

SUSTAINABLE CATCHMENT PROGRAMME – WEAVING SCIENCE AND COMMUNITY INTO ACTION

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ABSTRACT

Integrated catchment management (ICM) is a holistic approach to managing natural resources within a defined geographical catchment area. The management effort in catchments is often fragmented, lacking cohesion and focus and sometimes at odds with each other. These are complex issues with limited resources that councils can not deal with on their own. An integrated, strategic approach is imperative to ensure that efforts are as effective as possible. Fragmentation of catchment management can be on a number of levels including biophysical; scale (geographical and temporal); governance (legal and jurisdictional structures, institutional and stakeholder activities, weaving top down and bottom up processes); and management (objectives and issues, monitoring and research, interventions, interdisciplinary skills). Elements of ICM best practice that help address this fragmentation include political leadership and appropriate legislation; collaboration; effective community participation; clearly articulated roles, goals, and responsibilities; ICM champions; strategic approach; capacity building; adequate resourcing, and monitoring, evaluation and an adaptive management approach. The Mahurangi Action Plan is an example of a catchment based project growing into integrated catchment management. It is a five year partnership project with the Rodney District Council, initially focused on reducing sediment into the Mahurangi harbour to protect its long term health, while developing community ownership. It is a pilot project that has informed the development of the Auckland Regional Council's Sustainable Catchments Programme. This programme provides an integrated planning and implementation framework that enables the ARC to prioritise and deliver interventions into catchments to address the long term health of priority harbours.

KEYWORDS

Sustainable catchment programme, Mahurangi Action Plan, community involvement; integrated catchment management

1 INTRODUCTION

Integrated catchment management (ICM) is a holistic approach to managing natural resources within a defined geographical catchment area. It ensures that individual resource management issues are not considered in isolation but in an integrated plan of management that considers the environmental, social and economic impacts of activities in the catchment. It is a globally established concept operating in numerous countries (Feeney and Gustafson, 2008). Although there is a growing appreciation of the need to more fully integrate the planning and management of catchments, there is a remarkable lack of parity of experience in terms of successes and shortcomings in the development and implementation of integrated catchment and/or coastal management plans (Feeney and Gustafson, 2008).

The management of catchments is complex and challenging, addressing multiple issues that require engaging with numerous players, including a wide range of professional disciplines. This complexity often results in fragmented catchment management. Although historically there has been many catchment based projects these have often focused on a single issue (e.g. flooding or stormwater) without integrating these issues into the broader context of the catchment. ICM moves beyond this single issue focus to address multiple issues and outcomes.

Given the broader scope of ICM, engagement of community, iwi, business, and local and national government is critical. Often seen as a 'nice to have', engagement of key partners is a fundamental component of integrated catchment management and its success.

This paper discusses the way in which catchment management is often fragmented, the key elements for integrated catchment management, and outlines a case study of how the Auckland Regional Council (ARC) in partnership with the Rodney District Council (RDC) re-embraced ICM through the Mahurangi Action Plan (MAP). It then outlines how that experience informed the newly formed Sustainable Catchment Programme (SCP).

2 FRAGMENTATION IN MANAGING CATCHMENTS

Often the management of catchments is fragmented, lacking cohesion and focus, and is sometimes at odds with each other. This fragmentation can be on a number of levels including biophysical; scale (geographical and temporal); governance (legal and jurisdictional structures, institutional and stakeholder activities, weaving top down and bottom up processes); and management (objectives and issues, monitoring and research, interventions, interdisciplinary skills).

Due to the complexity and challenge of the issues and the limited resources available, fragmentation frequently occurs. Councils are often unable to address this complexity on their own. Given this catchment based planning is often undertaken with a single issues focus, catalysed by an immediate identifiable problem which is not integrated into a broader context. This results in issues being addressed in isolation, with solutions either missing opportunities to leverage off existing activity or address multiple issues and benefits. ICM seeks to manage these varied issues and outcomes, addressing the multiple tensions that exist when balancing the needs of different resource users. It also seeks to manage the interconnectedness of activities on private property with their impact on common land (e.g. waterways and harbours).

Outlined below are the primary drivers that lead to fragmentation in catchment management. .

Biophysical aspects

A common thread of overseas ICM is the lack of full 'integration' of ICM issues in the planning and implementation process. Aspects critical to integration, such as coastal and marine waters, groundwater, catchment land use planning and the full breadth of socio-economic considerations are not always incorporated in ICM process (Gustafson, 2009). The management of catchments seldom integrates the coastal sections with the catchment. Such separation does not reflect the systems based, holistic nature of these areas. Integrated management requires addressing all land and water uses and processes in management areas defined on the basis of meaningful geographic and ecosystem boundaries important. There is a need to understand the holistic management of catchment areas, from the ridge tops to the coasts which includes coastal land with estuarine areas (Feeney and Gustafson, 2008). The different aspects within a catchment also need integrating including water quality, biodiversity, habitat protection, landscape etc.

Scale aspects

Geographical

The geographic or spatial scale of an ICM process is critical to defining the issues which should be addressed, the public and private sector participants that should be involved and the goals, objectives and timeframes for developing, implementing, and adapting the ICM (Feeney and Gustafson, 2008). Scale also influences the level of decision making and the degree of community involvement. It also determines what type of activities might dominate e.g. policy, regulatory, incentives, or education and the degree and type of community participation, strategic/vision based or action on the ground. Hooper (2006) outlines three planning scales: macro, part of a large scale geographic zone; meso, a regional or local ecological resource system; and micro, areas with relatively uniform ecological conditions. If managers are not clear what scale they are working within inappropriate decisions might be made on the issues needed to be addressed,

who is involved and how, what scale of planning is undertaken (e.g. strategic versus operational), and what type of activity occurs.

Temporal

There is currently a tendency toward short term actions and strategies. These need to be framed within longer term visions and programmes, balancing quick, easy win actions on the ground with longer term goals and activities. This is best supported with clearly identified order of outcomes (short, medium, long term) and a supporting monitoring and evaluation plan that outlines how these outcomes are measured, identifies if results are occurring, and whether they are being effective.

Governance aspects

Legal and jurisdictional structures

Legal and management structures of catchment and coastal management are fragmented and complex. The management of coastal areas is largely split across eight types of statutory management agencies with overlapping responsibilities in New Zealand: the Department of Conservation, the Ministry of Fisheries, Biosecurity New Zealand, Maritime New Zealand, the Ministry of Energy, regional councils, territorial authorities, and iwi and hapu (Peart, 2008). These can often be at odds with each other and without integrating processes, the only recourse sometimes becomes through the courts. This scattering of governance can result in fragmented decision making, resourcing, information, and strategic focus.

There is still considerable debate about how the Local Government Act and the Resource Management Act and their respective requirements for sustainable development and sustainable management fit (Feeney and Gustafson 2008). This has implications for ICM, given that many tools for catchment planning sit under both of these legislations.

