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Community-Level Systems Thinking

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Abstract

Regions are evolutionary and dynamic, and examining the notion of sustainability requires a new way of thinking about systems and communities. Improving the sustainability of a region must take into account the interconnections and interdependence of the economic, social, environmental and governance systems. Pursuing the goal of sustainability requires continual monitoring and reassessment. The Regional Development Futures (RDF) framework developed by a multidisciplinary group of scientists in Australia is being used to develop location-specific sustainability options. The methods and techniques combine systems thinking and collegiate research approaches. The RDF provides processes that ensure ‘the future is everyone’s business’, as well as simulation modelling underpinned by quantitative data to allow evidence-based decision-making. A central feature of the framework is ensuring regions acquire the systems processes, skills and systems tools to ensure sustained learning. Examples from a number of case studies are used to demonstrate the usefulness of the approach.

Key Words: participatory research, systems thinking, sustainability

Introduction

The notion of sustainability emerged in the natural sciences, and has most commonly been used when considering the environmental impacts of human activities. But it is now also being applied in such a way as to include economic and social systems. Managing change is a key ingredient of sustainability. Sustainability is more than just holding your ground (defence), it is also about knowing how and when to initiate and maintain strategic direction and change (offence). Being sustainable is to be better prepared, and to be proactive in developing new ideas for the future that sustain the social, economic and environmental systems. According to Hart (2000), when addressing issues of both structural and relational change, there is a need to look beyond the change in one aspect of community, and examine the links between the economic, social and environmental systems that make up a community. Any action taken to improve the sustainability of a community must take into account the interconnections and interdependence of these sub-systems.

Communities and regions are evolutionary and dynamic – thus community is not a stable entity. Similarly, sustainability is not an end point – it is neither an output nor an outcome. It is a goal that must be continually reassessed and pursued, because what is sustainable today may not be tomorrow.

This paper reports on the use of systems thinking techniques that have been developed to investigate sustainability in regional Australia. These techniques are combined with participatory approaches to assist communities and scientists to develop shared understandings about sustainable development and implement agreed upon strategies for change. The framework and associated techniques described in this paper are used to capture a diversity of viewpoints and assist in the sharing of knowledge at the community or collective level.

What do we mean by Participatory Research Approaches?

The term ‘participatory research’ is commonly used by researchers and practitioners who conduct applied research in real world settings. As pointed out by Cornwall and Jewkes (1995), a conceptual blurring around the term now exists. The concept is originally derived from a number of methods largely developed in the social sciences. These include action research, participatory action research, and empowerment research.

Action research (attributed to Lewin 1946, cited in Small 1995) is an approach that involves the researcher trying to change the system while simultaneously generating information about it. Action research has the aim of making a contribution to both the practical concerns of people and to the goals of science. Research is a collaborative venture where the scientists bring theoretical knowledge and the participants bring their practical knowledge and experience about the system that is being studied. Both sets of knowledge are equally valued and the research collaboration takes place within a mutually acceptable ethical framework.

The second research method commonly associated with participatory research is participatory action research which was largely based on the work of Paulo Freire. Participatory action research was initially developed for use with oppressed groups in Third World Countries. However, during the 1990s it was increasingly used with disadvantaged groups in developed countries. This research approach seeks to understand the needs of the local system and translate them into actions that can be directly used by the community. It is anticipated that through this process, beneficial change will occur (Cornwall and Jewkes 1995).

The third theoretical approach that has influenced participatory research as we know it today is the empowerment research model. This approach rests on empowerment theory originating in Community Psychology (see Rappaport 1981). The empowerment model is viewed as a process that assists people, organisations and communities to gain mastery over their affairs by focusing on individual, organisational and community strengths. Empowerment research argues for the use of paradoxical criteria, that is, the recognition that different stakeholders have different and sometimes opposite expectations, perspectives and preferences, and highlighting these contradictions is

considered important. Empowerment research methodology also acknowledges the importance of both spatial and temporal contexts.

At the heart of all these methods is the notion of participation. Participatory research emphasises bottom-up processes, it focuses on locally defined priorities, and it tries to capture and understand multiple perspectives. Wandersman (1981) defined participation as “a process in which individuals take part in decision-making in the institutions, programs and environments that affect them”. However, participation is more than just taking part – it involves being active, it includes choice and the possibility that something will flow on from that choice. Research has found that engendering active participation is often the key to being able to develop feelings of ownership that in turn motivate people to invest their time and energy.

