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Building a framework for transformative action in the Wakool Shire

*Transformation for resilient landscapes
and communities project
Working Paper 1, December 2010*

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Greg Walkerden, Valerie
Brown & Brian Walker*

Charles Sturt University



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Transformation for resilient landscapes and communities

Working Paper 1

Building a framework for transformative action in the Wakool Shire

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Disclaimer

The views expressed in this report are solely the authors, and do not necessarily reflect the views of Charles Sturt University, National Centre for Groundwater Research and Training, Murray CMA, NSW Natural Resources Commission or any other individual or organisation consulted during the research.

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Foreword and summary of project outcomes

The '*Transformation for resilient landscapes and communities*' project seeks to explore whether rural communities facing significant changes to resource availability, social adjustment challenges and uncertain futures can, through a guided learning process, instigate an intentional transition to a more sustainable human-nature relationship. The project was conceived in discussions in 2007 between Rod Griffith and Valerie Brown who had worked together on various participatory action research projects and had a mutual interest in transformation and its role in sustainability.

Both were comfortable with the idea that natural resource management and sustainability problems were mostly 'wicked' or intractable problems which require deeper societal change to tackle them effectively. The ideas floated in those early discussions then evolved through an initial scoping study funded by Land & Water Australia (Griffith et al., 2009b) into a cascading sequence of three case studies, each three years in length and set in different geographical, cultural, resource and institutional conditions. The study is based on three concepts: resilience, adaptive governance and collective learning which separately and together provide the tools to drive transition.

This is the first of a series of working papers from the project. It tells the emerging story of how a Catchment Management Authority (CMA), a Local Government Council, their shared community and an aspiring trans-disciplinary research team have worked together to build and implement a process for transformative action in one rural resource-dependent community. The guided process of planning, doing and learning that has developed through this partnership from October 2009 to mid 2010 is still evolving and will continue to be refined over the remaining years of the project. The process as it currently stands and the background to its development are documented here for others to draw on – though we do not make claim to a universal solution. Our collective experience is that such processes, while based on sound principles, require patient grounding in local circumstances and conditions. Nevertheless it is hoped that the account is a useful guide.

The Wakool Shire, a low population rural shire located in the south west of New South Wales (NSW) on the border with Victoria is our first case study area. Its two main town centres are Barham and Moulamein (more details are provided in section 2 of this report). The Wakool Shire Council administers land use planning and service delivery in the Shire and has other regulatory and community functions. Its role is changing under new local government legislation and as hardship in the community has become more evident. Recent change to legislation in NSW has introduced the requirement for Councils to assist their communities to prepare a Community Strategic Plan and it is this opportunity that we are using as a vehicle for change. The Murray CMA is one of 13 regional CMAs established under NSW legislation to serve as a bridging organisation between state and federal governments and stakeholders on the ground in the setting of natural resource management (NRM) priorities and the delivery of NRM programs. The Murray CMA is both a project partner on the ground as well as a financial investor in this project, along with the NSW Natural Resources Commission (NRC) and the National Centre for Groundwater Research and Training (NCGRT). The NRC has invested in a number of studies related to resilience thinking, and was keen to support the novel multi-organisational approach proposed in the initial scoping study. The NCGRT invested in the project as part of its bigger picture blue sky interest in novel research that might have future

application in its other collaborative research efforts. Subsequent investment by the Rural Industries Research and Development Council (RIRDC) has enabled the project to continue beyond 2010 and to commence our second case study in Cape York and to scope a third multi-regional case study.

The key outcomes from the project so far are presented in this working paper. They include:

- Trust building between partner organisations and between those organisations and researchers is confirmed as an important element of a transition process. In this case study it took much longer than expected to establish deeper trust after promising initial enthusiasm shown in initial meetings. Working through language issues is a key consideration. A further part of this trust building is being able to link new ideas to existing institutional arrangements and particularly statutory obligations. Linking the change process to the need to produce a new Community Strategic Plan has been particularly important.
- In this case as anger has risen in the community over decisions made by governments at state and national scales, the two partner organisations have sought to put off running community engagement processes originally planned for this project and instead sought to negotiate lower risk approaches. As trust has built this reluctance is now breaking down and a forward agenda has been agreed.
- It has proved more difficult to achieve integration between resilience, adaptive governance and collective learning tools than originally envisaged. The difficulty is not so much about any inherent practical or conceptual incompatibilities. Instead, it has been an issue of the independent way in which the tools and concepts have developed, each with their own advocates, who identify different ways in which their ideas can help advance transformation change processes. The research partners in the field observed a lack of integration and pressed for greater synergy. This was achieved by framing the ideas within a wider transition process, and through dialogue among the proponents of the tools, including a re-design of how the tools could be used collaboratively and synergistically.
- The wider transition process we used was developed by a Dutch group called DRIFT. However the DRIFT transition framework was very much couched as an outside-in process whereas we were looking for an inside-out process that was driven by the community as community practice. This reframed transition process with its new language has proven to be a key turning point in the project.
- A small transformation has already happened in that there has been a clear move towards practical functioning of collaborative governance arrangements between the Council and CMA. When we started the project, both partner organisations were rebuilding after episodes of what was recognised as poor governance. A baseline survey of governance showed willingness to change but few runs on the board. The ideas contained in adaptive governance – including connectivity and reflexivity (see section 4.3) – seem to have been taken on board by the leadership group within our partner organisations. This trend is expected to be confirmed when we revisit the survey process in the near future to identify if there has been any progress from the baseline. So what we have observed is a shift in thinking and action in how the Council and CMA collaborate. The move is away from the

traditional hierarchical approach to collaboration with smaller-scale local government serving as the local link to implement the broader agenda of the CMA. Instead, both parties explicitly appreciate that they are working with a local community that they both share. As a result, future planning is being undertaken locally and collaboratively, with the CMA functioning as a joint conduit with the Council to facilitate the resourcing of innovative ideas that arise from local engagement in future planning.

The Wakool case study is now just on one year into a three year program of change. The pace is ramping up after a slower than expected start. We thought it useful to document the main concepts and how they have led to an agreed process for transformative action in the Wakool Shire. There are other streams of activity underway though it is too soon to share them.

Further working papers are anticipated as this case study and the wider project unfolds.

Acronyms

ABS = Australian Bureau of Statistics

CAP = Catchment Action Plan

CMA = Catchment Management Authority

CSIRO = Commonwealth Scientific and Industrial Research Organisation

CSU = Charles Sturt University

DRIFT = Dutch Research Institute for Transitions

LGA = local government area

MER = monitoring, evaluation and reporting

NCGRT = National Centre for Groundwater Research and Training

NRC = Natural Resources Commission

NRM = natural resource management

NSW = New South Wales

RIRDC = Rural Industries Research and Development Council

Glossary

Adaptability = the ability to manage resilience in a particular system – or in particular parts of the system

Adaptations = changes that fit with new situations or surroundings; modifications without changing the overall social-ecological system or dominant regime

Adaptive cycle = see Figure 4 – this is a widely used heuristic to characterise the growth, decline and re-growth stages that many systems – or parts of a system – experience over time

Adaptive governance = societal power-sharing arrangements that can readily adapt in the face of uncertainty and constantly changing circumstances, and that can deal with different knowledges, values, interests, perspectives and power in ways that enable effective self-organisation in the face of change

Adaptive management = learning-by-doing; the implementation of policies and programs in flexible ways that enable frequent monitoring, reflection and changes in methods of implementation through learning

Agency = capacity to carry out individual will – extended here to include capacity of a whole community to exercise its collective will

Collective = a group of individuals with diverse interest and different ways of knowing (i.e. with different knowledge cultures) that come together for a particular purpose

Collective learning = the result of collective thinking in combining diverse ideas through a creative synergy

Collective thinking = the theory and process of bringing together, affirming and making maximum productive use of diverse and often conflicting knowledge cultures in a collective synergy – as outlined in Brown (2008)

Double loop learning = a more profound type of learning that uncovers and questions the underlying assumptions and purpose behind organisations and other such systems

Governance = how people in society can share and organise power with each other and with governments in the decision making and delivery of policies and programs

Intentional transition = a community's efforts to bring about a significant shift in their community life, livelihoods and landscape towards their desired futures

Inside-out (versus outside-in) = where the research or change management process is developed by and for the intended beneficiaries (often in collaboration with outsiders) in contrast to an 'outside-in' process, which is driven and directed by outside experts

Knowledge networks (or epistemic communities) = networks of people with specialist expertise and/or grounded experiential knowledge

Landscape – formed by the interactions between humans and their environment – we would argue that all landscapes have been modified by humans and that communities are therefore an integral part of landscapes – but we retain specific reference to “landscapes and communities” as a reminder that communities are part of all landscapes; we do not mean to imply that communities are somehow separate from their landscapes, or landscapes from their communities

Modulate = when things – especially ideas or innovations – start to move in a similar direction

Modular components = where the components of a system are not fully connected

Outside-in (see inside-out)

Panarchy = the influences of multi-scale interactions; understanding that a system experiences a range of feedbacks across and between different scales – term created from adding pan- (across everything) to -archy (as in hierarchy, monarchy, etc.)

Participatory action research = research where those being studied are collaborators, co-learners and/or co-designers of the research process and outcomes; where the researchers seek to actively influence the outcomes of the phenomenon being studied

Planning-by-doing – akin to adaptive management where plans are initiated and rolled out in a flexible and adaptive way so that the plans can be modified throughout the process of implementation – this is in contrast to most planning which is top-down – i.e. where the plan is created first and then implemented

Resilience = the capacity to bounce back from disturbance or adversity; the amount of change a social-ecological system can undergo (its capacity to absorb disturbances) and remain within the same regime – essentially retaining the same function, structure and feedbacks

Resilience assessment = a process of using resilience thinking to understand current and potential future dynamics of a particular place (when understood as a social-ecological system); guidelines for the process of resilience assessment are available for free download (Resilience Alliance, 2007)

Resilience thinking = applying a range of ideas relating to how well a social-ecological system (in general) – or parts of the system (as ‘specified’ resilience) – can or will rebound after disturbance; the thinking includes an analysis of system feedbacks, thresholds, adaptability (the ability to stay within a current state) and transformability (the ability to cross over into alternate states)

Safe arenas = a space where innovative practices and ideas can be nurtured without undue interference from countervailing forces

Shadow networks = networks of people that operate outside formal societal structures and can explore alternative futures with freedom

Social learning = broad-based societal changes in thinking that have resulted from shared experiences or purposeful collaborative activity – usually depicted as the outcome from such shared learning, but is also presented as the process of how to achieve such an outcome

Social-ecological system = a term to capture the idea that a particular place (or landscape) is a complex, dynamic and self adjusting system that involves interactions and linkages at a range of scales between the social world and the ecological world wherein that place is situated

Synergy = developing integration by focusing on the interactions between distinct elements or ideas that both enhances the individual elements or ideas and the sum of the elements or ideas

Synthesis = the fusion of separate elements or ideas into a new whole

Threshold = points on a trajectory of change for a particular variable (especially one that changes slowly) that, when crossed, can potentially change the structure, function and identify of the system affected

Tipping point = another commonly used term for a threshold, especially in social and political spheres

Transformability = the capacity to take transformative action and to navigate transformation; the ability to bring about a shift to a new system – or to particular parts of the system

Transformation = a fundamentally new social-ecological system created when ecological, economic, or social (including political) conditions make the existing system untenable

Transformative action = an action that will result in the transformation of the existing social-ecological system or of some component part of the system

Transition = a shift from one recognisable form or state to another, usually over a period of time, and which can build from adaptations and/or transformations

Transition management = designing when and how transformations or structural changes in society can be initiated, facilitated and influenced

Triple loop learning = an extension of double loop learning whereby the assumptions underpinning broader societal and governance arrangements are uncovered and questioned

Wicked problem = a highly complex and intractable problem such as those related to NRM and sustainability; a problem that is shared and persistent, where existing solutions often impede change and where more effective solutions can come from unexpected sources

1. Introduction

Communities whose livelihoods are dependent on natural resources face a critical situation when there are substantial changes to the availability of or access to those resources. A worst case result is a 'ghost town' – observable in Australian and US history when there's nothing financially viable left to mine. For today's rural communities threatened by reduced irrigation, forestry or even long-term changes in rainfall patterns, this result is hardly the desired option. Many individuals in such communities are highly attached to their place. Its history and landscape have become integral to their individual and community identities, and many refuse to abandon their place and its community. We thus arrive at the notion of rural, place-based and resource-dependent communities, often characterised in the popular imagination as being highly resilient to the adversities that come with being dependent on natural resources. They've bounced back before; they'll bounce back again.

History reveals the transitions and transformations that have enabled rural, place-based and resource-dependent communities to grow and survive. For communities that have grown up with irrigation development, the establishment of irrigation was itself a transformation – sometimes government inspired, sponsored and led; sometimes driven by individual entrepreneurialism (Blackburn, 2004; Hallows & Thompson, 1996; Lewis, 1994). On the other hand, critics observe the disastrous transformations associated with the downfall of ancient irrigation-dependent empires, thus questioning the long-term sustainability of irrigation as practised in some parts of the world (e.g. Postel, 1999). In contemporary Australia, irrigation communities across Australia are facing policy changes due to determinations that there has been an over-allocation of water for irrigation at the expense of river health and sustainability (e.g. CSIRO, 2008). Many have already faced massive reductions in allocations, with some irrigators in the Namoi region for example losing up to 87% of groundwater access upon which their farms depend (Kuehne & Bjornlund, 2006, p. 227). Many more communities across the Murray-Darling Basin expect similar drastic reductions in allocations, compounding years of actual reductions in water availability due to one of the longest and most severe droughts in Australia's recorded history (Murray Darling Basin Authority, 2009). Many communities across the Murray-Darling Basin are coming to the realisation that they are facing a(nother) transition. The changes to landscape and community will most probably go beyond just adapting to the major biophysical, social, policy and economic changes being thrust upon them; they will require transformations of their landscapes and communities¹.

This research project has been established to understand more about how communities and their support organisations can respond to these challenges and to learn more about transformation as a type of change in the context of rural, place-based and resource-dependent communities. The underlying practical intent of the project is to support communities facing these challenges to take transformative action in pursuit of their own futures rather than have their futures determined by

¹ We appreciate and accept the widely held view that communities are an integral part of landscapes. However, this understanding that landscapes are formed by interactions between humans and their environment is not always immediately appreciated, and so we have decided to retain specific reference to communities as a reminder that they are indeed an integral part of all landscapes. We do not mean to imply that communities are somehow separate from their landscapes, or landscapes from their communities.

an imposed transformation driven by forces beyond their control. In other words, our practical aim is to assist rural communities undertake an 'intentional transition' in response to changes to the natural resources availability upon which their communities depend.

We use the term 'intentional transition' in this context to refer to a community's efforts to bring about a significant shift in their community life, livelihoods and landscape in response to changing circumstances and opportunities; and for rural, resource-dependent communities in particular, those changes related to resource access or availability. 'Transformability' is used broadly as the capacity to take transformative action and to navigate transformation (Olsson et al., 2006). We consider transformability as a key consideration of adaptive governance – that is a mode of governance that enables communities and societies to self-organise in the face of change (Lebel et al., 2006).

The objectives of this case study are:

1. To develop, implement and evaluate a collaborative and adaptive/ transformative approach to planning and investment prioritisation between Murray CMA, Wakool Shire Council and their shared communities;
2. To use contemporary thinking about resilience, governance and collective learning to assist the Wakool community, Wakool Shire Council and Murray CMA to take transformative action toward more sustainable and resilient futures;
3. To tailor resilience assessment (Resilience Alliance, 2007), collective learning spiral (Brown, 2008) and adaptive governance self-assessment (Griffith et al., 2009) to meet the needs of CMA-local government partnerships;
4. To understand and document what enables and inhibits transformative action and collaboration in this context; and
5. To transfer the necessary skills to these partners to use these tools effectively.

In the spirit of 'participatory action' research an 'intentional transition' process has emerged in the previously underutilised collaboration space with the Wakool Shire Council and Murray CMA as key organisations engaged with the Wakool community in southwest NSW. The design builds from an apparent appreciation among the Wakool community that it will need to transition out of a situation that has unsustainable aspects to it, or to avoid crossing thresholds that could result in unsustainable situations.

The Wakool Shire community is under considerable stress. In resilience language it has experienced a series of shocks. On top of severe prolonged drought and future climatic uncertainty, national water policy reform has reduced irrigation water allocations, and changes in the land tenure of local NSW forests has had a major impact on the scale and viability of the local timber industry. The resource-dependent livelihoods that have served the community in the past are no longer secure. As detailed to us during the recent resilience assessment workshop we facilitated in Barham on 21-22 June 2010, population and services are in a downward and interlinked spiral, and this is placing further pressure on the Wakool Shire community. Community leaders recognise that change is

inevitable; that transformation is being forced on the Wakool community; and that this adversity and uncertainty can also create windows of opportunity to examine and consider significant adaptations and/or transformations.

This recognition that change was inevitable was also made apparent during a leadership workshop in December 2009 involving participants from our partner organisations in the field. Those present acknowledged that the future was a matter of survival. They also recognised their strong commitment to a sustainable future for the region, and a high value for making connections among all the players, and strengthening an already strong community. They were quickly able to identify initiatives already in place and plan some future directions – giving participants a taste of what the collective learning process could achieve.

Our key partners ‘on the ground’ in this project are the Wakool Shire Council and the Murray Catchment Management Authority (CMA). The Wakool Shire Council is responsible for developing a Community Strategic Plan for the Shire on behalf its community and has decided to use this research project to underpin the community engagement required for the development of this plan. Murray CMA is responsible for developing a Catchment Action Plan which sets out a vision and strategy for sustainably managing the natural resource base of the Murray region, which traverses nine local government areas, including the Wakool Shire. The Council and the CMA are keen to find out if and how resilience, adaptive governance and collective learning can be applied in a practical way to guide the development of their respective statutory strategic-level planning processes. At the time of writing, our engagement with members of the community has been through the two previously mentioned workshops: i.e. an initial leadership workshop in December 2009 involving sessions in resilience assessment and collective learning; and the resilience assessment workshop we facilitated in June 2010.

The need for a considered yet immediate response to current shocks to the system evident in the Wakool Shire and the likelihood of further shocks lends itself to an adaptive learning-based approach. A traditional comprehensive planning process in which the planning and implementation phases are separated in time would be too rigid for these circumstances, especially where transformation is a likely outcome. As Olsson et al. (2006) have suggested, transformations imply very little certainty and controllability between the process of transformation and its outcome, and thus argue that the process of transformation requires constant ‘navigation through the turbulence’.

While we would not necessarily endorse Olsson’s metaphor of navigation we argue that this journey through turbulence is a collective effort, requiring the knowledge and skills of those on the ground working collaboratively with those outside. We have therefore sought to put in place an integrated, multi-scale program of planning and doing at the same time, drawing on the best available theoretical understandings from transition management, resilience, governance and collective learning and on the practical knowledge and innovative capacity of the Wakool community and its support organisations. This community-driven transition process is proposed as having applicability in other rural change contexts. However, it should not be interpreted as a one-size-fits-all template. Rather it should be regarded as a set of principles (listed in section 6) and flexible tools (based on the guides provided by Resilience Alliance, 2007 and Brown, 2008) that would have to be tailored and perhaps even radically reshaped to apply in new contexts.

This working paper documents the initial trust building and conceptual development phases of the project with our partners leading to an agreed, practical transition process which is consistent with their statutory obligations and formal institutional arrangements. Forging this synergy with our partners' practical activities is one way in which we see this research project making a contribution that practitioners (particularly those in local government and NRM) and other researchers may be interested in, and may want to follow as the project unfolds. The other way that we believe our work to date is making a contribution is in how we have framed the transition process by integrating and building on theoretical notions associated with resilience, adaptive governance and collective learning, and it is this aspect that has received most focus in this paper. In taking the reader through our experiences with this project, we will address the following questions.

- Q1. What have we learnt from our initial efforts to explore synergies between contemporary resilience, governance and collective learning theories and associated toolkits in terms of designing a process that will help the Wakool community build their transformability and adaptability to manage sustainability issues?
- Q2. What have we learnt from our interactions with partner organisations and community that has helped to shape our understanding of the context in which we are working including factors that might enable or inhibit the transition and hence the design of an intentional transition process?