Institutional and stakeholder activities

Catchments hold a multitude of players within them including tangata whenua, residents, environmental groups, business, national and local government agencies, and visitors. Their interplay and impact on the catchment can be varied, with different aspirations, knowledge, perspectives, needs, and priorities. Actions they undertake can often be done in isolation, missing opportunities for leveraging of each other for added value and combining strategic focus and action. Sometimes these activities can be at odds with each other, further exacerbating underlying and/or historic conflict.

Weaving bottom up processes with top down

There is much debate as to when planning processes should be top down (i.e. as directed by local, regional, or national government) or bottom up (i.e. lead by community) and when it is appropriate to seek to merge these two processes. Catchment planning is one area that requires the processes of both. To facilitate a robust and workable management framework, Kemper et al. (2007) suggest the implementation of decentralised institutional arrangements operating at a marco scale. Hooper (2006) suggests that ICM decision making while being made via a similar authority or commission manager as endorsed by Kempler et al. (2007), is most successful when it occurs within an overarching, national natural resource management framework that includes defined objectives and investment strategies. Allen et al. (2002) distinguished between agency-led partnerships; community-led partnerships; and joint partnerships. Their research suggested that joint partnerships have the greatest capacity for long-term sustainability, finding that partnerships that share resources and decision-making power lead to the most effective long-term commitment to changing environmental management outcomes.

Catchment planning is best supported within consistent regional and/or national frameworks that enable local scale community involvement, both with setting objectives as well as their implementation. This marries up the need for high level political support and cross sectoral engagement with the need to engage those that can directly affect change on the ground. As noted by the United States Environmental Protection Agency (2008), nonpoint source pollution poses the greatest threat to water quality and is the most significant source of water quality impairment in the nation.

Management aspects

Objectives and issues

Given catchments by definition cover wide ranging physical landscapes and how communities interplay with them there is often a multitude of objectives and issues that need to be identified and addressed. These can cover the range of wellbeings - environment, social, cultural, and economic. As noted by Bellamy et al (1999) there is a need to consider socio economic issues and considerations alongside environmental given many on ground ICM processes require in-kind participation by landholders which comes at personal time and financial cost.

Often issues are identified and addressed in isolation, with many projects focusing on single issues. This single issue focus can come at the costs of identifying the 'clever' projects that provide multiple benefits (e.g. planting waterways providing biodiversity, water quality, amenity, landscape, soil conservation, and stock health benefits). The challenge becomes how to manage the increased complexity which results from integration with the need to ensure projects remain doable.

The setting of objectives is challenging. Firstly, is the challenge of identifying what the vision/objectives actually are both at a regional and local level, particularly in association with community. Secondly, if there are nationally and/or regionally set objectives it can be challenging to translate these into operational catchment specific objectives, linked to the issues identified in the catchment. Although challenging, this does enable catchment management plans achieve a strong mandate by giving effect to national, regional, and district plans. The operational catchment objectives should be measurable and linked to a monitoring programme to show their effectiveness.

Monitoring, research, and information

Good information is essential for catchment planning and often resides within multiple organisations. An understanding of data available and sharing of information enables better planning. Ideally monitoring in a catchment is embedded in a policy cycle and monitoring results are evaluated regularly. Balance must be met with resourcing action on the ground while also funding research and monitoring needs to guide effective action. There is a need to integrate different types of information such as qualitative and quantitative. Integration is also sought between traditional ecological knowledge and western science. The latter dominates but there is increasing recognition of the contribution that traditional knowledge can make (Peart, 2007).

Interventions

The management of catchments is scattered across organisations as well as within organisations such as councils, therefore interventions are often decided and undertaken in isolation of each other. International environmental policy trends are recognising the need to creatively utilise the multiple mechanisms available (e.g. regulatory, incentive, and education) in designing approaches to promote coordinated action on environmental issues (Feeney and Gustafson, 2008). Often these tools sit across an organisation and the processes to integrate them may not be well developed. Place based projects can be as much about integrating activities within a council as it is integrating stakeholder and community activity. Catchment planning provides a good placed based mechanism for integration, enabling councils to understand how separate functions come together.

Interdisciplinary skills

A full range of skills is required to manage catchments including engineering, science, economics, strategic thinking and planning, facilitation, negotiation, and communication. How to integrate these different disciplines is challenging and can be in conflict with each other, as they are by nature different e.g. linear vs emergent, creative vs rationale, and experiential vs observed. They require different skill sets and rarely sit within one person. Professionals are also formed through traditions and processes within their professional field. An environmental scientist for example can be driven by environmental facts and objectives while a social scientist is likely to be more interested in the interaction of different stakeholders. The challenges of this integration are particularly apparent when integrating science within community processes.

Often the described 'hard' skills of science and engineering dominate and are valued over the perceived 'soft' skills of community engagement, facilitation, communication, and strategic thinking. The

importance of these (later) skills cannot be over-emphasised, yet they are undervalued in many organisations (Feeney, 2009).

3 KEY ELEMENTS OF AN INTEGRATED PLANNING PROCESS

Addressing the fragmentation identified above is essential for ICM. This section outlines the key elements of ICM best practice that helps manage this fragmentation.

Biophysical

A fundamental aspect of ICM is to integrate the various attributes and issues of a catchment, within which a focused, strategic approach can then be used (see below). Key aspects to be integrated might include integrating land use with stream health with harbour health; linking biological health with habitat health; more explicit integration of land based activities with habitat protection; and linking water quality with fish stock.

The international review revealed that ICM has evolved over its history to include a greater coverage of natural resource, environmental, social, and economic variables. This widening circle of issues is being driven not simply through a realisation that the holistic approach is beneficial in delivering positive on ground outcomes, but by the inclusiveness of contemporary ICM following the wider adoption of a bottom-up approach and input of community and stakeholder issues for ICM (Gustafson et al., 2009). Analysis of the literature shows that generally most of these issues are at least considered in the early planning/scoping phases, but often not carried forward into on-ground implementation (Gustafson et al., 2009). The challenge developing frameworks that support the intent and vision set at the beginning of these long processes carried through shifts in resourcing, political cycles, and staffing.