Cornwall and Jewkes (1995) in their review of participatory research methods identified four modes of participation. The first is contractual where people are contracted into the projects of researchers to take part in their inquiries or experiments. The next level is consultative where people are asked for their opinions by researchers before an intervention takes place. The third level is collaborative where researchers and local people work together on projects that are designed, initiated and managed by the researchers. The final participatory level is collegiate where researchers and local people work together as colleagues in a process of mutual learning. At this level, it is assumed that local people have as much control over the research process as the scientists, and solutions to the problem will emerge over the duration of the research.

The relationship between the researcher and the participant is the distinctive feature in these modes of participation in a research setting. Scientists using participatory methods try to involve the knowledgeable research participants as active co-researchers, an aspect particularly highlighted when adopting a collegiate participatory approach. The researcher often needs to relinquish control over the process and the outcomes to focus more on facilitating the research as a learning process. Here the role of a participatory researcher is not to establish the ‘truth’ or to describe what is really happening, but to reveal the different truths and realities held by different people and groups. People interpret facts and information differently depending on their own experiences, worldviews and cultural backgrounds – they hold different mental models. A participatory researcher will thus try to consider scientific knowledge and local knowledge, multiple scientific views, multiple local views and other contextual factors such as institutional and economic conditions.

As scientists utilising participatory research methods, we have found the adoption of systems thinking approaches to be a very useful way to work in a collegiate manner in the research setting.

The Systems View

Pertinent to this discussion about using systems thinking to investigate sustainability, is the anecdote about the six blind men each feeling different parts of an elephant and trying to determine what the object is. Each blind man could only feel an aspect of the elephant and so no one person could explain how their portion formed part of the whole.

We are reminded that dividing an elephant into parts does not lead to several small elephants!

Unfortunately when it comes to investigating some of our most pressing sustainability issues, our society and institutions have partitioned the problems into discrete parts – the environment, the economy, social issues, development, land, soil, water, pollution, and so on. Problems in the real world however, do not conform to disciplinary boundaries just as they often fail to be constrained by social or geographic boundaries. As Pritchard, Folke and Gunderson (2000, 38) stated, the relationships between human and ecological systems are non-linear, they are continually shifting, with human values and preferences emerging in unpredictable ways as nature and society interact. “Values emerge from the interaction of systems, both people with nature and people with people, and this is an ongoing process”. Indeed, configurations of people, psychological processes and context are spatially and temporally unique and will seldom occur again in the same form. Because of this, change may occur in emergent and novel ways, and outcomes are therefore not always predictable based on knowledge about the separate aspects of the whole system (Altman 1986). Yet we often continue to study these parts in relative isolation regardless of our acknowledgement that the interactions are central to future planning. Similar to the blind men and the elephant, we merely grapple at the edges of the system.

Applying systems thinking approaches is about being both strategic and systemic. As Capra (1996) stated “Systems Thinking is contextual ... analysis means taking something apart in order to understand it; systems thinking means putting it into the context of a larger whole”. The moral of the blind men and the elephant story is that unless we work in a collegiate and collaborative way, we may never be able to ‘see’ the system, let alone take strategic and systemic actions towards its sustainability.

Systems Thinking is used to describe cause and effect, how a system operates and how it might react to change. Systems Thinking is also described as a language, a language that is circular rather than linear, and one that provides a framework for communication about complex issues by highlighting interconnections and patterns (Goodman, et al. 1997; Kim 1995). Essentially, the application of a systems thinking approach provides a structure for deeper investigation. Putting the parts together as a whole to see how and why they interact is the primary focus of Systems Thinking. In so doing, it is possible to begin to see the whole in all its complexity with the challenge of trying to unravel that complexity to identify possible systemic solutions to the problems we face. It means shifting attention from the individual objects or parts of the system towards focusing on the interactions between them. “For the systems thinker, the relationships are primary” (Capra 1996).

Applying a systems perspective highlights the direct and indirect impacts of change, capturing the interaction and overlap inherent within dynamic human and ecological systems. From a systems perspective, healthy sustainable regions have well-integrated, interdependent sectors that share responsibility to resolve problems and enhance the well-being of the community.

The Challenges of Systems Thinking and Participatory Approaches

Thinking systemically and strategically is not easy. Complex systemic problems require the insights and tools and intelligence that are not present in any one individual (Isaacs 1994). Like the blind men, to learn more about the system and how it might respond to possible change or intervention, there is a need to share knowledge and insights.

The dilemma often faced in research is that people want something done now – do something, anything, just fix it. However, past failures suggest that what is fixed easily or in haste today can become the source of future planning dilemmas. Actions are often of marginal and short-term benefit at best and ineffective at worst. Putting systems thinking into practice with regional communities means acknowledging that “there is never a single right answer to any (*systemic*) question” (Senge et al. 1994).

