Ministry for the Environment

Integrated Catchment Management – a review of literature and practice

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Ask not how integrated is the catchment management, but how is the catchment management integrated?

(With apologies to Howard Gardner)

Acknowledgements

A large number of very busy people gave us their time, expertise and insights in the interviews we conducted and the ideas on which we sought their feedback.

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Author contact details

Clare Feeney
Environmental Communications Ltd
A member of the Environment and Business Group
P O Box 147424, Ponsonby, Auckland 1144
Phone: + 64 9 820 3205 Mobile: 021 631 843
E-mail: clare.feeney@ebg.co.nz
Website: www.clarefeeney.com

Dr. Will Allen
Will Allen and Associates
13 Whittington Ave, Opawa, Christchurch 8023
Email: willallennz@gmail.com
Phone: 03 – 980 4216
Mobile: 0274 934 213
Website: http://learningforsustainability.net

Annette Lees
Annette Lees and Associates
110 Bethells Road, RD 1, Henderson, Waitakere City
Phone 09 810 9535
Email: a.lees@xtra.co.nz

Maree Drury
Golder Associates (NZ) Ltd
PO Box 33 849, Takapuna, Auckland
Phone: +64 9 918 5034
Fax: 64 9 486 8072
Mobile: 021 485 933
E-mail: mdrury@golder.co.nz

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Abbreviations

ANZECC	Australian and New Zealand Environment and Conservation Council
ARA	Auckland Regional Authority
ARC	Auckland Regional Council
ARWB	Auckland Regional Water Board (a part of the ARA)
BMP	Best management practice
BPO	Best practicable option
CMA	Coastal marine area
DoC	Department of Conservation
DSIR	Department of Scientific and Industrial Research
EFP	Environmental farm plan
FRST	Foundation for Research, Science and Technology
ICM	Integrated catchment management
ICCM	Integrated catchment and coastal management
ICMP	Integrated catchment management plan
IKHMG	Integrated Kaipara Harbour Management Group
IPENZ	Institution of Professional Engineers
IRM	Integrated resource management
ISO	International Standards Organization
LGA	Local Government Act 2002
LID/LIUDD	Low impact design/low impact urban design and development
LTCCP	Long term council community plan
MAF	Ministry of Agriculture and Forestry
MFish	Ministry of Fisheries
MOWD	Ministry of Works and Development
NES	National Environmental Standard
NPS	National Policy Statement
NRRP	Natural Resources Regional Plan (Environment Canterbury)
NSFW	New Start for Freshwater
NZARM	New Zealand Association of Resource Management
NZBCSD	New Zealand Business Council for Sustainable Development
NZLCT	New Zealand Landcare Trust
MHWS	Mean high water springs
MfE	Ministry for the Environment
OAG	Office of the Auditor-General
ORC	Otago Regional Council

PDC	Papakura District Council
PUCM	Planning under co-operative mandates, a 13-year FRST-funded RMA and LGA research program of IGCI (International Global Change Institute) at the University of Waikato
QE II	Queen Elizabeth II Trust
RCP	Regional coastal plan
RFP	Request for proposal
RMA	Resource Management Act 1991
SAMsn	Sustainable Agriculture/Horticultural Management Systems Network
SMF	Sustainable Management Fund (Ministry for the Environment)
SFF	Sustainable Farming Fund (Ministry of Agriculture)
TDC	Taupo District Council
TA/TLA	Territorial (local) authority

EXECUTIVE SUMMARY

1. Project background, aims and methods

This project has been undertaken for the Ministry for the Environment (MfE) to look at ways that integrated catchment management (ICM) approaches can be used to achieve improved local water management practices, including measurable improvement in water quality and evidence of more efficient water use. The project involves a review of existing literature and examples of (ICM) projects in New Zealand.

One of the underlying philosophical assumptions of the NSFW programme is that water management in New Zealand will be based around integrated catchment and groundwater management.

While the philosophy of ICM informs the NSFW programme at a strategic level, the focus of the ICM component of the Supporting Measures project is on establishing **where and how the philosophical ICM approach can be translated into practical, effective and efficient solutions**.

As stated in the request for proposal, a local ICM approach could be used to:

- identify community objectives
- make the best use of funds, time and local resource management capacity
- focus on a demonstrable improvement in water quality (both fresh water and coastal) and other outcomes for freshwater management desired by the community in question.

Accordingly, this report aims to meet the following aims of the RFP and:

1. gain an understanding of how ICM initiatives have been implemented in New Zealand, and how effective they have been
2. provide information for officials to develop options for how government could enhance the effectiveness of ICM initiatives
3. provide information for officials to develop options for how government could increase uptake of ICM initiatives, where it is apparent ICM represents a beneficial approach to managing water.

The report identifies the distribution, scale and characteristics of ICM initiatives included in this report, and uses the information in Part A together with existing literature and ICM plans and projects in order to assess the effectiveness of integrated catchment management initiatives in New Zealand by exploring the following research questions in the RFP:

a. what has worked and why (including factors critical to success)
b. barriers to development, adoption and implementation of ICM approaches
c. significant constraints to effectiveness in terms of the criteria for evaluation
d. barriers to the widespread community support and buy-in to ICM initiatives
e. assessing the usefulness of integrated catchment management plans (ICMP) in enabling communities to determine and work towards achieving their joint aspirations for water in their catchment and linked coastal marine areas
f. how different governance arrangements and processes help or hinder ICM initiatives
g. what consideration is given to impacts of catchment management practices on coastal marine areas, including fisheries and biodiversity values.

The report concludes with a summary of key findings and opportunities to enhance the practice of ICM.

2. ICM and its effectiveness

Our first step to meeting the project aims was to review how people understand and use the concept of ICM in New Zealand. The findings are generally reveal a wide diversity of opinions, approaches and practice in New Zealand. This confirms other findings and goes some way towards explaining the extraordinary diversity of activities that are undertaken as ICM.

Two broad groups of activity are so often mentioned in the literature and interviews that we set them out here in order to apply a consistent terminology that differentiates between them:

- **catchment management plans or integrated catchment management plans** (CMPs and ICMPs), which often comprise more formal processes for larger areas ("the catchment level")
- **catchment-related projects**, which may be more or less informal, are focused on small sites and contribute to beneficial outcomes in catchments without themselves constituting ICM ("the project level").

The term catchment-related initiatives is used throughout the report to refer to both.

Best practice, barriers and constraints to effective ICM may occur at a number of project stages. Based on our experience with the most common defects in the preparation, implementation, monitoring and review of ICMPs, together with the large number of elements of best practice, we organised the information in terms of:

- the "plan-do-check-review" planning cycle in the ISO series of quality standards.
- the University of Waikato-based PUCM team's criteria for a "good plan", which links the assessment of plan quality and the quality of its implementation to environmental outcomes.
- the "orders of outcomes" framework that enables the documentation of enabling conditions, changes in practice and the environmental and other outcomes that results from the first two.

Based on these and a survey of New Zealand literature, we then identified a number of elements of best practice ICM. There are many such lists, but what makes this list different is its strong focus on the planning cycle; emphasis on plan logic and the internal consistency between issues, objectives and indicators; and the use of the orders of outcomes to distinguish more clearly between process and outcome indicators, so as to better enable the assessment of the outcomes and effectiveness of ICM in New Zealand.

3. Distribution, scale and characteristics of catchment-related initiatives in New Zealand: a rapid appraisal

We created a thematic list of ICM and related initiatives under the following headings, all of which require different types of collaboration and collective action:

- national initiatives include a mix of policy and operational initiatives such as:
  - **national level strategy and policy** such as the New Start for Freshwater
  - **nation-wide sector strategies or programmes** that may or may not self-identify as "ICM". Examples include **nation-wide operational programmes** by groups such as the Landcare Trust, or **sector based strategies** such as those of Irrigation New Zealand, or **sector-based operational programmes** around a land-use such as dairying and its associated water impacts such as

such as the Dairying and Clean Streams Accord
    - **nationally-applicable generic or issue-based research** that will contribute to better outcomes for catchments generally
- regional or sectoral activities may include research necessary to identify issues, objectives and methods in order to inform operational (plan or programme) initiatives, including:
    - **plans**: catchment-based plans that are documented in some form for a defined spatial area. These are often **non-statutory operational plans** which are implemented by a range of methods, and often include a **mix of regulatory and non-regulatory methods**. They are normally called catchment or integrated catchment management plans, depending on the number of different issues addressed or the scale with respect to, for example the ultimate receiving environment (see discussion on scale below). The Regional Plans that address water quality in the Taupo and Rotorua lakes are an example of a fully regulatory approach, although this is supported by a range of other non-regulatory methods.
    - **programmes**: **issue-based operational activities** that contribute to beneficial outcomes in catchments without necessarily being catchment specific. They may be explicitly formulated for catchment-related improvements, and/or linked to management plans for defined catchments. They may also be multi-focused either through a broad vision, multiple objectives, multiple parties or multiple sites in many catchments within a region or across the country. Examples include regional council led urban and rural point source contaminant control carried out across a region, especially in areas where these land uses are concentrated. Where they are identified as an issue in a particular catchment, they may become an operational focus there.
    - **projects**: at the localised project level, a large number of smaller activities related to a specific defined catchment are often simply "done" without necessarily having a formal/written plan or outcome monitoring programme. These may have a single-focus or have a single party involved (e.g. a local community group dedicated to replanting the riparian margin of a single stream). These do not on their own constitute "ICM", though they contribute to a greater or lesser degree to outcomes in catchments.

Any or all of these may also focus on marine receiving environments and fisheries.

We then broadly assessed them in terms of the following headings:

- the lead agency/level
- landscape (rural, urban, or rural and urban)
- purpose (e.g. water allocation, soil erosion, flooding, agri-nutrients or other rural non-point sources, water quality, urban erosion and sediment control and other contaminants)
- triggers/drivers for the development of an ICM initiative
- areal extent/scale (national, regional, local or variations of these) – the spatial scale of the work
- degree of integration
- degree of regulation
- degree of documentation
- funding
- focus within the broader planning cycle (plan, do, check, review) – including the extent to which there is documentation of the first, second and third orders of outcomes.

There was tremendous variation in all of these aspects. a large number of different agencies and groups involved, and a number of different websites collating various supporting tools.

Regional council and community led initiatives are especially prolific (at their respective macro/meso and micro scales respectively).

Catchment-related initiatives in most parts of the country are rural and most appear reactive, being developed in response to various drivers or triggers such as the pressures of intensive farming, especially dairying, rather than providing a proactive framework for managing the effects of land use on water quality and quantity and other catchment-related matters. This is in line with overseas experience.

However trends are emerging for structure plans such as for Long Bay and urban ICMPs to anticipate and avoid, remedy or mitigate the adverse effects of development on land and fresh and saline waters.

A strong theme is that of Maori and community interest in ICM as a means of solving difficult issues including those related to coasts and fisheries.

"Planning" and "doing" seem to be more often documented than "checking" monitoring results and "reviewing" plan effectiveness.

The high numbers of interrelated initiatives around the country and the interviewee responses and available literature imply that ICM in New Zealand is probably more honoured in practice than in principle. Many of the elements of ICM are present, but there is little formal acknowledgement of this. The interviews and literature indicate that the linkages between issues, within and between organisations and with external stakeholders are often informal and dependent on the modus operandi of individual people. This makes it difficult to ascertain the actual extent of what may be deemed "real" integrated catchment management in New Zealand.

Despite the large number of initiatives around the country, therefore, few of those listed would qualify as genuine ICM as widely defined in the literature. Those that could do so also seem to address coastal as well as catchment issues, and include:

- the Manukau Harbour Water Quality Management Plan
- the Integrated Kaipara Harbour Management Group
- the Hauraki Gulf Forum
- Project Twin Streams
- the Long Bay Structure Plan
- some of the more broadly-focused urban ICMPs being prepared in Auckland and Christchurch.

So thus far (and in line with international literature) the effectiveness of ICM in New Zealand as an approach to managing land and water use issues has not yet always been able to deliver measurable outcomes in terms of the indicators of concern. Of the initiatives listed it seems those with measurable objectives and/or outcomes for freshwater may be in the minority, partly because few initiatives either set measurable objectives, or, when they do, frame them so they are capable of being measured; and few have been in operation long enough to be able to reasonably attribute any changes in baseline indicators to the implementation of the methods adopted to achieve the objectives.