Scale

Hooper (2006) outlines 3 planning scales macro, part of a large scale geographic zone (e.g. the Hauraki Gulf); meso, a regional or local ecological resource system (e.g. the Mahurangi); and micro, areas with relatively uniform ecological conditions (Dyers Creek, a sub catchment of the Mahurangi). Each level of scale will inform the management of the lower scales. The scale being worked in will guide the issues to be addressed, participants and the goals, objectives and timeframes. Scale also influences the level of decision making and the degree of community involvement and the type of interventions undertaken. Below outlines an example:

Macro: the Hauraki Gulf

Defined on the basis of shared saline receiving environment into which many local catchments discharge into. A key driver for managing at this scale might be ecosystem health in the saline receiving environments. There may not necessarily need to be a detailed ICMP for this scale catchment, though enough detail would be needed to prioritise the issues affecting lands, freshwater and the saline receiving environment. These priorities would then guide setting research and management priorities in more detailed plans in the local scale catchments. A primary catchment management plan might set out processes for joint management of catchments, research and intervention priorities. Engagement is mainly strategic, focusing on key partners and organisations to set high level objectives and limited activities.

Meso - local catchment: the Mahurangi

This is defined on the basis of watersheds within the macro scaled catchment. In addition to reflecting local impacts on the estuarine environment that support issues and objectives in the macro (primary catchment) level planning, the local catchment plans could consider local issues of importance, such as flood management, water allocation and the ecological health of the streams. This is in keeping with the definition of an ICMP in the Proposed Auckland Regional Plan: Air, Land and Water (PARP:ALW, ARC, 2007). When considering wider objectives of the macro scale catchment, local catchment plans might incorporate community identified objectives that may lie outside of statutory requirements (e.g., socio-economic issues). Engagement becomes more participatory, involving agencies and community in setting local objectives and implementing action on the ground.

Micro - subcatchment: Dyers Creek sub catchment of the Mahurangi

Within each local catchment it may be desirable to focus on certain sub-catchments for particular management reasons such as land use intensification or stormwater quality discharge to protect. This level of catchment planning would accompany the detailed land use structure planning process and reflect consistency with both the macro scale catchment and local catchment levels of planning. Engagement is primarily focused on delivering the local objectives set above through implementation e.g. riparian fencing and planting on private land.

Temporal considerations are also important, with a need to balance long term goals with effective, demonstrable action on the ground. Achieving clear action on the ground builds support and momentum for the projects as well as breaks long term goals down into doable steps. Given the uncertainty around information and actions needed to achieve long term goals breaking these down into shorter term actions and outcomes helps track change as well as enable learnings to be gathered and inform future activity i.e. support an adaptive management approach.

Governance aspects

Political leadership and appropriate legislation

Given the types of fragmentation outlined in section two, no one person or body holds absolute authority to develop and implement catchment planning. Therefore strong mandate both within organizations, legislation, and policy are important, enabling these long-term processes to have commitment across political structures and cycles.

Collaboration

As outlined in section two, catchments have a multitude of players that effect their health. Using a stepped, engaged, interactive process with stakeholders, that is driven by trust and partnership building, and supported by rigorous science is essential to achieving a collaborative ICM process (Menzies and Hooper, 2008). Resoundingly the results of the review of international practice indicate that a genuine collaboration between government and its agencies, and all parts of the private sector is more likely to achieve greater long term benefit and outcomes when utilised from start of the ICM process (Feeney and Gustafson, 2008).

Good process is required to enable the different and sometime competing interests that exists within a catchment to find common ground and where multi-sectoral stakeholder issues are regulated and balanced (Global Water Partnership, 2003). Creating a joint vision is essential. However, not all implementation needs to be done in partnership, so understanding when to and when not to partner is essential to effective implementation. Key elements of collaboration include trust and relationship building; clear communication, a willingness to participate, and a process that separates value decisions from technical decisions.

An important consideration is that collaborative participation by both the public and private sector in ICM should be ongoing and continuous; it does not stop following the finalisation of the plan, but should continue throughout the implementation, monitoring, evaluation and adaptation phases of ICM (Holzwarth, 2002).

Effective community participation

As noted in section two, weaving top down and bottom up processes are important in managing catchments. An effective grass roots community process is important in balancing any regional or nationally defined framework. This will ensure that the approach within a catchment is localized, reflective of the specific issues and community that exist there. Much of the activity within a catchment is undertaken on private land so if an effective community process is not in place then limited on the ground activity can take place. The challenge becomes how to ensure the community processes are appropriately supported by the science available; marrying up the knowledge, commitment, and energy of local communities with science to guide effective action.

Clearly articulated roles, goals and responsibilities

From the start of the process, clearly articulated goals and objectives, roles and responsibilities of the public and private sector partners involved in the ICM process are essential. Understanding each others processes, needs, constraints, and requirements and how/when they are different is critical and important to trust building. This enables different parties to be able to come together over long periods of time to create and implement collective visions and plans while remaining able to fulfill their unique roles and responsibilities. Respecting the various roles and constraints of different partners is an important aspects of working together.

ICM champions

Given the nature of integrating various partners to manage catchments who may or may not have formal mandate to be involved, a strong ICM champion is important to energise activity and commitment to a common cause. This is both within organisations and in the community. However, for longevity this needs more than a single champion.

Management aspects

Strategic - setting of priorities

Integrated management requires a strategic focus so that the multitude of interventions, actions, and players that impact on a catchment can be guided toward a common vision. Addressing issues facing catchments can be long term, complex and expensive. Hooper 2006 notes the importance of the approach being strategic, focusing on what needs to be done first, rather than on all-embracing efforts. A strategic approach helps identify projects that address multiple objectives, pool resources, and leverage off existing interventions and funding. Given the complexity of the issues it is important to remember that there is no one 'right' answer and not everything needs to be done. There is no single 'best way' (Feeney and Gustafson, 2008).

Using good information to identify priorities is critical in ensuring effective action is undertaken. Understanding cumulative effects and just how much work on the ground is required is a critical part of understanding the big picture. Part of this is understanding what are the 'tipping points' in a catchment, i.e. how much of an intervention in a catchment is necessary and when is it 'enough'. However, these are some of the most difficult questions to answer so understanding even partial parts of these questions helps move toward effective action. An important aspect of a strategic focus is the setting of a common vision and objectives, particularly in the management of accumulative effects. The establishment of a vision can be challenging given the need to identify and resolve conflicts between resource users including the impact of private land activities on the commons.

Capacity building

Capacity building for the community and professionals is identified by the Global Water Partnership (2000) as a critical area that requires further effort. Periods of reflection need to be built in in order that people become more conscious of needs, successes and learnings (Feeney and Gustafson, 2008). A broader range of skills is now more than ever considered necessary in staff involved in catchment management. The need to consider the human dimension of land users in catchment management integrates a wider range of skills and issues than the traditional soil conservation, flood management, and water allocation of traditional water quality management plans.

Engagement is a key theme for catchment managers in New Zealand: 'the skills we require into the future will be more associated with human resources and project management – the power of engagement' (Stokes, 2008). Education programmes aimed at support community participation is also an essential element of good catchment planning processes, focused both on sharing knowledge and information as well as building skills within the community to enable participation.