Learning about systems is a process of testing, reflection and adaptation. Senge (1994) notes that the cycle of reflecting–connecting–deciding–doing eases a group of people out of a pattern of frenzied activity into a pattern of team learning and reflection. The process of building a systems view involves sharing current understanding of the interactions and learning about new relations. One of the key aims of a systemic approach is to get diverse groups to discuss the problems and key drivers affecting them in an open non-confrontational way. This means working with communities differently to open up alternative views of the world to stimulate new discussion and new possibilities.

Gaining community acceptance involves a substantial investment in time and energy to overcome the inherent, and understandable view held by many in regional communities of ‘been there – done that’. As described later, building a learning process with local people helps generate renewed energy and interest in debating the causes of problems and strategies for addressing them. In the work undertaken with regional communities, there are several steps that form part of a Systems Thinking approach. These include:

- Making sure that the community (as well as the researchers) consider they are doing something that really matters.
- Helping individuals realise that systems are complex and there is no one person who has the knowledge of the whole system; let alone the answers to the problems being faced by those who are part of it.
- Assisting people to enquire about each other’s assumptions and biases in a non-confrontational manner.

Our Research Approach

Our multi-disciplinary team of researchers (e.g. community psychology, ecology, resource economics, system dynamics modelling) from CSIRO Sustainable Ecosystems (Canberra, Australia) have developed a framework for sustainable development research – the Regional Development Futures (RDF) framework. The management of change is an important aspect of sustainability, and that includes being able to balance short and long term investments and impacts, and achieve a balance between economic, social and environmental outcomes. Long term planning also requires the development of evidence-based decision-making tools that are location-specific. Our approach involves

seeking a ‘shared language’ in which the community and project team openly question, probe and recognise future options and opportunities. The systems thinking methodology behind the framework has been designed to accommodate diverse community views, aspirations and values.

The framework has four distinct phases. The first, *Developing Partnerships*, involves building relationships with community, government and industry groups and developing an understanding of the key issues within the region. The time involved in developing the commitment to a research partnership varies between regions but can take up to 18 months. In the second stage, *Creating the Foundation*, an understanding of past and current resources and trends is acquired. As well as gathering and analysing statistics, this phase will often include gathering qualitative data to understand the collective values that have been important in the past and may be driving current change.

The third phase has a strong reliance on systems thinking techniques. This stage is called *Opportunities for Change*, and its primary focus is on gaining a systems understanding of the region in question. Participatory techniques are used to identify the key drivers of change, explore the interconnections between economic, social and environmental issues, and investigate the possible flow-on consequences of investment decisions. Through the identification of critical leverage points in the regional system, local decision-makers are able to focus upon strategies to enhance regional sustainability. The final phase, *Building Resilient Futures*, includes a process of scenario evaluation and developing evidence-based decision-making tools to explore future development options. Simulation tools are developed to explore ‘what if’ scenarios and are underpinned by quantitative data systems to monitor strategies. Inherent in all phases of the RDF framework is the notion of the ‘learning organisation’.

Essential to the research process is the use of participatory approaches involving scientists, decision-makers and the broader community to work in a collegiate manner. This coupled with the use of Systems Thinking concepts is totally consistent with ‘whole-of-government’ and ‘whole-of-community’ approaches, and an outcome of the approach is that it stimulates debate about the sustainable future of a region. A greater appreciation and understanding of diverse perspectives emerges along with an enhanced ability to articulate the impacts of policy decisions.

Putting Systems Thinking into a Collegiate Research Practice

Senge et al. (1994) outlined five core organisational learning principles that collectively encapsulate a systems thinking approach. The challenge for the science team has been to develop practical methods to enable collegiate research to be conducted with communities in real world multi-dimensional (economic, social, environmental etc) settings. The following section describes how this has been achieved.

Senge’s first organisational learning principle, *Personal Mastery*, involves expanding individual capacity to create desired results, including the creation of an organisational environment that encourages the self-development of all its members. Research related to individuals’ beliefs about whether they can master events and outcomes (personal efficacy), have proved to be important predictors as to whether an individual will cope

with change (see Bandura 1997). But how does this apply at a collective or community level?

Collective efficacy (mastery) has been defined as “people’s shared beliefs in their collective power to produce desired outcomes...” (Bandura 1998, 65). At the community level, people’s beliefs in their collective efficacy can influence several factors. These include shared visions for the community’s future, the utilisation of community resources, community motivation when facing change, the community’s persistence when faced with obstacles and opposition, and finally, collective efficacy will affect how vulnerable the community is to discouragement. Collectively a community has responded to, interpreted, and stored information about numerous events in its past and this collective response becomes part of a community’s narrative or story, which in turn affects a community’s perceived sense of mastery in controlling outcomes.