4. What has worked and why

"Effectiveness" and "what works well" have different definitions depending on the school of ICM adopted for a given programme, whether the proponents are primarily seeking ecological bottom lines or improved social processes and outcomes.

ICM programmes with a "resilient communities" focus note a number of factors that need to be in place to meet their objectives, relating to good process by good people in councils and the community.

ICM programmes with an "ecological bottom lines" focus have an additional focus on robust scientific information, the judicious application of regulatory tools (as evidenced by increasing willingness to take hard decisions about regulating land and/or water use activities in order to address very serious ecological issues and water scarcity) and a growing interest in programme review and assessments of effectiveness.

The following headings capture the factors most commonly listed or implied as being the most critical factors for success:

- institutional alignment and engagement
- stakeholder/community engagement
- leadership and partnership
- capacity-building
- judicious regulation
- long term funding
- consideration of all four wellbeings
- collaborative monitoring and adaptive management.

Institutional engagement means communication and co-ordination between agencies and of their joint and several points of engagement with catchment communities, whether proactive or in response to iwi, community or sectoral initiatives. This is important because catchment-related initiatives are more effective when:

- they have the support of the key relevant agencies
- messages and information coming from their different perspectives are aligned
- ICM decision-making occurs within an overarching resource management framework with defined objectives and investment strategies: this enables decision-making that is consensual and coordinated across the public and private interests in the catchment
- such a framework, provided by government, supports catchment managers and communities in making difficult decisions.

Stakeholder and community engagement is the community dimension of institutional engagement in ICM. Trust will arise out of good communication and shared understandings of different needs and points of view. This is important because catchment-related initiatives at all scales (macro, meso and micro) are more effective when:

- local stakeholders are involved in on-the-ground projects
- groups are supported by good facilitation, which is key to developing dialogue and relationships and working through the conflict and road blocks that emerge when different stakeholders come together
- good communication is enabled amongst people and groups

- social gatherings allow everyone to have fun and celebrate success.

Good leadership, including of collaborative or partnership processes, is important because catchment-related initiatives are more effective when:

- clear goals and roles are set at the start of the process
- different groups have effective representatives
- group leaders build and maintain groups so they can stay motivated to achieve their objectives.

Capacity-building is vital because much of the challenge of implementing integrated management lies in promoting change in the behaviour of the different parts of the respective agencies, different user groups and wider communities. Factors that enhance community engagement in group activities and building group capacity and partnerships with local government and industry are closely linked. Catchment-related initiatives often have to last a long time, so they are more effective when:

- adequate provision (amount and duration) of resources is made for the development of people and organisations
- iwi and communities are supported in their capacity to take part in ICM processes
- succession planning is considered for ICM community representatives and agency staff, who can easily "burn out", as well as for public and private sector technical experts who may move on as a result of organisational change
- capacity building is recognised as a two-way process, whereby technical or policy experts pass knowledge to political leaders, industry, NGO participants, individuals and the broader community but that knowledge is also transferred from these “non-technical” participants back to the technical experts.

Judicious regulation is regarded by most of the interviewees and international literature as an essential component of ICM. This is important because catchment-related initiatives are more effective when regulation:

- is introduced as part of a community consultation process aimed at allowing communities to reach shared understandings of the issues and management options
- provides a framework within which a range of voluntary or supporting methods are provided to help achieve measurable ecological objectives.

Long term funding promotes more effective catchment-related initiatives because:

- the macro and meso scale ICM requires sustained financial investment in financial and human resources over the planning, implementation and review phases, yet funding is often provided over a five to seven year timeframe, when perceptible changes to resource condition often occur on much longer timeframes (for example 20-50 years or more)
- at the micro scale, experience suggests it takes up to three years to establish a functioning group and a further three years to achieve tangible environmental outputs, while environmental outcomes become apparent over the next 20-30 years, so funding is needed over this latter period to monitor the changes and feed this information back into the process
- seed or set-up funding can help get things started, but few people in rural or urban communities can remain solely responsible for long-lived programmes without the long term support of their catchment managers
- explicit long term funding of monitoring and review will support regional councils’ capacity to monitor the interventions and outcomes of other agencies engaged in initiatives that contribute to beneficial outcomes in catchments.

The four wellbeings – social, economic, cultural and environmental – are becoming more important. Catchment-related initiatives are more effective when:

- socio-economic issues have been identified during the planning process and acknowledged and accepted by the community
- community and internal/external stakeholder engagement helps catchment managers to identify, prioritise and monitor catchment issues, management options and community outcomes across all four wellbeings
- catchment management goals tie together economic and environmental sustainability objectives
- land-users can see a clear benefit (short, medium or long-term) to the economic sustainability of their operation and objectives and activities make a clear link between environmental and economic benefits.

Collaborative monitoring promotes adaptive management. This promotes more effective catchment initiatives because:

- it encourages learning and adaptation amongst project participants and communication with other catchment projects
- it leads to an empowered group of stakeholders keen to find out more to continue an adaptive management process
- monitoring is key to adaptive management and adaptive management is key to effective ICM.

"Top down" together with "bottom up" approaches promote more effective catchment-related initiatives because:

- the strength of the on-site approach is in the implfementation on-site works that lead to improvement in urban and/or rural environmental condition
- the strength of the ICM approach is in relation to social outcomes, where the community-based approach has proved successful in creating awareness and creating a good deal of acceptance of the "care" ethic
- the most comprehensive outcome gains can be made through a combination approach involving individual land owner action set within a strategic ICM framework.

These and similar findings can help make it easier for people and agencies planning programmes and projects at a range of scales to catchment-related interventions to both be – and be documented as being – more effective.

5. Barriers to development, adoption and implementation of ICM approaches

Strictly speaking, a barrier would be defined as a "thing that totally prevents something from happening or means it comes to an end earlier than anticipated" – which may mean we hear little or nothing about them. In practice and as a result of different people's terminology, barriers will overlap with constraints, so there is a porous divide between the two.

Many barriers have been comprehensively identified in international and local literature and reveal that the understanding of best practice in helping and facilitating communities has been well-developed for the last twenty-odd years.

Barriers would thus appear to relate more to the **capacity** of ICM and project managers to **access** best practice information and the funding and other resources available to apply it.

Identified barriers fall under the following headings, which broadly relate to the "plan" and "do" phases of the planning cycle (the process aspects of catchment-related initiatives), as it is here that things are more likely to prevent or stymie catchment-related initiatives:

- the problem of integration
    - concepts
    - capacity
    - co-ordination
- the problems of scale
    - big areas
    - big problems
- the problem of time
- institutional capacity barriers
- regulatory barrriers.

"Too big, too hard, too little time, too little money" sums up the findings of this section, indicating that institutional capacity is a key barrier to more "integrated" catchment management.

Such barriers mean that people in government, councils, sector groups and the community will sometimes tackle a manageable portion of the work rather than the whole thing; or take another approach to it than ICM or community engagement; because of lack of resources to overcome barriers associated with scale and intra- and inter-organisational integration and a lack of capacity to do this in appropriate ways.

In practice, many agencies find that the entire macro-scale catchment unit is too large, that they do not have the resources to manage whole catchment programmes effectively and that communities themselves don't always recognise catchment boundaries, making it harder to work with them.

The capacity gaps identified could be at least partially met by government affirmation of the significance of ICM: it would give a stronger mandate for more formal and "integrated" catchment management at the macro and meso scale, a better understanding of the capacity needs for this so the necessary resources can be provided and could boost the ability of councils to build and share capacity amongst each other, and with research institutions, iwi and communities, sector interests and other stakeholders.

6. Significant constraints to effectiveness of ICM

We have defined a constraint to effectiveness as being "something that makes an initiative less effective than it could otherwise have been because of 'not enough of a good thing' or 'too much of a bad thing'".

Many of the barriers noted in Section 5 thus often also act as constraints to effectiveness.

The effectiveness of many initiatives (especially small projects) can not be assessed because of the lack of measurable objectives and the lack of a monitoring programme, especially for outcomes that may not be expressed for some years.

Some significant constraints are identified and discussed for both ICM and catchment related projects in terms of the broad criteria listed in Table 3 as phases of the plan/do/check/review cycle:

- plan:
  - silos within and between organisations
  - lack of time and culture (capacity) for collaboration
  - lack of clear research needs and sharing
  - lack of a shared information system
  - insufficient funding, short and long term
- do:
  - the timeliness and alignment of regional and district instruments
  - lack of institutional co-ordination
  - people turnover and burnout
  - lack of practical integration of understandable research
  - lack of practical tools
  - lack of uptake by some land owners
- check:
  - lack of baselines and benchmarks
  - absence or vagueness of objectives
  - lack of provision for capture of third order outcomes
- review:
  - lack of summative reviews
  - the difficulty of adaptive management and the need for a learning – as opposed to a risk-averse and punitive – culture.

Things that would make it easier for people to do more effective ICM broadly included:

- increased capacity
- sharing of research and data
- better national and regional setting of priorities
- measurable objectives and monitoring
- more emphasis on programme review, learning and adaptive management.

7. Barriers and constraints to iwi and community support for ICM initiatives

While communities can and do drive genuine ICM initiatives and large numbers of local projects, they may not always have the time or the interest to respond to the needs of catchment managers. Communities may also be dispersed over large distances and communities of place do not necessarily correspond with communities of interest.

Real or perceived equity issues may also arise where some targeted individuals fail to support an initiative (voluntary or regulatory), or where sustainability investments that aim to deliver public benefits also deliver improved property values.

Other barriers and constraints affecting the degree to which iwi and communities support ICM are the other face of the elements of best practice noted in Table 3 and Section 4, as well as the barriers and constraints in Sections 5 and 6. Key among these are:

- conflicting or inconsistent messages from key agencies, or the absence of key agencies from local engagement
- poor identification of stakeholders, including by overlooking key groups or leading individuals

- failure of agencies to provide good facilitators or to give them enough time and resourcing to engage effectively with iwi and communities on the agency's or agencies' behalf
- failure of agencies to provide or support the capacity of iwi and communities to engage with them and ICM, or to provide it for a long enough time to build trust and traction
- failure of agencies and/or iwi and communities to formulate clear goals, measurable objectives and clearly defined roles and responsibilities at the start of the process
- lack of widespread understanding of the many aspects of capacity that need to be developed to allow organisations, iwi and communities to engage more effectively in ICM, including intra- and inter-agency capacity, human resource development, iwi and community development, professional capacity-building and succession planning
- lack of understanding by agencies of the many different motivations iwi and communities have for engaging in ICM, including across all four wellbeings
- fear of or opposition to regulation by sectors in the community
- lack of adequate and long term funding within agencies and for iwi and communities
- institutional distrust of community and cultural knowledge and information
- lack of community identification with a catchment because of its sheer size, meaning they don't realise or believe that collective activities can affect distant water bodies (such as was shown in the Motueka)
- communities may share institutional feelings of apathy or despair about the scale of catchment problems or consider ongoing environmental deterioration an inevitable "cost of progress" that is compensated for by greater economic wellbeing
- communities may be deterred from taking part if they consider it will "just take too long" to make a difference to the issues, especially if they don't see small gains being made towards it emerging from regular monitoring
- communities may not understand the science behind and hence the need for ICM
- there may not be enough readily applicable or credible tools for them to use
- they may not trust the agencies or their motives for wanting to engage with them.

Sustained commitment to building relationships based on communication, respect and trust is thus needed, including with and by the science community, interpreting issues, actions and public and private benefits.

8. Catchments and coasts

While the RMA emphasises integrated management, mean high water springs (MHWS) was set as the RMA jurisdictional boundary between regional and territorial authorities, dividing coastal areas off from land management. Together with the many other pieces of legislation and agencies with responsibility above and below MHWS, this means that integration of the management between land and sea has not been achieved particularly well. The specific management of land uses for the purposes of maintaining the health of the freshwater and saline ecosystems in which their effects are expressed has yet to become mainstream.