Adequate resourcing

Catchment management projects can be complex, long term, and expensive that go beyond councils' annual and 10 year planning processes. A key element of successful collaborative processes is adequate, assured funding. Uncertainty around funding beyond a single year can produce barriers to effective

engagement and implementation. However, it is important to note that although councils' roles are ongoing, the degree and scale of financial commitment can legitimately ebb and flow depending on degree of intervention required and other priorities.

At a regional level there are competing projects and areas that also need to be considered. Identifying long term funding streams or income generation opportunities, both to develop and implement catchment planning over periods of time will be essential to these programmes maintaining momentum. Tension will remain between planning and doing so it is essential that planning, review, monitoring are also adequately funded.

Monitoring, evaluation, and adaptive management

Given the complexity of catchments, the lack of information available, and changing legislative and community environments, a management regime that enables the testing of new processes, learns and reflects from experience, and tracks the impact of interventions is critical. When preparing an ICM plan and managing for implementation, adaptive management responses are critical to ensuring that the ICM outcomes are sufficiently flexible to address and manage altered, new or emerging resource responses (Feeney and Gustafson, 2008). Hooper and Menzies (2008) describe management as being adaptive when relevant stakeholders in a catchment assess the efficacy of different ICM options, test these in sub-catchments, learn from these experiences, then promote wider application. The European Water Framework Directive permits flexibility and adaptive management to develop solutions that are tailored for local circumstances. Adaptive management uses a 'learn as we go' approach and is not paralysed by not knowing everything, being comfortable that enough is known. Having identified review periods in plans is critical.

Robust adaptive management must incorporate regular monitoring, evaluation, and reporting of outcomes. The setting of clear goals, objectives, and targets are critical to achieving adaptive management. Good information is essential. However, it can be expensive to obtain and is often seen as distracting from efforts on the ground. Often monitoring information is spread across organizations which use different monitoring methods and process. Developing consistent monitoring approaches across organizations is an important step toward in ICM.

4 CASE STUDY: THE MAHURANGI ACTION PLAN - GROWING INTO CATCHMENT PLANNING

4.1 BACKGROUND

The Mahurangi Action Plan (MAP) is a catchment based restoration programme targeted at reducing sediment inputs and restoring the health of the harbour. MAP emerged in response to State of the Environment monitoring for the Mahurangi Harbour undertaken over 20 years that showed that the harbour health was in decline, with sedimentation from land based sources identified as the primary cause. In response, the ARC established MAP as a five year pilot with the Rodney District Council (RDC) as a key partner. The primary objective for MAP is 'to halt, slow or reverse the adverse effects of sedimentation on the health of the Mahurangi Harbour'.

MAP is a story of a project growing into more holistic catchment management. From the beginning the project was focused on protecting the health of the harbour and a recognition that it required a catchment based approach. Initially its approach was single issue focused, strongly led by the ARC. The project was guided by science and research on what the primary issue was and sought to be focused and strategic in its response. Community ownership was also a key outcome sought for the project and it was this that became an important driver for the project to grow into integrated catchment management.

Below briefly outlines the values of the catchment, the science that informed MAP, the actions and learnings that occurred, and what the next steps are for protecting the Mahurangi Harbour.

4.2 CATCHMENT DESCRIPTION

Tainui explorers named the harbour Waihē while exploring the Hauraki Gulf, and it may later have been named after an elderly woman called Mahurangi in Hawaiki. Mahurangi also means gentle or healing sky (Light, 2008). A long, complex history of settlement, war and peace has seen Ngāti Awa, Ngāti Whatua, Ngāti Maru (Hauraki), Ngāti Whanaunga, Ngāti Paoa and Te Kawerau a Maki come, go and stay. Today the Manawhenua of Mahurangi is held by three iwi; Ngati Whatua Nga Rima o Kaipara, Ngati Manuhiri and Ngati Paoa.

The Mahurangi is a small but perfectly formed example of a ria coast – a drowned river valley, forming a complex harbour of nearly 25km, as important in the past as it is today for its wealth of kaimoana. Its 120km catchment feeds many small streams and rivers, the largest being the Mahurangi, which drains 65% of the catchment and meets the sea at the township of Warkworth (figure 1).