The use of collegiate research methodology relies on the participation of local residents and citizen participation has been strongly linked with the concept of empowerment (Perkins et al. 1990; Wandersman 1981; Zimmerman and Rappaport 1988). The use of collegiate or ‘bottom-up’ processes can lead to greater empowerment. According to Rappaport (1987), empowerment is a mechanism by which people, organisations and communities gain democratic participation and control over their affairs. An empowered community is one in which individuals and organisations apply skills and resources in collective efforts that will influence change in the larger system (Israel et al. 1994).

In our work with regions, a variety of approaches are used to help develop personal and collective mastery for local residents. For example, local champions for the project take on the task of maximising participation in the process by utilising existing networks. This increases the number of people who have a ‘voice’ in the research process and thus the outcomes. Local knowledge is valued in several ways: through conducting interviews, drawing on the memories and data of long term residents to identify significant past change points in the region’s social, economic and environmental systems, and through forming local project reference groups to help inform the direction and content of the sustainability research. In work to date, a key outcome is the identification of critical sustainability issues by both the scientists and local people. Further, actions and strategies are jointly developed to address these issues.

Senge et al.’s second principle, *Mental Models*, calls for us to reflect, clarify and improve our internal pictures of the world, and begin to understand how our mental models influence our actions and decisions. Working with this at a community level is challenging, as ‘community’ is not made up of homogenous worldviews. Further, many people commonly believe their viewpoint is in conflict with that of others, and participatory approaches need to be carefully designed and implemented to resolve and learn from the conflict.

The research process used in the RDF approach involves conducting ‘systems workshops’ requiring the participation of residents to share their different perspectives of the system. Initially the focus is on identifying the key drivers of change in a region

and how those drivers might affect future sustainability. An output of these workshops is a ‘systems diagram’ that depicts local residents’ thinking about how their regional system operates.

As a general rule, people from diverse backgrounds participate in the workshops so that the systems diagrams show how different economic, social and environmental factors influence each other (based on the mental models of the participants). However, systems workshops based on critical sectors or areas, (e.g. tourism, agriculture, natural assets) or with a relatively homogenous community subgroup (e.g. business, young people, government decision-makers) are also conducted. Even with targeted community sub-groups, inevitably participants use a mix of environmental, social and economic factors to describe the local system. From the diagrams that are generated through the workshop process, groups of factors forming ‘feed-back loops’ can be identified, and these often can help to explain boom and bust cycles of development and their impact on the environmental and social systems. We also analyse the structural characteristics of these mental models using the methods described by Godet (2000). A structural analysis of the system diagram can be used to identify the pivotal factors in the system topology.