However it seems that initiatives that address coastal issues are well-represented among New Zealand ICM endeavours, with some plans such as those for Doubtless Bay, the Hauraki Gulf and the Kaipara Harbour all addressing the impacts of land

use, catchment management practices and marine-based activities on coastal marine areas, including fisheries and biodiversity values, as well as the associated cultural and economic values.

Land managers need better access to information on the effects of land use activities on coastal waters and fisheries that are sensitive to significant inputs of freshwater, including:

- the effects of sedimentation, which can affect commercial offshore fisheries as well as inshore ecosystems and fisheries
- eutrophication
- other stressors including organic pollution, heavy metal contaminants, mangrove spread, the influence of significant freshwater extraction on river plumes and interactions between these stressors together with pressure from over-fishing.

Land and water managers may also benefit from more knowledge of what fisheries are most at risk, especially commercially, recreationally, culturally or ecologically significant inshore shellfisheries and finfisheries (especially in estuaries).

More thematic and place-based research is needed here.

As well as the regulatory line along MHWS that separates regional coastal plans from other regional plans, other government agencies have an interest in the effects of land use activities in fresh and saline waters, including the Department of Conservation and the Ministry of Fisheries, yet these agencies have traditionally had little involvement in catchment management for the purposes of managing inshore and offshore water quality and ecosystems. Many ICM initiatives, including those driven by the threat to marine ecosystems, link loosely if at all with freshwater and coastal fisheries interests – it's just another layer of complexity.

However, the functional interconnectedness of land and all waters makes it essential for greater interagency communication and integration across MHWS. The development of close working relationships at government level will exert a positive influence in this respect.

Maori have long been advocates and practitioners of ICM with a specific focus on coastal matters, and a number of traditional management and conservation methods and tools such as rahui, taiapure and mataitai are now becoming more common within formal legal frameworks such as the various forms of marine protected areas administered by DoC. Many iwi and community groups engage in a range of coastal protection and enhancement activities, and while such projects do contribute to beneficial outcomes, their activities need to somehow be considered within an integrated catchment and coastal management and monitoring framework.

Iwi aspirations and drivers, multi-agency co-operation, good science and action on the ground are some of the key themes of case studies of integrated catchment and coastal management plans. Collectively, they display many (if not all) of the elements of effective ICM and show how they build the capacity of project sponsors and participants alike for effective integrated management of land and waters across MHWS and across interagency roles.

The experience of successful multi-party and multi-issue integrated catchment and coastal mangement plans such as the three-year Manukau Harbour Action Plan in the late 1980s could usefully inform current and future initiatives. There needs to be

more encouragement of and support for integrated research and co-ordination amongst government agencies, councils, iwi and communites of place and interest across MHWS.

9. Governance

Governance is something you have whether you consider it or not. In its widest sense it refers to how any organisation or groups of organisations and/or people, including nations, are run. It is beneficial to think carefully about appropriate levels and forms of governance – the environment that enables the desired changes in practice to be supported, adopted and enacted by the different stakeholder groups involved in a multi-stakeholder decision-making process.

The many players, different levels and dynamic natural, political and economic forces involved mean that effective governance in the water sector tends to be adaptive and "messy", with the different scales acting as a decision-making "commons" operating at three interrelated levels; the macro and meso scale at which "formal" ICM is conducted and the micro scale of many catchment-related initiatives.

The development of good integrated catchment management governance then requires coordination mechanisms between these three levels and among the relevant parties, iwi and communities. As Bruce Hooper observes, this is not easy, nor does it happen without direction.

Most of the interviewees stated the need for national government leadership and direction on freshwater policy Several interviewees believe it is important to have a national clear statement of the goal of ICM to provide direction at a local level for what can be an elusive practice and target. Interviewees hoped that national guidelines will determine nationally significant issues and would provide explicit guidelines for freshwater quality as well as for ICM planning and stakeholder engagement.

Under this umbrella mandate, partnerships and a mix of regulatory and well-understood non-regulatory measures would be able to operate. Partnerships that share resources and decision-making power lead to the most effective long-term commitment to changing environmental management outcomes.

Partnerships are also emerging under the Treaty of Waitangi and memoranda of understanding with regional councils.

Both the literature review and interviews indicate that ICM operates most effectively where there is a balance between regulatory, economic and voluntary mechanisms. However, it does not appear that there is any optimal balance: the indications are that the balance should be determined in conjunction with the context, situation and communities involved.

10. ICM: meeting iwi and community aspirations for catchments and coasts?

How useful is integrated catchment management in enabling communities to determine and work towards achieving their joint aspirations for water in their catchment and linked coastal marine areas?

For many of them, it's hard to tell because of the lack of setting of measurable (or any) objectives; the lack of documentation and the consequent reliance on anecdotal evidence; or the lack of time for the desired outcomes to emerge. Among the exceptions are the Manukau Harbour Action Plan, the ICM project review by the Landcare Trust, the Taieri Trust, Project Twin Streams and the Mahurangi Action Plan.

A number of those we interviewed pointed to the increasingly important role that iwi are playing in the management of our rivers and other freshwater resources. ICM work needs to be particularly mindful to ensure the perspectives and contributions of Tangata Whenua are included.

Future work needs to include the documentation of traditional uses, values and ways of understanding interaction of people and the natural environment. And more can be done to take advantage of the understanding and experience that iwi have with collective approaches to resource management. Iwi and community involvement will often result in better integration across MHWS, as coastal issues commonly trigger the interest of Maori and local communities in ICM.

However – iwi, communities and catchment managers all need capacity building and resourcing to plan, start, manage, monitor and evaluation ICM to meet community aspirations for catchments and coasts. Where this occurs, a number of beneficial capacity outcomes can be expected:

- inclusive participation and active involvement in groups and networks is maintained
- on-going learning, skills development and training is supported
- access to and use of technical information is improved
- institutions are aligned to regional sustainability.

Research and project monitoring do show that ICM can deliver a range of beneficial outcomes under all four wellbeings – social, cultural, environmental and economic. Defining these with iwi and the community enables people to more easily relate to the outcome areas described, and once indicators are applied to these outcomes, the effectiveness of catchment-related initiatives at all scales can be evaluated.

Once coastal waters are brought into the equation, the macro scale becomes the one that 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, monitoring, reviewing and adapting an integrated catchment and coastal plan.

11. Summary and conclusions

Many of the recommendations summarised in the table below relate to co-ordination and capacity needs that if met, will help make it easier for people and agencies planning programmes and projects at a range of scales to catchment-related interventions to both be – and be documented as being – more effective.

The functional interconnectedness of land and all waters makes it essential for greater interagency communication and integration above, across and below MHWS. We believe the development of close working relationships at government level as evidenced in the approach to this report will exert a positive influence on other players in this respect.

Summary of opportunities to enhance the practice of ICM and its potential to deliver measurable environmental improvements

A national mandate for ICM

Things that would make it easier for sponsors of integrated catchment and coastal initiatives (ICCM), iwi and communities to access the long term resources they need include:

- clear central government leadership and direction on ICM, including for greater interagency liaison
- good scientific and other information that will support national, regional, territorial, sector and other agencies in addressing pressing issues in a more timely manner
- national guidelines to help decision-makers levels to come up with innovative ways of meeting regional and local needs, while still achieving nationally mandated outcomes of good management of the adverse effects of land and freshwater use on coastal waters and resources.

Institutional alignment and co-ordination (horizontal and vertical) for ICM

Things that would make integrated catchment and coastal initiatives more efficient and effective include:

- a strong national mandate for greater interagency liaison so that adequate resourcing could be provided to enable staff to better co-ordinate strategic planning at the horizontal level at the national scale
- better vertical alignment of institutions and management tools from national to regional and local levels
- greater horizontal institutional alignment and co-ordination in ICM at the macro scale, including integration across MHWS, and co-ordination of on-the-ground interactions of agencies at the meso scale with each other and at the micro scale with land owners
- better alignment of management tools above, below and across MHWS
- better access for land managers to information on the effects on fisheries of land use activities on coastal waters sensitive to significant inputs of freshwater, to increase their understanding of the extent and importance of the issues and enlist greater iwi and community support for them.

Shared conceptual frameworks

Things that would promote consistent understandings about integrated catchment and coastal initiatives include:

- more consistent terminology around ICM versus catchment-related initiatives, to facilitate comparison of "apples with apples"
- use of Hooper's macro, meso and micro scales as a unifying framework within which to integrate the work of the many different groups involved in catchment-related initiatives into a catchment-based governance framework
- more consistent terminology around outcomes, perhaps based on the orders of outcomes model
- better understanding, especially by funders at all levels, of the timeframes needed to achieve third order environmental outcomes
- an ongoing conversation amongst key parties about ICM as an explicit and synthesising vehicle for the many outcomes under the four wellbeings to which they aspire
- more clarity about the concepts and tools of ecological economics to inform the identification of issues and development of solutions that will enable communities to meet their aspirations for catchments and coasts, and the social, cultural, environmental and economic benefits of their sustainable management.

An agreed research strategy

Things that would make integrated catchment and coastal initiatives more cost-effective include:

- a systematic attempt to develop a set of research needs and priorities at the national and regional scales that would help the relevant agencies carry out macro and meso scale ICM more cost-effectively and provide them with a rationale for working out which micro scale initiatives should be supported within that context
- better sharing amongst all the relevant agencies with responsibilities above and below MHWS of research needs, initiatives and results
- more co-ordinated approaches to collecting expensive but essential data that could be shared
- better framing of research so that it can be informed by end users and given to them in a form they can readily use, to make it easier for catchment managers to encourage and land owners to adopt more effective ICM, including how to make research findings more transferable to different catchments.

Commitment to capacity-building

Things that would make it easier for agencies, iwi, communities and groups to take part in integrated catchment and

coastal initiatives include:

- a nation-wide focus on inter and intra-organisational capacity building and resourcing, to help catchment managers and government and other agencies plan, manage, monitor and evaluate ICCM and "get on top of issues" in a more positive and proactive way
- a focus on capacity building and resourcing to help iwi, communities, sectors and groups take part in ICCM processes from visioning and action to monitoring and review
- central government playing a role in directly supporting ICM capacity-building in partnership with local government and the community.

Measurable objectives and monitoring

Things that would make it easier to measure the outcomes of integrated catchment and coastal initiatives include:

- better awareness by all parties of the need to identify baseline indicators across all four wellbeings at the start of any initiative, even for single issue initiatives
- better use of benchmarks to inform the development of measurable environmental objectives
- better provision and capacity building for framing and documenting first, second and third order outcomes in order to provide good data for formative and summative reviews
- better provision for the capture of first, second and third order outcomes of all catchment-related activities and linking of them with the identification and interpretation of drivers, pressures and state of the environment monitoring results, to help identify factors contributing to observed changes
- appropriate provision for and interagency co-ordination of the documentation of third order and third party ICM outcomes, including by funders of catchment-related projects as part of their project funding criteria, including by participatory monitoring and evaluation
- provision of an overall geospatial and monitoring framework in which catchments become place-based integrators of multiple land and water management efforts into which the actions and first, second and third order outcomes of the many initiatives of the many players in catchments are captured. This could provide a live inventory of all ICM-related projects including community-based ICM projects as well as catchment initiatives that are being driven by central and local government, research providers and industry, and capture information about what is being done within key agencies and by all parties active in a catchment and monitoring of the third order outcomes that result. It could also be linked to state of the environment and other sources of environmental data.

Review, learning and adaptive management

Things that would make it easier to assess the effectiveness of integrated catchment and coastal initiatives include:

- a participatory approach to monitoring and review
- the concept of organisational learning being more widely acknowledged and endorsed as a positive process of building organisational and community/stakeholder capacity and commitment
- stronger links between programme review and learning as part of the adaptive management needed to carry out ICM as part of an evolutionary process of managing ongoing change
- a system for building the capacity for and sharing the learnings of such processes.