And to a minor extent, at this early stage of the project:

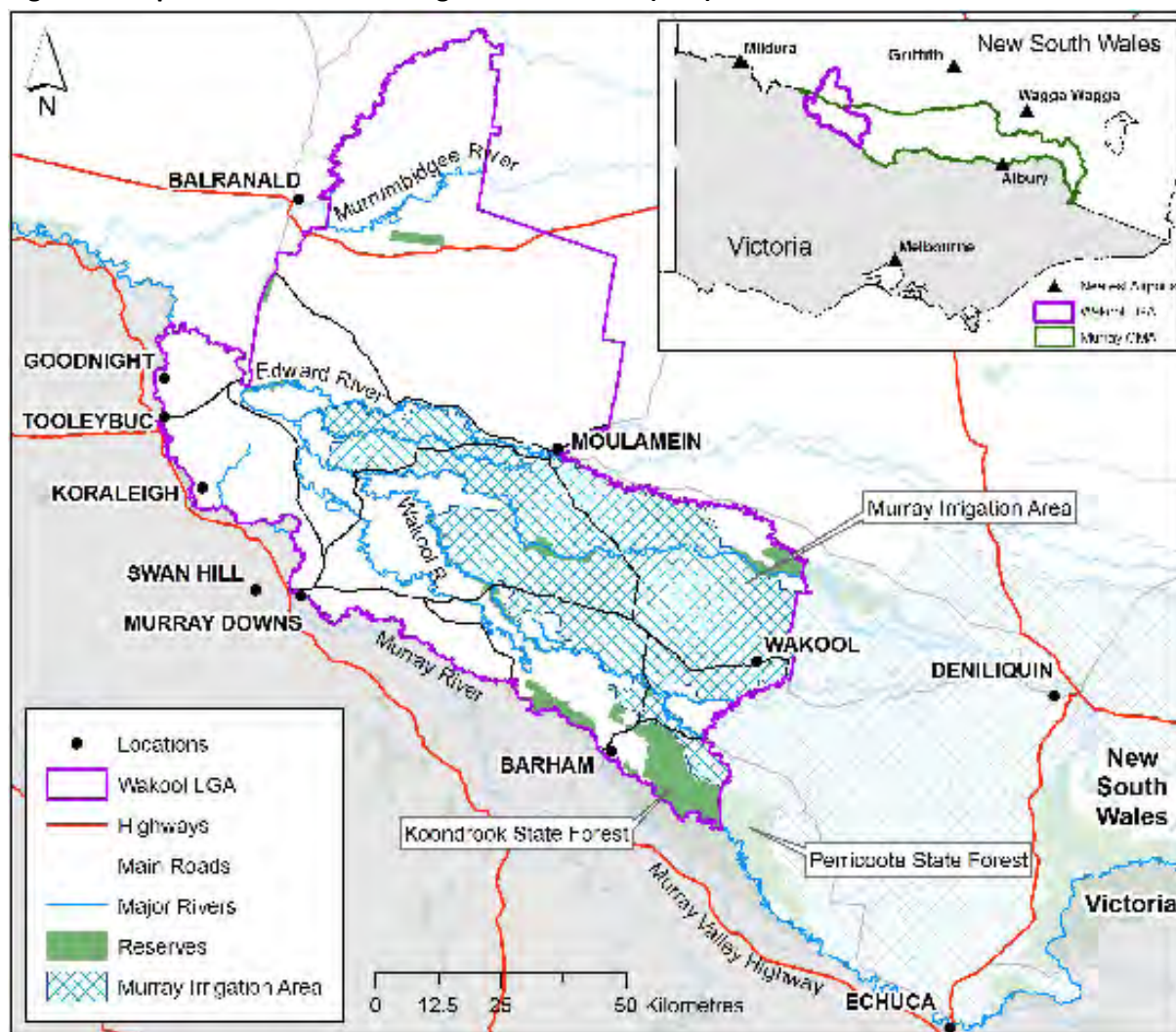
- Q3. What have we learnt from these experiences about the meaning and implications of transformational change as distinct from other types of change, its role in transitions and what this means for understanding and enhancing resilience and/or sustainability?

The paper is structured to address these questions, and takes into account the participatory process used to address them, a process that evolved iteratively through a series of significant events and breakthroughs. We begin by providing a brief background to the case study context (section 2) and by explaining the participatory action research methodology used for the project (section 3). In section 4, we introduce the relevant literatures and some key terms, before recounting the story of our learnings as we explored different ways to make use of these literatures and associated toolkits in an integrated way (section 5). Section 5 also outlines the negotiations and interactions with our research partners on the ground so far, a process of co-learning and trust building that is a necessary part of undertaking participatory action research with communities facing significant change pressures. Section 6 outlines the latest iteration of the design of an agreed community-driven transition process using the Community Strategic Plan as a vehicle for transition. We conclude the report with a summary of our learnings as framed by the questions above.

2. Project location

Wakool is a rural shire located in the south-west of NSW on the border with Victoria (see Figure 1). Like most areas of NSW south of the Murrumbidgee River, the community has closer links with Victoria even though it is politically part of NSW. For example, the region's television and radio news services are within the broadcast footprint of Victoria, and in the case of Wakool Shire, the nearest major centres are across the border. This accentuates the feeling of disconnection from the NSW politicians whose decisions affect the shire. Yet the border remains a political boundary separating the NSW side from change developments inspired by the Victorian government and its agencies.

Figure 1: Map of Wakool Shire local government area (LGA)



(Map created by Simon McDonald, CSU Spatial Data Analysis Network)

The local government area (LGA) of Wakool Shire is about 7,500 km² in extent and has a population of 4,362 persons (at the 2006 Australian Bureau of Statistics (ABS) census). Its two main centres of Barham (population 1,130) and Moulamein (population 350) are disconnected from the main transport routes, notably the Murray Valley Highway to the south and the Sturt Highway to the north. The nearest major centres include Swan Hill (population 9,680) and Echuca (12,360) in

Victoria and Deniliquin (7,400) and Balranald (1,220) in NSW (all population statistics taken from 2006 ABS census). The nearest airports all require well over three hours of driving to reach (see inset in Figure 1).

Primary industry (agriculture and forestry) has been the backbone of the local economy, and provides employment for almost 40% of the labour force (i.e. around 750 out of 1,900 persons at the 2006 census). Most of those working in these primary industries are managers (>70%) and the biggest sub-sector of this industry is 'sheep, beef cattle and grain farming'.

The area has greatly benefited from the extension of the Murray Irrigation Area to cover most of the agricultural land in the south of the shire. This has enabled rice to become the most lucrative agricultural product for the region, a seasonal crop that can be grown when sufficient irrigation water is available for purchase. Very little rice has been grown over the past several years of drought, and the rice mill located in Deniliquin ceased operations in mid-2008 as a result. Decisions concerning planned future irrigation water allocations are due to be announced in 2010, and many expect that there will be major reductions.

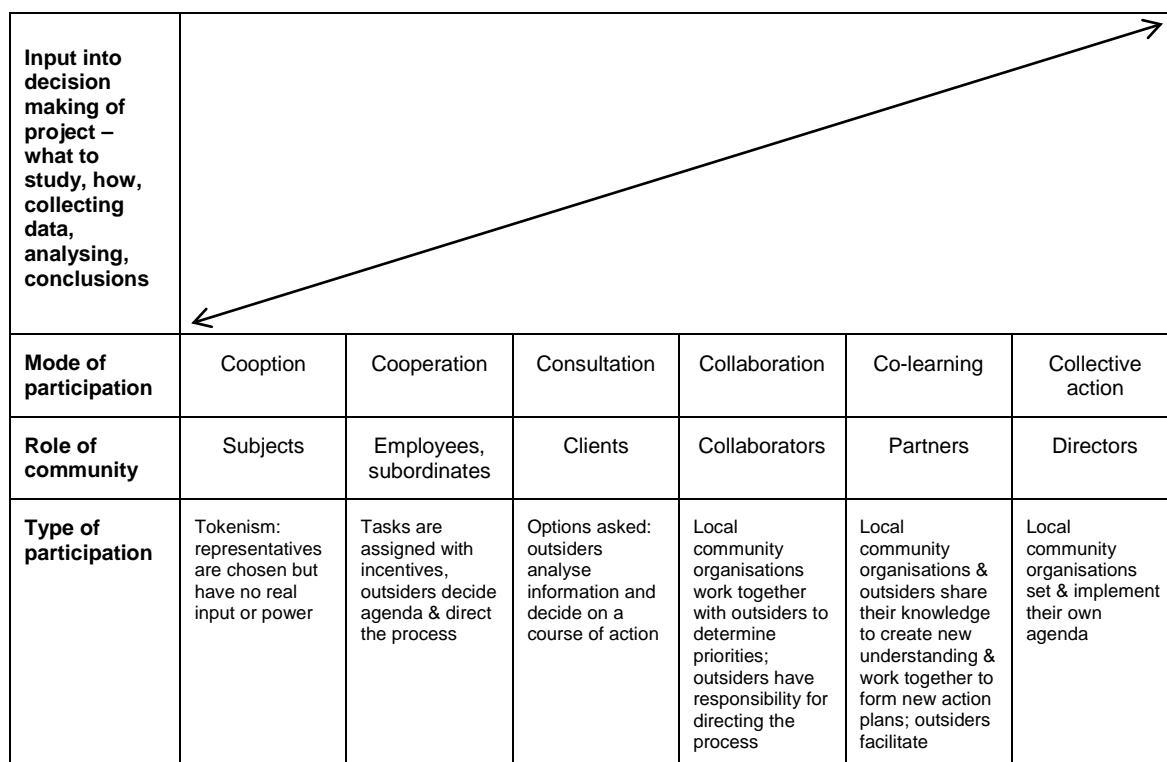
Compounding the anticipated adverse effects that changes in water allocations will have on the local economy has been the recent decision by the NSW government to change the land tenure of forested land along the Murray River from State Forests (where logging is permitted under licence) to National Parks (where logging will no longer be permitted). It is these changes to the access and availability of the natural resources upon which the local community depend that has driven support and interest in the approach we have been taking in this project.

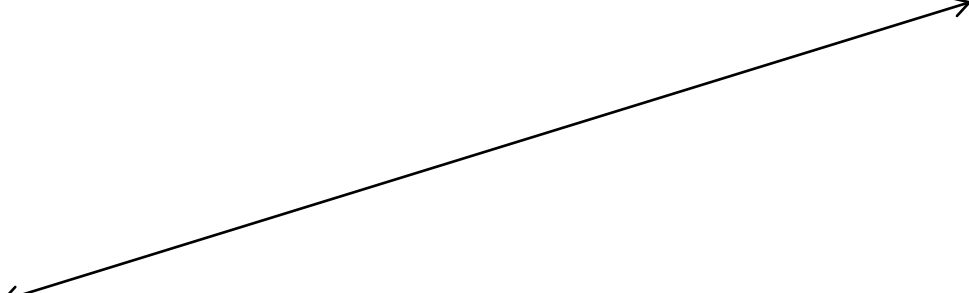
3. The project as participatory action research

Our partnership with Murray CMA, the Wakool Shire Council and others in the Wakool community is guided by principles of ‘participatory action research’. There are many variants of this approach in the research literature, but our approach is essentially a mix of pragmatism and critical engagement.

The so-called ‘pragmatic action research’ approach has been described as research that adopts a “co-generative” approach (Greenwood & Levin, 2007, p. 134). This means that through engagement with our partners, we are seeking to create spaces “for dialogue and mutual learning” so as to collaboratively generate the design and outcomes of the research project. If we were to scale the level of input from our partners in determining research design and outcomes (as shown in Figure 2), we would see our research partners as being at least “collaborators” with us, and preferably “directors” as we embark on this journey of discovery together.

Figure 2: A typology of participation: A continuum of approaches
(Adaptation of Cornwell’s typology)



Input into decision making of project – what to study, how, collecting data, analysing, conclusions						
Mode of participation	Cooption	Cooperation	Consultation	Collaboration	Co-learning	Collective action
Role of community	Subjects	Employees, subordinates	Clients	Collaborators	Partners	Directors
Type of participation	Tokenism: representatives are chosen but have no real input or power	Tasks are assigned with incentives, outsiders decide agenda & direct the process	Options asked: outsiders analyse information and decide on a course of action	Local community organisations work together with outsiders to determine priorities; outsiders have responsibility for directing the process	Local community organisations & outsiders share their knowledge to create new understanding & work together to form new action plans; outsiders facilitate	Local community organisations set & implement their own agenda

(Source: Race & Buchy, 1999, p. 407)

This type of research is based on the view that researchers do not have a monopoly on knowledge. Indeed, we recognise that any development in our understanding of intentional change processes can only come through the interactions we have with our research partners as people with on-ground practical experiences of striving to influence their preferred futures. Our initial discussions with the Murray CMA were on the basis that we had some ideas and tools which we thought would be of benefit in tackling ‘wicked’, ‘persistent’ or ‘intractable’ problems of the type common in NRM; i.e. we asked the CMA whether there were any projects or activities that they had or were planning that involved collaboration with local government and the potential for transformation that we

could assist them to work on. It was the CMA which then approached Wakool Shire as a potential partner.

Our participatory approach is also driven by a desire to influence the outcomes of the project. We are determined to support the Wakool community to both deeply explore change options and to decide changes that are appropriate. We are not studying what happens at Wakool as ‘outside observers’. Rather we seek to work closely with the community and change agents among our research partners in the change process. By reflecting on and sharing our experiences of resilience thinking, collective thinking and adaptive thinking, we intend to provide a reflective and critical eye over how our collaboration and the project develops – i.e. akin to a so-called “critical participatory action research” approach (Kemmis & McTaggart, 2005) – as well as provide opportunities for our research partners to develop new skills and understandings.

In practice this approach is far from easy as other research teams have documented (Waltner-Toews & Kay, 2005). Participatory action research depends on active input on research design by the partners. Busy organisations are probably more familiar with a consultancy type of approach or with research where the method is well established up front and the steps are clearly laid out. It is therefore to our partners’ credit that following the presentation of the resilience assessment and collective learning tools at the December 1 workshop, those organisational leaders present were prepared to take a bit of a risk with us, and to journey forward with us even though the plan for how we would bring the process together was somewhat unclear and it was evident that the tools on display came from different knowledge traditions and were presented as separate tools (see section 5.3). As a research team we had not by that point achieved a transition to anything like a trans-disciplinary team and this lack of cohesion was apparent to several organisational leaders.

Key champions from our partner organisations appreciated the opportunity to provide input into the design of the process and after a cautious start have gradually taken a more active design role. Regrettably, their ‘voices’ are not well captured in this paper other than as outcomes embodied in the transition process that has been negotiated and agreed upon. Documenting and presenting the voices of our partners is a task to be pursued for our future working papers.

4. Establishing a theoretical basis for transformative action

This project is fundamentally about communities understanding and living with change in a positive way. As will be evident from the literature reviewed below, resilience thinking, adaptive governance and collective learning are ideas and sets of tools that accept that we live in a dynamic, ever changing world and that our social and ecological systems are often operating far from a situation of stability or equilibrium. The following sections cover the concepts and views expressed in the literature that are relevant to this study. The analysis is meant to be informative rather than comprehensive. While we have started with the propositions that resilience thinking, adaptive governance and collective learning will be useful concepts for communities facing significant change and that transformation is necessary for addressing many sustainability problems, we do not set out here to defend any particular interpretation of these concepts. Rather we seek to present the key ideas and ask how we can add value to the concepts. In particular we asked from the outset how the literature might provide us with theoretical starting points for building the necessary agency and a collective framework for taking transformative action in the face of significant changes to the availability of natural resources in resource-dependent communities such as the Wakool Shire.

4.1. Transitions, transformations, adaptations

Transitions, transformations and adaptations are presented here as types of change though like many terms associated with change they lack precise definition and are often used interchangeably as a process and as an outcome of change – especially in the context of the practicality of monitoring and reporting (Griffith, 2010), as well as among those who appreciate the critical role of learning and adaptive management as processes that are also desired outcomes (e.g. Armitage et al., 2008; Pahl-Wostl et al., 2007b). To add to the interpretation difficulties, transition, transformation and adaptation are not mutually exclusive notions when viewed across different literatures though within a particular set of literature such as that relating to resilience thinking (e.g. Walker et al., 2004; 2009) they are assigned distinct meanings. We begin by explaining the overarching concept of a transition, before examining similarities and differences between the notions of adaptation and transformation as building blocks for transitions.

The idea of a transition in a social context is probably the most straightforward of the three terms. A societal transition implies firstly that there is a shift from one recognisable form or state to another, secondly that there is some novelty in the new state, and thirdly that the shift happens over time with a temporal gap between one state and the next. Grand examples include the industrial revolution, the ‘green’ revolution in agriculture and the Internet revolution. Because of the profound nature of the change, and the time it can take for those involved to adjust to or make the change, new public policy is often directed at pursuing transitional arrangements that enable a smooth shift from old to new.

This literature on societal transitions is dominated by two schools of research, one in the Netherlands (Dutch Research Institute for Transitions or DRIFT) which has its origins in environmental studies, technological innovation research and integrated assessment (Rotmans &

Loorbach, 2009) and the other in Austria which portrays transitions as changes in socio-economic metabolism, meaning changes in the flow of materials and energy resulting from human modification of the landscape – changes that can thus be measured and examined (Haberl et al., 2004; Fischer-Kowalski & Haberl, 2007; Schandl et al., 2009). The Austrian school drew on a notion of transitions as big society-wide shifts such as the shift from agrarian to industrialised society (e.g. Schandl et al., 2009). However the idea of transitions has also built on experiences at a more localised scale (e.g. van der Brugge & van Raak, 2007; Pahl-Wostl, 2009) – including in relation to water management in the Netherlands, which more closely relates to the scale at which we are working with the Wakool community and covers similar subject matter.

Both the Austrian and Dutch schools sought first to describe and understand past transitions then turned attention to developing ideas about how future transitions might be managed. While they differ in approach, the two schools share some common understandings about transitions. In a joint paper written by two leading scholars from these two schools (Fischer-Kowalski & Rotmans, 2009), they are in general agreement that:

- Transitions consist of a series of stages or phases – i.e. pre-development, take-off, acceleration and stabilisation – though the sequencing is rarely linear or incremental and can be chaotic. This is also similar to Olsson et al.'s (2006) model of transformation developed from the resilience literature – a model that we used as a starting point for the design of earlier versions of our conceptual framework.
- What appears chaotic at a finer scale may appear to be incremental and smooth at a broader scale.
- Change is paradoxically too complex to manage – hence a degree of aggregation, coordination and emergence will shape different transitions.
- Interaction across multiple functional scales shapes a transition. This is a principle arising from complex systems theory and is shared with resilience thinking.

According to the same authors, where the schools differ is that the DRIFT group interprets transitions as complex social interplays between dominant regimes and new emerging regimes of niches while the Austrian group uses empirical study of resources or material stocks and the flows between biophysical structures of society and the natural world to explain the shift.

A third use of the term transition is also relevant to our project. There is a well established concept in ecology and in resilience thinking known as a state and transition model (e.g. Holling, 1973; Westoby et al., 1989; Briske et al., 2008). This model identifies alternative states of a system and the thresholds or tipping points that might be implicated in shifting from one state to another (Friedel, 1991; Gunderson & Holling, 2002). Interestingly these transitions in ecological systems can sometimes be reversible while the ones discussed above are uni-directional. In the section on resilience thinking below, we note and critique this difference between transitions dynamics in ecology and those dominated by social processes and will explore this important distinction in more depth as the project progresses.

Transition management

In developing our conceptual framework for application in the Wakool Shire we have drawn more on the work of the Dutch school. This is because its frameworks and tools are more orientated to future transitions management and more compatible with resilience, adaptive governance and collective learning theories. We also drew on papers comparing the work of the two big transitions schools (e.g. Fischer-Kowalski & Rotmans, 2009). Transition management is described by van der Brugge and van Raak (2007) as “a relatively young interdisciplinary research field concerned with the dynamics of structural change in societies, and when and how transformations can be initiated, facilitated and influenced.”