Figure 1: A Shared Mental Model of a System – Collie, WA

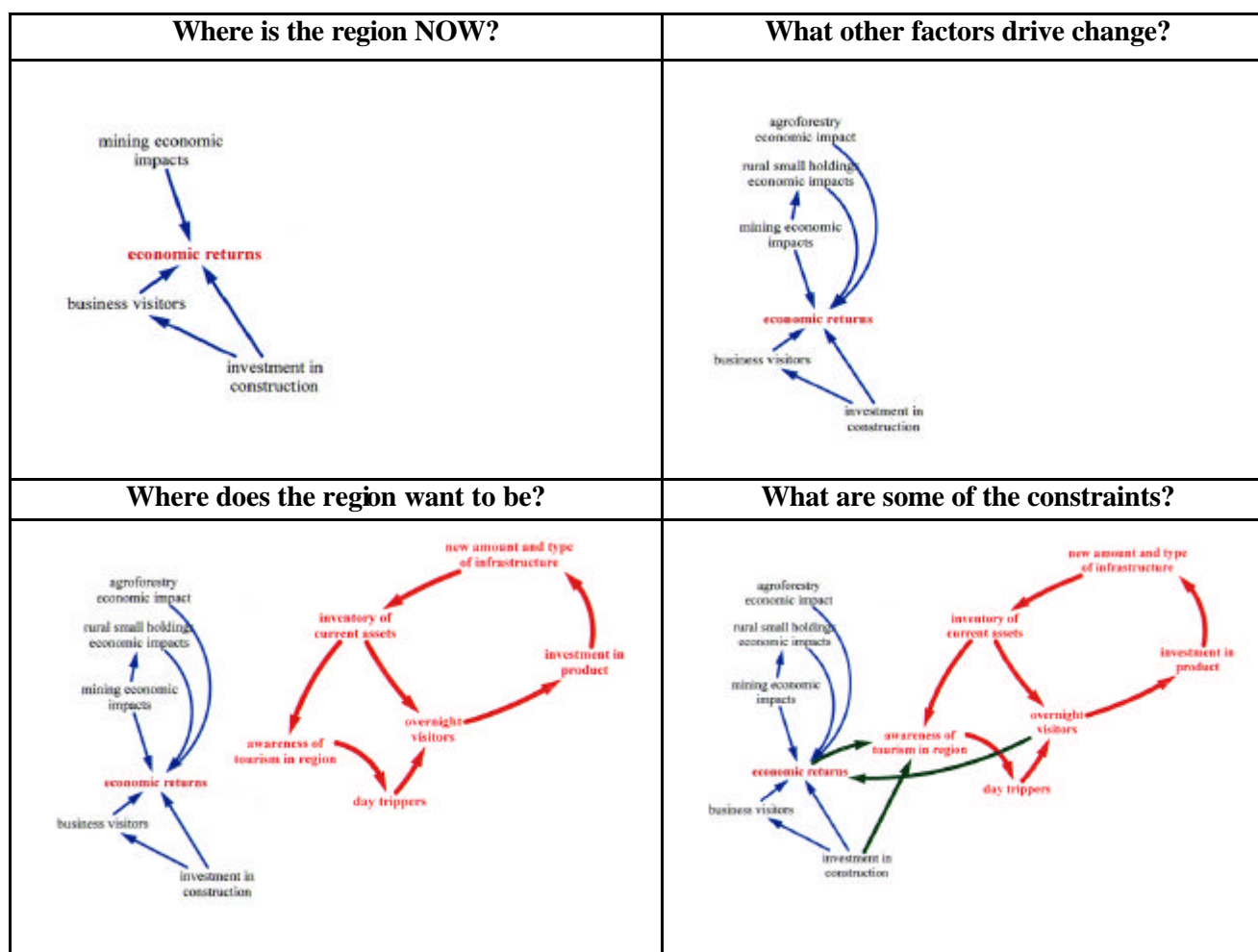


Figure 1 above shows the partial development of a systems diagram generated by local tourist operators and planners in the Local Government area of Collie in Western Australia. The goal of this collegiate workshop was to develop an understanding of the local economic system, and develop strategies so that the region could move towards a future that included tourism.

When developing a consensus picture of how the system works, careful facilitation is used to help participants overcome emotions and personal agendas. They 'see' how their mental model 'fits' with the larger view, and are better able to acknowledge and value others' views different from their own. Participatory processes such as these require people to reflect on their viewpoint, to clarify their logic as to why they believe factors interact, and to articulate the real world manifestation of that interaction in their local area. Understanding how the system works and deciding where the high leverage points are, is essential for developing and implementing enduring interventions (investment, strategy).

For instance, in the Collie example above, motor sport was identified as an investment strategy that had the potential to move the region closer to a preferred future. Through the systems diagram, participants clearly articulated why this strategy was important for them. Their region is dominated by mining and construction although these sectors have a declining role in the local economy. Two the key assets the region had were engineering skills and well constructed roads – both ideal for motor sport. The use of systems thinking techniques allowed people to explore the possible social and environmental consequences of the motor sport strategy in advance. An outcome of this work was that the Local Government Authority developed a motor sport facility to increase tourism in the region, and this strategy proved successful in attracting new activities to the region (including the use of the facility for driver training).

The third organisational learning principle is *Shared Vision*, which is described as building a sense of commitment within a group through the development of shared images for the future, based upon agreed guiding codes of process. In the case of organisations this means focusing on that organisation's purpose for existing. However, this is a much more difficult proposition when dealing with geographical communities. There has been an increase in the number of 'community visioning' approaches that now exist (e.g. Steven Ames, Portland Oregon, USA).