A forum and platform for sharing research, data and best practice tools and case studies

Things that would make it easier for all parties to share and benefit from best practice and carry out effective of integrated catchment and coastal initiatives include:

A regularly maintained database

- a centralised, multi-agency, regularly updated and very well-publicised database of related resource conserving tools and resources that are available for landholders, community groups and resource management agencies, including existing and proposed research and videos of experienced practitioners whose expertise won't otherwise be captured (the highly successful Quality Planning website provides a good model for this)
- case studies and other information could include:
  - the use of environmental baselines and benchmarks to inform the setting of measurable environmental objectives
  - examples of measurable outcomes across all four wellbeings, particularly for third order environmental bottom line outcomes

- effective intra- and inter-organisational communication and the timeframes, mechanisms and resources needed to bring it about
- the processes used to introduce regulation, the non-regulatory supporting measures provided, the time, budget and skills required, when and how to use them and their needs for planning, management, ongoing resourcing, monitoring and review
- early results about the effectiveness of the different approaches of Environment Waikato and Environment BOP to nutrient issues (land use controls vs trophic status indicators) and other examples of alternative approaches to common issues to help other regions decide on approaches
- what has worked well and lessons learned from catchment-related initiatives at all scales in order to build the capacity of iwi, communities and catchment managers to engage with each other
- lessons about conducting ICM-related science and research and the capacity needed for all parties to do this
- alternative methods and inclusive processes under RMA and LGA that can produce results in the short term when needed
- the range of management, conservation and protection tools available for use above, across and below MHWS
- the balance between public:private investment to help both rural and urban land owners and occupiers reduce their adverse environmental effects
- methods and results of reviews

Online and face to face forums

- a list-serve email list such as nzwaste or the Water New Zealand web forum, where practitioners from the public, private and not-for-profit sectors can email each other new information and ask questions
- regional meetings of ICM practitioners
- capacity-building workshops, including by webinar and podcast that can also be uploaded to the shared database
- yearly or two-yearly conferences.

PART A ABOUT THE PROJECT AND ITS APPROACH

1. Project context

1.1 The project and its sponsors

This project has been undertaken for the Ministry for the Environment (MfE) to look at ways that integrated catchment management (ICM) approaches can be used to achieve improved local water management practices, including measurable improvement in water quality and evidence of more efficient water use. The project involves a review of existing literature and examples of (ICM) projects in New Zealand.

The work is part of the Supplementary Measures project of the Government's "New Start for Fresh Water" (NSFW) programme. As such it will contribute to improving the uptake and effectiveness of industry and voluntary initiatives to improve environmental outcomes, especially for water allocation and quality. The information is to be used at central government-level to help officials develop options for improving the effectiveness and uptake of ICM approaches to freshwater management.

As freshwater quality and quantity impacts on matters coastal, the Ministry for the Environment convened a sponsors group for this project comprising representatives from the Ministry of Agriculture and Forestry (MAF), Department of Conservation (DoC) and the Ministry of Fisheries (MFish).

As stated in the request for proposal (RFP), one of the underlying philosophical assumptions of the NSFW programme is that water management in New Zealand will be based around integrated catchment and groundwater management.

While the philosophy of ICM informs the NSFW programme at a strategic level, the focus of the ICM component of the Supporting Measures project is on establishing **where and how the philosophical ICM approach can be translated into practical, effective and efficient solutions**.

As stated in the request for proposal, a local ICM approach could be used to:

- identify community objectives
- make the best use of funds, time and local resource management capacity
- focus on a demonstrable improvement in water quality (both fresh water and coastal) and other outcomes for freshwater management desired by the community in question.

Accordingly, this report aims to meet the following aims of the RFP and:

1. gain an understanding of how ICM initiatives have been implemented in New Zealand, and how effective they have been
2. provide information for officials to develop options for how government could enhance the effectiveness of ICM initiatives
3. provide information for officials to develop options for how government could increase uptake of ICM initiatives, where it is apparent ICM represents a beneficial approach to managing water.

It goes about this by splitting the report into three parts. Part A of the report:

- sets the context for understanding effective ICM by identifying the different ways practitioners define successful ICM and different scales of catchment-related activities
- identifies best practice frameworks and assessment criteria that can be used to evaluate ICM effectiveness, including those listed in the Ministry's Statement of Work:

- the degree to which local Iwi / Maori are involved in both the setting of goals and activities as part of the ICM initiative
- measurable, timely and cost-effective improvements in fresh water and/or marine water quality (as relevant) and associated environmental variables, for example evidence of land use or land management changes (as relevant)
- good community buy-in and involvement from interested parties, both inland and coastal
- in the case of ICMPs, evidence of clear objectives and processes in place to measure performance and adjust management settings as needed
- evidence of more efficient use of extracted water.

Part B of the report then identifies the distribution, scale and characteristics of ICM initiatives included in this report, and uses the information in Part A together with existing literature and ICM plans and projects in order to assess the effectiveness of integrated catchment management initiatives in New Zealand by exploring the following research questions in the RFP:

a. what has worked and why (including factors critical to success)

b. barriers to development, adoption and implementation of ICM approaches

c. significant constraints to effectiveness in terms of the criteria for evaluation

d. barriers to the widespread community support and buy-in to ICM initiatives

e. assessing the usefulness of integrated catchment management plans (ICMP) in enabling communities to determine and work towards achieving their joint aspirations for water in their catchment and linked coastal marine areas

f. how different governance arrangements and processes help or hinder ICM initiatives

g. what consideration is given to impacts of catchment management practices on coastal marine areas, including fisheries and biodiversity values.

The report concludes with a summary in Part C of key findings and opportunities to enhance the practice of ICM.

1.2 Approach and methodology

ICM is widely used across New Zealand. Using its broadest definition and scope would yield hundreds if not thousands of projects and programmes that make use of some ICM principle or other. This review has used best endeavours, limited by a tight time frame, to provide an overview of the ICM "landscape" within New Zealand.

Details of project scope and methodology are in Appendix A. Briefly, methods were:

- to identify the range of understanding of ICM in New Zealand and key success factors and major barriers, we conducted two literature surveys and two phases of interviews. The first literature survey collated elements of best practice ICM based on a mainly New Zealand-focused literature survey, and the first phase interviews used a semi-structured interview and a snowball technique to identify respondents in order to identify how practitioners see ICM
- practitioners interviewed included representatives from central government, regional government (including planners, engineers, soil conservators, land managers, water managers, ICM staff, stormwater staff and community relations/partnerships staff), territorial local authorities (planners, engineers), non-government organisations (NGOs) engaged in local projects, staff of research organisations and iwi researchers
- to undertake a literature review of ICM projects in terms of the elements for good ICM in order to determine the effectiveness of the interventions described

- to complement this information for catchment-related initiatives by using secondary sources such as surveys by Edgar (2004), Dodd et al (2009) and MAF (1999) to review, supplemented with targeted interviews
- in order to identify the scope of current ICM activities in New Zealand, to use a semi-structured interview based on the results emerging from the first phase interviews and the experience of the project team. We then undertook a second phase of interviews based on a regional and thematic spread
- to check our methodology against an ethics review checklist (Appendix B)
- to use a review group (listed in Appendix C) to help us identify key respondents (also listed) and review the draft report
- to prepare two major drafts of the report for a working group comprising representatives from MfE, MAF, DoC and MFish to respond to.

We initially selected a mix of ICMPs and catchment-related projects for assessment on the basis of the elements of best practice listed in Table 3, but found their documentation did not allow us to do so. The information we collated is reported in the series of tables in Appendix D, and confirmed the findings of Bellamy et al (1999) and Brown (2006) reported that evaluation of effectiveness of integrated programmes is a neglected area worldwide and that the New Zealand situation is the same.

We therefore examined some key secondary sources (Buchan, 2007; Dodd et al 2009; Edgar, 2004, 2006; Gustafson and Feeney 2008; MAF, 1999) that had already assessed the effectiveness of ICM and other catchment-related initiatives in New Zealand. We supplemented the findings from these and the interviews with sponsors of regional-scale projects with selected specific references and a small number of targeted interviews with people associated with local projects.

The results of interviews and literature are summarised in the rest of the report.

2. ICM and its effectiveness

Introduction and overview

This section canvasses the debate about what ICM is and isn't and highlights a wide diversity of opinions, approaches and practice in New Zealand.

It proposes a pragmatic grouping of catchment-related activities to highlight the many different approaches to ICM. It then proposes an assessment framework incorporating a set of best practice principles including those derived from New Zealand-based work.

2.1 What is ICM?

Integrated catchment management has a broad range of meanings and a wide range of applications in New Zealand. As set out in the request for proposal:

> Section 30(1)(a) of the Resource Management Act 1991 (RMA) requires regional councils to establish, implement and review objectives, policies and methods to achieve integrated management of the natural and physical resources of the region.
>
> Integrated management of natural and physical resources requires consideration of the complex relationships between natural and physical resources (flora and fauna, geology and hydrology, soils and the biosphere and the biosphere and the atmosphere) and social, cultural, economic and political matters. It can be a contentious and elusive task.

Across New Zealand, integrated catchment management varies in its design and implementation depending on a wide range of factors, including:

- the issue or issues in a given region or locality, including drivers of change
- the objectives, resources, political environment and culture of the lead agency
- the physical and ecological characteristics of the catchment
- the social and economic circumstances of its communities
- the engagement and interests of iwi and stakeholders.

Similar diversity is seen in the many different definitions of ICM locally and globally.

Consequently, our first step to meeting the project aims is to review how people understand and use the concept of ICM in New Zealand. The findings are detailed in Part B of this report, but generally reveal a wide diversity of opinions, approaches and practice in New Zealand. This confirms the conclusions of a major New Zealand-based survey of ICM (Edgar, 2004) and goes some way towards explaining the extraordinary diversity of activities that are undertaken as ICM.

Two broad groups of activity are so often mentioned in the literature and interviews that we set them out here in order to apply a consistent terminology that differentiates between them:

- **catchment management plans or integrated catchment management plans** (CMPs and ICMPs), which often comprise more formal processes for larger areas (the macro and meso "catchment" scales defined in Section 3)
- **catchment-related projects**, which may be more or less informal, are focused on small sites and contribute to beneficial outcomes in catchments without themselves constituting ICM (the project level and the micro scale defined in Section 3).

The term **catchment-related initiatives** will be used throughout the rest of the report to refer to both these groups.

2.2 How can we assess the effectiveness of ICM and other catchment-related initiatives in New Zealand?

This report is commissioned in a context where water quality, especially of lowland rivers and estuaries, is deteriorating (MfE 2007; NIWA 2009), land uses are intensifying and water demand is increasing.

Interviewees' beliefs about the ability of ICM to change this ranged over the following spectrum:

- ongoing environmental decline is inevitable due to the pressure of economic growth
- with stronger regulation, the decline can be reversed
- informed communities can decide their own sustainable futures
- ICM offers a pathway to environmental improvement or slower decline.

Given the range of beliefs, it has arguably never been more important to assess the effectiveness of catchment-related interventions.

This section covers:

- different approaches to ICM
- frameworks for evaluating effectiveness
- elements of best practice for catchment management initiatives
- a review of primary and secondary sources to derive elements of best practice that can be used to assess selected initiatives.

2.3 Different approaches to ICM

Catchment-based principles have been used in New Zealand since 1868 (Gustafson and Feeney 2008, p45) as implementing agencies and communities sought to address flooding, erosion, sedimentation, water quality and water allocation issues. Despite this and as discussed in later sections, the published literature in New Zealand (as globally) contains relatively few thorough and independent reviews of ICM plans and programmes against which their effectiveness can be assessed.

Key available publications were surveyed and interviews conducted to determine "what has worked and why", especially for initiatives aiming to effect measurable change in water quality baseline and water use efficiency indicators.

Effectiveness is measured in terms of any initiative's stated objectives and overall purpose. However, the purpose of ICM is debated to a surprisingly wide extent. In our interviews and the literature review, two broad sets of views emerged on its defining outcome; the "resilient community" school (with the belief that the ultimate aim of ICM is to achieve resilient communities that are able to solve problems together (including water quality and allocation problems) and the "ecological bottom lines" school (with the belief that the clear aim of ICM is improved baseline environmental indicators).

2.3.1 Ecological bottom lines

This school views effective ICM as achieving measurable ecological or other outcomes: the core purpose of establishing an ICM initiative is to achieve water quality and quantity objectives and this is how its success should be judged. Fresh water should be, for example, "swimmable, fishable and in good ecological health."

> 'Most councils haven't got defined water quality objectives so we've not got clear criteria of success.'