Already some patterns are being identified in how transitions can occur. Fischer-Kowalski and Rotmans (2009) explain that the thinking developed by DRIFT can help characterise different types of transitions according to the various ways that transitions evolve (1) over time and (2) across scales, as well as (3) in terms of identifiable patterns in which sites of novelty (where niche/innovative activities develop) interact with the dominant regime or status quo way of doing things:

1. Different types of transitions can be identified from variations in the temporal sequencing of events and activities. These can vary according to whether change develops with a purposeful agenda or emerges in a more unpredictable way; the overall extent that the events and activities are coordinated; and the overall sum of events and activities that constitute the transition.
2. Transitions can also be differentiated according to the way they interact across multiple scales. The concept of scale used by DRIFT is functional rather than geographical – i.e. it is about the “functional relationships among actors, structures and working practices that are closely interwoven” – and are differentiated into macro, meso and micro functional scales. Transitions come about when the novelty of innovations in different locations and at different levels begins to ‘modulate’ or move in a similar direction.
3. Three different patterns of interplay between dominant regimes and sites of novelty have been identified as follows: (1) a bottom-up one where niches develop at the micro scale and challenge the dominant regime, (2) one where niches coalesce at the meso scale and evolve into a new regime, and (3) one where top-down change is massive and leads to profound impact on the regime.²

A number of principles and tools from transition management (some of which overlap with and build from foundation ideas in resilience and adaptive management) have been useful, firstly in shaping our understanding of how others view the relationship between transitions, transformation and adaptation and then later as our understanding matured, in applying this knowledge to construction of a ‘planning-by-doing’ framework for Wakool Shire.

The principles developed by DRIFT are listed in the middle column of Table 1 as responses to the list of characteristics associated with complex systems in the left column, and some means to

² As we note below, the patterns they identify here do not include an ‘inside-out’ process as sought for our project; where a place (farm, township, city, watershed or region) and its people are at the centre of change and the process of change is from the inside out influencing the factors working from the outside in.

implement the principles listed in the right hand column. Most of these principles are shared with the resilience discourse and other complex systems derived approaches. The value of niches as experiments towards alternative futures and the maxim of radical change through incremental steps are ideas that shaped our thinking and hence our transition process. Perceiving transformations as changes that develop from the progressive adoption of the innovations inspired by niche experiments allowed us to understand the nuances in Olsson et al.'s (2006) explanation of transformation as a turbulent process. They were also ideas that were well-received by our partners, and became an effective way for us to communicate the concept and value of transformability.

Table 1: Linking of complexity characteristics, theoretical principles of transition management, and systemic instruments for transition management

<i>Complexity characteristics</i>	<i>Theoretical principles of transition management</i>	<i>Systemic instruments for transition management</i>
Emergence	Creating spaces for niches	Transition arena
Dissipative structures	Focus on frontrunners	Transition arena and competence analysis
Diversity and coherence	Guided variation and selection	Transition experiments and transition pathways
New attractions, punctuated equilibriums	Radical change in incremental steps	Envisioning for sustainable futures
Co-evolution	Empowering niches	Competence development
Variation and selection	Learning by doing and doing by learning	Deepening, broadening, scaling up experiments
Interactions, feedbacks	Multi-level approach, multi-domain approach	Complex systems analysis
Patterns, mechanisms	Anticipation and adaptation	Multi-pattern and multi-level analysis

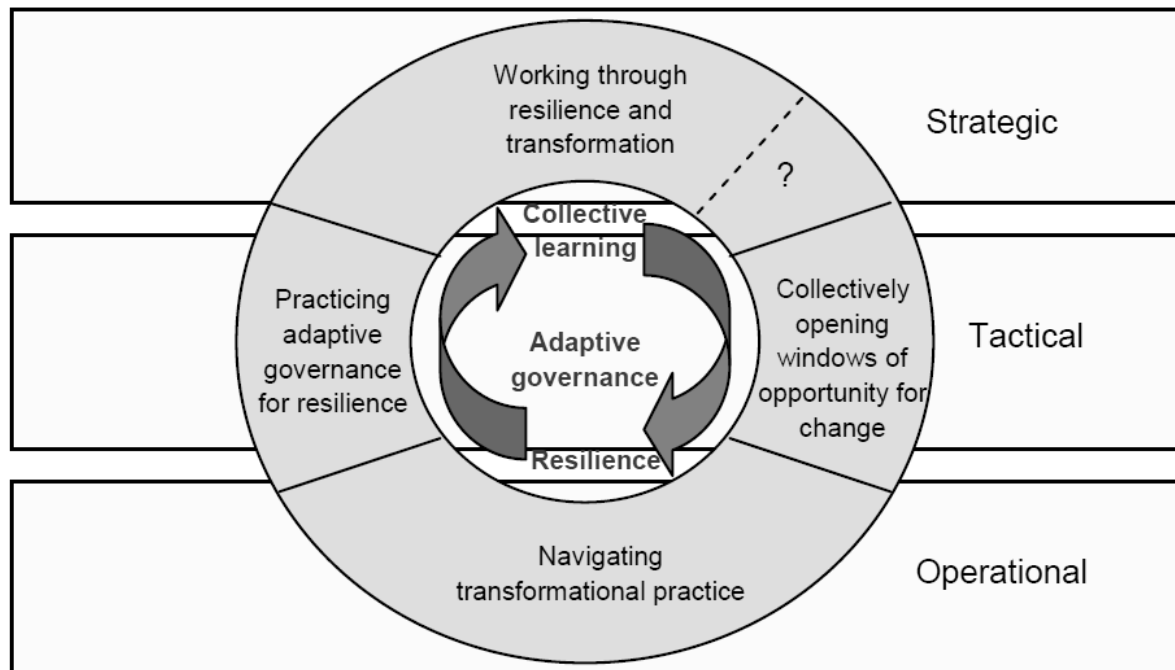
(Source: Rotmans & Loorbach, 2009, p. 191)

However, when presenting DRIFT's transition process as an iterative model, we found it necessary to reframe their perspective, and this included modifying some of the language they use. Much of the DRIFT approach to transition management is framed from an 'outside-in' perspective (i.e. from outside experts who bring their ideas to the lay community). In this project we envisaged a change process that would be driven from the inside out, with us as outsiders working together with those on the inside to deliver a form of community practice that fits with and is directed by the needs of those on the inside. So we modified the transitions management approach, language and material and developed devices and language that explained the transition process as a form of community practice (as explained in section 6).

For example, Figure 3 is based on the model for a 'transition management cycle' presented by Rotmans and Loorbach (2009) drawn from Loorbach's (2007) book detailing the transition management approach. We found the original language used for the steps in the cycle to be too managerial and top-down. So, for example, we changed step two of the cycle from their language of 'developing coalitions and transition agendas' to the language used by Olsson et al. (2006) of

‘collectively opening windows of opportunity for change.’ Similarly, instead of the more directive ideas of ‘mobilising actors and executing projects’, we saw our collective approach as one of mentoring or navigating transformational practice. We also showed how this cycle moved iteratively between aspects of the process which relate to strategic and tactical manoeuvres and the operational sphere. These were not just changes in language, of course, but represented a different perspective on how change is generated.

Figure 3: DRIFT multi-level transition process (modified from ‘outside-in’ to ‘inside-out’)



(Source: modified from Rotmans & Loorbach, 2009, p. 192)

From transformation and adaptation to transformability and adaptability

Transformation and adaptation are building blocks for transitions. For both terms a general meaning is widely understood – that is transformation as a radical, deeper, more profound form of change (Bawden, 1994; Olsson et al., 2006; Griffith, 2010) – and adaptation as something changing to fit with new surroundings. Different traditions however define the terms differently.

Resilience and transition management are two discourses that make a clear distinction between the two terms. In these discourses, adaptation refers to change within a particular social-ecological system whereas transformation refers to a change of system to another system with different structure and function (Walker et al., 2004; 2009; van der Brugge & van Raak, 2007). For example, Walker et al.’s (2004; 2009) examination of the impacts of irrigated agriculture in the Goulburn-Broken catchment detailed how pumping was used as an adaptive response to rising groundwater levels, but noted that the ongoing rise in salinity levels in the soil coupled with reduced vegetation cover would continue to push the landscape towards a threshold which, if crossed, would transform vast tracts of land to become unusable for agriculture as currently practised.

So transformation in particular appears to be a complex notion as it depends on the scale of the system being transformed. What looks like deep, profound or radical change at one scale may appear as incremental change at a broader scale. Folke et al. (2010) have noted that fine scale transformations may even be necessary sometimes to maintain resilience at larger scales.

Structures thought to be helpful for building transformability over and above the capacities necessary for adaptation include:

- Active shadow networks (Olsson et al., 2006), which are networks that operate outside the formal societal structures and can explore alternative futures with freedom;
- Epistemic communities (Olsson et al., 2006), i.e. knowledge networks – not just networks of people with specialist expertise knowledge but also networks of people with grounded experiential knowledge;
- Transition or safe arenas (Loorbach, 2007), which are protected spaces where niches or innovative ideas are nurtured; and
- Leadership that can recognise and open windows of opportunities and assure communities can navigate their way through the turbulence and uncertainties inherent in transformative change processes (Olsson et al., 2006)

By comparison, the broader literature has a much more diverse range in which these terms are used, and it can be difficult and even unhelpful to try to sort through a relationship between the two concepts as they are used in different literatures. It is not so much that the terms are contested (although they are to a degree). Rather, it is that the nuances are difficult to grasp and generalise. In some contexts – for example in evolutionary theory – small transformations assist adaptation as an ongoing process as do larger transformations in a punctuated equilibrium interpretation of evolution. Learning and change theorists similarly propose that incremental so-called ‘small wins’ can evolve into broader societal changes that are radical or transformational in character, particularly when these ‘small wins’ occur at the same time in different places and/or as a series of consecutive ‘small wins’ that move “in a similar direction” (Weick & Westley, 1996, p. 445) – i.e. achieving radical change through small steps.

The terms adaptation, adaptability and adaptive remain problematic even if the differentiation between transformation and adaptation stipulated in the resilience literature is accepted, as the use of the word adaptive in the same discourse tends to be much more general. We found ourselves using the word adaptive quite frequently in conversation and in drafting this paper and had to stop and think what we really meant when we used it. For consistency with the resilience literature we have accepted (for now) that adaptability is the ability to manage resilience in a particular system – or in particular parts of the system – while transformability is the ability to bring about a shift to a new system – or to particular parts of the system. We have also accepted that both adaptability and transformability (as they have been used in the resilience discourse) will be necessary capacities if the Wakool community is to manage an intentional transition – whether that is in response to current resource shocks or more generally in response to future challenges. Both the transition school and those working on resilience recognise that the new system identity emerges as transformation proceeds. It is counter-productive for communities to try to pick a preferred new system identity and then hope to move towards that.

As this project has progressed and we have considered these conceptual challenges we have turned attention away from transformation as an outcome preferring instead to talk of taking transformative action as a process and of building transformability as a necessary community capacity for dealing with significant change. This change of emphasis from tracking transformation to building transformability means that we can learn more about transformation as an outcome through the actions of the Wakool community.

4.2. Resilience thinking

What is resilience?

Resilience is a word that we often hear in general usage, but is also a term that has a specific and more restricted meaning in a number of different scientific fields. Generally, if something is resilient, it has an elastic strength or capacity to bounce back from disturbance or adversity in some form. The more specific and scientific use of the term resilience was originally applied in engineering and in ecology in the 1970s. In the former it was about how quickly or strongly a mechanical system could bounce back to its original condition after it experienced a disturbance or shock (as this was a key aspect sought from its design). In ecology, two usages arose. The first – like its usage in engineering – related to speed of return, but instead related to studies based on stability analyses of food webs, predator-prey systems and the like. The problem with the analysis used in these studies was that it only had validity for small changes in the neighbourhood of the equilibrium and didn't say much about what happens for changes that were far from equilibrium. The second use arose precisely out of such an interest – what are the limits to change? How much can a system be disturbed and still be able to recover? In this sense resilience is concerned with the dynamics of ecosystems and of interacting social-ecological systems (as further explained below), especially when a system is at the edge of its capacity to keep self-organising in the same way – i.e. there is very little scope to change how the current system is functioning without ending up shifting to a different domain of stability (an alternate regime of the system) – as exemplified in the example noted earlier from Walker et al.'s (2004; 2009) examination of irrigated agriculture in the Goulburn-Broken catchment. When applied to ecosystem dynamics, therefore, resilience is more about whether or not the system *can* recover after a disturbance, rather than how fast it recovers. There is no assumption that it will return to the exact original state, but only that it will remain within the same basin of attraction (also known as a system regime). Hence this type of resilience thinking concentrates its explorations on potential alternate states and thresholds (the points at which a system shifts from one domain of attraction to another), as well as the feedback mechanisms that make this happen (Walker & Salt, 2006).

To better understand how this latter approach to resilience thinking has evolved, it is helpful to lay some foundations. Firstly, under resilience thinking the Wakool Shire – like all places – can be envisaged as a dynamic, complex, self-adjusting social-ecological system. A social-ecological system has multiple interactions and linkages between the biophysical world and the social world, nested across a number of scales (Walker et al., 2004). What is important is that the linked or coupled system contains elements – including individuals and communities – that have the capacity to learn

from experience and the capacity to self-organise³. Self-organisation can be perceived as being a process in which “the internal organisation of open systems increases in complexity without being guided or managed by an outside source” or “the spontaneous organisational outcome of interacting negative and positive feedbacks” – especially as certain thresholds are crossed (van der Brugge & van Rak, 2007, citing Prigogine, 1987 and Walker, 2005). This allows a co-evolution of changes that can result from disparate learning experiences by individuals, organisations and communities; the emergence of new ideas and processes; as well as self-organisation. These co-evolutions of changes combined thus have the potential to create an intentional transition.

The resilience discourse has its roots in, and is a version of, complex systems thinking and a particular way of viewing the world. A number of discourses including the early sustainability agendas have attempted to take this complex self-organising systems view of the world and apply it to some of societies’ more intractable and difficult problems – or ‘wicked’ problems – see below. However resilience is not a synonym for sustainability. Systems (of land use for example) can be highly resilient to some types of disturbance but not sustainable in the longer term because they undermine the integrity of the ecosystem. A good example is irrigated agriculture on floodplains where water can be stored and its supply regulated to reduce the adverse effects of droughts and floods. Farmers with access to irrigation are generally more resilient to long periods of drought than their dryland counterparts. But the downside is that sophisticated human intervention is needed to replenish the nutrient loss from the soil now that flooding no longer provides this replenishment, and the build up of other compounds in the soil and changes in groundwater also need to be carefully managed. Systems that are sustainable (likely to persist without undermining ecosystem integrity or decline in human well-being) are likely to be characterised by general resilience, meaning that the system will not only be resilient to a specific disturbance such as drought, but be generally resilient to a much wider range of disturbances including, for example, rising salinity levels and changes to soil and water quality, as well as to management changes arising from a market shock.

So, a second foundational point is that NRM problems related to the pursuit of sustainability and improved resource condition in complex self-organising systems can often be perceived as ‘wicked’ problems⁴. This is a term that has been used to describe problems that are persistent or intractable, and is thus an apt description for many of the problems faced by communities in the Murray-Darling Basin (Allan, 2008). When introducing the notion of a ‘wicked’ problem, Rittel and Webber (1973) characterised it as follows:

- **No final solution:** since a wicked problem is part of the social fabric in which it sits, any resolution of the problem leads to social change, and so generates fresh problems that need new solutions, in a continuing learning spiral;
- **Every problem unique:** any complex social-environmental problem can only be understood as the product of a society at a given time and place;

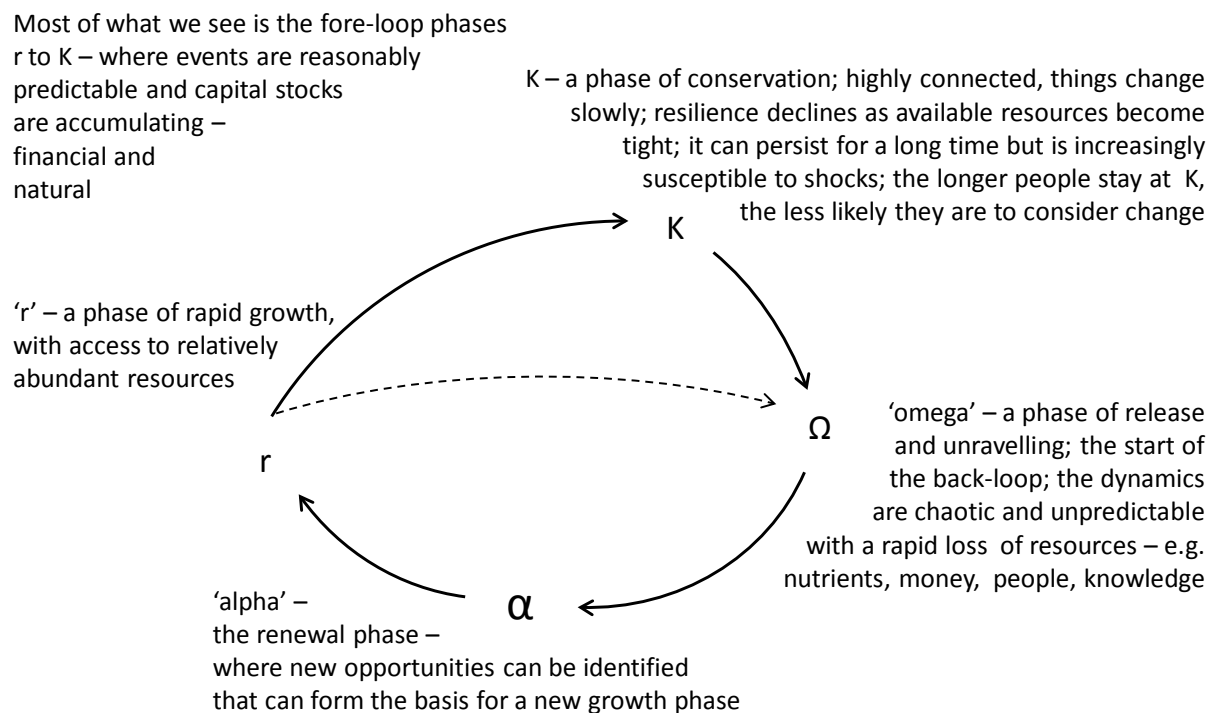
³ Though self-organisation in society operates in different ways to how it operates in ecological systems, as discussed at the end of the section; the important point here is that the social and ecological systems are closely inter-connected.

⁴ These foundational points – and especially the idea of ‘wicked problems’ and the difficulty in responding to them – are also fundamental concepts behind the need to pursue adaptive governance and collective learning

- **Existing solutions can impede change:** concentration on what works now restricts the capacity to creatively explore what could be;
- **Confusion between facts and values:** in complex issues requiring social change, the distinction between fact (what is) and value (what should be) becomes blurred and the debate becomes confused; and
- **Solutions from unexpected sources:** paradoxes are signals of points where a society has become unstable, and so offer fruitful areas for social learning and change.

A third foundational point is that ecological, economic and social systems are dynamic. Drawing on much earlier work related to cycles in capitalist economic processes, Gunderson and Holling (2002) perceived an adaptive cycle for ecological systems that they proposed also had relevance to social and economic systems and hence to social-ecological systems (although there may be multiple variants of the ways that such a cycle is manifest in the social world). The cycle has four phases (see Figure 4).

Figure 4: The adaptive cycle



(Source: modified from Gunderson & Holling, 2002)

This adaptive cycle was used as part of our resilience assessment workshop with Wakool Shire community representatives in June 2010, where participants found it a useful metaphor to characterise recent experiences in the Wakool Shire. For example, the two industries of irrigated agriculture and forestry have been in a late growth or conservation stage for several decades. Broader societal concern about conserving remnant redgum forests along the Murray River have led to a political decision that has dramatically hit the local timber industry. For the workshop participants, it was clear that the timber industry had now been forced into the ‘omega’ stage as a result of the declaration of national parks in place of forestry reserves, and was already moving towards a re-organisation stage where new opportunities were being considered. By comparison,

irrigated agriculture was still seen to be in the 'K' stage. We (researchers) would argue that, contrary to the popular imagination, the situation of those in the irrigation industry is not one of high resilience (even if the spirit and determination of many irrigators could be characterised as highly resilient). While the flexibility between choosing rice over a wheat crop when water is available has served irrigators well in the past, the current situation – where very little rice has been grown over the past decade, where debt levels are high, and where pockets of irrigators have decided to trade out their irrigation allocations – is one highly susceptible to shock – especially to a political decision involving permanent reduction in water allocations.