Community visioning develops processes through which a community can imagine the future it most desires. This involves developing plausible and preferred scenarios, identifying areas of greatest uncertainty, and developing strategies or plans on how to achieve that future. A visioning process seeks to address the questions 'Where do we want to be?' and 'What do we need to do to get there?' Essential to this process is the need to identify the community's core values to ensure that the 'vision' and developed strategies are congruent with those values. It is through the use of collegiate research processes that it becomes possible to focus on scenarios that are most highly valued, will most directly affect the region in the future, and over which local residents and decision-makers have the greatest measure of influence. The systems thinking process helps to ensure the pre-requisites to the vision are identified as well as actions that

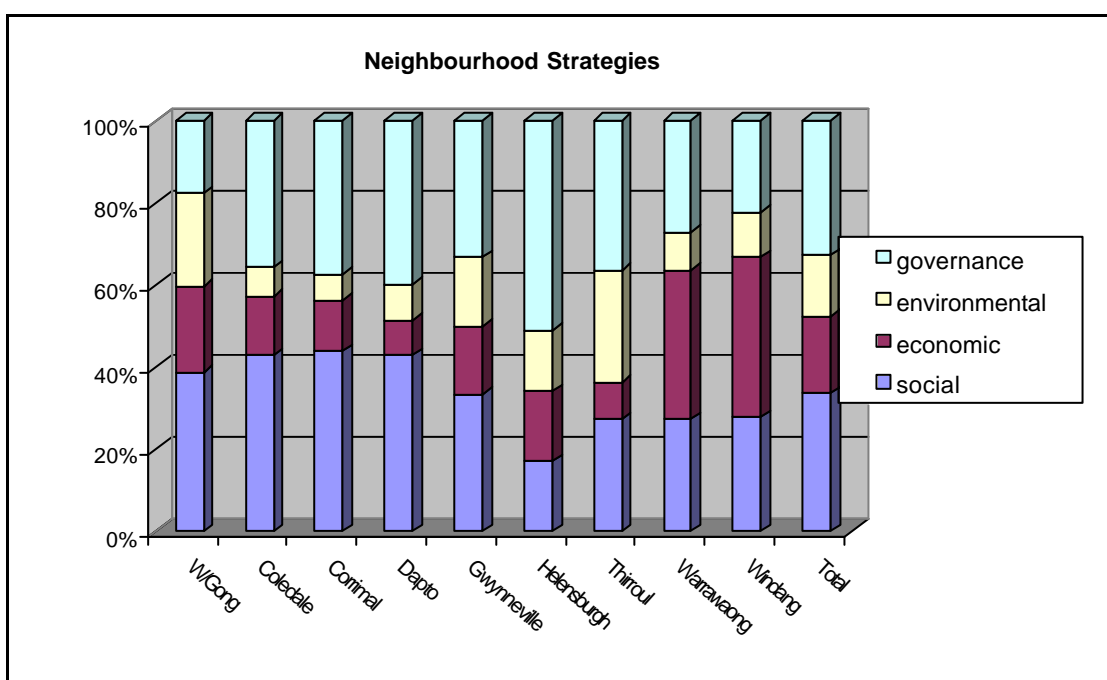
might accelerate change towards or away from the vision. Direct and indirect consequences of actions are also identified.

An important aspect of the visioning process is to identify and enhance ‘sense of community’, that is, the community spirit and sense of belonging that emerges through the synergy of the collective. Feelings of belonging, having influence, integrating and fulfilling residents’ needs, and having a shared emotional connection in time and space are important components of sense of community (McMillan and Chavis 1986). Through the process of exploring what they want their region/community to be in the future, people become better at developing a shared meaning of what is important, and better at collectively identifying issues and constructively responding to needs and problems.

People in communities value different aspects of sustainability. These include social, economic, and environmental elements of community, as well as the formal and informal mechanisms needed for good governance. Capturing and understanding the reasons why residents vary in their values is critical in developing a shared vision. A variety of methods are used to build a shared vision for future sustainability including running a ‘learning from the past’ module that explores past visions. The participants in this method are usually ‘older’ residents who can share with us stories of social, economic and environmental change.

In developing shared visions, the challenge is not only to investigate how visions change over time, but also how they vary across space. For instance, what differences exist in the vision statements of neighbourhoods? What are the types of strategies (economic, social, environmental, governance) that different neighbourhoods think will help realise those visions?

Graph 1: Analysing Neighbourhood Strategies – Wollongong, NSW



Graph 1 above shows the variability in strategy focus for one local government region (the 'x' axis represents the different neighbourhoods). In comparison, Thirroul has a strong environmental focus, Windang an economic one, and Helensburgh residents would prefer strategies based on improving governance arrangements. Developing a shared regional vision is difficult because of the existence of this type of variability. However, the use of systems thinking techniques in combination with participatory approaches allows decision-makers, residents and scientists to work with the variability in these dimensions while simultaneously having a process to openly discuss the implications for future planning.

Senge et al.'s fourth principle is *Team Learning*. This involves getting groups of people to develop joint knowledge that is greater than the sum of the knowledge or insights of the individual group members. We believe that for regions to be sustainable, residents need to develop the process of learning how to learn. By this we mean that communities develop the skills and understanding of how they can collectively share knowledge within a systemic framework.