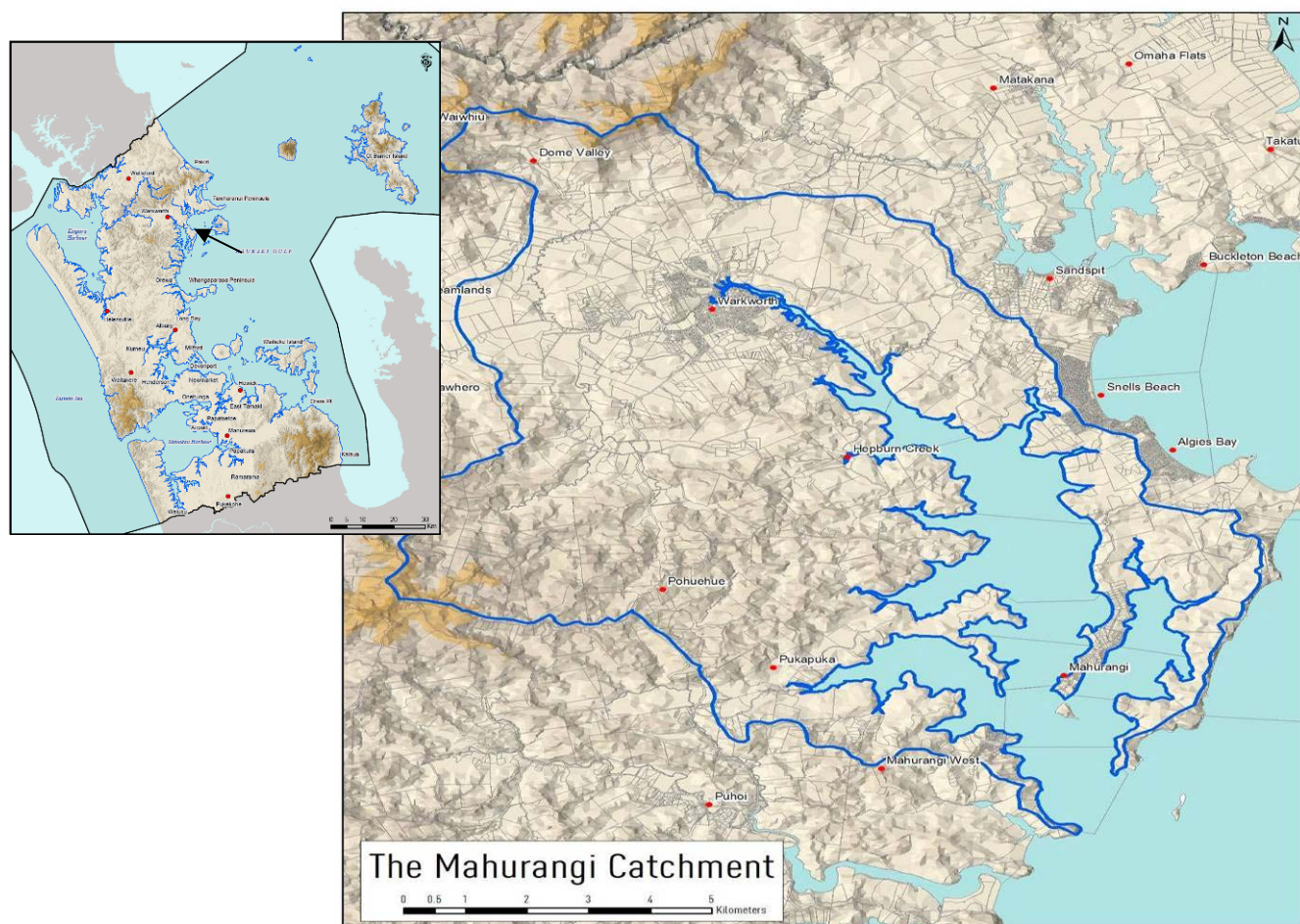


Figure 1: The Mahurangi Catchment

Two-thirds of the land is rural, a fifth in native forest and a twelfth in exotic forest plantations. Urban and industrial land are less than 5% of the catchment's land area, but are growing, as are some of the more intensive high-value rural crops like grapes and olives (figure 2).

It is regionally significant area, with a harbour in good health, and although nearly all of the original kauri and broadleaf native forest has gone, valuable fragments remain. Many of the foothill tributaries of the Mahurangi River still has good stream bank vegetation, although most freshwater wetland has been lost. Coastal ecosystems include mangrove forests and salt marsh sedgelands that are relatively undisturbed compared with the freshwater wetlands. The coastal and estuarine waters are home to many different native birds, lizards are found on the beaches and in forests and scrublands, and native frogs and kauri snail in the forest. Bird life in the remnant forests is much reduced except in the bigger native blocks.

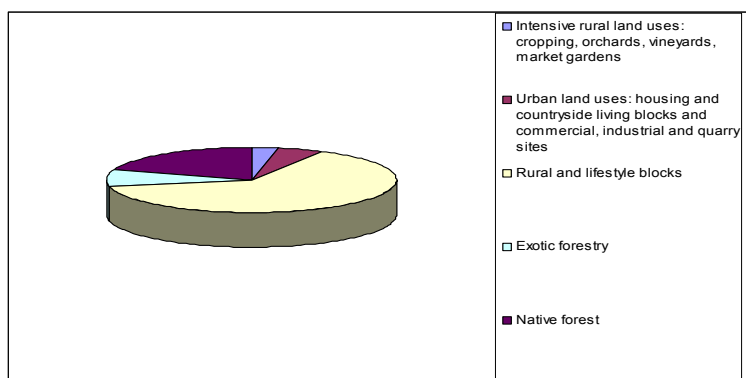


Figure 2: Land use in the Mahurangi catchment

4.3 KNOWLEDGE

Part of MAP's story is how it has been strongly guided by monitoring and research. Since the 1970s, locals have expressed concerns about degradation of the Mahurangi catchment, with the then Rodney County Council, the Mahurangi Residents and Ratepayers Association, the Friends of the Mahurangi and several oyster farmers expressing an urgent desire for the then Auckland Regional Water Board to continue the water quality sampling undertaken in the 1970s by the Health Department and Ministry of Agriculture and Fisheries.

Since 1980, the ARC and its predecessors, as well as the RDC, have carried out routine environmental monitoring in the Mahurangi. This long information record importantly revealed a steady ecological decline in the Harbour from the early 1990s, with an increase in the rate of decline from 2003. This data provided clear evidence of a marine environment under increasing stress:

- a decline in the abundance of many species, especially those that can not tolerate sediment, like cockles, wedge shells and horse mussels
- increasing similarity in sediment sizes and species presence and abundance between sample sites that had originally been chosen for their differences.

The harbour monitoring results showed that the problem was increasing suspended sediment and sediment deposition: the effects were significant and spread throughout the harbour; they matched the known patterns of sediment movement in it; and they matched the known habitat preferences of the sentinel species monitored and their sensitivity to increased levels of sediment suspended in the water and smothering by settled sediment.

Once sediment was identified as the cause of the decline, investigations started to determine the source. The then newly developed Compound-Specific Isotope (CSI) research was undertaken (Gibbs, 2006). Naturally occurring fatty and resin acids in soils can be identified and distinguished from each other by their compound-specific isotope signatures. These proved to be quite different for each of the land areas contributing sediment to the harbour. By looking at the ratios of the signatures in harbour sediments the relative proportions of sediment coming off land under native forest, pasture and pine forest was identified. Researchers also distinguish between soils coming from either side of the harbour and could compare them with oceanic or coastal sediments coming and going through the harbour entrance.

In brief, it was found that:

- a small number of storms each year deliver most of the sediment to the harbour
- soil coming into the Harbour via the Mahurangi River tends to accumulate in the river delta in the upper harbour, a deposition zone that is slowly infilling

- exotic pine forest produces a lot of the soil in the upper harbour delta area and about 14% of the sediment load to the whole Harbour, contributing on average almost twice as much sediment per unit area of catchment as pasture and native forest
- up to 70% of the total sediment load to the harbour comes from pasture in the small sub-catchments alongside the harbour
- sediment from native forest sources is throughout the harbour, but at low levels compared with other sources except in subcatchments with significant native forest
- sediments from outside the harbour are found for about three quarters of the distance up the harbour from the sea, becoming less marine and more estuarine, with sediments in the upper harbour and major inlets coming from the land

Alongside modelling work undertaken in the mid 1990s, this work has been critical in focusing the efforts of MAP primarily on pasture land in three priority sub catchments.

Other research has also taken place throughout this period:

- Coastal erosion - local residents had suggested that coastal erosion could be a significant source of sediments in the Harbour, which was investigated. The results of this separate study estimated that an annual average of about 55,000 tonnes of sediment enters the harbour, and about 10% comes from coastal erosion. This indicated that while it may be locally important coastal erosion is a minor contributor to the total sediment in the Harbour.
- Forestry context – providing an understanding of the spatial extent of forestry, key players, and identify the next harvest years.
- Riparian management best practice – investigating best practice in other regional councils.
- Integrated coastal and catchment best practice - review of international and national best practice.
- Mahurangi catchment background document – drawing together all known research and information on the Mahurangi harbour and catchment across organisations into a single document.

4.4 ACTION

Driven by the information available, MAP started action on the ground in 2004. Primarily focused on reducing sediment into the Mahurangi Harbour, it also sought to develop community ownership through the process. Outlined below are key MAP achievements towards these objectives.