Building on these foundational concepts, resilience has been defined by Walker and Salt (2006) as:

The amount of change a (social-ecological) system can undergo (its capacity to absorb disturbance) and remain within the same regime – essentially retaining the same function, structure and feedbacks.

The Resilience Alliance website (www.resalliance.org) provides a bit more detail:

Resilience is... “the ability to absorb disturbances, to be changed and then to re-organise and still have the same identity (retain the same basic structure and ways of functioning). It includes the ability to learn from the disturbance. A resilient system is forgiving of external shocks. As resilience declines, the magnitude of a shock from which it cannot recover gets smaller and smaller. Resilience shifts attention from purely growth and efficiency to needed recovery and flexibility. Growth and efficiency alone can often lead ecological systems, businesses and societies into fragile rigidities, exposing them to turbulent transformation. Learning, recovery and flexibility open eyes to novelty and new worlds of opportunity.”

The aim of managing resilience is... “either to keep the system within a particular configuration of states (system ‘regime’) that will continue to deliver desired ecosystem goods and services (preventing the system from moving into an undesirable regime from which it is either difficult or impossible to recover); or to move from a less desirable to a more desirable regime.”

There are two broad aspects to resilience – ‘general’ and ‘specified’. We can think about ‘specified’ resilience as the resilience ‘of what’, ‘to what’. This is what we are mostly concerned about – the resilience of some aspect of a system (its productivity, the species it contains, the livelihoods of people) to some defined shocks (a drought, a fire, a market shift).

The theory suggests that these linked social-ecological systems are controlled by a small number of variables – usually slow acting variables which influence other variables in the system through feedback effects (Walker et al., 2004). Thresholds are points on the controlling variable at which a critical feedback changes, affecting function and hence structure of the system. A classic example at sub-catchment scale is depth of the groundwater table from the surface. There is a threshold at around two metres, depending on soil type, and if this is crossed, water is drawn to the surface by capillary action, bringing with it salts in the soil profile, resulting in water logging and perhaps soil salinisation, leading to severely degraded crop production. Adaptability, from a resilience discourse

perspective, is the ability of actors in the system (usually human) to manage such thresholds so as not to significantly change the structure and function of the system and therefore retain its identity. The aforementioned (Walker et al., 2004) example of water pumping was an adaptive response that reduced the level of waterlogging affecting parts of the Goulburn-Broken catchment during wetter times.

Efforts to increase resilience of some aspect of a system regime to a specified set of disturbances can unwittingly reduce the resilience of other aspects of that system to other, non-specified (perhaps novel) disturbances. There is therefore a need to balance the maintenance of 'general' resilience while engaged in necessary efforts to enhance 'specified' resilience to known threats and disturbances. It is a difficult issue to address.

Resilience as a concept, particularly the system dynamics described by Walker et al. (2004) and Folke et al. (2010), is not without its critics. Several strands of criticism have emerged and were recently summarised by Dovers (2010):

- That much of the theory is explained by heuristics – or helpful conceptual devices and metaphors – rather than derived from empirical results⁵;
- The literature is inwardly focussed and too self-referencing particularly the sharing of a limited number of case studies;
- The existence of thresholds is poorly supported – particularly social thresholds;
- It is accused of being still embedded in its ecological roots and light on robust social processes despite a recent expansion of resilience literature from a social perspective;
- Stakeholder participation is more consultative than interactive; and
- The literature on institutional dynamics, change and governance is largely ignored.

We provide details below on how resilience thinking is evolving in response to the criticism that it has been light on robust social processes. A key aspect to that criticism is that the systemic relationships of individuals and communities are quite different to those operating within ecological systems, even though individuals and communities are part of connected social-ecological systems. Feedbacks in the social world operate in different ways to those in the ecological world. Community self-regulation can function as “a moving feast of interests, coalitions, values, resources and aspirations due to the purposive nature of human action; the variable impact of change within communities; the cultural and subjective dimensions of change; and the influence of power relations between stakeholders” (Lockie & Jennings, 2003, p. 132). Human expectations, choices and beliefs are key variables in the system and interact between themselves in unexpected ways. Resilience in an individual, a community and an organisation, and of their ecological system, each has its own internal dynamic, as well as the potential for constructive collaboration. While each is involved in any change process large enough to be labelled transformative, their interaction can range from conflicts of interest to collective learning. In the latter each group contributes equally, learning from each other, so that the end result is a synergy, a new understanding that no one could have achieved alone (Brown, 2008; Brown et al., 2010).

⁵ Some of the early work from which the concepts were derived built on empirical studies involving forests, lakes and savannahs

As researchers exploring the relevance of resilience thinking to the prospect of intentional and transformational community-driven change, we are open to these criticisms, and seek to be aware of their implications and to address them as our broader thinking and learning evolves out of the experiences that this project will provide.

How has the concept of resilience evolved?

A number of broad shifts in the resilience discourse from its introduction in the 1970s to the present are evident. A clear history up to about five years ago is provided by Folke (2006). When Holling (1973) wrote his seminal paper on resilience in ecological systems, he realised that he also needed a mechanism to manage it – and adaptive management was conceived. From about the 1980s ecological resilience was extended to cover linked social and ecological systems (like sustainability). Later adaptive co-management emerged as a social dimension of adaptive management and resilience – the idea that no one organisation or social group can manage common pool ecosystems – and adaptive governance (Dietz et al., 2003) was adopted by resilience thinkers as the enabler of this adaptive co-management and hence resilience (Folke et al., 2005).

Contemporary resilience thinking (i.e. post 2006) is shifting from its ecological roots and is incorporating a set of multi-faceted and diverse perspectives on the dynamics of linked or coupled social-ecological systems. In particular (as noted above) there is now a wider appreciation that the dynamics of the social dimension operate in different ways to those in their ecological counterpart. Social characteristics such as language, institutions, governance, reflexivity, social learning and power are slowly gaining more prominence in the resilience literature (Ostrom, 2005; Olsson et al., 2006; Lebel et al., 2006; Pahl-Wostl, 2009; Underdal, 2010; and others). Hence criticisms of previous versions of the resilience discourse including ‘wholesale import of theories from the natural sciences’ have less contemporary relevance (Duit et al., 2010). So resilience thinking in the NRM context is ‘third generation’ complex systems thinking about social and ecological interactions which have and will continue to change landscapes and livelihood strategies based on natural resources. It is an alternative approach to efficiency-driven techno-centric command and control management and is suited to situations characterised by high levels of complexity and uncertainty and low levels of controllability (Cork, 2009). Putting resilience thinking into wider NRM practice requires profound changes to value systems and methodologies, including the current dominant ways knowledge is constructed and the way entities are viewed, and could thus constitute a paradigm shift.

It may be worth noting that the notion of social resilience or community resilience had also emerged as a separate literature particularly in the US, some of which seems to apply to the general meaning of resilience with theoretical roots in psychology (e.g. the study of Stanthorpe in Queensland by Hegney et al., 2008) while others follow a complex systems logic.

The translation of resilience thinking into practice is generally not well captured in the resilience literature and much of it remains conceptual, relying on case studies as illustrations. As a consequence it is difficult to sort through how studies were actually carried out. However, the Resilience Alliance (2007) has published a workbook for practitioners for assessing and managing resilience in social-ecological systems drawing on earlier work by Walker et al. (2002). While some additional modules have been added covering social networks (Bodin & Crona, 2009), this workbook

fails to capture the full gamut and potential of the resilience discourse represented in the contemporary literature. In addition, the early participatory intent highlighted by Walker et al. (2002) has not reached the maturity that would be expected of that term in the social sciences. Much of the practice of resilience assessment that we have experienced remains expert-driven rather than drawing on well-established principles associated with adult learning and/or collective learning. In response to this we set out in this project to develop a participatory approach to resilience practice which draws on the workbook and lessons from its implementation (Resilience Alliance, 2007) including the Goulburn-Broken catchment in Australia but does not accept the workbook as a ready-made change process for rural communities.

How we have attempted to find synergies with collective learning and governance theories is covered in section 5 of this paper. How we have improved the resilience assessment process in ways that could improve its participatory intent will be the subject of a future working paper.

What are resilient landscapes and communities?

In their book *Resilience Thinking* Walker and Salt (2006) came up with some characteristics of a resilient world. While they eschew prescription they suggest that those aspiring to create or make the most of a resilient world⁶ would:

- Promote and sustain diversity in all forms (biological, landscape, social and economic);
- Embrace and work with ecological variability rather than attempting to control it;
- Appreciate, retain and/or further enhance the modular structure of system components (i.e. where the components of the system are not fully and irrevocably connected, because if they were it would be much easier for a disturbance to move rapidly through the system – the classic example is the spread of a disease and the benefit of having means to separate, section off, and quarantine people to curtail the spread);
- Focus policies on slow controlling variables associated with thresholds (i.e. it is the variables where change occurs slowly and imperceptibly that can go unnoticed, and therefore extra attention is needed to monitor these variables as they approach thresholds deemed to be of critical concern);
- Understand the implications of the tightness of feedbacks (i.e. the feedback between cause – e.g. removal of vegetation – and effect – rise in groundwater levels in this case – is readily apparent, and therefore ‘tight’, meaning information feedbacks are tight and do not get bogged down in committees and top heavy bureaucratic requirements; and also where land managers take an action, the implications of that action are not hidden or occur in a distant place; a contrasting example is groundwater use where its implications for water quality and quantity is often greatly removed in both time and place; loose feedbacks like these tend to reduce resilience);
- Promote and build social networks and leadership styles based on trust and other social qualities often grouped together using the term ‘social capital’;

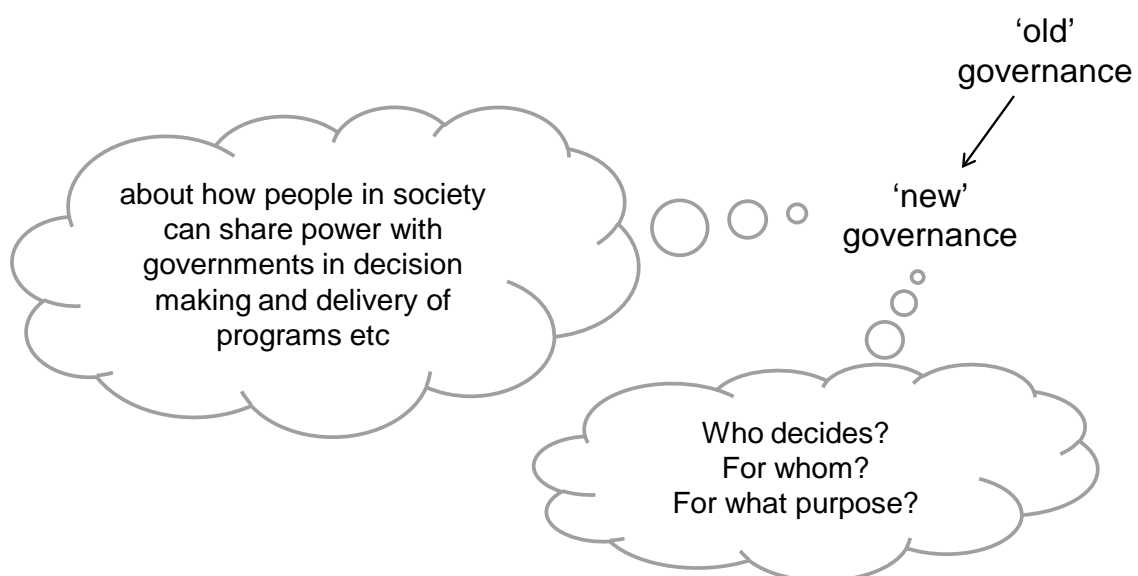
⁶ i.e. sometimes we as human change agents can take action that enhances or creates resilience; but sometimes resilience is already inherent in the existing system – we haven’t created that resilience but we can be aware of it, and take action that makes the most of it

- Place an emphasis on innovation, learning, experimentation, locally developed rules and embracing change;
- Promote and build the type of institutions that are able to include redundancy in their governance structures (rather than exclude redundancy as is the usual outcome of efficiency-driven motives); and
- Include all the unpriced ecosystem services in development proposals and assessment.

We have used this set as a starting point for developing a set of general resilience criteria for resilience assessments recognising that many of these characteristics are common to other discourses. The Stanthorpe study mentioned earlier (Hegney et al., 2008) has also developed a set of resilience attributes for communities. By the end of this project we may be able to provide some more specific characteristics related to resilient landscapes and communities. Such an exercise is not meant to be an effort in merely re-badging widely accepted best practice in the pursuit of sustainability. Instead, we are seeking to add value to a range of well-established sets of discourses by building on the evolving discourse within resilience thinking as it seeks to incorporate ideas from this broader range of discourses, as well as seek to add to the evolving and coalescing discourses with which resilience thinking is interacting as it further explores the complexity of how connected social-ecological systems respond to wicked problems in NRM and the pursuit of sustainability. One key discourse that has evolved out of resilience thinking at least in name, but is also now coalescing with other discourses, is adaptive governance, to which our attention now turns.

4.3. Adaptive governance

In recent years, the term '*governance*' has been applied to new contexts which are different from its original use to describe the systems and mechanics of government and how it delivers policies and programs. The term is now being used to describe and better determine how people in society can share power with governments in decision making and program delivery.

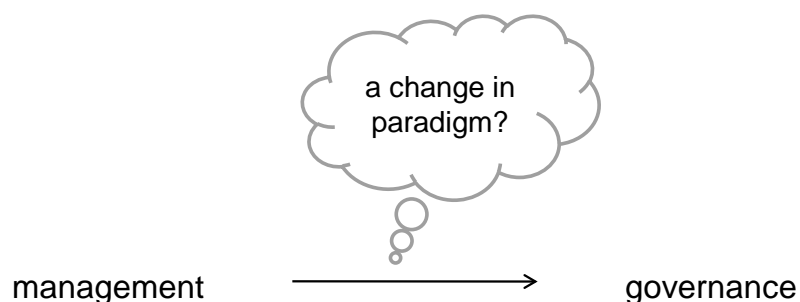


By focusing on the questions of ‘Who decides?’ ‘For whom?’ and ‘For what purpose?’, this new attention on governance is seen as crucial in improving the delivery of NRM programs and the sustainability agenda (Stratford et al., 2007), especially given that failure to resolve NRM issues is usually a result of failures in governance arrangements.

As society deals with entrenched ‘wicked’ problems in NRM, it has become apparent that we need to respond to these problems in an adaptive way (Bellamy, 2006). Governments and government agencies recognise this, and increasingly refer to their efforts of “adaptive management”, even if their actual approaches provide little more than lip-service to the ideals of an adaptive management approach (Allan & Curtis, 2005; Allan, 2008). Adaptive management has an extensive literature which is not reviewed here.

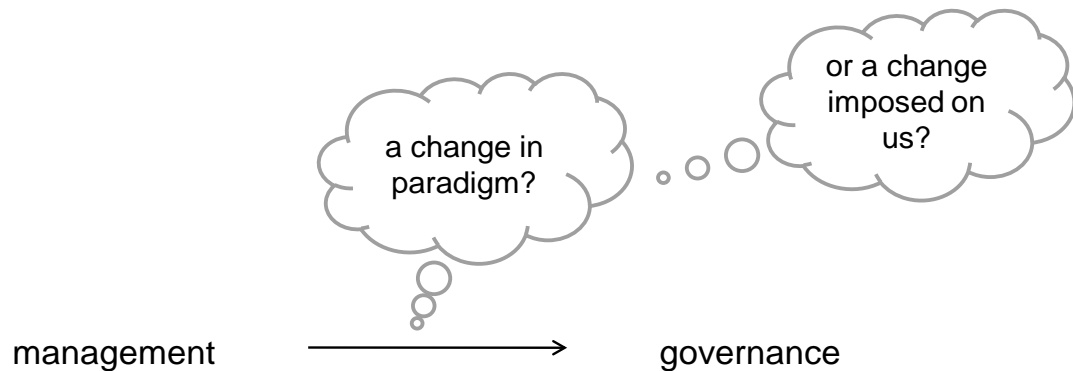
For much the same reasons, those exploring the concept of resilience and its application to complex social-ecological systems also refer to the need for an adaptive approach. Bringing this need for an adaptive approach together with the need for greater participation from society in determining how government develops its response to ‘wicked’ problems has led to the adoption of the term “adaptive governance” (Folke et al., 2005). Adaptive governance is portrayed in the resilience literature as the enabler of adaptive management (Lebel et al., 2006) and an integral part of resilience thinking (Walker & Salt, 2006). However, it is also a well established concept outside the resilience discourse and many authors see it as an extension of a long established discourse on power and authority, decision making and citizen participation (Davidson et al., 2006; Bellamy, 2006).

The idea of governance “conveys the difficulty of control, the need to proceed in the face of substantial uncertainty, and the importance of dealing with diversity and reconciling conflict among people and groups who differ in values, interests, perspectives, power, and the kinds of information they bring to situations” (Dietz et al., 2003, p. 1911). Good governance is needed when applying resilience thinking as changes in system dynamics will benefit some people and some species while disadvantaging others. While some see governance as a preferable alternative to management, in practice the two concepts are often two sides of the one coin, each necessary for action. What looks like governance at one scale is often management at another scale.



Not all that goes under the banner of governance is necessarily ‘good’ and something that we need. It has also been used to describe unpleasant phenomena that have been imposed on us. With reference to the current neo-liberal agenda that has driven government policy and practice concerning agriculture and NRM, Lockie and Higgins (2007, p. 2) refer to new governance arrangements that represent “a restructuring of state-based regulation in ways that promote

privatisation, free trade, deregulation and global competitiveness – sometimes characterised as a withdrawal of state intervention in favour of ‘market rule’ or ‘jungle law’.” The resulting neo-liberal governance arrangements involve devolution of power, responsibility and accountability to regional, local and individual farm levels; an emphasis on corporate governance and self-regulation; and is all part of a broader social response to living in what Beck has described as a ‘risk society’ (Beck, 2006).



i.e.: part of a neo-liberal agenda as *“a restructuring of state-based regulation in ways that promote privatisation, free trade, deregulation and global competitiveness – sometimes characterised as a withdrawal of state intervention in favour of ‘market rule’ or ‘jungle law’*

Lockie & Higgins, 2007, p. 2

involves

devolution of power, responsibility and accountability;

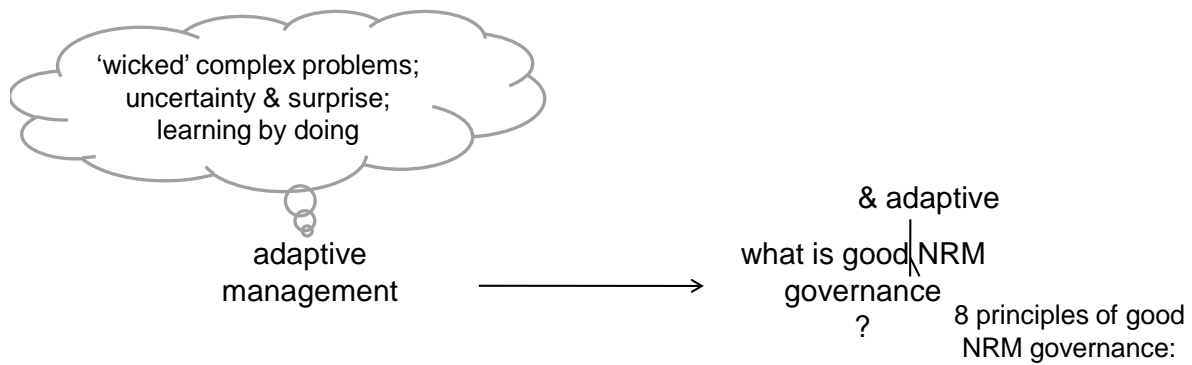
emphasis on corporate governance and self-regulation

our response to living in a ‘risk society’ = ‘reflexive governance’ (Beck, 2006)

It is important therefore to situate our understanding of ‘adaptive governance’ in the context of the literature that details the characteristics of good governance. In a substantial review of literature and experiences of NRM practices in Australia, Davidson et al. (2006) identified eight principles of good NRM governance, as follows:

1. Legitimacy
2. Transparency
3. Accountability
4. Inclusiveness
5. Fairness
6. Integration
7. Capability
8. Adaptability

To translate each of these principles of good NRM governance into a set of principles of good and adaptive governance Griffith et al. (2009) subsequently sought to put ‘an adaptive lens’ over these principles.



