
- Milk yields increase 10%.
- Increase irrigation efficiency.
- Irrigation water use increases by 10%.

**HORTICULTURE**
- Mass production increases 10%. Import challenges are met through diversification into new products.
- Growth in new industries with controlled environment systems for indoor, year round crop growth.
- Irrigation water use decreases 10%.

**FORESTRY**
- Mass production increases 10%.
- Irrigation water use decreases 10%.

**FISHERIES**
- Productivity increases 10%.
- Irrigation water use decreases 10%.

**REGIONAL IMPACTS**

**GENERAL**
- The regional economy continues to prosper despite global competition.
- Farmers experience increased efficiencies and cost savings.
- Irrigation water use decreases 10%.
- Irrigation water use decreases 10%.

**IRRIGATION INFRASTRUCTURE**
- Farmers require additional infrastructure to meet demand.
- Irrigation water use decreases 10%.
- Irrigation water use decreases 10%.

**WATER RELATED DRIVERS**

**GOVERNMENT POLICY**
- More investment in water infrastructure.
- Cross-subsidisation of infrastructure costs decreases as a result of privatisation. Water tariffs increase to build in a commercial profit and through increased cost recovery.
- Climate remains drier than historical average. Summer rainfall more intense.
- High reliability water and 20% of medium reliability water available.

**WATER TRADE**
- More regional and trade closer to market, reduces overhead.
- Floods outside the region reduce as less water available and delivery capacity is reached.

**OTHER**
- Demand for water from Melbourne continues to have little impact.

**INDUSTRY IMPACTS**

**DAIRY**
- Milk production increases by 30%.
- Area of dairy farms land decreases 10%.
- Milk yields increase 10%.
- Increase irrigation efficiency.
- Irrigation water use increases by 10%.

**HORTICULTURE**
- Mass production increases 10%. Import challenges are met through diversification into new products.
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- Irrigation water use decreases 10%.

**REGIONAL IMPACTS**

**GENERAL**
- The regional economy continues to prosper despite global competition.
- Farmers experience increased efficiencies and cost savings.
- Irrigation water use decreases 10%.
- Irrigation water use decreases 10%.
Summary of Scenario 2: New Frontiers

Driving Forces
2005-2020
- Free trade agreements signed with USA and ASEAN create demand for all agricultural products. Middle East trading partners lost due to our alliance with United States.
- Large increase in lifestyle developments.
- Genetically modified organisms prohibited.
- Community concern for the environment increases.
- Environmental flow entitlement increased through deal with medium reliability entitlement.
- Climate change results in long period with high reliability allocation of less than 100%.
- 15% of irrigation water is traded out of the region to Sunraysia and Northeast Victoria.

2020-2035
- International free trade is introduced.
- Fireblight and regulation cause a major decline in agricultural production across all industries.
- Synthetic food production significantly reduces the demand for naturally produced foods including dairy, horticultural and meat products, but substantially increases demand for grain.
- Demand for lifestyle properties plateaus.
- Genetically modified organisms allowed.

Impacts
- Initially, a small decline in agricultural activity occurs due to the loss of markets. Followed by a substantial decline due to synthetic food production. Niche agricultural industries on some small properties cater for the health food market.
- Demand for grain causes increase in annual cropping. Large quantities of water trades to New South Wales where grain production is more efficient due to larger land parcel sizes. Water trade increases infrastructure costs for remaining irrigators.
- Regional economy is maintained by new lifestyle development. Lifestyle development is unplanned causing conflicts between agricultural production and lifestyle values.
- Land is reserved for environmental purposes.

Implications
- Major contraction in most irrigated agricultural industries.
- Area under irrigation and irrigation water use decreases substantially (45%) due to water trade.
- Best areas for irrigation may change according to market demand for products and land availability.

Land Use

Farm Gate Gross Value of Production
## Description of Scenario 2: New Frontiers

### WATER RELATED DRIVERS

**Government Policy**
- Lower, or in the case of Murray/River, neutral (giving large water users certainty).
- Agricultural land purchased for production will diffuse and allow for development at current usage levels.
- The potential for domestic and regional water supply. 
- No significant change in water availability.
- Water quality is the priority in the Murray/River catchment.

**Non-Water Related Drivers**
- Increased efficiency due to a reduction in the cost of production.
- Large increases in new irrigator adoption .
- Large increases in new irrigator adoption .
- Large increases in new irrigator adoption .

**Industry Impacts**
- Production decreases 5%.
- Irrigated areas decreases 10%.

**Regional Impacts**
- Major contraction in rice industry.
- Irrigated area decreases 30%.
- Irrigated water use decreases 40%.
- All year round demand for rice industries is met.
- Land use is different in the future land use.
- Annual cropping highly responsive to water availability.

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- Lower, or in the case of Murray/River, neutral (giving large water users certainty).
- Agricultural land purchased for production will diffuse and allow for development at current usage levels.
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- Irrigated areas decreases 10%.

**Regional Impacts**
- Major contraction in rice industry.
- Irrigated area decreases 30%.
- Irrigated water use decreases 40%.
- All year round demand for rice industries is met.
- Land use is different in the future land use.
- Annual cropping highly responsive to water availability.
Summary of Scenario 3: Pendulum

Driving Forces
2005-2020
- Free trade agreements signed with USA and ASEAN create demand for all agricultural products.
- Multinationals take over food processing plants.
- Genetically modified organisms prohibited.
- High energy costs create demand for biofuels.
- Government returns 3500 GL of environmental water to Murray River. Victoria contributes 1500 GL through buy back of all medium reliability and 30% of high reliability water, at premium prices. Some water trades into Goulburn Valley from NSW.
- Water buy back coupled with government purchase, amalgamation and auction of land.