A related concept prominent in current Australian regional development policy is the notion of 'capacity building'. This has been defined as a process by which individuals, organisations and communities further develop their understanding and abilities to successfully manage change (Kelly and Baker 2001). People are at the heart of capacity building and it rests on the notion that the community itself has both the solutions and the ability to translate ideas into action. Ideally, building regional capacity focuses on enhancing existing strengths and abilities, with greater esteem, skills, long-range thinking and resources signalling increased capacity. However, as noted by Kelly and Baker, building capacity requires leadership, time, effort and resources (e.g. training, finance) and a supportive institutional environment. Thomson and Pepperdine (2003) argue that capacity building not only implies an ability to act, but also the capability to prosper in a changing world. Importantly, capacity also encompasses an ability to set one's own agenda (Land 2000), thus building capacity is a continuous process of learning.

How does a community set its own agenda given the diversity of perspectives, agencies, neighbourhoods, institutions and so on? Our research approach seeks to assist communities to identify the range of tasks needed for collective decision-making rather than identifying a quick fix solution. Inherent in the RDF framework is training to encourage team learning so that researchers relinquish some of the control over the research, while simultaneously putting greater responsibility on the partners to drive the research agenda and implement strategies.

This occurs at the commencement of the project planning by adopting methods that clarify in writing the mutual expectations and obligations of the scientists and the region, which then forms the contractual basis for the research. Scientists rely heavily on local champions to assist in the team learning process. Champions take ownership of the research by repackaging the knowledge in language appropriate to local needs, they work at motivating others to become involved, and they take the responsibility of

presenting the research to their local communities. This is congruent with a collegiate research approach where scientists and local residents work together to set the research agenda.

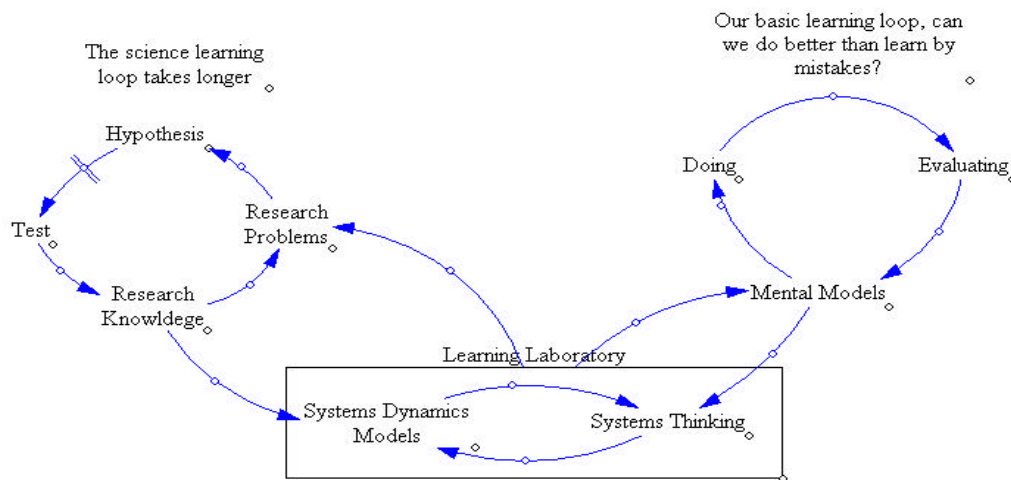
At a more practical level, scientists conduct training to enhance team learning. This includes training to develop collective skills in systems thinking, training on how to use the simulation modelling tools, and training on how to do participatory research. For instance, young people are trained to facilitate workshops using systems thinking techniques and interactive software systems to run workshops with local young people. An expectation of the scientists is that the community will apply this knowledge in the future for regional sustainability planning.

Senge's fifth learning organisation principle is *Systems Thinking*. This is described as a way of thinking about, and a language for describing and understanding, the interactions that shape the behaviour of systems. Our fifth principle is *systems tools*, as systems thinking as an overarching concept under which all five learning principles belong. For instance, a systems view is applied to team learning and to develop personal and collective mastery.

When applying the RDF framework, *systems tools* encompass a range of techniques including those from complex systems science and from community based information systems. Planning for sustainability is a complex issue, the parameters keep changing and there is a lot of uncertainty. The tools developed in collaboration with local regions are used to develop an appreciation of the challenges facing future decision-makers, as well as helping to unravel that complexity. One of the main tools developed by the team is a "Futures Simulator" which draws on systems dynamics to understand why a regional system behaves as it does, how the system might behave over time, and how it might respond to different strategies. In particular, investigating feedback loops helps decision makers explore the flow-on and indirect consequences of their decisions in a virtual world of a computer model. It also enables them to explore their ability to adapt strategies in response to system impacts; and is hence, consistent with adaptive management procedures.