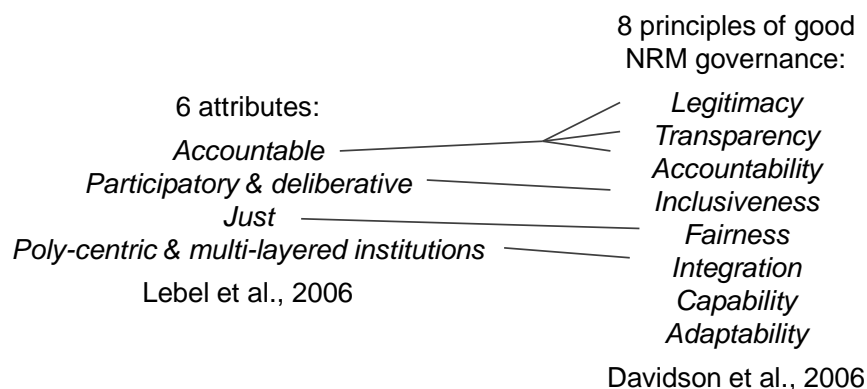
Using resilience thinking, Folke et al. (2005) had already identified four attributes of adaptive governance, as follows:

- **System dynamics focussed knowledge**
- **Collective social learning**
- **Adaptive co-management**
- **Preparation for uncertainty and surprise**

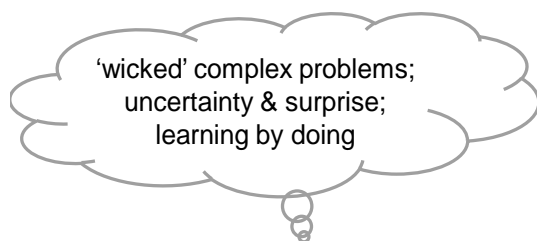
Building on this, Lebel et al. (2006) identified six key attributes of adaptive governance that enable resilience of social-ecological systems. These are:

- **Participation (1)** which builds trust;
- **Deliberation (2)** which leads to shared understanding needed to mobilise and self organise;
- **Polycentric (3)** and **multi-layered (4)** institutions which improve the fit between knowledge, action and social-ecological contexts in ways that allow societies to respond more adaptively at appropriate levels; and
- **Accountable (5)** authorities that pursue **just (6)** distributions of benefits and involuntary risks enhance adaptive capacity of vulnerable groups and society as a whole.

It is clear that the set of attributes identified by Lebel et al. (2006) link well with those identified by Davidson et al. (2006).



And from these sets of attributes, Griffith et al. (2009) identified a new set of seven principles of good and adaptive governance which we now hope to test through this project with Wakool, as listed in the figure below.



What is good and adaptive NRM governance?

7 principles of adaptive governance:

Legitimacy
Accountability
Procedural fairness
Connectivity
Reflexivity
Adaptability
Transformability

Griffith et al., 2009

4 attributes of adaptive governance:

Knowledge of system dynamics
Social learning by doing
Adaptive co-management
Preparation for uncertainty and surprise

Folke et al., 2005

8 principles of good NRM governance:

Legitimacy
Transparency
Accountability
Inclusiveness
Fairness
Integration
Capability
Adaptability

Davidson et al., 2006

What we have already achieved in this project is to develop a set of criteria from each of these principles and have used this framework to build a baseline of Wakool's adaptive governance capacity relying on self-assessment against these criteria by key leaders from our partner organisations. Key representatives from the Wakool Shire Council and Murray CMA rated how they saw their adaptive governance arrangements against a set of criteria written as specific desired outcomes related to each of the principles identified by Griffith et al. (2009). This adaptive governance assessment framework is still a work in progress, and feedback from Wakool participants has already helped us revise the criteria. The baseline assessment undertaken with those key representatives has been documented so that each of the key representatives can assess later the extent that there has been a change in adaptive governance arrangements.

4.4. Collective learning

From the outset of this project, we envisioned that collective learning would partner well with approaches based on resilience thinking and adaptive governance as a means to drive transformative action and the possibility for transformational change. Collective learning brings together the multiple sets of interests involved in addressing complex problems, in a way that each interest can learn from all the others. The outcome is an understanding and an opportunity for change greater than any one interest could achieve alone. Like resilience thinking and adaptive governance, collective learning is both part of the process by which the transformational change occurs and the outcome of that process.

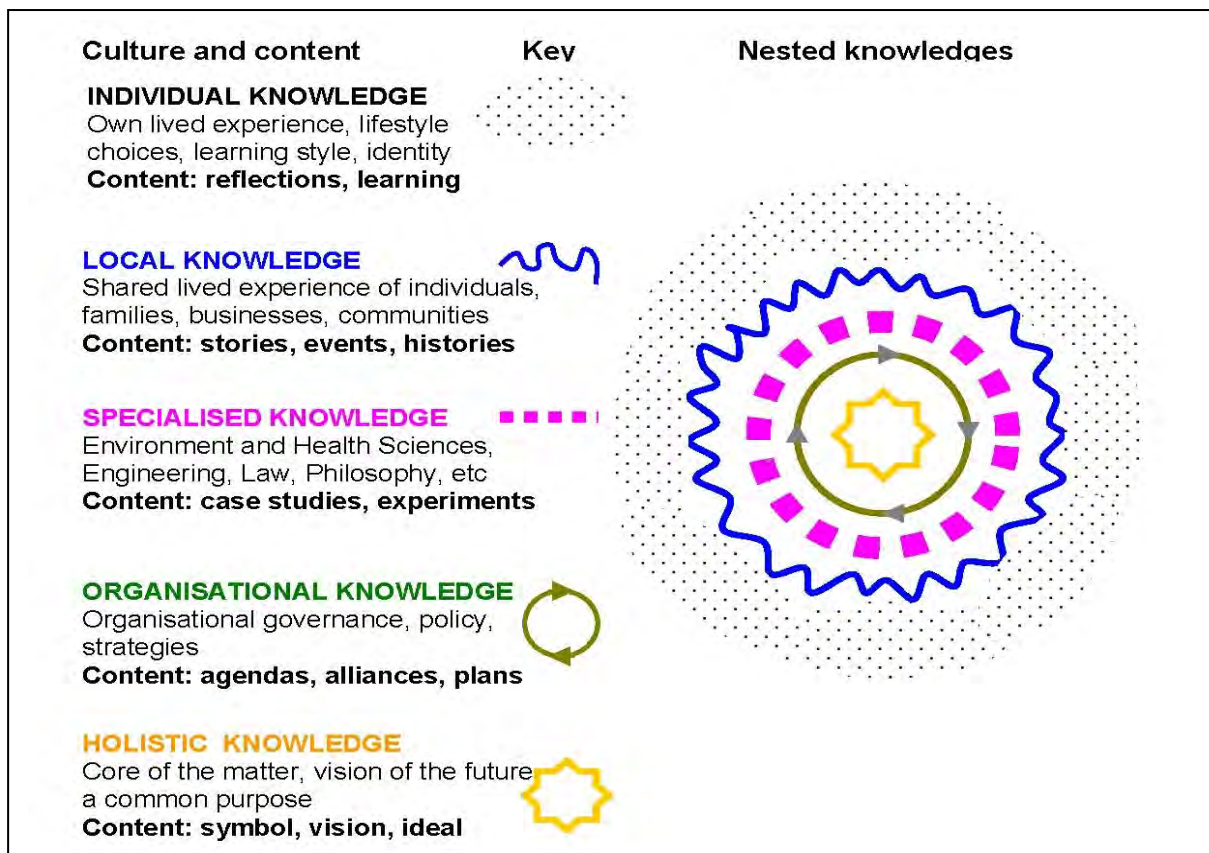
Collective thinking reverses the current mode of dividing complex issues into separate parts and having special interests dealing with each separate part. Experiences from a six year action research program to build local capacity for enhanced sustainability (Brown, 2008) found that different interests use different languages to describe the same issue, choose different courses of action, work to different timetables and are directed towards different outcomes. Such patterns of

difference were not primarily matters of right and wrong. They were different interpretations of the same reality, each internally consistent and valid within their own terms. Each produced a version of reality validated against criteria, thus isolating each version in a different knowledge culture. Instead, a collective learning approach involves setting up a collaborative team that operates with the following principles (Brown, 2008, p. 171-183):

1. Respect for other's ways of knowing – their sources of evidence and tests of truth;
2. Reflection on and critical consideration of one's own thinking;
3. Learning to hear community voices and recognise their key icons and symbols;
4. Translation of specialised research into common-sense questions;
5. Transparency of the values and interests of influential organisations (including one's own);
6. Shared clarity of purpose (not necessarily consensus).

A collaborative team working together to improve the governance and resilience of a particular area would build a synergy from the knowledges of the following: the individuals involved (their livelihoods and everyday experiences); the community (their shared practices, events and symbols); specialist advisors (relating to aspects of biophysical condition, quality of life, loss of biodiversity, etc.); and organisations (whether it be government policy, industry profits, or social service and/or equity, they have their own goals and agendas) (see Figure 5). To achieve a shared understanding of their mutual goal, creative thinkers are needed. For sound and lasting decisions, contributions from all these forms of knowledge are equally important. Every participant in the collective needs to think as part of a collective working towards a shared and common purpose.

Figure 5: Knowledge cultures as a nested system



(Source: Brown, 2005)

Collective learning thus offers a pathway that opens minds and opportunities for transformational change in a society or community. A key method used to open up transformational change possibilities is that the pathway starts with collective reflection of ideals, rather than starting with the problem (as is often the case). Starting with ideals provides opportunities for participants in the collective to step out of the problems they want to address.

Collective learning is connected with the literature on social learning (e.g. Keen et al., 2005). Social learning is often presented as an outcome, and the result of collaborative activity in particular (so the idea of social learning like collective learning is both process and outcome). Social learning has recently become a pivotal concept among those working with resilience thinking and complex social-ecological systems (e.g. Folke et al., 2005; Pahl-Wostl et al., 2007a; Mostert et al., 2007; Pahl-Wostl, 2009). For these researchers many complex problems are less associated with resource limitations and more with governance failures, leading to assertions that adaptive governance and social learning are essential for managing change in social-ecological systems.

Social learning towards more sustainable futures is unlikely to occur if the plan of action does not include the full suite of decision-makers in that society. Any effective plan of action requires contributions from key individuals, the affected community, relevant expertise, influential organisations and a holistic focus. Usually, when a diverse set of interests are brought together, focus ends up on the conflicts of interest rather than on how to build a synergy among the participants so that the collective of diverse interests is valued. For this reason, the approach of collective thinking depends on an appreciation of these diverse experiences and knowledges (Brown, 2008). The collective learns together, combining diverse ideas through a creative synergy capable of resolving the wicked problems of their society. The collective glue is the shared clarity of purpose – it is not about trying to secure a consensus but achieving a common purpose among a set of diverse interests. The output is collective decisions for a set of actions to address the common purpose.

Such an approach is in stark contrast to that usually practised where relationships among the knowledges are perceived as conflicts of interest and each knowledge culture rejects the others through criticism, e.g. reflections of individual knowledge are criticised as being biased; stories of community knowledge are seen as mere anecdotes; terms used by experts are seen as unhelpful jargon; the strategic decisions of organisations are all about making deals; and efforts to provide holistic insight are criticised as being airy-fairy. Most approaches to decision making is spearheaded by a competition for primacy between expert knowledge and strategic political knowledge. Community and individual knowledges are treated as second best, and holistic knowledge seldom acknowledged or used. In collective thinking, all knowledges are respected equally, requiring a significant shift in thinking.

The first step in moving from compartmentalised to collective thinking is to focus on the connections and not the divisions. This is harder than it seems, since it is contrary to current practice. The more familiar decision-making hierarchy is headlined by a competition for primacy between expert knowledge and strategic political knowledge.

In Figure 5 the decision-makers' knowledge cultures are presented as interconnected as each knowledge builds on the one before. All knowledge begins in the individual's head, and contributes to the knowledge base of their various communities. Specialised knowledge draws evidence from

contributing communities, each from a particular perspective. In making the strategic decisions of organisations, these findings are ideally drawn together in an informed decision. Finally, some holistic, or core, understanding must weave through the connected system, so that the contributions are shared by the contributors. While Figure 5 lists the types of knowledge of the decision-makers who contribute to sustainable practice, it also lists the modes of inquiry that lead to those knowledges. Thus collective thinking is not only about the outcome from combining knowledges, it is also about involvement in collective learning.

The method to achieve this is based on a modification of Kolb's (1984) experiential learning cycle (Brown, 2008). Kolb's original learning cycle was the outcome of extensive research in the 1970s and 1980s that confirmed that individual learning was only established for the long term after going through four stages: Clarifying existing ideals: *what should be?*; then documenting the parameters of the projects, the facts: *what is?*; accessing new ideas: *what could be?*; and testing the ideas in action: *what can be, in practice?* The same cycle can be used collectively, by including the diverse knowledge cultures at each learning stage. The holistic focus question guides the direction of collaborative action towards a common purpose. The collective learning is emergent and cumulative as proponents from each of the knowledge cultures answer the following questions in turn:

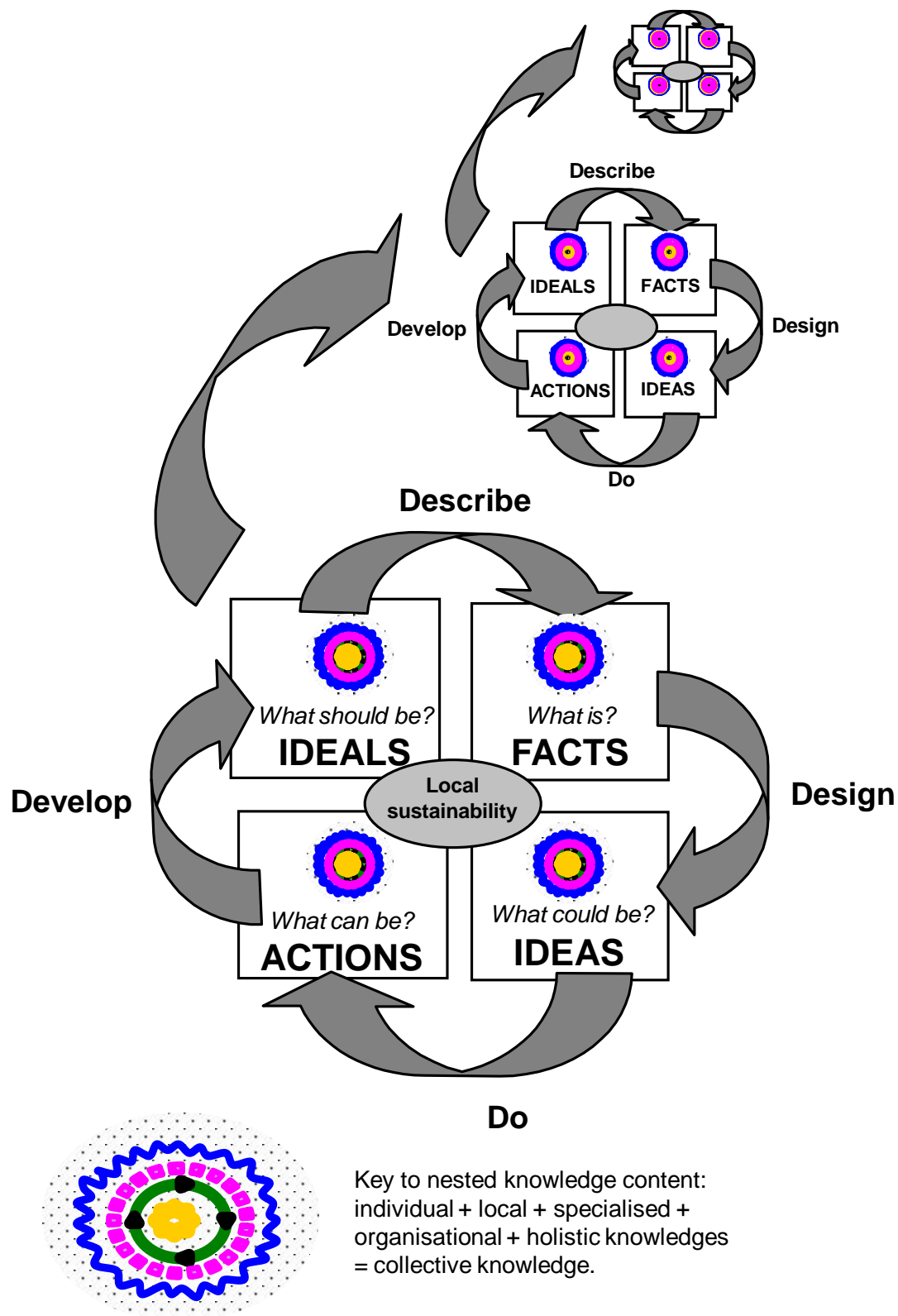
- | | |
|---------------------------|---|
| Q. <i>What should be?</i> | A. The range of ideals from each knowledge culture; |
| Q. <i>What is?</i> | A. Sets of facts from each knowledge culture; |
| Q. <i>What could be?</i> | A. Creative ideas for collective change; |
| Q. <i>What can be?</i> | A. Innovative program for collaborative action |

This cycle of collective learning does not occur as part of one isolated event, but can recur as a spiral of connected collective learning events (see Figure 6).

The possibility of transformative action is built into the process.

Before concluding this section, it is important to note that an important consideration in both collective learning and social learning is the opportunity for different levels, intensities and outcomes of learning. This was raised and explored by Argyris and Schön (1978) who put forward a distinction between single and double loop learning – the former being learning which did not challenge the underlying assumptions of individual and organisational behaviour while the latter achieved a new level of insight through the challenge of revisiting assumptions. Some people go further to describe a third level of learning called triple loop or epistemic learning (e.g. Bawden, 1994; Keen et al., 2005; Pahl-Wostl, 2009). This hierarchy of learning approaches has become a widely adopted idea in the change and management literature. Bawden (1994); Weick and Westley (1996); Griffith (2000; 2002) and many others have perceived links between double loop learning and transformational change – mostly in terms of a transformational change in thinking rather than of systems.

