NATIONAL PROGRAM FOR Sustainable Irrigation

Research Bulletin

Frameworks to Support Irrigation Decision Making in Northern Australia

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The Northern Australia Irrigation Futures (NAIF) project has provided new knowledge, tools and processes to support decision making regarding irrigation in northern Australia.

NAIF examined frameworks to support irrigation decision making in northern Australia, including:

- Examining the role and use of biophysical indicators of sustainability
- Understanding social-ecological systems, sustainability and resilience[1] concepts
- Reviewing the use of ecologically sustainable development (ESD) Component Tree systems and developing one specific to irrigation in northern Australia
- Understanding learning models and the potential role of new and emerging web-based technology in resolving complex problems

Key messages from the research include:

- Decisions about the future of irrigation in northern Australia are about people and their relationships with each other and their environment
- Dealing with complexity, uncertainty and risk in irrigation decision making is a shared need and responsibility of catchment communities, proponents and governments
- Achieving long term ecologically sustainable development in northern Australia will require decision making and irrigation management systems that better utilise existing and emerging technologies and approaches
- Implementing frameworks, including catchment knowledge platforms and ESD Component Tree systems, can support more comprehensive, transparent and consistent planning and decision making

Background

Northern Australia holds an iconic status for many Australians. The interplay between the landscapes, rivers, groundwater and strongly monsoonal weather patterns has resulted in unique and diverse ecological systems.

With 60 to 70 per cent of Australia's fresh water discharging from tropical rivers, the region faces significant environmental challenges associated with increasing pressure to develop land and water resources, catchments and coastal environments, as well as managing existing threats, including weeds, pests, feral animals and fire.

At the same time, the community now expects that decisions about proposals for developments will not only deliver economic benefits to individuals but will also deliver social and economic benefits to the broader community, with acceptable environmental impacts.

There is an unique and historic opportunity to ensure that management and use of Australia's northern land and water resources takes place within a strategic, ecologically, culturally and economically sustainable framework. The purpose of this research was to work towards the conceptualisation and delivery of such a framework.

Key findings

Initially, NAIF aimed to deliver a framework based on sustainability indicators and management criteria at a range of scales (field, farm, district, scheme, and catchment). As issues of resilience, complexity, uncertainty, managing risk and adaptive management emerged through the research, thought about the framework shifted to an increased focus on the social processes of decision making. This change in focus led to development of a framework involving a suite of simple tools to support communities and decision makers dealing with complexity and uncertainty in a comprehensive, transparent and inclusive way. The research identified and incorporated 6 key issues in developing a framework to support irrigation decision making.

1 Resilience is the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks (Walker, B. et al.. 2004. Resilience, adaptability and transformability in social–ecological systems. Ecology and Society 9(2): 5. [online] URL: http://www.ecologyandsociety.org/vol9/iss2/art5/)

1 Measuring sustainability

A framework that uses indicators to measure sustainability implies that there are already known sustainability indicators. Getting to that stage in a transparent and equitable way requires a systems approach to ensure:

- relationships are not separated from system components
- a full range of stakeholders' perspectives are accepted and used to negotiate understanding
- traditional knowledge, experiences and learnings of local people is as important as scientific understanding

2 Ecological Risk Assessment

Ecological Risk Assessment (ERA) can be biased (or appear to be) by values and beliefs of the individuals involved in conducting an ERA. This can reduce some stakeholders' support for the process. Participants should be informed early about how an ERA will contribute towards an overall process that deals with the social, economic and ecological issues.

3 Modelling

Models, such as Bayesian Belief Networks, can be useful tools for advising, educating and mutual learning. Modelling with groups, such as grower groups, can build transparency, trust and cooperation, which facilitates the integration and adaptation of management practices.

4 Visualisation

Visualisation is the development of alternative future scenarios (e.g. different development options for irrigation areas) which can help communities prepare for potential change in several ways. Visualisation assists in the development of plans that set out responses to possible futures and can build community capacity by strengthening social networks, trust, cooperative relationships, and knowledge integration.

5 Local Influences

An understanding of the structures and influences that control a particular location is important to stakeholders, decision makers and those proposing irrigation developments. Mechanisms to support understanding of the contemporary control structures (statutory and non-statutory frameworks as well as the capacity of industry, community and the government) are important components of any overall framework.

6 Ecologically Sustainable Development (ESD)

Economic activity (e.g. irrigation) is part of and takes place within the social system, which in turn is part of and takes place within the ecological system. The key question is not whether an industry or individual development is sustainable or not, but rather what positive and negative contributions that industry or development makes across the full range of ESD.

Implications

The framework developed by NAIF aims to aid understanding within the community and government of the inherent complexity and uncertainty in irrigation decision making. This will help to ensure that any decisions are made in a transparent manner but most importantly, will deliver the best possible decision in regards to the environment, social and economic benefits as well as fitting within statutory and non-statutory frameworks.