Whether ICM is the vehicle by which ecological bottom lines can be delivered is debated by practitioners: defined against ecological outcomes, proponents of this view believe that ICM has been a failure in New Zealand.

> 'Some people talk about success in terms of changing people's attitudes, but will it lead to good water quality outcomes? Examination of the facts doesn't support this.'

> 'ICM is not working. There is declining water quality right across the country. I haven't seen the empirical evidence that ICM is working – just years of non-compliance.'

They do acknowledge that community engagement and empowerment can be a valuable tool in designing and achieving sustainable ecological outcomes but it will not alone lead to water quality improvement.

> 'You can get good community-buy-in but not get runs on the board. You can grow a community of interest but not have a clear focus.'

> 'There's a whole generation of people who don't even know you could swim in this creek so complaints about its state have stopped coming.'

Some projects that focus on specific outcomes cite stakeholder support for this approach.

> 'Some community engagement is important, but it can be hard going. Farmers keep bringing it back to their farms. They want focus on hard actions – don't want a talkfest – they want best practice knowledge. It works for them for us to go farm by farm. It's less about the community.'

Many practitioners with this view felt that the very complexity of the issues required strong and focused outcomes.

Those interviewees who described a sense of urgency about the problems they were dealing with were more likely to use ecological bottom lines as a measure for defining the success of ICM.

2.3.2 Resilient communities

This school believes that the ultimate aim of ICM is to achieve resilient communities that are able to solve problems together. Through understanding the dimensions of local environmental problems and through building trust and respect for each other, communities will effectively address and resolve fresh water and other catchment management issues in a collaborative manner. An empowered community will take ownership of environmental problems.

> 'You can't go through this process without getting better environmental outcomes.'

> 'If you get a stronger community base, you can get them to rethink where they are in life – this will lead to change.'

This school is more likely to see ICM as a process rather than a set of outcomes. ICM becomes the mechanism that binds stakeholders together with a common vision. Water quality and allocation issues are too complex to be focused on single outcomes.

> 'ICM's a process, not an end product. It's like sustainability – how do you know when you've got it?'

> 'It's not a project, it's the way people live.'

> 'ICM is an organising philosophy – how do we connect people, knowledge, streams and research. It sits very comfortably with Maori, they understand the big picture.'

> 'The environmental focus doesn't appeal to people.'

There appears to be no standard definition of what constitutes "resilience" in a community, and like other aspects of ICM and the four wellbeings (social, cultural, economic and

environmental) the issues, objectives and indicators relating to the baseline and desired state will vary from community to community (including communities of interest not necessarily defined by place).

For some communities such as the Upper Taieri, resilience reflects the economic importance of water to the people, and thus (SSF, no date) building multi-stakeholder groups is given great attention in order to enable the delivery of the desired outcome – a community-led operational system for water allocation.

To some extent this debate reflects a range of emphasis between *process* and *outcomes*, so they are not mutually exclusive opposites. Both schools of thought incorporate elements of the other, but perhaps tend to start their process from either end of the spectrum and may or may not move towards the middle to some degree.

These differing views will result in the setting of different objectives, methods, outcomes and indicators for different ICM initiatives. The ICM experts we interviewed fell equally into both schools.

2.4 Frameworks for evaluating effectiveness of catchment-related initiatives

The scope of ICM programmes has made them difficult to evaluate: according to Bellamy et al (1999) in an international review, the evaluation of the effectiveness of integrated programs in resolving or ameliorating natural resource use and management problems, is one of the more neglected areas of integrated resource management (IRM) research. This observation has also been made in New Zealand: a lack of summative evaluation data is also the norm for integrated catchment management programmes in this country (Ian Brown, 2006a), making it very difficult to gain an overview of their effectiveness.

Because of the evolving and holistic nature of the concept of IRM, there is a belief that evaluations of IRM programmes or processes need to use criteria from the biophysical, social, economic, and institutional/policy perspectives, and need to recognize the interrelationships between these evaluation criteria. As Bellamy et al (1999) point out this would then require a multifaceted evaluation methodology that provides a general analytical framework within which:

- an evaluation can be planned to account for the broad range of issues encompassed by the integrated resource management concept, as well as objectives of documented policies
- the nature of IRM as an evolutionary process of managing change is recognised.

However, if the ICM programme being evaluated has clear and specific “ecological bottom-line” objectives, potentially a simpler evaluation strategy can be designed.

This section provides some conceptual and analytical frameworks to help address this problem.

Four approaches have been brought together in this report to provide a common framework within which the elements of best practice ICM and other catchment-related initiatives and their effectiveness at producing the desired outcomes can be assessed:

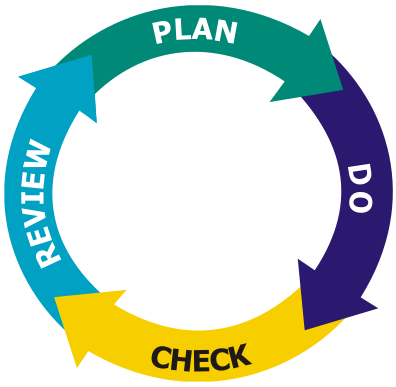
- the plan/do/check/review cycle sponsored by ISO (the International Standards Organisation) and included as the framework for ISO 14001, the international environmental standard
- the elements of a good plan (Ericksen et al, 2003a)

- the orders of outcomes framework adopted by the United Nations Environment Programme (UNEP/GPA, 2006) and based on the work of Olsen et al (1999) and Olsen et al (2003)
- elements of best practice based on New Zealand literature and practice.

2.4.1 The plan/do/check/review cycle

Based on our experience with the most common defects in the preparation, implementation, monitoring and review of plans generally, including ICMPs, together with the large number of elements of best practice, we believe the information could usefully be organised in terms of the "plan-do-check-review" planning cycle in the ISO series of quality standards, shown in Figure 1.

Figure 1 The ISO planning cycle



ICMPs and catchment-related programmes and projects can check that their activities include:

- plan: how to write an ICMP or project plan that meet the criteria for a "good plan" discussed below. These include establishing a clear understanding of the issues of concern in the targeted catchment, what actions will effectively address these issues and what will be measured in order to tell when they have been reduced or averted (this is similar to the Pressure-State-Response model in linking pressures on the environment to effective responses)
- do: how to plan and document implementation of the methods set out in the ICMP or project plan
- check: how to monitor ICMP outcomes under the Resource Management, Local Government and other relevant Acts, as well as government policies; and what provision is made for capturing such information for short term locality-specific projects
- review: how to determine whether and why or why not the ICMP or project plan was effective, for example whether the methods were implemented, whether land use management practices changed, and whether this resulted in changes in baseline indicators showing improved water quality or more efficient water use.

2.4.2 Elements of a "good plan"

As noted in the RFP, ICM has long been used in New Zealand, but although many ICM processes have been initiated as a response to poor water quality, monitoring and achieving measurable improvement has not generally been a focus. The Ministry for the Environment has identified a resulting issue; namely that there is no readily accessible information about

the effectiveness of ICM in achieving improved water quality. Consequently this project is intended to look at how ICM approaches can be improved or better implemented to address this issue.

The core issue here is "good planning" and New Zealand has conducted some leading research in this area. The University of Waikato-based PUCM team reviewed regional policy statements, district plans and LTCCPs (long term council community plans) to better understand the links between environmental policy and outcomes, by studying the quality of the preparation and implementation of plans produced under the Resource Management and Local Government Acts (Ericksen et al, 2003b).

The research links the assessment of plan quality (PQ) to implementation quality (IQ) and, finally, to environmental quality (EQ), or outcomes.

It found that the logical links are weak between high-level outcome statements, policy interventions and environmental and other indicators monitored at national, regional and local level (Ericksen et al, 2003). This finding was supported by further specific research work into the stormwater provisions of district plans. The Office of the Auditor General of New Zealand has identified similar issues with waste management plans, asset management plans and LTCCPs.

It is therefore not surprising that the Auckland Regional Council (Feeney et al, 2007) identified that ICMPs, despite their sound technical basis, also share many of the same plan logic issues as other plans in New Zealand: despite their good technical content, their internal logic is weak, their implementation and outcomes are poorly documented and their effectiveness is poorly assessed.

The eight criteria for a good plan are summarised in Table 1. It can be seen that these criteria are very consistent with the elements of "effective ICM" set out in the RFP.

Table 1 Elements of a good plan

Source Ericksen et al, 2003a

1. Appropriate interpretation of the legal mandate for the local area
2. Clearly stated purpose and outcomes
3. Clear identification of issues
4. Well-developed fact base
5. Internal logic and consistency (objectives clearly linked to issues; polices to objectives; methods to policies; anticipated results and indicators to all the above)
6. Integration with other plans and policy instruments
7. Monitoring
8. Well-organised and presented for ease of use by lay and professional alike

2.4.3 Orders of outcomes

The Auckland Regional Council has recently adopted Olsen's (1999, 2003, UNEP/GPA 2006) orders of outcomes framework to support the development of ICMPs whose implementation, outcomes and effectiveness can be documented.

Olsen's framework for grouping the outcomes of ICM initiatives to recognise these elements is shown in Figure 2 and the text expanded in Table 2. The framework recognises that ICM is a process for negotiating and implementing public policy to achieve improvements in catchment management. It highlights the importance of changes in state (such as reductions in sediment loads, abundance of fish or quality of life) but also recognises that for each change in state there are correlated changes in the practice of key partners and stakeholders within the sphere of influence of the managers.

Developing the range of outcomes that support evidence of good policy and practice in complex social and environmental situations is challenging, not least because results in these sorts of areas can easily take some years to materialise (Allen and Apgar, 2008). The value of the framework lies in helping catchment managers visualise outcomes that can be seen to form a logical sequencing over such time periods. Importantly, the model helps us plan our activities in sequence so they build on each other over time.

In New Zealand this model has been applied to the following ICM-related initiatives:

- an evaluation of the Auckland Regional Council's Stormwater Action Plan (Hellberg et al 2009)
- best practice plan preparation for ICMPs for the Auckland Regional Council (a training workshop developed on the basis of a paper by Feeney and Greenaway (2007)
- a review of adaptive management and integration at a landscape or ecosystem level in the South Island (Allen and Jacobson 2009).

Figure 2 The orders of outcomes model

Source: Adapted from Olsen (2003) and Kettle (2006)