2020-2035
- Chinese Yuan floated and China grows as a market for agricultural products.
- Genetically modified free status becomes a marketing advantage.
- Government reverses policy and returns water to agriculture by auction. Proceeds of auction fund development of distribution infrastructure which is transferred to irrigator cooperatives.
- Wet climate sequence causes floods.

Impacts
- Initially the regional economy declines as water is returned to the environment. Unemployment rises considerably as demand for service industries decreases.
- Perception of little additional benefit resulting from water being returned to the environment.
- Subsequently, the economy booms as international market conditions improve and policy reversal means more water is available for agriculture.
- Labour shortages occur.
- Planned adjustment of land and water resources allows infrastructure costs to be managed and leads to an improved match between land capability and use.
- Increased rainfall and floods lead to a re-emergence of water logging and salinity problems.

Implications
- Changes in government policy enable large changes in irrigated area and water use to be planned.

![Farm Water Use](image1)
![Irrigated Area](image2)
![Farm Gate Gross Value of Production](image3)

Land Use
- 1997
- 2005
- 2020
- 2035

Dryland
Incropland
Dairy
Horticulture
Livestock
Cropping
Lifestyle
<table>
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<td><strong>Dairy</strong></td>
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<tr>
<td>Water recycling and reuse becomes a Federal responsibility</td>
<td>No change in milk production as water remains in dairy and slaughter.</td>
<td>Land area increases 40%</td>
<td>Reduced water policy and market conditions produce a rapid (3-5 years) expansion of irrigated agriculture.</td>
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<td>Lack of response from environmental flow plans</td>
<td>Dairy feed grain increases 40%</td>
<td>Land area increases 10%</td>
<td>Regional economy benefits from the back of expansion of agriculture and forestry and increased energy availability.</td>
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<td>Water rights become more available to irrigators</td>
<td>Irrigation water use increases 50%</td>
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<td>Water stocks rise due to increased rainfall.</td>
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<td>Agricultural and irrigation water distribution companies</td>
<td>Irrigation water use increases 50%</td>
<td>Irrigation water use increases 100%</td>
<td>Irrigation water use increases 70%</td>
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<td>New water targeted to best areas.</td>
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Summary of Scenario 4: Drying Up

Driving Forces
2005-2020
- Financial crisis in the United States creates a global recession that reduces international trade considerably between 2009 and 2012.
- As global economy recovers, China begins to export high value horticultural products and import cheaper bulk commodities.
- Australian dollar strengthen making agricultural products expensive to overseas purchasers.
- Use of genetically modified organisms prohibited.
- Drought commences in 2012 lasting until 2020. High reliability irrigation water allocations between 2015 and 2020 are 80%, 60%, 30%, 90%, 100%.

2020-2035
- International export markets recover.
- International and domestic markets demand healthy food.
- Genetically modified free status becomes a marketing advantage.
- Government assists restoration and redevelopment of agriculture with focus on health food, environmental sustainability and animal welfare.
- Climate becomes wetter and enables medium reliability allocation of 25%.

Impacts
- Initially, all agricultural industries and the regional economy is decimated by international market collapse and prolonged drought. The population is stable because employment opportunities are poor elsewhere. Unemployment is very high.
- Irrigators unable to pay for costs of infrastructure maintenance.
- Subsequently, regional economy booms as international markets grow and water availability increases. Growth of agricultural industries is constrained by land parcel size.
- Drought increases the frequency of severe bushfires.

Implications
- Initially, a large decrease in irrigation water use and area irrigated as drought decreases allocations, followed by a large increase in irrigated area and water use as the drought subsides.
- Water returns along existing irrigation infrastructure as no restructuring occurred during drought.
- Infrastructure declines during times of little maintenance.

* Graphics depict 2017 drought conditions with high reliability water allocation of 30%
### Description of Scenario 4: Drying up

#### 2005-2020

**WATER RELATED DRIVERS**
- Water reform white paper is progressively implemented, reaching full coverage of water rights, creating a process for infrastructure rehabilitation, and introducing water fees to ensure revenues from water use.
- Economic growth, but water resources are under strain due to population growth.

**NON-WATER RELATED DRIVERS**
- Free trade agreements with US and Asian markets create new opportunities for exports, but also challenges with China's trade partners.
- Financial crises in the US and China lead to increased interest rates and volatility in global markets.
- China exports high-value horticultural products and imports low-value manufactured goods.

**INDUSTRY IMPACTS (2017)**
- General: Slowdown in manufacturing, leading to decreased demand.
- Horticulture: Production decreases, leading to increased imports.
- Livestock: Production decreases, leading to increased imports.
- Lifestyle: Increase in demand for imported luxury goods.

**REGIONAL IMPACTS (2017)**
- General: International trade resumes, leading to increased exports and imports.
- Irrigation infrastructure: Increased investment in infrastructure.
- Livestock: Decline in livestock production, leading to increased imports.

#### 2020-2035

**WATER RELATED DRIVERS**
- Water policy changes, including increased water reuse and recycling.
- Focus on sustainable water management.

**WATER AVAILABILITY**
- Climate change affects water availability.
- Increasing water demand.

**NON-WATER RELATED DRIVERS**
- Government policies aim to reduce dependence on imported water.
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