Ecologically Sustainable Development (ESD) Component Tree System

ESD Component Tree systems are helpful to understand and deal with the difference between uncertainty and risk in complex systems. This can increase confidence in decision making when dealing with such complex systems. ESD Component Tree systems are intended to enhance the decision making process and have been successfully developed and applied in fisheries, aquaculture, agriculture, and irrigation triple bottom line reporting.

ESD Component Trees allow the user to navigate through the myriad of issues relevant to decisions in a systematic way. They are a set of all issues, impacts or factors, positive and negative, which are relevant to a particular industry (e.g. irrigation), proposal or location. Each issue is part of a hierarchical tree, connected to other components through that tree (See Figure 1).

By ensuring that all the relevant factors have been identified, ESD Component Trees can help reduce complexity and help build confidence in the community and decision makers.

The potential applications of ESD Component Trees for irrigation in northern Australia include:

1. catchment and irrigation visioning and planning
2. developing and assessing irrigation proposals
3. improving existing irrigation
4. triple-bottom-line or ESD reporting
5. identifying and managing knowledge gaps

ESD Component Trees can also be used to help form the base of knowledge platforms. Knowledge

platforms are one way to disseminate knowledge about a particular location in all forms (whether research data or an individual's story) to all stakeholders, including the broader community. In this way knowledge platforms help make debate and decision making about irrigation in a particular location more transparent.

The Lower Burdekin Prototype Framework and Knowledge Platform

NAIF developed a prototype framework for the lower Burdekin catchment in northern Queensland. This consisted of an ESD Component Tree system and a knowledge platform which helped contribute towards capacity building and knowledge transfer amongst the people of the lower Burdekin. Ultimately it aims to help improve the integration of science, policy, industry and stakeholders and support more comprehensive, transparent and consistent planning and decision making in the catchment.

Catchment communities and governments can better understand how catchments operate in a biophysical, social and economic sense through:

- Better use of existing knowledge within catchments including a synthesised understanding of how a catchment functions
- Improved methods for transferring experience across catchments
- New understandings about learning models and about how and when individuals search for and share their knowledge

The prototype Lower Burdekin Knowledge Platform (LBKP) provides on-line access to appropriate knowledge, and expertise, relevant to making decisions about water management in the catchment.

Core to this approach is a flexible and responsive content framework which allows documents, audio files, video, presentations, online reports or live data feeds to be uploaded and used in different contexts. These rich media types, which may contain such things as interviews and personal stories, have much more immediacy and impact than documents alone.

The LBKP also allows quick retrieval of information, and supports many different types of users according to their specific interests, needs and learning styles.

Ways to access information on the LBKP include:

ESD Components: A set of ESD Component Trees is provided, based on each of the relevant ESD factors (ecological, social, economic and external). This allows the user to explore all information related to a specific ESD factor. This view is most familiar on web sites, often in the form of menus.