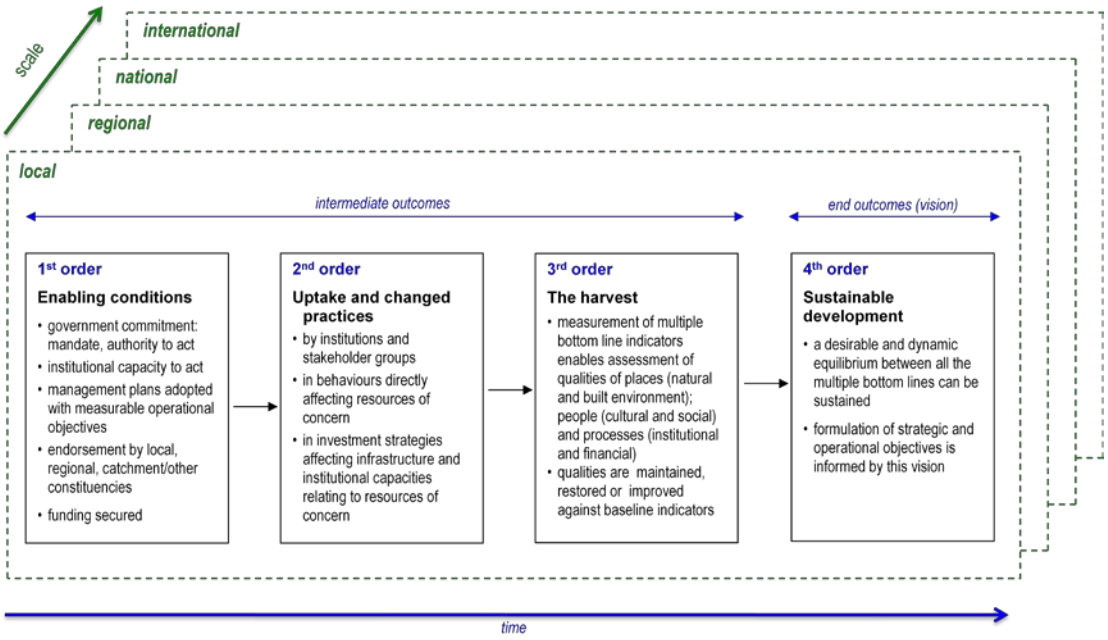


Table 2 The orders of outcomes

Source: UNEP/GPA, 2006

Enabling conditions First-order outcomes are the organisational conditions that must be present when we begin any programme to bring about a change such as those proposed by cross-theme policy frameworks. Together these form the "enabling conditions" that are required if these policy frameworks are to be successfully implemented. First-order outcomes require building the constituencies and the institutional capacity to undertake this more integrated approach to policy development and implementation. First-order outcomes also require securing the authority, funding and other resources that make it feasible for stakeholder groups to implement policies and actions on-the-ground. The setting of clear and measurable objectives is a key ingredient at this stage.
Changes in practice Second-order outcomes are evidence of the successful implementation of a programme that aims to change practice. They mark changes in the practices of individuals and individual organisational groups. These include evidence of new forms of collaborative action among stakeholder groups, investments in infrastructure, and the response of actors in response to policy, regulations, and by voluntary actions.
The harvest Third-order outcomes are the socio-economic, structural, and environmental results that define the ultimate effectiveness of the programme. These must be defined in unambiguous terms early on in any management process and should relate to relevant and defensible metrics, for example for water quality or usage. Vague or conflicting objectives produce inefficiency and ineffectiveness.
Sustainable development In the end all of our different activities and policies collectively contribute towards an enhanced future. This ultimate goal of sustainable urban development is recognised in the model as fourth-order outcomes. Rather than being seen as an externally designed goal to be achieved, sustainability is better viewed as a desirable and dynamic relationship between environmental, social, and economic aspects. In this sense, then, we come full circle and acknowledge policy development as an ongoing iterative process, with continuous policy cycles. Fourth order outcomes also inform the development of policy and high level strategic objectives that are not necessarily intended to be measurable, and thus influence the measurable indicators developed in the first three orders.

2.5 Elements of best practice for effective catchment management

A number of New Zealand and international reports have listed elements implicit in good ICM practice. Using those listed in MAF (1999), Allen et al (2002a), Ericksen et al (2003a), Edgar (2004, 2006), Chrystall (2006), Hooper (2006 a, b and c), Gustafson and Feeney (2008), Dodd et al (2009), Landcare Research as listed on the Motueka-ICM website http://icm.landcareresearch.co.nz/ and the MfE RFP, those outlined in Table 3 were selected as key elements of best practice.

The elements are organised under the four headings of the ISO quality planning cycle (plan, do, check, review) and include the PUCM criteria for a good plan and the orders of

outcomes. While they may appear to relate only to the bigger and more formalised ICMPs most commonly carried out by regional councils, the principles apply to all project, large and small.

Of particular interest to MfE and included in Table 3 were:

- the degree to which local Iwi / Maori are involved in both the setting of goals and activities as part of the ICM initiative
- good community buy-in and involvement from parties interested in land, fresh water and coastal waters
- in the case of ICMPs, evidence of clear objectives and processes in place to measure performance and adjust management settings as needed
- measurable, timely and cost-effective improvements in fresh water and/or marine water quality (as relevant) and associated environmental variables, for example evidence of land use or land management changes (as relevant)
- evidence of more efficient use of extracted water.

This list does not weight the elements and is not intended to imply that every ICMP or catchment-related project needs to have every element in order to be successful.

There are numerous lists in the literature of best practice ICM.

What makes this list different is its explicit unpacking of key elements of effective programmes that are often implicit or conflated with (not clearly distinguished from or muddled with) each other:

- strong focus on all stages of the planning cycle
- emphasis on plan logic and the internal consistency between issues, objectives and indicators that set up the framework for measurable objectives and monitoring
- use of the orders of outcomes to distinguish more clearly between process and outcome indicators, so as to better enable monitoring of the different outcomes and overall assessment of the effectiveness of ICM in New Zealand.

It can be seen from Figure 2 and Tables 2 and 3 that:

- elements of both the “resilient communities” and “ecological bottom lines” schools of ICM are represented in the processes and indicators listed, the former largely through the social, cultural and economic wellbeings and the latter largely through environmental wellbeing
- outcomes of interest to the “resilient communities” school of ICM are represented in the first and second order outcomes
- outcomes of the “ecological bottom lines” schools of ICM are represented in the third order outcomes.

Table 3 Elements of best practice for effective catchment management

Sources: MAF (1999), Allen et al (2002a), Ericksen et al (2003a), Edgar (2004, 2006), Chrystall (2006), Hooper (2006 a and b, 2007), Gustafson and Feeney (2008), Dodd et al (2009), Landcare Research (Motueka website) and the MfE RFP

1. PLAN: First order outcomes - enabling conditions and elements of a good plan

1.1 Planning

1. Use of science, monitoring, local and traditional knowledge to identify issues and drivers, identify an appropriate scale for the plan/project, set baselines and identify benchmarks in order to inform the setting of measurable objectives
2. Internal and external stakeholders and their motivations are identified
3. Collaborative planning with all stakeholders
4. Multidisciplinary planning with team approach amongst all stakeholders
5. Vision defined for high level / strategic outcomes with all stakeholders
6. Management plan has clear logic, issue identification based on well developed fact base, SMARTER (specific, measurable, affordable, realistic, time-based, endorsed and relevant) objectives that are directly linked to resolving identified issues, anticipated 1st, 2nd and 3rd order outcomes and indicators (including for drivers and pressures), and articulated roles and responsibilities
7. Consideration of use of a range of implementation methods and tools
8. Combination of short and long term actions and outcomes
9. Plan easy to use, to understand, clearly workable and accessible to all stakeholders

1.2 Legal and policy factors

1. Plan consistent and integrated with other plans, policies and budgets
2. Plan consistent with Treaty of Waitangi principles
3. Can be strengthened by legislative framework and regulatory tools
4. Consideration of all four wellbeings under RMA and LGA
5. Where needed, effects of freshwater quality on saline water quality and ecosystems

1.3 Commitment and capacity

1. Plan / project sponsors clearly identified and roles and responsibilities of all parties spelled out and agreed
2. Ability/capacity of internal and external project staff and/or volunteers to understand and work with policies, plans and hence fulfil their roles
3. Ability/capacity of project staff to understand and work with technical information
4. Local champions or representatives in place (where relevant)
5. Ability/capacity/resourcing of project staff to understand social processes and work collaboratively in multi stakeholder situations including facilitation experience and supporting institutional and stakeholder group participation to achieve co-management
6. Adequate budgets allocated to appropriate parties over appropriate timeframes

2. DO: Second order outcomes - uptake and changed practices

2.1 All stakeholders are actively engaged in implementation (public/private sectors, institutions, iwi, community)

2.2 Positive changes in behaviours directly affecting resources of concern are visible at all levels of influence (land managers, public interest groups, iwi, local government)

2.3 Implementation is documented and follows plan using adaptive management

2.4 Project is flexible and able to take advantage of opportunities as they arise

3. CHECK: Third order outcomes - monitoring the harvest

3.1 Monitoring and measurement of indicators for outcomes (social, cultural, economic and environmental) undertaken at all key points in project cycle

3.2 Stakeholders/iwi engaged in monitoring

3.3 Evaluation of monitoring results occurs in appropriate forums

3.4 Targeted environmental and other wellbeings are maintained, restored or improved against baseline indicators, appropriate benchmarks and measurable objectives

4. REVIEW: Getting to fourth order outcomes by learning, adaptive management and sustainable management/development

4.1 Project outcomes reviewed against ICMP, project plan and objectives of any funding strategy and its implementation, using monitoring results across all four wellbeings under RMA and LGA

4.2 Review engages internal and external stakeholders and iwi

4.3 Review times linked to decision-making and budgetary timeframes

4.4 Review findings linked to adaptive management, supporting organisational learning and changed practices including policies as well as other plans and programmes

4.5 New ICM projects build on knowledge from previous reviews in learning-centred organisations

Together, these four frameworks can provide a common terminology that would promote more clarity and consistency in discussions of ICMPs and catchment-related initiatives.

As we shall see in forthcoming sections, ICM initiatives vary in which wellbeings they target. However, the NSFW programme targets measurable outcomes for fresh and saline waters, and so while examples of both schools are discussed, the discussion will emphasise the need for measurable outcomes for the environment with respect to freshwater quality and quantity and saline water quality.

Next, in Part B, we draw upon interviews and primary and secondary sources in order to answer MfE's research questions.

The elements in Table 3, particularly those associated with third order outcomes, will inform the discussion in Part B on which factors appear to be most strongly associated with the effectiveness or otherwise of the plans and projects reviewed.

PART B ASSESSING ICM IN NEW ZEALAND

Introduction and overview

The purpose of Part B is to use the terminology, frameworks and elements of best practice to assess ICMPs and catchment-related projects in New Zealand in terms of the following research questions in the RFP, which are addressed in Sections 3-10:

- what is going on in catchments around New Zealand
- what has worked and why (including factors critical to success)
- barriers to development, adoption and implementation of ICM approaches
- significant constraints to effectiveness (criteria for evaluation below)
- barriers to the widespread community support and buy-in to ICM initiatives
- what consideration is given to impacts of catchment management practices on coastal marine areas, including fisheries and biodiversity values
- how different governance arrangements and processes help or hinder ICM initiatives
- assessing the usefulness of integrated catchment management plans (ICMP) in enabling iwi and communities to determine and work towards achieving their joint aspirations for water in their catchment and linked coastal marine areas.

The analysis synthesises and draws out the findings of literature reviews and interviews at two broad levels:

- the ICM level, usually carried out at the macro or meso scale and usually (though not always) sponsored by a regional council[1] or a significant iwi or community collective
- the project level, usually carried out at the micro scale and sometimes associated with a nation-wide programme of some sort.

3. Distribution, scale and characteristics of catchment-related initiatives in New Zealand: a rapid appraisal

Introduction and overview

The findings of Section 1 illustrate how plastic the definition of ICM is in practice. It also points to one of the strengths of ICM being the synergy developed across different activities and scales. For the purposes of determining the location, scale and scope of ICM in New Zealand and to ensure the review covered the full range of ICM experience, we selected a number of regions and identified people to interview (see Appendix E for the semi-structured interview format).

While we were careful to allow catchment initiatives to be "self-identified" as ICM, we also included several initiatives not self-identified and not necessarily "integrated catchment management" in a formal sense, because they aim to contribute to beneficial outcomes in catchments without necessarily being linked to more formal catchment-scale plans.

The material presented is drawn from a series of semi-structured interviews that invited a number of experts to take a birds-eye view of the region or sector with which they are most familiar and identify initiatives that address catchments or catchment issues, and can be

[1] The term "regional council" throughout this report includes unitary authorities that carry out the roles of both regional council and territorial authorities.

seen broadly to be within the family of integrated natural resource management approaches.

This section looks at:

- broad categories of catchment-related initiatives
- broad characteristics of catchment-related initiatives
- a review of recent rural catchment research
- an overview of agencies with an interest in ICM
- data sources that inform catchment-related initiatives
- tools that support catchment-related initiatives.

3.1 Broad categories of catchment-related initiatives

The challenges facing landowners and resource managers have multiplied in recent decades. Where once rural agricultural and horticultural environments were viewed as single-sector-oriented productive landscapes, they now face the pressures of demands by new players – for instance those interested in voicing their views on environmental standards, landscape, recreation, conservation, tourism or corporate farming – and expecting to be heard (Allen et al, 2002b). Similarly, urban catchment managers are expected to manage the effects of land use intensification on aging water, stormwater and wastewater infrastructure while reducing flooding of homes and businesses and maintaining good bathing beach and estuarine sediment quality.

Furthermore, management of catchments operates at a range of scales involving decisions made at grassroots, local, regional and national levels. While landowners make land use decisions "on-the-ground", others play an active role in creating the context (positive or negative) that enables sustainable and desirable landscapes to flourish.