Figure 6: The collective learning spiral

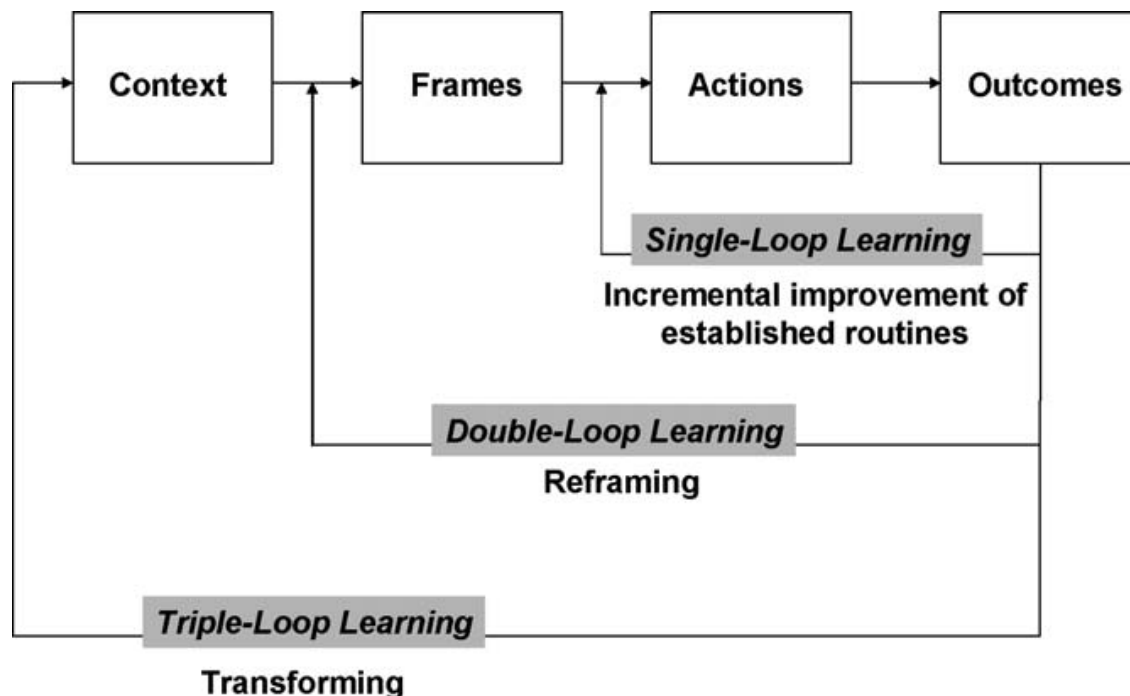


(Source: Brown, 2008)

More recent work on triple loop learning in relation to governance changes is summarised in Pahl-Wostl (2009). In that explanation, triple loop learning is proposed as essential for transformation with double loop learning necessary but not sufficient to achieve transformation (see Figure 7). This explanation is not shared by all on our research team, as the concept of double loop learning in Argyris and Schön's (1978) original treatment could be interpreted as broad enough to encompass a revisiting of assumptions that operate at a societal level. The schematic in Figure 7 assumes that much of what was covered under Argyris and Schön's (1978) explanation of double loop learning has been assigned to triple loop learning and most of what is covered in Bawden's (1994) treatment of epistemic learning is omitted. If we adopt the view represented in this schematic, as used by Pahl-Wostl (2009), it would emphasise that deeper collective, social and societal learning is a key to taking transformative action, a position all of us can agree with.

The issue of learning loops is one which will need to be addressed as we continue with the project.

Figure 7: Sequence of learning cycles in the concept of triple-loop learning



(Source: Pahl-Wostl, 2009, p. 359)

5. Building trust and a framework for transformative action

This section outlines the key steps in an interactive journey with our partners to build sufficient trust to enable the project and to design a feasible guided transition process which is both conceptually robust and contextually relevant. An important part of this overall story is the significant investment by our partners and the research team in negotiating a transition process that will build on past activities as well as work synergistically with other concurrent and planned activities. This interaction has significantly shaped the overall concept, particularly:

1. by partners challenging us to communicate theory and ideas in language that the community can relate to as community practice;
2. in its representation as an iterative 'planning-and-doing' process that could serve as the Wakool Shire Council's model for its community strategic planning obligations;
3. in clarifying for our partners the roles they play in fostering community engagement in the identification and assessment of innovations, transformative actions and alternative futures, as well as in identifying opportunities for cross-scale support towards those ends;
4. in clarifying the roles and activities expected of the research team; and
5. the contribution the process can make towards the monitoring, evaluation and reporting processes of both organisations.

5.1. Early trust building efforts

A scoping study for this project (Griffith et al., 2009b) had raised trust building as an important and necessary activity for transformation. After cautious but positive meetings with the partners we organised to interview the leaders within each partner organisation. The aim was to learn more about partner expectations and capacities and at the same time to set a baseline of current adaptive governance using the self assessment framework introduced in section 4.3.

Our second effort to engage our partners was through a partner collaboration workshop organised for early December 2009, as explained in section 5.3. We had identified in the earlier scoping study for the project that it was a necessary part of trust building for project champions and leaders of partner organisations to be familiar with the tools to be used in the project and the sort of outcomes those tools might be expected to produce when applied with their communities. Also, from the adaptive governance baseline assessment we had undertaken the month prior, we identified a relatively undeveloped collaboration space between the Murray CMA and Wakool Shire Council, and aimed to open up that space through interactive activities based around the resilience and collective learning tools. This also gave us an opportunity to demonstrate the tools which we would use to guide community processes as the project unfolded. We were relying on a research team workshop

described in the next section to clarify how to integrate these tools into a single collaborative change process.

5.2. A failed effort at synthesis

During these early engagements the project had been communicated to partners as a guided transformation process based on a framework implied in a paper by Per Olsson and colleagues (Olsson et al., 2006) which included:

- A preparation phase building leadership capability, shadow networks and epistemic communities;
- Opening windows of opportunity;
- Navigating the turbulence; and
- Embedding adaptive governance.

It was assumed in the project design that collective learning tools developed by Brown (2008) would deliver the change process; resilience thinking the analysis of what might change; and adaptive governance (including strong cross-scale collaboration) as the means to enable it all to happen. This was all based around a proposition that societies need to learn their way through the process of tackling wicked problems such as those facing the Wakool community and its support organisations.

So what we had at that stage were some elements of what might be important in guiding transformation in a loose framework but no guided change process as such.

Our initial design task was to integrate ideas from the literatures so that they could be part of a single change management process used by a community. In the Wakool context that meant breaking the dependency on natural resources that are either diminishing in supply or have changed access rules affecting availability. World-leading spokespersons and thinkers in the area of resilience thinking (Brian Walker) and collective learning (Valerie Brown) were keen to participate in the development of this concept.

Our first efforts at integration were directed at fusing the elements of resilience assessment with the principles of a collective learning process, perhaps using adaptive governance as common unifying theme. This effort at synthesis (the fusion of separate elements into a new whole) was counter-productive, as explained below. Instead of creating a single approach, we later drew on the notion of developing synergy between approaches – i.e. developing interactions between the inputs, outputs and capacity to generate higher order learning of the different approaches that enhances both the individual aspects of these approaches as well as the overall new approach – enhancing both parts and whole in the language of Brown (2008, p. 16).

Our failed efforts at a synthesis took place at a one-day research team workshop on 20 October 2009 attended by Rod Griffith, Michael Mitchell, Greg Walkerden, Valerie Brown, Brian Walker and Allan Curtis. It had been decided beforehand to use Brown's collective learning process to structure this workshop. So we began with a discussion of 'what should be' – our personal and professional ideals for this research project; then tackling 'what is' – presentations about our base knowledge on collective learning, resilience thinking and adaptive governance; before embarking on a

brainstorming type discussion of ‘what could be’ – a synthesis based on the theoretical and practical relationships we could identify between each of the concepts and their approaches. Brown’s reasoning as to why we might choose to start a collective learning process with a discussion of ‘what should be’ is so that our learning involves working towards our collective ideals rather than being constrained by the parameters of ‘what is’ (Brown, 2008). Framing the collective learning process in this way might increase the scope for thinking outside the square, and thus inspiring transformational learning outcomes.

Our discussion bogged down over two issues: the appropriate starting point for a guided change process, and whether resilience should sit inside a collective learning approach or vice versa. Strong personalities complicated efforts to find a way through clearly defined and long held but opposing positions. The collective learning principle of starting on a community change process with ‘what should be’ did not fit well with the systems driven starting point of resilience assessment being to define the system to be assessed (resilience ‘of what’) and its drivers and disturbances (resilience ‘to what’) – i.e. a discussion of ‘what is’. It was for Walker inconceivable to undertake a resilience assessment without beginning by asking resilience ‘of what’ and ‘to what’. Likewise, for Brown it was inconceivable to embark on a collective learning approach without starting with a discussion of the ideals of the participants. This inability to shift from these positions prevented us from achieving design of a single change tool on that occasion and almost undermined the project. The conflict involved issues of principle and practicality, and these are not trivial matters. At heart is a notion of how a community engages in a process of learning that can open up the possibility of transformational change options.

In the end, we pragmatically agreed to proceed to the partner collaboration workshop as the next step in the project plan with resilience assessment and collective learning as two separate and unfused approaches. This explains why we decided to demonstrate them as two distinct approaches to our partners at the workshop in December 2009. This practical demonstration of what the two approaches could offer would at least allow our partners to consider how best to make use of the approaches for their purposes. We also hoped that the experience of demonstrating the two approaches one after the other might also offer insights into how the two approaches could work together.

5.3. The partner collaboration workshop

The full day workshop held on December 2, 2009 brought together board members, managers and staff from Murray CMA (14 in total) with councillors, managers and staff from Wakool Shire Council (6), as well as the research team (5), and a representative from the Natural Resources Commission. Many of these participants had also been able to attend a dinner together on the night prior. The workshop began with an introduction to the project by Rod Griffith. Brian Walker then provided a presentation on resilience thinking and led a discussion that provided a taste of the kind of resilience assessment that could be conducted for Wakool Shire. The session took the rest of the morning, and was conducted as one group seated in a large semicircle. Extensive notes were taken from this session and compiled into a brief report sent to participants.

In this resilience assessment, we started by asking ‘What are we trying to maintain the resilience of?’ – i.e. ‘What is the “focal scale”? What are we trying to sustain?’ (the answer, unsurprisingly, was Wakool Shire); but also ‘What larger scale processes impact on Wakool’s resilience?’ (e.g. water reform process) and what are some of the component aspects of Wakool Shire whose resilience could be affected (e.g. sense of community, riverine environment). We then examined some of the current conditions of the Wakool as a system, and whether there were any trends in process and related thresholds that if crossed would significantly change the Wakool system.

In the afternoon, we moved into a different room and sat around a set of tables with around eight participants per table. Valerie Brown provided a short presentation on the principles and practice behind her approach of collective learning before leading a short session that provided a taste of the four-stage process. While the intention was partly to provide an experiential demonstration of the process, the discussions were captured and outputs considered as key components that could still be taken up as future actions. A report of this workshop was also provided to all participants, and the actions that resulted from the exercise have become part of the change management strategy described in section 7.

At the end of these two sessions we invited participants to provide their thoughts on how these two tools could be used with their communities as part of a change management process.

Understandably, this was a tough ask, especially as we were not providing a ready solution. It was at this point that the lack of integration became most apparent to our partners. It is to the credit of our partners and their leaders that they were prepared to take the journey forward with us even though there was as yet no clear plan. Through subsequent discussions, it became clear that what was needed was to pursue greater synergy rather than synthesis.

5.4. The breakthrough: Synergy within an inside-out transition approach

What follows here illustrates the benefits of the research team working closely and iteratively with field partner organisations in the concept development phases. The December partner collaboration workshop involving organisational leaders had generated enthusiasm for exploring transformational change in the Wakool Shire and achieved a considerable level of collaboration. However it had also raised understandable uneasiness about the change process and its apparent lack of integration.

The partners called a synergies meeting about two weeks after the workshop to explore how this project might fit with other initiatives and projects being undertaken or planned in the region. It is important for understanding the story of how our conceptual framework evolved in a theoretical sense to stress here the pivotal role of this synergy meeting and its follow up events in shaping the conceptual framework and how it is now communicated. It was at that meeting and after a further literature analysis that we floated the possibility of using a transitions management framework along the lines of that developed by the Dutch DRIFT team within which resilience assessment and collective learning processes could operate in synergy. However we did not just adopt the DRIFT approach which as mentioned in the literature review can appear as researcher driven. The basic visuals were retained but the language was reworked to reflect what the transition process might look like if it were community driven. That is the activities were reframed as community practice.

The partners immediately saw the logic and potential linkages with their respective business obligations and the project was able to move on. A set of principles for the project arose from these discussions.

1. This is not a new project as such – but brings new thinking to existing Wakool Shire Council and Murray CMA obligations and initiatives.
2. Our approach would form the core component of Wakool Shire Council's obligation to engage its community in producing a Community Strategic Plan by 2012. As Wakool Shire Council and Murray CMA share the same community, this will contribute to Murray CMA's Catchment Action Plan upgrade at the same time.
3. Our approach to transition should be place-based, involve multiple sectors, and develop collaboratively from the 'inside' out. At the same time, our approach needs to acknowledge the top-down way in which planning decisions are made (the default if the community does nothing) and the need for some bottom-up initiatives.
4. In recognition of the urgency for change, our approach to planning will involve both learning-by-doing (drawing on ideas and principles from collective learning, adaptive management and adaptive governance) and planning-by-doing (rather than top-down planning followed by implementation). That is, what the community will be doing will comprise the collaborative and innovative projects developed at the previous events, including at the December 1 workshop – provided that support, resourcing etc is forthcoming.
5. Recognising that Wakool Shire Council's previous efforts to engage the community (e.g. Future Search Conference) have not resulted in sufficient action, our community engagement events need to provide procedures for both big picture visioning and practical planning that will result in action delivery. The first big picture engagement could not start until late May 2010.
6. The collage is a useful image for merging new ideas with a range of existing engagements and proposed outputs many of which have never been developed into action plans or on ground change – and also for building a composite of change initiatives.
7. The opportunity exists to integrate a 'State of Place' assessment and reporting system with the planning-by-doing process so that performance and condition evaluation is consistent with new legislation and CMA reporting requirements. This is where our resilience assessment baseline might sit.
8. The establishment of a resilience 'project' as identified at the December 1 workshop should proceed first – a lower risk way of starting the project. The resilience 'project' will need to both inform the big picture engagement (through assessment of general and specified landscape and community resilience, and by identifying opportunities and leverage points for system adaptation and transformation) and add value to practical action (how innovative projects could contribute to system resilience).

9. The research team should look at new ways to tailor and apply resilience and collective learning toolkits with these principles in mind.
10. A steering committee of community people should be established to assist with planning and implementation. Our network mapping exercises undertaken with Wakool Shire Council and Murray CMA has identified some potential members.

This practical set of principles was then used to guide a program of active interaction and mutual learning and the implementation of our transition process in the Wakool Shire. From a research team perspective adding this transitions framework more overtly into the forefront of the conceptual framework dissolved some of the concern over creating hierarchies among our three original concepts.

5.5. Strengthening the synergies

After this interaction with our partners, the research team met together for a second time on 23 March 2010 to finalise the conceptual framework and a project plan. Most of the same research team members were present: Rod Griffith, Michael Mitchell, Greg Walkerden, Valerie Brown, Brian Walker, Paul Ryan and Dianne Bentley.

The workshop began by going back to our research questions. Each research team member had been asked to prepare a set of questions that captured their individual research interests in this project. From this, we would have a discussion to identify common team research questions for the project (alongside other individual research interests).

Going back to our research questions reaffirmed the importance of undertaking our research in an iterative and adaptive way. As one team member commented in their reflections after the workshop, what *“emerged as paramount”* was the *“necessary iterative nature of doing a hands-on project like this.”* The exercise helped build appreciation for our individual and collective research interests and how our project could benefit broader research agendas. A key outcome was an appreciation that the three research process components of collective learning, resilience assessment and ongoing monitoring were logically inter-related, and that our learnings from each of these components could feed off each other as part of an ongoing and iterative spiral of learning. The same team member quoted above explained that *“It really doesn’t matter where we start, since we need to iterate through a number of steps that need to be re-visited, and each informs the others.”* Another team member commented that *“the three concepts now have a relational logic ... theory is being put into practice.”* Yet another thought that the workshop *“felt like a tipping point in the project.”*

Our mutual conclusion was that we could conduct a workshop on resilience assessment that retained its logical integrity. This could feed into a workshop based designed to add value by establishing collective learning among all the interests involved. The collective learning process ends each learning phase with a collaborative action plan for the next (actually a learning spiral). Underpinning both resilience assessment and collective learning is the need for ongoing monitoring – but not the kind of monitoring associated with audits and milestones. This is the kind of monitoring associated with planning-by-doing / learning-by-doing / adaptive management. Together

with resilience assessment and an appreciation for nurturing adaptability and transformability through a deeper level of learning, this adaptive approach could nurture governance arrangements that are more adaptive in character – something else that this project is in a position to monitor, given that we have already developed some limited baseline assessment of the adaptive governance arrangements as perceived by key representatives of Wakool Shire Council and Murray CMA. Most importantly, none of the proposed events would be one-off events, but could recur as part of an integrated spiral of coordinated events driven to achieve collective learning and intentional transition for a place-based community.

As part of the discussion, those on the research team working in the area of resilience thinking and those whose research drew on learning theory were able to recount instances where a critical moment was reached in which basic assumptions were questioned. For example, Brian Walker recounted the story of an apple farmer who was able to first question the assumption that he was an apple farmer that would never grow other fruit, and from that learning was then able to start questioning assumptions about other means through which he could earn an income from his land (similar to the notion of double loop learning as described in section 4.4). By extension, this kind of learning where basic assumptions are questioned can go a step further. Questioning assumptions about what comprises an individual farmer's sustainability can be extended to questioning assumptions about what comprises sustainability for the community to which the farmer belongs. This may potentially raise questions about how the community functions in terms of existing governance arrangements; and that in order to achieve desired community-level sustainability, it may be necessary to work outside existing governance arrangements – i.e. to transform those governance arrangements so that communities can advance towards their desired futures using more adaptive governance arrangements (akin to the notion of triple loop learning).

Adopting the concept of a learning community bringing together multiple interests gives that community the freedom to determine its own future, rather than accepting a future imposed by any one particular interest. For instance, in a mining town affected by lead dust, the various interests (key individuals, the town's residents, the specialists involved in mining and the dominance of the mine management) had accepted a lead level above that of WHO standards. Their jobs were at stake. After a report from the community health centre found that over half the town's children, a collective learning workshop allowed key individuals to hear each other's point of view. The 'wicked problem' moved from risk of unemployment to preserving children's health. Community concern led to the mine management bringing in specialists to help remove the dust plume; the town council accessed national health funds to move residents from the worst contaminated areas; unions and management developed new consultation structures; and the community elected a multiple-interest Council the next time round. Changes were therefore both immediate action and long term restructure.

We also clarified that the concept of community can have multiple meanings, and that we need to be guided by how those we are working with identify themselves as a community, but to also be constantly wary not to assume that there is unity in community. We have chosen to focus on Wakool as a place-based resource-dependent community, but it is also possible to conceive of communities of identity, communities of interest, and communities of practice (Harrington et al., 2008). The

notion of a community of practice (Wenger, 1998; Brown, 2010) might be particularly helpful for what we are trying to achieve through the use of collective learning and its outcomes.

As an action-oriented project, a key aspect to our theoretical proposition as explained below is that we aspire to work with our research partners in Wakool to help build their capacity to determine the kind of transformational change they will undertake, rather than having that change imposed on them by forces beyond their control. Therefore a crucial question for us is how transformational change is distinguished from other types of change, so that we can support the Wakool community by helping them differentiate, in advance, processes that might provide positive support for transformation, and processes that might not. Another critical factor for our action-oriented approach is that we are deliberately working in a space between two scales of governance – the catchment scale of the Murray CMA and the local government scale of Wakool Shire. Our partners can build on existing work while also taking advantage of new opportunities for collaboration. There is lots of interest in what might evolve, and how the project could contribute to strategic planning at both scales, and the possibility of collaboration and coordination through the use of common monitoring and reporting frameworks.

5.6. Establishing a resilience network

From the literature we knew of the importance of small groups of informed and curious people prepared to take time to understand the way their place worked structurally and functionally and to explore plausible alternative futures and their implications. While the labels used for these groups are different, both transition management (niches and transition arenas) and resilience (shadow networks and epistemic communities) literatures place emphasis on the need to form such groups when considering transition or transformative action.

In implementing the partners' decision to start with resilience assessment as the least risk starting point with the community we took the opportunity to set up such a group. Rather than just hold a one off resilience assessment workshop we instead used the findings of a network analysis with our partners to find those key people in the Wakool community who would form an ongoing resilience network. The work of this group has been invaluable to the project and we will report on its establishment, activities and outcomes in the next working paper on resilience.

5.7. Reframing the CMA-Council collaboration

Early in the development of the project it was generally accepted that collaboration between the CMA and Wakool Shire Council would be aimed at assisting the CMA with the development of its Catchment Action Plan. As the CMA leaders became more familiar with adaptive governance and the understanding of what a Community Strategic Plan for a local government area like Wakool Shire involved, the relationship began to shift. The CMA started to envisage that if Community Strategic Plans were to be prepared by all local governments in the catchment then the CMA could take a role in supporting these plans and particularly the implementation of any NRM or landscape components.