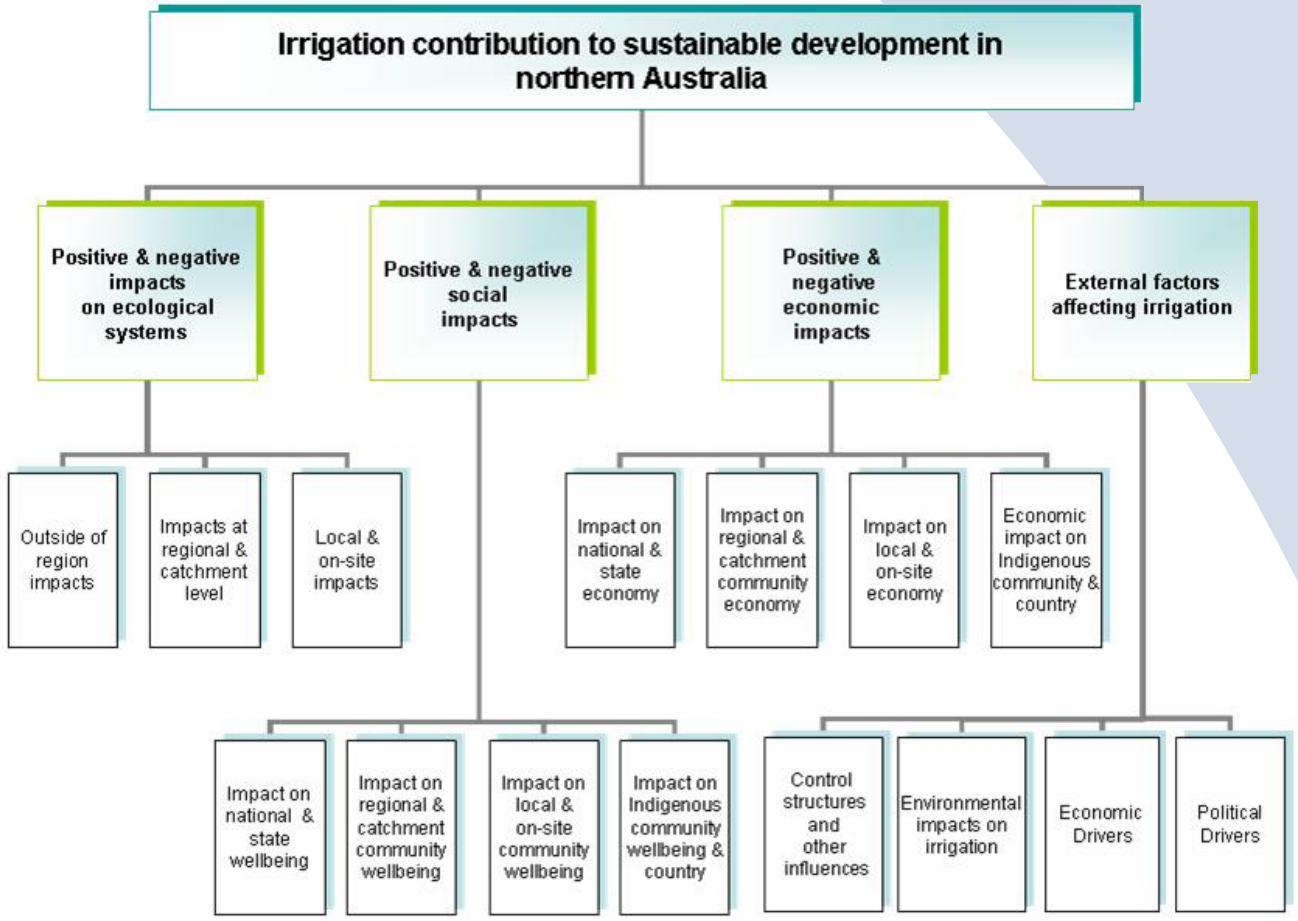

Figure 1 Two levels of an ESD Component Tree developed by NAIF

Geospatial: The geospatial view provides a map-based system where all information related to a particular location is displayed on a map of the lower Burdekin. This is useful for portraying bore monitoring data, rainfall data, live feeds of dam levels, management boundaries and satellite images.

Themes: Themes are key issues related to many ESD components. The knowledge platform provides a tool for displaying related information which the user can move to select the desired theme. The themes identified for the lower Burdekin are: Groundwater, Surface Water, Catchment Community, Climate, Sustainability, Farm Management, The Reef and The Wetlands.

Live Search function: The search engine searches for the information as the user enters key search words.

The LBKP has received strong support from the community and is now being transferred from a prototype to a live website that will be operated and managed by the local community. The Lower Burdekin Water Futures Group, Burdekin Dry Tropics NRM and the Burdekin Shire Council are all contributing to the development and on-going management of the site as a community tool.

Conclusion

Decisions about the future of irrigation in northern Australia are about people and relationships, and no single framework can hope to ensure sustainability. However, it is possible to help catchment communities and governments by developing knowledge, tools and processes that reflect this reality and support those charged with making decisions about these complex issues.

For more Information

Camkin, J.K., Story, J. and K.L. Bristow. 2007. An ESD component system to support irrigation decision making in northern Australia. CSIRO Land and Water Science Report No.78/07, CRC for Irrigation Futures Technical Report No. 10/07

Camkin, J.K., Kellett, B.M. and K.L. Bristow. 2007. Northern Australia Irrigation Futures: Origin, evolution and future directions for the development of a sustainability framework. CSIRO Land and Water Science Report No.73/07, CRC for Irrigation Futures Tech. Report No. 11/07 48 pp.

NAIF reports can be found at **www.npsi.gov.au** or visit the NAIF website at **www.clw.csiro.au/naif**

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"The NAIF thinking, particularly the ESD component trees, has helped us evaluate the risks of a full irrigation scheme compared to a mosaic style system and helped guide the preparation of our Ministerial briefings. Being able to look at major component trees and compare multiple scenarios helped in terms of risk assessment, and influenced the thinking behind our water allocation planning".

TOM CROTHERS, GENERAL MANAGER WATER ALLOCATION AND PLANNING, QLD DEPT. NATURAL RESOURCES AND WATER, QLD

NAIF is a collaboration between the National Program for Sustainable Irrigation and:

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Department of Agriculture, Fisheries and Forestry

NAIF
Northern Australia Irrigation Futures

CSIRO

Cooperative Research Centre for Irrigation Futures

Government of Western Australia

Northern Territory Government
Department of Natural Resources, Environment and the Arts

Queensland Government
Natural Resources and Water

North Burdekin Water Board

SunWater

About the Program

The National Program for Sustainable Irrigation defines and invests in research on the development and adoption of sustainable irrigation practices in Australian agriculture. The aim is to address critical emerging environmental management issues, while generating long-term economic and social benefits that ensure irrigation has a viable future.

The Program has 16 funding partners: Australian Government Department of Environment and Water Resources, Cotton Research & Development Corporation, Gascoyne Water Asset Mutual Co-operative, Gascoyne Water Co-operative, Goulburn-Murray Rural Water Corporation, Grains Research & Development Corporation, Harvey Water, Horticulture Australia Limited, Land & Water Australia, Lower Murray Water, Ord Irrigation Asset Mutual Co-operative, Ord Irrigation Co-operative, South Australian Research and Development Institute, Sugar Research & Development Corporation, Sunwater, and Western Australia Department of Water.

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