Activities toward reducing sediment

- a strong research programme helped guide activities including the Sediment Source Mapping in Mahurangi Harbour (ARC, 2006);
- provision of approximately \$1,370,000 for fencing, planting and alternative water supply activities (figure 3)
 - funded 80 kilometres of stream and coastal edge fencing;
 - protected some 869 hectares of land through this fencing;
 - planted approximately 150,000 native seedlings planted;
 - piloting of the first farm plans in the Auckland Region, with 40 farm plans now completed. Within priority areas in the Mahurangi, all farms over 20 hectares (that were willing to participate) have completed a farm plan.

- identification of priority sub catchments. Through modelling work from the mid 1990s, Dyers Creek was identified as the primary contributor of sediment to the harbour. Additional criteria focusing on community leadership and restoration opportunities were used to identify Ducks Creek and Te Kapa as additional priority sub catchments. The outputs in Dyers Creek (figure 4) include,
 - 14 farm plans;
 - 77%of area covered by farm plans or grants;
 - approximately 7km of fenced watercourses existing pre MAP;
 - approximately 15km of fenced watercourses funded by MAP;
 - approximately 21km of unfenced watercourses left;
 - 49,000 native plant seedlings.

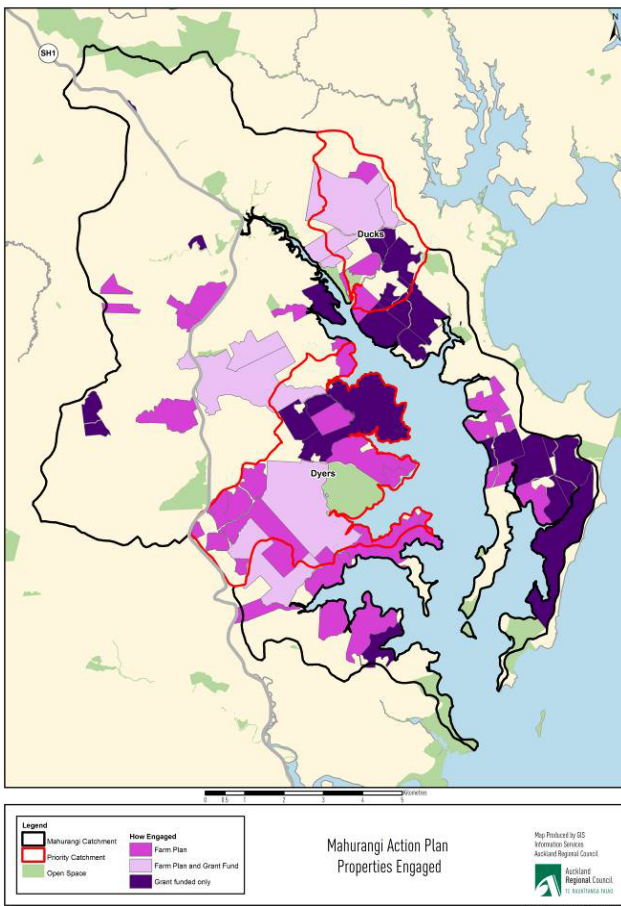


Figure 3: MAP funded activities in Mahurangi catchment

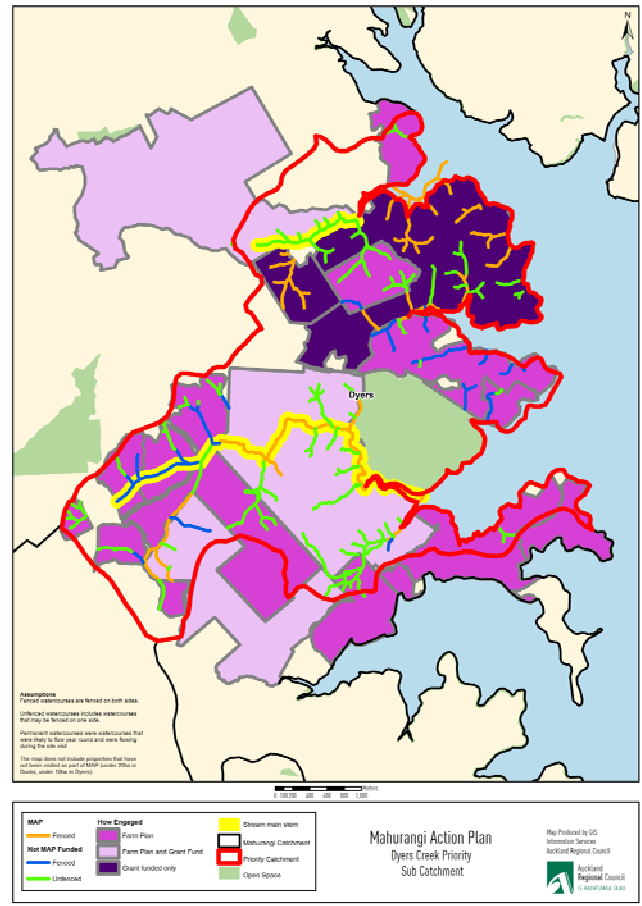


Figure 4: MAP funded activities in Dyers Creek sub catchment

Activities toward fostering community ownership

Community ownership has been fostered through an environmental education programme, awareness raising, and supporting existing local initiatives:

- environmental education programme;

- Wai Care based schools programme including over 100 environmental education events/workshops/fieldtrips, shellfish monitoring days, a student led MAP presentation to the South East Asian Congress in Christchurch 2007;
 - co-hosting eight tree planting days with RDC, Push Play, Mahurangi Rangers, and the Friends of the Mahurangi;
 - over 9500 hours of volunteer involvement from the community;
 - establishment of the Mahurangi Rangers – a small youth group catalysed through work with home school students.
- awareness raising activities including pamphlets, quarterly updates in the local paper (Mahurangi Matters), T shirts, and press releases;
 - supporting community initiatives such as:
 - the Friends of Mahurangi (FoM) open ground native plant trials was developed through discussions on developing a community nursery. FoM responded by initiating research into how native plants can be grown in a forestry manner, allowing for greater cost efficiencies. Over 11,000 trial plants have now been planted in the Mahurangi with promising results. FoM has received significant funding from the Sustainable Farming Fund and the Lake Taupo Protection Trust to further the research;
 - the Mahurangi Regatta is one of the oldest yachting regattas in New Zealand and had not been held for a number of years when it was re-established as a vehicle to launch MAP. It has now been re-established as an annual event in the Mahurangi;
 - Magic Earth Theatre Society was assisted by MAP to develop 'River Magic' - an environmental theatre production based on the Mahurangi River;
 - Mahurangi Forum is a community led network of key groups and individuals that was catalysed through discussions on the future of MAP. The forum meets every three months to discuss how to work together to protect the long term health of the harbour;
 - Jane Gifford Restoration Trust – Based in Warkworth from 1921 to 1938, the 100 year old scow the Jane Gifford, was restored and relaunched in May 2009. The trust aims to use it for education programmes and it is seen as a major flagship for the restoration of the Mahurangi harbour and river.