At the same time the Council started to understand the significant shift in emphasis between these new Community Strategic Plans and older style council-driven management plans. Community

Strategic Plans in effect belong to the community and as such will contain strategic directions which the Council does not have jurisdiction or responsibility. It gradually became evident to council leaders that they would have to take on a new role—one of broker for the community – garnering support for achieving the intent of the plan.

This mutual realisation placed more emphasis on the role of brokering support for innovations and innovative projects as the mechanism for achieving transformative action and on the small group of people who had agreed to form a resilience network to explore plausible alternative futures.

6. An emergent framework for transformative action in Wakool Shire

This section sets out where we have arrived at through the process described in the previous sections. The participatory development process that has enabled us to reach the point we are at today has been iterative – involving a strong intertwining of trust building, developmental work on the concept and reality checking with partners. The work was at times exciting as we made conceptual advances or breakthroughs, at other times frustrating as a breakthrough seemed just out of reach and often painstakingly slow as both the research team and the partners worked their way through new ideas and proposals and practical complications.

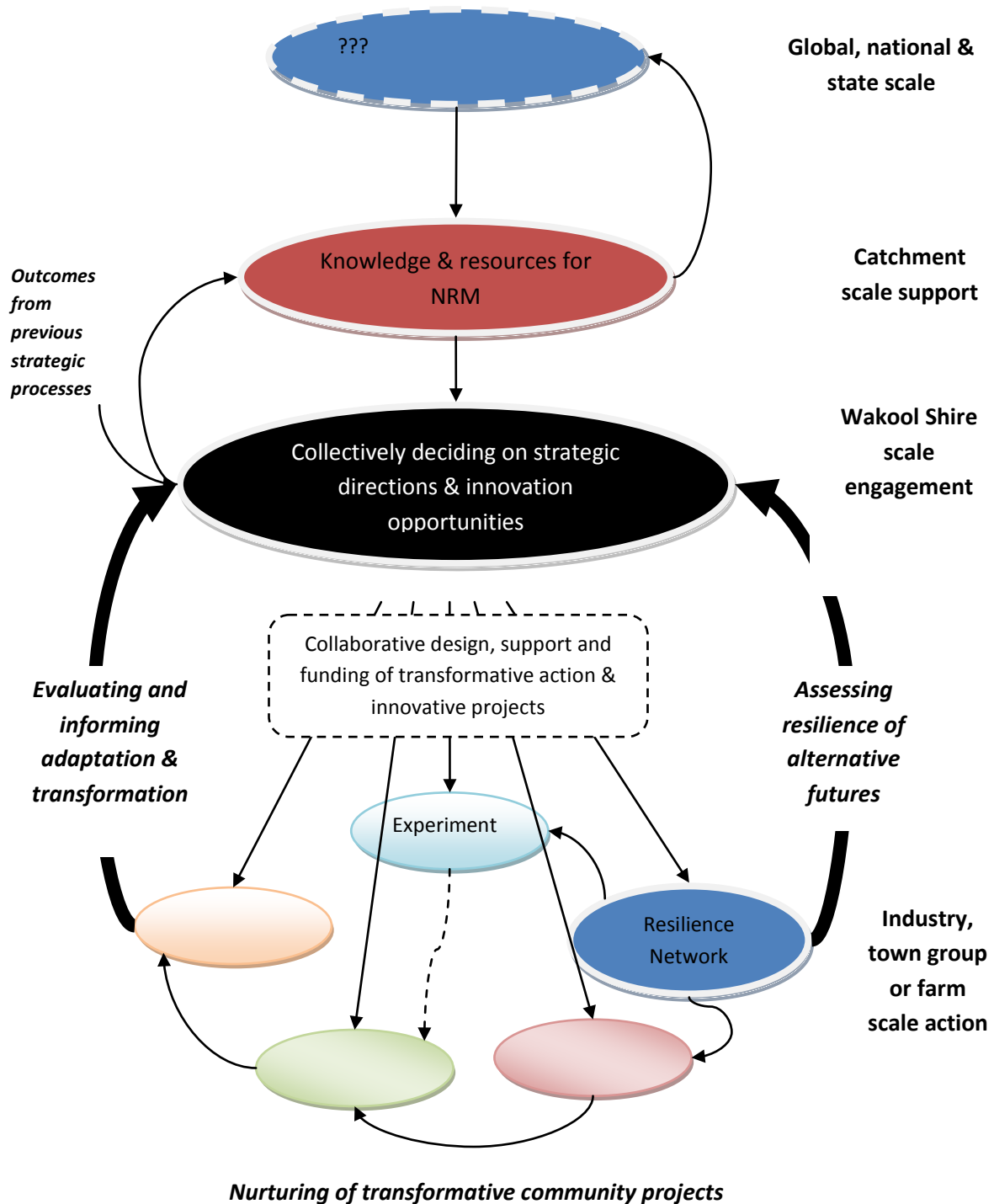
Assisting the Wakool community and its support organisations to undertake an intentional transition has become a process involving components of (1) resilience assessment of landscape and community, (2) community participation and planning using a collective learning process, (3) mentoring of innovations and (4) monitoring and evaluating, set in a much modified and reframed transitions framework. Each component is not just a one-off independent event but would develop interactively and iteratively over consecutive events in a coordinated way so that each component of the process could feed off and contribute to each other. The whole process is shaped and tied together by applying the principles of adaptive governance.

The community driven transition process that has emerged and is illustrated in Figure 8 has a number of attributes reflecting fundamental and/or shared characteristic of resilience thinking, adaptive governance, collective learning and transition management. These theoretical design principles include:

1. It is **iterative**;
2. It is **adaptive and learning based**. This is planning and learning by doing and hence adaptive governance;
3. It facilitates **radical change through small steps**;
4. The process is **transparent and deliberative** providing legitimacy for the community to work together;
5. It works through **collaboration**, both within and across scales;
6. It is **multi-scalar** – the focal scale is Wakool Shire. Innovation and transformative action enabled by support from above occur at lower scales, the strategic directions are worked through in a series collective learning workshops and the feedback effects cascade up the scales;
7. It allows **input from previous engagements** and planning processes to be considered along with new ideas;
8. There is **no one clear future** but rather a range of acceptable alternative futures; and

9. It recognises the importance of **leadership and of knowledge networks** in navigating a way through uncertainty and emergent surprises.

Figure 8: the multi-scale nature of the transition process



In this particular case the vehicle for implementation is the development of a Community Strategic Plan with a rolling 10 year time horizon. Rather than produce a fixed plan this approach is iterative in the spirit of adaptive governance and adaptive management. Each iteration is a learning event in a collective learning spiral.

6.1. A guide to building a process for transformative action

The following guide to building a working process for transformative action is based both on what we actually did or plan to do and what we would suggest, from our reflection on actual experiences of the research team and our partners, that should have been done.

Trust building

1. Potential partner organisations and researchers meet to gauge whether:
 - a. A ‘wicked’ problem can be articulated – i.e. one that is intractable; a sustainability-related problem that is shared and persistent;
 - b. There is value in organisations collaborating to address these shared and persistent sustainability problems; and
 - c. There is interest in exploring how resilience thinking, collective learning and adaptive governance could assist in finding a new way to deal with these intractable problems.

This alignment of problem recognition; the desire to address the problem; the availability of some new thinking and tools which on face value are suited to addressing the problem; and acknowledgement of the challenge of dealing with ‘wicked’ problems is particularly important.

2. Champions from each partner organisation ideally become active members of the research team – the roles include bringing knowledge of organisations and community to process design, communication with partner organisations and acting as a practical sounding board. In practice we found this difficult to achieve though over time the willingness of champions to engage in the more conceptual side of the project has increased.
3. A set of administrative and steering arrangements are agreed by the partners and research team. These do not have to be onerous or even formal. The principle is that effective communication with partners and facilitating in the collaboration space where partners interact is critical to success.
4. Leaders from each partner organisation assess their governance arrangements including existing collaboration and share their views with leaders from the other partner organisations and with researchers. The leaders we interviewed all found this a challenging but most worthwhile activity.
5. Partners and the research team jointly design, modify and organise a partner collaboration workshop to:
 - a. Provide organisational leaders and professionals the opportunity to share views on the sustainability issues affecting the Wakool Shire and community;
 - b. Experience whether the change process proposed by the research team and the resilience assessment and collective learning tools are suitable for use with the Wakool community by demonstrating these tools, and using these demonstrations

as a first step in the implementation of the project – i.e. undertake a preliminary resilience assessment and identify an initial set of proposed innovative initiatives that could be undertaken;

- c. Explicitly open up the collaboration space between CMA and Council and opportunities for further collaboration.
6. Communicate the outcomes of the workshop to those leaders that attended the first workshop as soon as possible after the event including how the initiatives identified through the collective learning process are to re-examined by the research team and partners to identify if any of these innovations can be taken forward as examples of how the wider engagement an innovation process might work.

In the Wakool case the projects that came at the December 2009 workshop are:

Innovative farming and industry Project
Family Support Project
Tree-change Incentives Project
Alternative Fuel Project
Carbon Farming for Wakool Shire
Landscape Resilience Project

This is one area where there was no opportunity for follow-up and remains a point of contention in the project.

7. After taking on board feedback from the workshop and follow up discussions with partners to explore potential opportunities and sticking points in more detail the research team proposes a modified community driven transition management process for consideration by partners. This should include how the innovative projects developed by that group have been addressed within the new framework.
8. Well connected community members (in a networking sense) are invited to form a small advisory or steering group to:
 - a. Guide the further development of the community engagement and innovation process and steer its implementation;
 - b. Advise on appropriate ways and language to communicate with the broader community; and
 - c. Act as bridging points to the broader community.

Working through the pros and cons of landscape & community change

9. The community steering group, partners and researchers plan, design and organise a resilience workshop to:
 - a. Assess resilience of the current communities landscapes and natural resource assets in the Wakool;

- b. Identify the known and potential drivers of change affecting communities, landscapes and natural resource assets;
- c. Work through plausible scenarios for alternative futures in the Wakool; and
- d. Identify key entry points and change levers for potential adaptation and/or transformation.

Note: The workshop should include a representative mix of different knowledge cultures including local system knowledge, specialists, partner organisations, big picture creative thinkers.

10. Coordinate with workshop participants to further develop this resilience assessment through smaller working groups, including if required specialists from outside the Wakool area, so that those parts of the resilience assessment not finalised within the allocated time for the workshop can be completed.

11. From the workshop participants establish a smaller network of people that could evaluate and advise on resilience as required hopefully on an ongoing basis as a legacy of the project.

Note: Part of the role of this new knowledge network would be to advise on how other innovations could contribute to community and landscape resilience and the management of natural resource assets.

12. Produce and circulate a 'State of Wakool' type issues flyer (with more detailed report to support) using the information gathered at the resilience workshop, subsequent small group resilience assessment work, and material and information gathered through engagement in other Wakool community processes supplemented by research.

Note: Other processes include:

- *The Future Search Conference*
- *Infrastructure upgrade program*
- *Townscape upgrade program*
- *The partner collaboration workshop – held in Albury*
- *The Murray CMA Catchment Action Plan (CAP)*

Note: This will require a place based framework for synthesising social, cultural, economic and cultural issues, values and knowledge with inbuilt capability for monitoring, evaluation and reporting against those community issues, of innovation performance and of landscape and community change-- which would be useful to CMA (for its CAP and investment processes) and Council (for its Community Strategic Plan process).

13. Allowing time for the community to network and discuss the flyer, the community steering group, partners and research team tailor and organise a big picture engagement and innovation workshop for the Wakool community.

Note: Participants would include members of the knowledge community on resilience, institutional partners, key industries and organisations, individual residents across the spectrum of knowledge cultures. The workshop process would be based on collective learning

as trialled in December 2009. The output from this workshop is a set of community supported innovative ideas and projects with built in implementation and monitoring, evaluation and reporting (MER) strategies.

Note: it is expected that the Wakool Shire Council will be able to lead and provide resourcing to some projects as part of its implementation plan as will Murray CMA as part of its investment strategy for NRM. In other cases collaborative partnership may emerge. Regional Development Australia for example may be in a position to find resourcing for projects and provide innovation mentoring. Some innovations may fail to find enough support to move forward.

Promoting and nurturing 'little picture' innovations and innovative practice

14. The collaborators around each innovation, project or group of innovations work together to progress the innovation to implementation. Project leaders ensure that the innovation has committed champions and adequate funding, is sufficiently developed and robust, is likely to contribute to transformation or adaptation, has a workable MER strategy, and the timing right for maximum success. Mentoring from the research team will be available for these projects.

Note: Projects may draw on the resilience network and possibly other external resources to assist in the refinement or further development of the innovation. The CMA and Wakool Shire Council may be key collaborators and funding partners or brokers of particular innovations that relate to their business.

Little is known about this phase other than that surprise and uncertainty will need to be managed. Some innovations may thrive, others stagnate and others fall by the wayside despite good planning intentions and sponsorship.

15. Project leaders and collaborators monitor and evaluate progress of each innovation through its journey and make adjustments as necessary in the spirit of adaptive management.

Reflection on progress

16. The community steering group, resilience network, partners and researchers assist the community to collectively evaluate all projects examining what worked and what didn't and what has transformed and what has adapted or even stayed unchanged serves as an integrating or synthesising process to inform and focus a further iteration of the big picture and little picture process. This evaluation would include reassessment of the system dynamics or resilience by the resilience network.
17. Organisational leaders review governance changes against the adaptive governance baseline established at the start of the project.

Adaptive co-management

18. After a series of iterations of the transition process, what we as 'outsiders' might describe as enhanced adaptive governance arrangements should be well established enabling ongoing collaborative and adaptive management of resilience in landscapes and communities of the Wakool Shire.

Our attempt to visualise the process of activities as comprising a spiral of inter-connected learning activities is a difficult one to illustrate. Figure 9 begins with a depiction of where we are at now – we conducted a workshop on December 1 where a number of innovative projects were proposed, one of which was to establish a resilience network. We see the next iteration as modelled on developments to date, especially in its depiction as a process of planning-by-doing. The resilience network has a key role in its contributions at various stages in the process, helping to drive the process forward and to monitor its initiatives and outcomes. Similarly, the community workshop built around the principles of collective learning has a key role in inspiring innovative proposals and collectively taking these proposals further. The depiction shows how some proposals emanate out of this community workshop, and if they can garner sufficient activism and other support to go forward, they represent or pass through a window of opportunity. They become part of the plan of action and benefit from the collaborative and reflective possibilities associated with a planning-by-doing approach. The final stage of the depiction opens the possibility that this cyclical set of activities can break out of an adaptive cycle as transformative realisations and options become apparent.

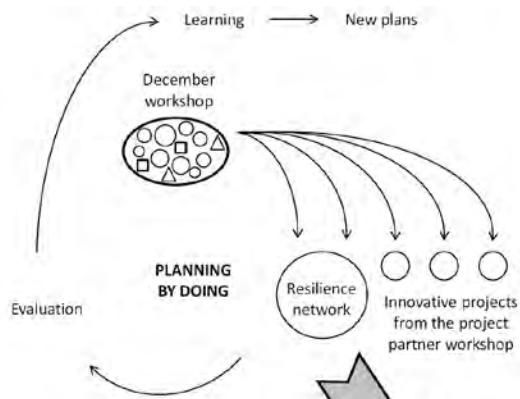
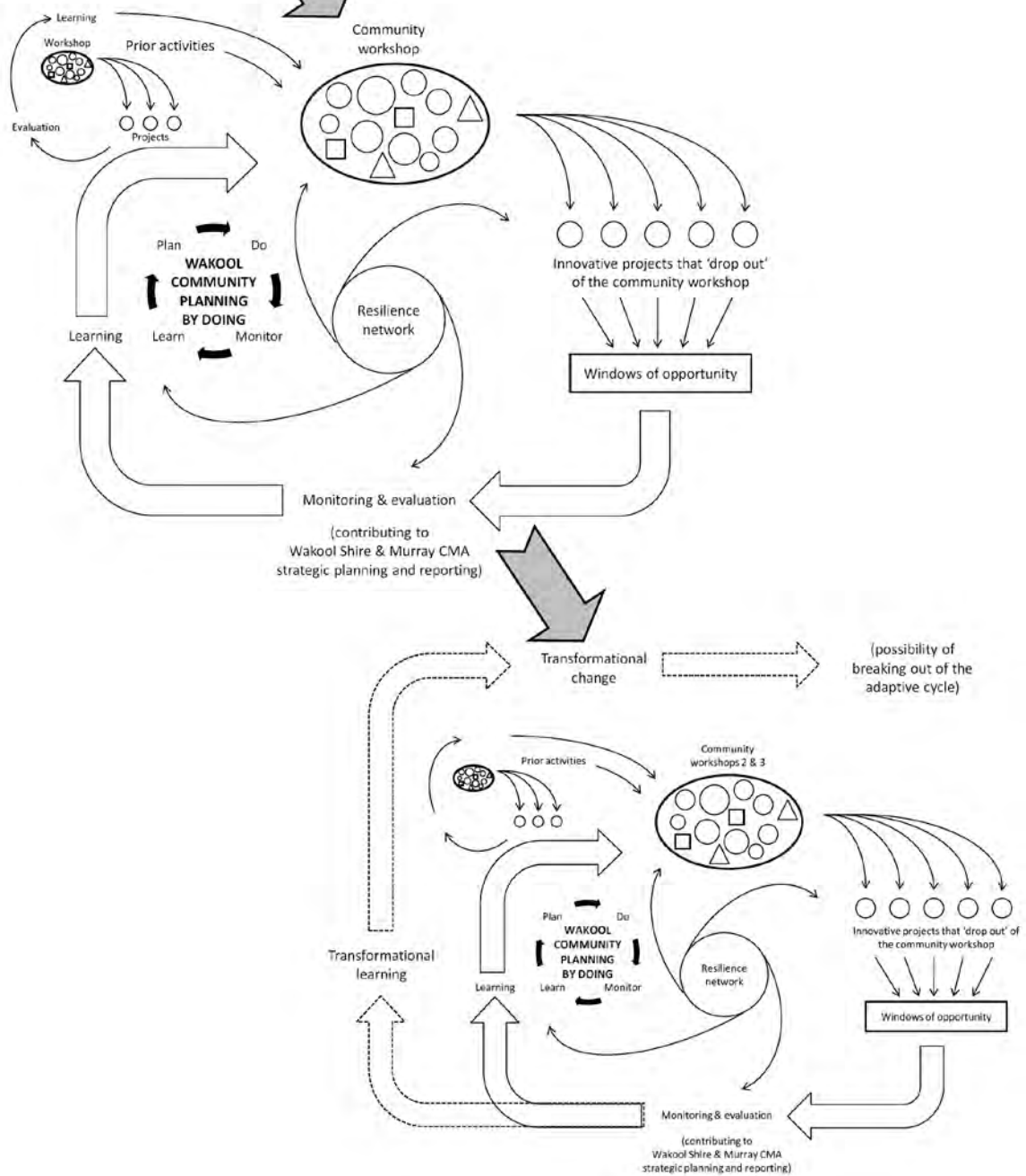


Figure 9: The research process as an iterative spiral of planning, doing, learning and adapting/ transforming



7. Summary of our learnings so far

What have we learnt from our initial efforts to explore synergies between contemporary resilience, governance and collective learning theories and associated toolkits in terms of designing a process that will help the Wakool community build their transformability and adaptability to manage sustainability issues?

Our key learning related to the theoretical foundations underpinning the design of our collaborative framework relates to our appreciation of the notion of ‘synergy’. Integrating resilience, governance and collective learning theories and associated toolkits proved much more difficult than we originally envisaged, especially in how the theories could be used to underpin and facilitate a transformational change process. The lack of integration was noticeable to our partners who sought greater synergy.

Theoretical discourses are continually evolving and moving feasts, and there is always scope for improving ideas and ways of putting ideas into action. However, this does not mean that when seeking to integrate ideas from different sets of evolving discourses that we should seek to counter their individual logical integrity. We found a better way. Our approach was to design a process that incorporated and where possible sought improvement to the practical application associated with resilience thinking and collective thinking as distinct and coherent ‘tools’. The task thus became one of thinking through a design formulation that could appreciate how the component activities were logically inter-related to each other as distinct activities.