ICM thus relies on a range of co-ordinated broad levels of activity, each of which require different types of collaboration and collective action. Broadly, these are:

- the strategy, policy and regulatory level
- the regional or sectoral operational level
- localised projects.

Accordingly we considered ICM and related initiatives under the following headings:

- national initiatives include a mix of policy, regulatory and operational initiatives such as:
  - **national level strategy and policy** such as the New Start for Freshwater
  - **nation-wide sector strategies or programmes** that may or may not self-identify as "ICM". Examples include **nation-wide operational programmes** by groups such as the Landcare Trust, or **sector based strategies** such as those of Irrigation New Zealand, or **sector-based operational programmes** around a land-use such as dairying and its associated water impacts such as such as the Dairying and Clean Streams Accord
  - **nationally-applicable generic or issue-based research** that will contribute to better outcomes for catchments generally
  - **national-level regulation**
- regional or sectoral activities may include research necessary to identify issues,

objectives and methods in order to inform operational (plan or programme) initiatives, including:

- **plans**: catchment-based plans that are documented in some form for a defined spatial area. These are often **non-statutory operational plans** which are implemented by a range of methods, and often include a **mix of regulatory and non-regulatory methods**. They are normally called catchment or integrated catchment management plans, depending on the number of different issues addressed or the scale with respect to, for example the ultimate receiving environment (see discussion on scale below). The Regional Plans that address water quality in the Taupo and Rotorua lakes are an example of a fully regulatory approach, although this is supported by a range of other non-regulatory methods
- **programmes**: **issue-based operational activities** that contribute to beneficial outcomes in catchments without necessarily being catchment specific. They may be explicitly formulated for catchment-related improvements, and /or linked to management plans for defined catchments. They may also be multi-focused either through a broad vision, multiple objectives, multiple parties or multiple sites in many catchments within a region or across the country. Examples include regional council-led urban and rural point source contaminant control carried out across a region, especially in areas where these land uses are concentrated. Where they are identified as an issue in a particular catchment, they may become an operational focus there

- **projects**: at the localised project level, a large number of smaller activities related to a specific defined catchment are often simply "done" without necessarily having a formal/written plan or outcome monitoring programme. These may have a single-focus or have a single party involved (e.g. a local community group dedicated to replanting the riparian margin of a single stream). These do not on their own constitute "ICM", though they contribute to a greater or lesser degree to outcomes in catchments.

Any or all of these may also focus on marine receiving environments and fisheries.

The results of an overview of initiatives in New Zealand are tabulated in the thematic summary in Table 4. They include some at the national strategy and policy level, as this highlights the number of different layers of initiatives that influence what is being played out on the ground in catchments.

Table 4 by no means comprises a total headcount – we did not interview people from every regional council or every non-government agency (NGO). Moreover, one of the problems we encountered reflects the diversity of things that can be considered ICM: we found that we would have to interview up to three or four different people in each regional council to find out what activities they themselves were doing, as well as those of other community, sector or NGO groups. Key people such as policy planners, soil conservators, river engineers, water allocation and water quality staff, farm liaison staff, natural heritage (terrestrial and aquatic ecologists plus plant and animal pest control) staff and community liaison co-ordinators are all housed in different parts of most regional councils – reflecting the wide scope of ICM and the need for intra-organisational integration as well. There is more on this in Section 5.

Table 4 Thematic overview of some New Zealand catchment-related initiatives

National level		
Lead agency	Policy, regulation and strategy	Operational plans and programmes
Government: nation-wide programmes	• NZ Coastal Policy Statement • National Policy Statement on Freshwater Management • National Environmental Standards for Ecological Levels and Flows	• New Start for Freshwater • Freshwater and coastal fisheries management plans • DOC funding initiatives e.g Community Conservation Fund • Sustainable Management Fund (SMF) • Sustainable Farming Fund (SFF) • FRST research • QE II Trust activities
Sector groups: nation-wide initiatives	• Primary Sector Water Partnership • NZ Business Council for Sustainable Development sustainable freshwater management initiative • Turnbull Group (Water New Zealand) • Irrigation New Zealand	• Dairying and Clean Streams Accord
NGOs: nation-wide initiatives	• Fish and Game Councils (collectively called Fish & Game New Zealand) are statutory bodies with specific statutory duties under the Conservation Act to "manage, maintain and enhance sports fish and game". The concerns of Fish & Game New Zealand about fresh water quality can be seen under News and Information at http://www.fishandgame.org.nz	• Tindall Foundation Habitat Protection Fund, administered by the WWF Worldwide Fund for Nature The NGOs listed below operate national programmes that support local initiatives. They all work closely with Regional Councils around New Zealand to control soil erosion, plant trees and restore streams. TFS and Landcare are rural; NZERN is urban and rural, while the Dunes Trust is coastal. • Trees for Survival http://www.tfsnz.org.nz/ • Landcare Trust • NZERN (NZ Ecological Restoration Network) The 24,000-page NZERN website www.bush.org.nz included a rapidly growing restoration directory of thousands of restoration projects. It closed early 2009 and will resume soon • Dunes Restoration Trust http://www.dunestrust.org.nz/ and the collaborative research network the Coastal Dune Vegetation Network

<table>
<tr><th colspan="3">Regional level</th></tr>
<tr><th>Lead agency</th><th>Operational plans and programmes</th><th>Localised projects</th></tr>
<tr><td>Iwi</td><td>• Integrated Kaipara Harbour Management Group (IKHMG), which focuses on biodiversity, climate change, fish stocks, integrated management and co-ordinated action, kaitiakitanga, resource use and development, sedimentation and water quality / socio-economic objectives
• Ngai Tahu riparian programme</td><td>• Hurunui catchment (iwi-led aspect)</td></tr>
<tr><td>Regional Councils: regional plans and programmes</td><td colspan="2">High level policy, regulation and strategy
• regional policy statements
• regional coastal plans - can't make rules in other than the coastal marine area though the receiving environments are affected by land use in the surrounding/adjoining catchments
• regional plans – many focus on catchment-related issues
• Auckland Sustainability Framework: 100-year planning horizon; catchment-based approach
• regulatory plans such as those of Environment Waikato for Lake Taupo and Environment BOP for the Rotorual Lakes; Hawkes Bay - Tutira; West Coast - Lake Brunner; Otago Regional Council - Queenstown Lakes
Operational catchment plans and programmes
• Water allocation plans supported by consenting processes (all or most councils for relevant catchments)
• Flood management plans (all or most councils for relevant catchments) that may or may not be supported by land use controls in district plans
• Water quality initiatives
• non-regulatory lake plans: ARC - Northern lakes; Hawkes Bay - Tutira; West Coast - Lake Brunner; Otago Regional Council - Queenstown Lakes
• Coastal focused catchment plans: e.g. ARC Mahurangi Action Plan and Strategic Plan; Tauranga (EBOP)
• soil conservation programmes e.g Hawkes Bay Regional Council
• riparian management programmes e.g. Auckland Regional Council
Related issue-based programmes
• Living / Clean streams (EW, ECan, ES and other Regional Councils)
• Erosion and sediment control (ARC, EW, EBOP, GW, Tasman District, ECan)
• Industrial pollution control (Ecan PPG)
• rural point source control programmes</td></tr>
<tr><td>Community</td><td colspan="2">• Doubtless Bay Marine Protection Group (Inc.Soc.) http://www.livingseadoubtlessbay.org.nz/Index.html
• Whaingaroa Environment Catchment Plan (initiated by the community and now supported by Environment Waikato)</td></tr>
</table>

Multi-party	• Hauraki Gulf Forum http://www.arc.govt.nz/environment/coastal-and-marine/hauraki-gulf-forum/hauraki-gulf-forum_home.cfm • Styx River in Christchurch (Trust and City Council) http://www.thestyx.co.nz/	
Local level		
Lead agency	Operational plans and programmes	Catchment projects
TLA/Utility	• District plans that make rules about land use • Structure Plans e.g Long Bay that • Stormwater, wastewater and water supply asset management plans (LGA) • Network discharge consents (RMA) and associated ICMPs e.g in the Auckland and Christchurch areas • Might River Power, Genesis Energy – hydro lake and river management	• Project Twin Streams (which will ultimately become an ICMP)
Research agency	• Motueka –Landcare Research ICM catchment • Upper Waitemata Harbour Catchment Study (Auckland University and Auckland Regional Water Board	
Community	• Water user groups /irrigation groups e.g.: • Napier urban drains • Hurunui, Taieri and many funded by SMF and SFF	• Dune care/Coastcare/Beach care • Waicare – there are 40 groups in North Shore City alone, as well as other stream-based initiatives • groups that are focused on one stream or reach such as the Friends of the Whau / Oakley / Mahurangi groups and others around New Zealand
Farmer		• many local groups often using SMF or SFF funding (excludes Landcare and other groups mentioned above) • local water user/irrigation groups
NGO	Waicare – Auckland-based group helping schools and community groups monitor and restore urban streams http://www.waicare.org.nz/	

In order to progress with the discussion of what is going on in catchments in New Zealand and to avoid confusion and needless debate about what is or is not ICM, we have distinguished between two broad groups of activity:

- **catchment management plans or integrated catchment management plans** (CMPs and ICMPs), which are often more formal processes for larger areas ("the catchment level")
- **catchment-related initiatives**, which may be more or less informal or site-specific and contribute to beneficial outcomes in catchments without themselves constituting ICM ("the project level"). These can include nation-wide issue-based programmes such as those of The Landcare Trust and Fonterra's Dairying and Clean Streams Accord.

This report uses the broad term "catchment-related initiatives" to describe both.

3.2 Broad characteristics of catchment-related initiatives

Table 4 illustrates a number of ICM initiatives that overlap in terms of scale. While in an ideal world it would be interesting to gain some kind of geographic overview of how much of the country is covered by formal ICMPs or informal catchment-related initiatives, it was not possible to capture more than a flavour of the many activities going on under the aegis of many different agencies, and indeed some outstanding individuals.

Appendix F sets out the characteristics that can help characterise such diverse catchment-related initiatives. A summary of these factors is set out in Table 5 and serves to highlight the range of initiatives that can contribute to catchment-related outcomes.

Table 5 Broad characteristics of catchment-related initiatives

1. The lead agency / level
2. Landscape (rural, urban, or rural and urban)
3. Purpose (e.g. water allocation, soil erosion, flooding, agri-nutrients or other rural non-point sources, water quality, urban erosion and sediment control and other contaminants)
4. Triggers/drivers for the development of an ICM initiative
5. Areal extent/scale (national, regional, local or variations of these) – the spatial scale of the work
6. Degree of integration
7. Degree of regulation
8. Degree of documentation
9. Funding
10. Focus within the broader planning cycle (plan,do, check, review) – including the extent to which there is documentation of the first, second and third orders of outcomes.

The summary below follows the headings in Table 5.

3.2.1 Lead agency/level

At the national level:

- while only some government initiatives are listed, it is easy to see that there is a lot of government interest in supporting catchment-related work on the ground
- several sector groups represent nation-wide coalitions such as the Primary Sector Water Partnership and the NZ Business Council for Sustainable Development (NZBCSD) (these are discussed further below)
- a number of national NGOs whose activities are focused on local action, usually of small spatial scale.

At the regional level:

- the most numerous major catchment related initiatives are driven by regional councils, as would be expected given their mandate under the Resource Management Act (RMA). Several regional council interviewees noted that they were the only real player in their region, with no NGOs or other catchment-related initiatives apart from those they had set up themselves. A wide range of activities is evident, with not all being formal ICM. Some programmes are obviously catchment-based, such as those relating to flooding or lake water quality while others are issue-based such as the various rural clean streams and riparian management programmes or the more urban-focused erosion and sediment control or industrial pollution prevention programmes
- however some significant ICMPs have been initiated by iwi, for example in the Kaipara; and by community groups, for example in the Whaingaroa.

At the local level there are many more initiatives than can be individually counted:

- some reflect the requirements of District Councils under the Resource Management or Local Government Acts (RMA and LGA) to prepare ICMPs and activity (asset) management plans (AMPs), both of which may involve stream restoration
- it is also at this level that community groups spring up, as they are often focused on particular streams, reaches or other localities. Many of these are not intended as ICM initiatives, but through communal activities such as litter and weed removal and riparian planting, can contribute to community resilience and catchment-related outcomes.