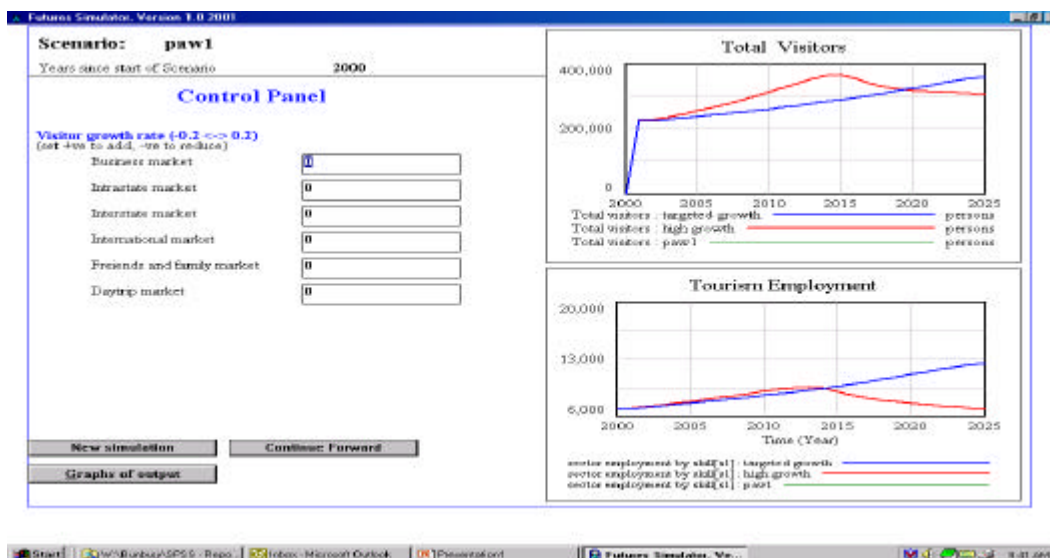
Learning in organisations and communities means the continuous testing of experience and the transformation of that experience into knowledge. The 'science learning loop' is similar – form hypotheses about the problem, test, develop knowledge which is then applied to the problem. Futures models can be thought of as learning laboratories that enable decision-makers to compare alternative strategies (see Figure 2). The participatory approach is used to identify the critical factors that need to be included in the model. These factors are underpinned by quantitative data to allow decision-makers to explore future trends – they cannot give precise forecasts. Furthermore, the process of using the Futures Model to compare scenarios requires the user to think about the interaction of a number of critical variables and what the flow-on consequences of an intervention might be. This is potentially where the greatest learning can occur.

Figure 2: Models as Learning Laboratories



The Tapestry Tourism Futures Model was developed as part of a 3-year research process using collegiate processes with the tourist industry and six Local Government Authorities in regional Western Australia. The model investigated how growth in population and visitor numbers might impact on the region. It calculates the direct impact of visitors’ spending patterns for a number of market segments, and provides trends as to the impact of growth in the market segments on employment, training requirements, investment in accommodation infrastructure, and policing requirements. Figure 3 shows an output from the model.

Figure 3: Example output of the Tapestry Tourism Futures Model



In addition to the modelling tools, the development of data collection and information systems is another important systems tool. A collegiate approach is used to develop a shared vision about a region's information requirements and data needs, and the expertise to enable regions to manage and sustain such systems. In the case of the Tapestry Region, the industry identified its data needs, designed appropriate collection systems for quantitative data, and involved local businesses in the on-going collection of the data. For the Port Douglas Region in Queensland, the establishment of data collection systems using a collegiate approach has ensured relevant, timely data for the past five years.

Conclusion

This paper has reported on the use of systems thinking techniques in combination with participatory research processes that have been developed to investigate sustainability in regional Australia. Sustainability involves working with communities to sustain collective efficacy, sustain the sharing of mental models, sustain the development and refinement of shared vision, sustain and enhance team learning, and sustain the continued development and application of systemic approaches to their future development needs.

Sustainability is not about holding the status quo, nor about pushing specific agendas. It is about a process of managing change and knowing when and how to initiate strategic change. Being more sustainable is about being better prepared for the future and applying systems thinking and participatory research approaches are essential for this to happen. The combination of systems and collegiate approaches help to ensure that the future is everyone's business.

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