Photograph 1: Friends of the Mahurangi's native plant open ground trials



Photograph 2: Magic Earth Theatre Society's "River Magic" production



Photograph 3: Mahurangi forum meeting

4.5 ADAPTIVE MANAGEMENT (LEARNINGS)

MAP was a pilot that was intended as a model and learning space to inform the ARC's approach to other catchment-based projects in the Auckland Region. Three periods of review occurred, out of which emerged a better understanding of the project and how to progress forward:

- Review of the Mahurangi Project (Handyside, 2006): its purpose was to review project processes including the governance structure of the project, its objectives, work practices, documentation and project resources;
- Mahurangi Action Plan – Beyond 2009: Community Engagement and Options for the Future (Cole and Lees, 2008): its purpose was to review the role of community ownership and what options were available for MAP beyond its pilot period ending in 2009;
- Mahurangi Action Plan: Stocktake Assessment (Trotman, 2008): its purpose was to take stock of what MAP had achieved in the first 4 years, identifying key gaps and learnings to inform MAP beyond 2009.

What the ARC learnt from the experience and reflection, and from the Mahurangi community can be grouped under three broad headings:

Integrated approaches

As often is the case in catchment based projects, MAP initially focused only on the main cause of the decline in the harbour. The ARC's environmental monitoring and scientific investigations identified sediment as the primary issue and then its key sources. This quickly narrowed MAP's approach to working with rural landowners in priority subcatchment. This in itself was not a difficulty allowing MAP to be strategic and focus, identifying what needed to be done first and how to allocate resourcing. However, no process was put in place to identified and managed the broader context within which sediment sat. This resulted in limited opportunities to leverage off other initiatives or identify multiple benefits, and resulted in difficulties in gaining wider engagement not only of the community but within the ARC itself.

A wider context engages a broader range of people. People saw sediment management as an ARC responsibility, so the strong focus on sediment in the Mahurangi limited the opportunities for broader community engagement. There is a need for a clear understanding of the strategic context of the catchment and its issues based on a good understanding of why and for whom each issue is an issue.

From a rural land owners' perspective it was highlighted that they felt that a broader catchment management planning process was essential to place MAP's programmes in a wider context, demonstrating how their efforts and that of their neighbours fit into the bigger picture. It was these drivers that moved MAP from a sediment focused catchment based project to its next phase developing and implementing a collaborative catchment plan (see section 4.6 for further details).

The ARC learned how a place can be the integrating space within which people can co-ordinate their action on issues, as much as within the ARC and externally. There are many internal partners within the ARC whose existing projects could be integrated where they take place within the Mahurangi. Coordinating Mahurangi based activities within the ARC enables catchment management needs to be met, not necessarily by doing anything new or differently, but more by better co-ordinating what is already being done, slightly intensifying existing efforts or redirecting existing resources to fill significant gaps. In this way, a project does not have to be resourced to "do it all". This place-based synthesis of the many activities enables a very cost-effective way of working. MAP's role was to integrate existing activity and then fill the gaps.

The early focused approach to MAP did have benefits for community engagement. It allowed quick, demonstrable actions on the ground to occur which provided momentum to the project and helped MAP grow into a more complex approach. However, what is important if starting with a narrow, focused approach is to ensure that this work sits within a long term goal of creating a more holistic ICM approach as momentum, funding, knowledge, and broad commitment is gained.

Partnership

A strong driver at the beginning of the MAP was to develop 'community ownership'. A critical period of reflection in 2008 sought to answer a number of questions: (1) what was meant by 'ownership' and how is this different from participation; (2) could it be achieved/did the community want it; and (3) what was the ongoing role of the councils and how does this change over time?

Importantly, what the ARC discovered was that people in the catchment did not necessarily want "ownership" but they did want partnership - as the ARC worked in the Mahurangi, it grew to understand the principles of partnership and moved away from a one-sided ownership view. The community wanted to be a part of the solution but not solely responsible for it. MAP highlighted that addressing catchment management issues requires activity on private land and the use of several methods including incentives, direct action on the ground, and policy and regulation. Not all of these can be owned or implemented by a community with the responsibility often sitting across public and private sectors. MAP helped the ARC understand the two vital roles in plays in catchment planning; focus on targeted action on specific issues within its responsibilities, while facilitating a broader process that brings key partners together within the holistic view needed to guide targeted action.

Given MAP's initial single issue focus working primarily with private landowners, the role of tangata whenua was unclear. As the project grew toward a true ICM approach, engagement became clearer, with a holistic approach more in line with tangata whenua views. This also proved the same for RDC as it reflected its broader responsibilities within the catchment.

Finally, the ARC learned that it is "in it for the long haul": while its level of engagement will vary over time depending on priorities, issues and agreed actions, the council has a long term involvement in the catchment. Expressing this long term commitment, albeit at varying intensities and roles, provided an important stabiliser for growing the community process.

Good management processes

The ARC learned the ongoing value to any programme of taking the time for planning; identifying hidden assumptions, what to do and why it will work, and clarifying if the project outputs are the right ones to achieve the agreed objectives. A lack of clearly defined short, medium, and long term objectives set at the beginning of the project has made it difficult to demonstrate effective change. MAP has a good understanding of its short term outputs (i.e. annual plan outputs) and has structures in place for broad long

term environmental objectives. However, there is an absence of medium term objectives and project specific monitoring to help determine if the short term outputs are effective. Moving forward, the catchment plan will include a clear vision, and a set of long, medium, and short term objectives which will be tracked through an evaluation and monitoring plan based on an adaptive management approach. This will all be developed alongside the plan and with partners.

Action on the ground formed an important ongoing backdrop to periods of critical reflection which provided momentum for the project. However, it is important to achieve a broadly acceptable balance between planning and action.

As MAP grew from a single issue project to a more complex ICM approach, the type of skills required in project staff changed. Collaborative place-based programmes need good project and people skills to draw all of the players together, facilitate the process of agreeing jointly what will be done, pool resources and expertise, and effectively engage diverse local communities. A good interface between scientists, managers and the community and their respective skills and responsibilities is needed. This includes understanding roles and responsibilities, finding common language, and respecting the skills of others.

MAP also demonstrated the critical need for a clear mandate and organisational commitment within and between project participants to address agreed issues and ensure effective cross council engagement occurs.

4.6 NEXT STEPS

After five years it is now appropriate to take time to review and plan where to next in regards to both setting and implementing priorities. Given the learnings from the project a more collaborative approach will be taken working with key partners to develop a strategic catchment plan in the 2009-2010 financial year.