To lay the foundation for a community to navigate its way through a process of transformation, the research team and our collaborating partner organisations saw that resilience thinking would provide a solid foundation through which a Wakool-based knowledge network could understand their system better, and the implications of proposed changes to the system. We also saw that collective thinking could lay the foundation for integrating different knowledge cultures across the Wakool community, and thus provide the means to make the most of those sets of knowledges in a forward-looking way towards identifying and nurturing innovative ideas that could constitute the practical components of transformation. And finally, our collaborating partners also appreciated the thinking behind exploring the governance arrangements as two organisations operating at different scales in terms of nurturing transformation, and navigating their way through a transformational process in a collaborative and adaptive way. We brought these ideas together with theories related to wider transition processes developed by DRIFT. However, we quickly learnt that DRIFT’s more managerial ‘outside-in process would not sit well with our partners, and reframed the way the process was conceptualised and enacted as one that was an inside-out process, driven by the community as community practice.

What have we learnt from our interactions with partner organisations and community that has helped to shape our understanding of the context in which we are working including factors that might enable or inhibit the transition and hence the design of an intentional transition process?

There are a number of key learnings that we can report in response to this question. The most critical learning relates to our decision to present this framework as one developed through collaboration with our partners on the ground. The way this collaboration evolved also increased the possibility for increased collaboration in the space between and involving both organisations. Indeed, we observed a small transformation towards a more practical and horizontal collaborative governance arrangement operating between Wakool Council and Murray CMA. Regrettably, we do not believe that we have adequately presented nor accounted for the input and ‘voice’ of the key champions from our collaborating partners in terms of how the framework has been designed. Our learning relates in part to a failure to adequately document the many discussions we had with these key champions, and to document our reflections on how their input helped shaped our thinking.

Second, there is the related experience that we share with others pursuing good quality collaborative research that such projects take time to establish, and that this time is invaluable in building mutual understanding, trust and shared objectives between researchers and collaborators. Working through language issues is a key consideration and part of this trust building to enable all involved to link new ideas to existing institutional arrangements and statutory obligations. Linking the change process to the need to produce a new Community Strategic Plan has been a particularly important outcome of these discussions.

Third, and on a more positive note, a key learning for us has been the key role that champions among the staff and leadership took in directing and supporting us in the practical implementation of the transformational objectives we set out to pursue. Having leaders from both organisations who were understanding and supportive of our research and practical change agenda made a world of difference, and their willingness to enact that support by delegating time and responsibility to key members of their staff was also crucial. At key moments through the process, we would have liked these staff to have been more active members of the research team. In this case, however, this had less to do with their willingness to be included as part of the research team, but more an issue of the tyranny of distance, and insufficient time and resources to practically enable their input as research team members. As a result, we would place caution on the claim that our research partners were able to be co-learners with us on this journey (although we are quite sure they would argue that they have learnt a lot through the process). The kind of engagement we enjoyed was therefore more akin to collaboration (working together to determine shared objectives and priorities) than co-learning (sharing knowledge to create new understandings and action plans) or being directed (in response to our partners who set and implement their own agenda) as depicted in Figure 2. But this point is open to interpretation, and as co-authors we might not all be in agreement.

Our fourth key learning relates to the language we used in communicating with our partners, which may also have undermined the extent they were able to participate in the creation of new and shared understandings. A frequent message from our partners was their concern about the level of academic terminology and jargon we used and their desire that we frame our ideas in language that

was more accessible. Some key terms like resilience, collective learning and adaptive governance are crucial as they represent the bodies of theory on which we are building our foundations for community practice. However, we learnt quickly that we also needed to be able to explain such terms, as well as all the other terms used as part of that explanation, in language that all those seeking to participate in and direct the community practice can connect with and relate to. In one sense this is a matter of translation – re-presenting ideas in new ways and with alternative, more familiar wording.

What have we learnt from these experiences about the meaning and implications of transformational change as distinct from other types of change, its role in transitions and what this means for understanding and enhancing resilience and/or sustainability?

As indicated from the outset, our learnings here are limited in that they principally relate to what we have learnt as theoretical propositions rather than from practical experience on the ground. These learnings have been presented in our analysis of the terms transitions, transformations and adaptations in section 4.1. Chief among these learnings are that transitions, transformations and adaptations can be seen as both processes and outcomes; that the distinction between these three notions are often fluid, although in certain bodies of literature clear distinctions have been proposed; and possibly most importantly, that there is great value to be gained from exploring the prospect of nurturing a change management process in an inside-out fashion, rather than outside-in or top-down. In alignment with these learnings, we have referred to a small transformation already observed in the governance arrangements involving our research partners. The way in which the Wakool Council and Murray CMA collaborate is an example of a significant change in process, and the resulting increase in collaborative governance greatly facilitates the nurturing of an inside-out approach to transition management. We look forward to seeing how these theoretical propositions become tested through practical experience, and to refine and present our learnings that ensue.

References

- Adger, W. N. (2000). Social and ecological resilience: Are they related? *Progress in Human Geography*, 24(3), 347-364.
- Allan, C., & Curtis, A. (2005). Nipped in the bud: Why regional scale adaptive management is not blooming. *Environmental Management*, 36(3), 414-425.
- Allan, C. (2008). Can adaptive management help us embrace the Murray-Darling Basin's wicked problems? In C. Pahl-Wostl, P. Kabat & J. Moltgen (Eds.), *Adaptive and integrated water management: Coping with complexity and uncertainty* (pp. 61-73). Berlin Heidelberg: Springer.
- Argyris, C., & Schön, D. A. (1978). *Organizational learning: A theory of action perspective*. Reading, MA: Addison-Wesley.
- Armitage, D., Marschke, M., & Plummer, R. (2008). Adaptive co-management and the paradox of learning. *Global Environmental Change*, 18(1), 86-98.
- Bawden, R. (1994). *Systemic development: A learning approach to change* (Occasional Paper). Sydney: UWS Centre for Systemic Development.
- Beck, U. (2006). Reflexive governance: Politics in the global risk society. In J.-P. Voß, D. Bauknecht & R. Kemp (Eds.), *Reflexive governance for sustainable development* (pp. 31-56). Cheltenham, UK: Edward Elgar.
- Bellamy, J. A. (2006). Adaptive governance: The challenge for regional natural resource management. In A. J. Brown & J. A. Bellamy (Eds.), *Federalism and regionalism in Australia: New approaches, new institutions?* Canberra: ANU E Press.
- Blackburn, G. (2004). *Pioneering irrigation in Australia to 1920*. Melbourne: Australian Scholarly Publishing.
- Bodin, Ö., & Crona, B. I. (2009). The role of social networks in natural resource governance: What relational patterns make a difference? *Global Environmental Change*, 19(3), 366-374.
- Briske, D. D., Bestelmeyer, B. T., Stringham, T. K., & Shaver, P. L. (2008). Recommendations for development of resilience-based state-and-transition models. *Rangeland Ecology and Management*, 61(4), 359-367.
- Brown, V. A. (2005). Knowing: Linking the knowledge cultures of sustainability and health. In V. A. Brown, J. Grootjans, J. Ritchie, M. Townsend & G. Verrinder (Eds.), *Sustainability and health: Supporting global ecological integrity in public health* (pp. 131-162). London: Earthscan.
- Brown, V. A. (2008). *Leonardo's vision: A guide to collective thinking and action*. Rotterdam: Sense.
- Brown, V. A. (2010). Can there be a community of practice? In V. A. Brown, J. A. Harris & J. Y. Russell (Eds.), *Tackling wicked problems through the transdisciplinary imagination*. London: Earthscan.
- Brown, V. A., Harris, J. A., & Russell, J. Y. (Eds.). (2010). *Tackling wicked problems through the transdisciplinary imagination*. London: Earthscan.

- Cork, S. (Ed.). (2009). *Brighter prospects: Enhancing the resilience of Australia*. Canberra: Australia 21. Available from: <http://www.australia21.org.au/buildingAustraliasResilience.htm>.
- CSIRO (2008). *Water availability in the Murray-Darling Basin* (A report to the Australian Government from the CSIRO Murray-Darling Basin Sustainable Yields Project). Retrieved December 2, 2008, from <http://www.csiro.au/files/files/pn9o.pdf>.
- Davidson, J., Lockwood, M., Curtis, A., Stratford, E., & Griffith, R. (2006). *Governance principles for regional natural resource management* (Pathways to good practice in regional NRM governance Report No. 1). Hobart: University of Tasmania. Available from: <http://www.geog.utas.edu.au/geography/nrmgovernance/>.
- Dietz, T., Ostrom, E., & Stern, P. C. (2003). The struggle to govern the commons. *Science*, 302(5552), 1907-1912.
- Dovers, S. (2010). Unpublished paper presented to the Shaping Australia's Resilience: Policy Development for Uncertain Futures Conference, Australian National University, Canberra, February 18-19, 2010. Organised by Australia 21: <http://www.australia21.org.au/buildingAustraliasResilience-papers.htm>.
- Duit, A., Galaz, V., Eckerberg, K., & Ebbesson, J. (2010). Governance, complexity, and resilience. *Global Environmental Change*, 20(3), 363-368.
- Fischer-Kowalski, M., & Haberl, H. (Eds.). (2007). *Socioecological transitions and global change: Trajectories of social metabolism and land use*. Cheltenham: Edward Elgar.
- Fischer-Kowalski, M., & Rotmans, J. (2009). Conceptualizing, observing, and influencing social-ecological transitions. *Ecology and Society*, 14(2), 3 [online] URL: <http://www.ecologyandsociety.org/vol14/iss2/art3/>.
- Folke, C. (2006). Resilience: The emergence of a perspective for social-ecological systems analyses. *Global Environmental Change*, 16(3), 253-267.
- Folke, C., Carpenter, S. R., Walker, B., Scheffer, M., Chapin, T., & Rockström, J. (2010). Resilience thinking: Integrating resilience, adaptability and transformability. *Ecology and Society*, 15(4), 20 [online] URL: <http://www.ecologyandsociety.org/vol15/iss4/art20/>.
- Folke, C., Hahn, T., Olsson, P., & Norberg, J. (2005). Adaptive governance of social-ecological systems. *Annual Review of Environment and Resources*, 30(1), 441-473.
- Friedel, M. H. (1991). Range condition assessment and the concept of thresholds: A viewpoint. *Journal of Range Management*, 44(5), 422-426.
- Greenwood, D. J., & Levin, M. (2007). *Introduction to action research: Social research for social change* (2nd ed.). Thousand Oaks, CA: Sage.
- Griffith, R. (2000). *Sustainable development: Should we read the obituary?* Paper presented at the 6th Annual International Conference on Sustainable Development, Leeds, England.
- Griffith, R. (2002). *How shall we live? The sustainability agenda and institutional change in local governance in Australia*. Unpublished PhD thesis, University of Western Sydney.

- Griffith, R., Davidson, J., & Lockwood, M. (2009). *NRM governance for change: Revisiting 'good' governance through an adaptive lens* (Report to Land and Water Australia as part of the Pathways to Good Practice in Regional NRM Governance project). Hobart: University of Tasmania. Available from: <http://www.geog.utas.edu.au/geography/nrmgovernance/>.
- Griffith, R., Brown, V. A., Measham, T. G., Walker, B., Pollino, C., Curtis, A., et al. (2009b). *Transformational change for resilient landscapes and communities: Scoping study*. Canberra: Rod Griffith & Associates.
- Griffith, R. (2010). Rethinking Change. In V. A. Brown, J. A. Harris & J. Y. Russell (Eds.), *Tackling wicked problems through the transdisciplinary imagination*. London: Earthscan.
- Gunderson, L. H., & Holling, C. S. (Eds.). (2002). *Panarchy synopsis: Understanding transformations in human and natural systems*. Washington DC: Island Press.
- Haberl, H., Fischer-Kowalski, M., Krausmann, F., Weisz, H., & Winiwarter, V. (2004). Progress towards sustainability? What the conceptual framework of material and energy flow accounting (MEFA) can offer. *Land Use Policy*, 21(3), 199-213.
- Hallows, P. J., & Thompson, D. G. (1996). *The history of irrigation in Australia*. Mildura, Vic: Australian National Committee on Irrigation and Drainage.
- Harrington, C., Curtis, A., & Black, R. (2008). Locating communities in natural resource management. *Journal of Environmental Policy and Planning*, 10(2), 199-215.
- Hegney, D. G., Ross, H., Baker, P., Rogers-Clark, C., King, C., Buikstra, E., et al. (2008). *Identification of personal and community resilience that enhances psychological wellness: A Stanthorpe study*. Toowoomba: Centre for Rural and Remote Health, University of Southern Queensland. Available from: <http://www.usq.edu.au/crrah/publications/2008/resiliencereport>.
- Holling, C. S. (1973). Resilience and stability of ecological systems. *Annual Review of Ecology and Systematics*, 4(1), 1-23.
- Keen, M., Brown, V. A., & Dyball, R. (Eds.). (2005). *Social learning in environmental management: Towards a sustainable future*. London: Earthscan.
- Kemmis, S., & McTaggart, R. (2005). Participatory action research: Communicative action and the public sphere. In N. K. Denzin & Y. S. Lincoln (Eds.), *The SAGE handbook of qualitative research* (3rd ed., pp. 559-603). Thousand Oaks, CA: Sage.
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Englewood Cliffs, N.J.: Prentice Hall.
- Kuehne, G., & Bjornlund, H. (2006). Custodians" or "investors": Classifying irrigators in Australia's Namoi Valley. In G. Lorenzini & C. A. Brebbia (Eds.), *Sustainable irrigation management, technologies and policies* (pp. 225-236). Southampton: WIT.
- Lebel, L., Anderies, J. M., Campbell, B., Folke, C., Hatfield-Dodds, S., Hughes, T. P., et al. (2006). Governance and the capacity to manage resilience in regional social-ecological systems. *Ecology and Society*, 11(1): 19 [online] URL: <http://www.ecologyandsociety.org/vol11/iss1/art19/>.

- Lewis, G. J. (1994). *An illustrated history of the Riverina rice industry*. Leeton, NSW: Ricegrowers Co-operative.
- Lockie, S., & Jennings, S. (2003). The social impacts of natural resource use and condition: The invisible dimension of coastal resource management. In B. Pritchard, A. Curtis, J. Spriggs & R. Le Heron (Eds.), *Social dimensions of the triple bottom line in rural Australia* (pp. 131-143). Canberra: Bureau of Rural Sciences.
- Lockie, S., & Higgins, V. (2007). Roll-out neoliberalism and hybrid practices of regulation in Australian agri-environmental governance. *Journal of Rural Studies*, 23(1), 1-11.
- Loorbach, D. (2007). *Transition management: New mode of governance for sustainable development*. Utrecht, The Netherlands: International Books.
- Mostert, E., Pahl-Wostl, C., Rees, Y., Searle, B., Tàbara, D., & Tippet, J. (2007). Social learning in European river-basin management: Barriers and fostering mechanisms from 10 river basins. *Ecology and Society*, 12(1), 9 [online] URL: <http://www.ecologyandsociety.org/vol12/iss1/art19/>.
- Murray-Darling Basin Authority (2009, April 7). *Media release: Murray autumn outlook bleak as inflows hit record lows*. Retrieved April 9, 2009, from http://www.mdba.gov.au/media_centre/media_releases/.
- Olsson, P., Gunderson, L. H., Carpenter, S. R., Ryan, P., Lebel, L., Folke, C., et al. (2006). Shooting the rapids: Navigating transitions to adaptive governance of social-ecological system. *Ecology and Society*, 11(1), 18 [online] URL: <http://www.ecologyandsociety.org/vol11/iss1/art18/>.
- Ostrom, E. (2005). *Understanding institutional diversity*. Princeton, NJ: Princeton University Press.
- Pahl-Wostl, C., Craps, M., Dewulf, A., Mostert, E., Tàbara, D., & Taillieu, T. (2007a). Social learning and water resources management. *Ecology and Society*, 12(2), 5 [online] URL: <http://www.ecologyandsociety.org/vol12/iss2/art5/>.
- Pahl-Wostl, C., J. Sendzimir, P. Jeffrey, J. Aerts, G. Berkamp, and K. Cross. (2007b). Managing change toward adaptive water management through social learning. *Ecology and Society* 12(2): 30. [online] URL: <http://www.ecologyandsociety.org/vol12/iss2/art30/>.
- Pahl-Wostl, C. (2009). A conceptual framework for analysing adaptive capacity and multi-level learning processes in resource governance regimes. *Global Environmental Change*, 19(3), 354-365.
- Postel, S. (1999). *Pillar of sand: Can the irrigation miracle last?* New York: W. W. Norton.
- Prigogine, I. (1987). Exploring complexity. *European Journal of Operational Research*, 30(2), 97-103.
- Race, D., & Buchy, M. (1999). A role for community participation in Australian forest management? *Rural Society*, 9(2), 405-419.
- Resilience Alliance (2007). *Assessing and managing resilience in social-ecological systems: A practitioners workbook*. Available from: <http://www.resalliance.org/3871.php>.
- Rittel, H. W. J., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, 4(2), 155-169.

- Rotmans, J., & Loorbach, D. (2009). Complexity and transition management. *Journal of Industrial Ecology*, 13(2), 184-196.
- Schandl, H., Fischer-Kowalski, M., Grunbuhel, C., & Krausmann, F. (2009). Socio-metabolic transitions in developing Asia. *Technological Forecasting and Social Change*, 76(2), 267-281.
- Stratford, E., Davidson, J., Griffith, R., Lockwood, M., & Curtis, A. (2007). *Sustainable development and good governance: The 'big ideas' influencing Australian NRM* (Pathways to good practice in regional NRM governance Report No. 3). Hobart: University of Tasmania. Available from: <http://www.geog.utas.edu.au/geography/nrmgovernance/>.
- Underdal, A. (2010). Complexity and challenges of long-term environmental governance. *Global Environmental Change*, 20(3), 386-393.
- van der Brugge, R., & van Raak, R. (2007). Facing the adaptive management challenge: Insights from transition management. *Ecology and Society*, 12(2), 33 [online] URL: <http://www.ecologyandsociety.org/vol12/iss2/art33/>.
- Walker, B., Carpenter, S. R., Anderies, J. M., Abel, N., Cumming, G. S., Janssen, M., et al. (2002). Resilience management in social-ecological systems: A working hypothesis for a participatory approach. *Conservation Ecology*, 6(1), 14 [online] URL: <http://www.consecol.org/vol6/iss1/art14/>.
- Walker, B. H., Holling, C. S., Carpenter, S. R., & Kinzig, A. P. (2004). Resilience, adaptability and transformability in social-ecological systems. *Ecology and Society*, 9(2), 5 [online] URL: <http://www.ecologyandsociety.org/vol9/iss2/art5>.
- Walker, B. H. (2005). A resilience approach to integrated assessment. *Integrated Assessment*, 5(1), 77-97.
- Walker, B. H., & Salt, D. (2006). *Resilience thinking: Sustaining ecosystems and people in a changing world*. Washington, DC: Island Press.
- Walker, B. H., Abel, N., Anderies, J. M., & Ryan, P. (2009). Resilience, adaptability, and transformability in the Goulburn-Broken Catchment, Australia. *Ecology and Society*, 14(1), 12 [online] URL: <http://www.ecologyandsociety.org/vol14/iss1/art12/>.
- Waltner-Toews, D., & Kay, J. (2005). The evolution of an ecosystem approach: The diamond schematic and an adaptive methodology for ecosystem sustainability and health. *Ecology and Society*, 10(1), 38 [online] URL: <http://www.ecologyandsociety.org/vol10/iss1/art38/>.
- Weick, K. E., & Westley, F. (1996). Organizational learning: Affirming an oxymoron. In S. R. Clegg, C. Hardy & W. R. Nord (Eds.), *Handbook of organization studies* (pp. 440-458). London: Sage.
- Wenger, E. (1998). *Communities of Practice: Learning, Meaning and Identity*. Cambridge: Cambridge University Press.
- Westoby, M., Walker, B., & Noy-Meir, I. (1989). Opportunistic management for rangelands not at equilibrium. *Journal of Range Management*, 42(4), 266-274.