The purpose of this plan is to integrate and prioritise actions into the Mahurangi catchment to address the long term health of the harbour and its catchment; merging community aspirations with science and bringing together key partners who can affect change.

The scope of the plan will be:

- geographically limited to Mahurangi catchment,
- focused on environmental, economic, cultural, and social outcomes associated with the harbour and catchment. It does not include broader social or economic outcomes such as poverty and local jobs (except when associated with economic use of the harbour) etc,
- strategic, focused, action orientated – identifies limited number of priority actions actionable within five years alongside longer term actions and how these interrelate,
- focused on 20 year plus, reviewed every five years.

The principles of the plan include:

- process incorporates collaboration, sound technical analysis, and sets priorities,
- strategic community participation – works through community leaders and those willing to work on process (is not a broad community process),
- deliberative, inclusive decision making,
- process reflects the difference between normative/value decisions vs technical decisions – and uses that distinction to aid the decision making process,

- integrates actions/interventions into a catchment and amongst stakeholders,
- identifies priority actions and informs priority setting within the LTCCP,
- iterative and adaptive process,
- holistic.

5 REGIONAL IMPLICATIONS – THE SUSTAINABLE CATCHMENTS PROGRAMME

As outlined earlier, MAP is a pilot from which the Sustainable Catchment Programme (SCP) has grown. The purpose of the SCP is to integrate and prioritise the delivery of interventions into local scale catchments to address the long term health of harbours and catchments on a priority basis, as identified through policy and research.

The following steps will guide work in priority catchments, the scale of which will be dependent on funding and the degree of issues:

1. Build partnerships/relationships
2. Describe/understand the catchment
3. Set goals and identify priority solutions
4. Design an implementation programme
5. Measure progress and adjust plan

Principles of the Sustainable Catchments Programme are:

- work in priority local catchments as guided by regional processes,
- the scale of response would be different for different catchments,
- the programme responds to issues within each catchment – the scale/type of approach is dependent on catchment values, scale of issues and degree of existing community engagement,
- integrates actions/interventions into a catchment and amongst stakeholders,
- identifies priority actions and informs priority setting within the LTCCP,
- provides a framework to draw together the ARC, iwi, local authorities and other stakeholders.

The SCP currently contains three catchment based programmes including the Mahurangi, Whangateau, and a limited amount of work in the Kaipara. This work is briefly outlined below:

Mahurangi Action Plan

The priorities for the Mahurangi will be to continue action on the ground activities including an additional round of the Landowners Assistance Fund and environmental education activities including riparian workshops, shellfish monitoring, tree planting days, and supporting community led education initiatives. The Mahurangi catchment strategic plan will also be developed and completed by June 2010 to guide future actions.

Whangateau Action Plan

The Whangateau is a highly valued harbour and catchment with outstanding ecological, habitat, heritage, recreational and landscape values. While the harbour is still of high quality, that status is threatened by a number of specific and interlinked problems. Background planning work was undertaken in 2008-2009 financial year that drew together all known information on the Whangateau Harbour including existing activities and information on tangata whenua and the communities in the catchment (Kelly, 2009; Boffa Miskell, 2009; Lee and Cole, 2009). The Whangateau is one of the more pristine harbours in the region and so a focus of the catchment planning is on prevention rather than restoration as in the Mahurangi. A major focus will be on ensuring that there is good information available to be able to track any change in state.

From the background analysis and workshops with tangata whenua and community a number of priority actions have been identified (which will support existing activities) for the 2009-2010 financial year including the set up for an information exchange forum; completion for a cultural sites record; support for a hikoi around the harbour in conjunction with Seaweek initiatives; identification and fencing of priority farms; and targeted education activities with forestry.

Kaipara project

The Kaipara harbour system is one of the largest in the southern hemisphere and much work is undertaken by numerous parties. Governance of the harbour and its catchment is one of the most complex in New Zealand including tangata whenua, two regional councils, two district councils, a number of government agencies, and many community groups and individuals. The work of this SCP project is focused on the integration of the management of the Kaipara and understanding its different scales. This will be achieved through continued support for the Integrated Kaipara Harbour Management Group, including the scoping of a strategic plan for the Kaipara, and developing a partnership project with the Primary Industry Water Partnership group (PIWP). The PIWP project will initially focus on engaging key landowners within a sub catchment of the Kaipara and developing joint funding applications for a broader ICM project. These projects contribute to ARC and other agencies existing projects within the Kaipara.

Additional SCP work includes establishing links to other catchment based projects including Waitakere City Council's Project Twinstreams, Integrated Catchment Management Plans, and the Hauraki Gulf Forum.

6 CONCLUSIONS

The management of catchments is complex and challenging and is often fragmented. Many aspects of catchment management require integration including the biophysical, scale, governance, and management aspects. A structured process is required to manage the complexity and draw together this fragmentation. Integrated catchment management (ICM) is one such holistic approach focused on managing natural resources within a defined geographical catchment area.

Many aspects of catchment management need integration. Most critical are the weaving of a top down approach with a bottom up approach, adaptive management, and a strategic focus. Weaving a top down approach with a bottom up one brings together the key strengths of both approaches. ICM requires committed long term involvement and funding across multiple parties and legislation. Strong political support alongside appropriate legislation is required. However, ICM is also about the people who interact with the place they live in, love, and interact with. A process is also required that enables a strong collaborative approach to be taken, adapting management to local needs and harnessing the local knowledge, commitment, energy, and resourcing. A key element of ICM is engaging community, iwi, business, and local and national government in addressing these issues. Often seen as a 'nice to have', engagement of key partners is a fundamental component of integrating the management of catchments and delivering tangible results on the ground.

Another critical element of ICM is adaptive management and good information. Much is known and also not known about the complexities of catchments. Formalising a process to learn and adapt to changing knowledge, resources, and legislative and political environments is critical to make best use of the

information available. At the same time it frees up managers to move forward with enough information, knowing a process is in place that will test assumptions, track changes, and help understand whether effective change is occurring.

A strategic approach is also one of the most important elements of ICM. Understanding the broad context, the linkages, who is involved, and the myriad of management responses available is important. The setting of a common vision and objectives is an important mechanism to help create a strategic approach as well as identify and resolve the underlying resource management conflicts that exists across users. A strategic approach also enables the identification of early projects that can start action on the ground, helping to build momentum and knowledge.

ICM is challenging. It requires the drawing together of multiple issues, objectives, partners, and skills. Often these are difficult to integrate given their different processes, language, and perspectives. The challenge becomes understanding the complexity while forming and implementing doable projects. It requires a willingness to start the job with the information known while creating good processes that enable emerging knowledge to be tracked and feedback into the process to effect change. And finally, most critically it requires an understanding of what are the respective roles of the technical aspects of catchment planning and community processes and how are they weaved together.

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