There is also evidence that the interest by iwi in the quality of fresh and saline waters, including fisheries, is leading iwi to initiate action as well as requesting that it be taken by the responsible agencies. In one major case (the Kaipara) this has resulted in iwi themselves driving the establishment of an ICM programme. It has also led to the establishment of taiapure and other management methods, as discussed in Section 8.3. The Mataura River is significant in this regard in having the first fresh water mātaitai in New Zealand (http://www.mahingakai.org.nz/area-management-tools/management-areas/mataura-river-mataitai).

Genuinely collaborative multi-stakeholder initiatives seem to be more rare.

3.2.2 Landscape

There is a clear rural/urban split in the focus of the various initiatives, reflecting the trend in both local and global literature cited in Gustafson and Feeney (2008).

At the national level:

- national policy applies in a generic sense to rural and urban waters
- both government and sector strategies, plans and programmes appear to have a rural focus as primary production intensifies both demands and impacts on water, water bodies and associated terrestrial ecosystems
- there is emerging interest in water availability and efficient use from the secondary and service sectors (as well as for households) in urban areas, as evidenced by the New Zealand Business Council for Sustainable Development.

At the regional level:

- by area and extent, most ICM and catchment-related initiatives in New Zealand are rural, and in predominantly rural regions, cities and townships appear to be largely ignored despite the large footprint of towns and cities on water demand and water quality
- by contrast, the most formalised ICMP development is currently being carried out in the urban areas of Auckland and Christchurch (and other main urban centres) with activity in the rural parts of both regions focused on water allocation planning rather than ICM in the wider sense
- in catchments with mixed land uses, catchment management initiatives tend to focus on either the rural or the urban portions, so that some ICM initiatives neglect some parts of the catchment. This is true of the Motueka study, which focuses on the rural areas and has not directly included the township at the foot of the catchment; and of many urban ICMPs being prepared in the Auckland Region to support network discharge consent applications, which thus mostly exclude any rural portions of the catchments
- macro-scale approaches relate to enclosed receiving environments such as estuaries (e.g. the Hauraki Gulf Forum and the Kaipara and Whaingaroa catchment plans) or lakes (e.g. Taupo, Rotorua, Tutira).

At the local level there is a mix of urban, rural and coastal projects, though a quantitative area/population survey would be needed to compare the respective scales and outcomes of these activities.

3.2.3 Trigger

ICM can be a principle that informs how land and water managers approach their work in a proactive and adaptive way. In this way ICM is issue driven, but integrates across issues on an ongoing basis. In practice, however, it is often a reactive measure triggered in response to an existing issue or in urgent anticipation of an imminent issue that can only be solved by taking a whole catchment approach. Some examples of the triggers/purpose of ICM include:

- **effects of anticipated development**: the Upper Waitemata Harbour Catchment Study, a three-year joint investigation by the University of Auckland and the Auckland Regional Water Board that aimed to put in place measures to reduce the effects of anticipated development in the catchment (Auckland Regional Authority, 1983)
- **iwi concerns and Waitangi claims**: the Manukau Harbour Action Plan (See Table D.4 in Appendix D) was initiated in response to the concerns of Tainui and their Waitangi Appeal about the Harbour's water quality (Auckland Regional Water Board, 1990). A second example is the Integrated Kaipara Harbour Management Group (IKHMG), an initiative developed by Te Uri o Hau and its stakeholders to help manage the Harbour by preparing a Sustainable Kaipara Catchment Plan. Apparently initiated by concern about a lack of focus

by the two responsible Regional Councils, the iwi see it as essential to develop a unified approach to research and planning

- **ecological tipping points**: the risk of reaching some ecological "tipping point" in a receiving environment, for example inputs of sediment to shallow estuaries such as the Tauranga Harbour (Environment BOP, 2010), the poor state of New Zealand's lowland rivers (MfE, 2007) or the synthesis of the effects of land use on water quality in lakes such as those in the Taupo-Rotorua area, and the ensuing ecological and community health, amenity, cultural and economic effects of ongoing deterioration
- **RMA consent requirements**: the development of ICMPs in urban areas triggered by the expiry of existing authorisations in 2001 and the need to obtain resource consents under the RMA for discharges from stormwater and wastewater networks. Likewise, the expiry in 2021 also under the RMA of mining licenses commonly used in the South Island for farm irrigation has triggered a constructive community response to developing water allocation plans that also address ecological flows
- **extreme weather events**: extreme or recurring weather events promoting the review or preparation of more comprehensive flood management plans for major river basins such as in Northland or the Manawatu
- **increased water demand**: competition for water or over-allocation as farmers intensify their land use by shifting from dryland to irrigated farming in order to increase returns, a trend that has been extremely rapid in areas such as Canterbury and Southland
- **effects of urban land use spread and intensification**: the pressures of urban growth on water-related infrastructure and the source and receiving environments affected by this combined with the need for RMA consents for stormwater and wastewater discharges from urban infrastructure have encouraged renewed interest in urban ICM.

This reactive pattern reflects the need to prioritise many competing work pressures, and is exacerbated in times of resource constraint. It may also reflect the reality that councils may defer politically difficult or costly initiatives until the situation reaches a point where they have a broader mandate to address it.

The nature of the trigger also helps to inform the response in terms of regulatory and/or non-regulatory methods, for example:

- where consents are needed (e.g. for water use), regulation is provided for in the RMA and the regional plans provided under it
- where land is not yet zoned for future urban development, regulation can be put in place via district plan controls, as well as non-statutory mechanisms such as ICMPs and structure plans and the activity management plans needed for asset management under the LGA
- where problems exist because of inappropriate development (e.g. flooding of homes on flood plains or poor management of overland flow paths) other methods may be needed, including asset upgrades via asset management plans and purchase of some affected properties in urban areas and river control schemes in rural areas
- some ecological and erosion problems lend themselves to non-regulatory approaches such as various forms of community planting which may or may not be formally linked to ICMPs and AMPs.

Triggers for "flaxroots" catchment-related projects also vary. They may result from:

- the vision of a key local resident who is able to mobilise others into a sustained group (Wendy John of the Friends of the Oakley Creek, for example)
- an issue such as coastal erosion and invasive weed control (e.g. Piha CoastCare Trust)

- the need to co-operate over access to a scarce resource (e.g. the Hurunui Community Water Development Project).

3.2.4 Spatial scale

The scale of action varies tremendously, from the Hauraki Gulf Marine Park (the catchment of which comprises a significant part of the Upper North Island) to short reaches of urban streams adopted by local communities.

Appropriate scale reflects the significant issues of concern. Thus, lake or estuarine water quality needs to be addressed in all surrounding catchments unless the key influence is spatially concentrated in one or more catchments. Flood management or water allocation may focus only on some reaches or key subcatchments of a major river system.

There are also many initiatives such as Landcare or Trees for Survival groups that target small areas but which may cumulatively make a difference to catchment outcomes.

Lakes have come into the limelight, but estuaries and other valued coastal receiving environments such as the Pauatahanui, Lake Ellesmere, the Waikouaiti Estuary in Otago and many others are emerging as needing more attention in New Zealand. In such cases, the macro-scale approach recommended in Gustafson and Feeney (2008, based on Hooper 2006a) and exemplified in the Upper Waitemata and Manukau Harbour initiatives is essential to ensure that all influences – rural and urban – are addressed, and that associated concerns related to estuarine and offshore fishing are also addressed.

The scale of ICM and other catchment-related initiatives may be defined (based on Hooper 2006a as adopted by Gustafson and Feeney, 2008) as:

- macro-scale: all catchments around a whole freshwater or saline receiving environment e.g. a lake, major wetland or estuary
- meso-scale: whole contributing catchment within a macro-catchment
- micro-scale: subcatchment – part of a meso-catchment
- structure plan, subdivision or site (these may cross catchments)
- groundwater aquifer including recharge zones (which may also cross surface catchments)
- other, such as ecological district or tribal rohe.

For the purposes of this work, other scales also include the national scale such as a national policy statement; the whole of region policy/regional plan scale; and national programmes with multi-site projects.

Thus, ICM in the formal sense usually takes place at the macro or meso scale, while many catchment-related projects, including those operated or supported by national organisations such as The Landcare Trust, SMF or SFF, operate at the micro or site scale.

3.2.5 Degree of integration

Under this heading, we focus our discussion on what may be deemed more “classic” or “formal” ICM initiatives then conclude with a short paragraph on catchment-related projects. There is more on integration in Section 5.1.1.

As we undertook the interviews with ICM practitioners, (the semi-structured script is in Appendix E) respondents usually began by identifying initiatives that were formally referred to as ICM. After further reflection they generally then observed that there were other similar initiatives running in different areas with the same broad aims. Often, the first initiatives mentioned were ones the councils or other agencies had initiated around water quality or allocation. Secondary initiatives mentioned were ones that were either involving stakeholders in a collaborative process of identifying issues to work on, or had begun

around issues of primary production and were expected to move on to addressing issues around water quality. The factor that linked these initiatives, that lead interviewees to link them to ICM, was *integration*, whether of issues, internal council departments or external agencies and stakeholders.

Many catchment management initiatives are single-issue, focusing on flooding or agri-nutrients or soil erosion or sedimentation, and the level of integration and coordination between initiatives and scales varied widely. However, most catchment managers interviewed (even those with work programmes that were comparatively well-integrated within the council) agreed that this was an area where more work could be done and that more integrated approaches could be beneficial.

Many initiatives appear to be triggered by the effects of land use on their ultimate coastal receiving environments, and adopted various means of land use and fresh water management to address these, thereby integrating coastal with catchment management. Others such as flood management or water allocation plans were less likely to consider this.

Others were more cautious and focused on achievable tasks as an interim step towards real outcomes on a pathway to further integration.

> 'We carefully took the "integrated" out of our catchment planning programme because we were aware that ICM is a potentially far-reaching holistic tool and we didn't want to be inadvertently over-committing to something we are still learning about.'

There is something of a discontinuity between ICM and other catchment-related initiatives, especially for local projects, which vary in terms of how well they are integrated "upwards" into existing catchment management frameworks. There is more on this in Section 6.

3.2.6 Degree of regulation

Central government can exert a strong influence on the matters to be considered by regional and territorial councils as they make rules relating to land use and fresh and saline water. In this sense, every regional, city, district and unitary authority in New Zealand has such rules. This however does not necessarily constitute ICM, and in Section 5 we look at the long and vexed history of regulating land use in order to control its effects on soil and water. Regulatory approaches often emerge as part of a package of measures to manage catchments.

Of the initiatives sampled in Table 4, a comparatively small proportion has adopted a regulatory approach specifically in order to achieve catchment-related outcomes, usually at the macro and meso scales. Examples include:

- the Auckland Regional Council's Proposed Auckland Regional Plan: Air, Land and Water (PARP:ALW), which provides for the preparation of ICMPs as a key (though not the only) management tool for the preparation of network discharge consent applications. While the plan notes that ICMPs are non-statutory documents that assist TAs in managing catchments to achieve specified outcomes, it says that ICMPs may also define statutory and non-statutory methods that will be used to contribute to the achievement of the outcomes sought. Schedule 9 of the plan sets out the contents of ICMPs and network management plans required for consent under rules 5.5.10-5.5.13
- the Long Bay Structure Plan, which aims to control land use in such a way as to comply with Environment Court rulings relating to resource consents issued by the Auckland Regional Council to North Shore City Council and by both councils to the developers so as to protect (among other things under the headings of the four wellbeings) the terrestrial, fresh water and coastal ecosystems affected by the development

- the regional rule-based initiatives of Environment Waikato and Environment BOP to manage water quality in the Taupo and Rotorua lakes
- the resource consents issued to water users on the basis of numerous surface and underground water allocation plans throughout the country, which normally based an allocation on water availability and known assessments of water requirements for specific land uses.

Other approaches do not need to impose regulation, for example river control schemes for flooding (though they do need relevant resource consents for the works) and their effectiveness is assessed by their ability to accommodate the designed storm event impacts.

Riparian and coastal replanting is an area that is largely non-regulated (apart from specific resource consents that may require particular forms of restoration), with methods including provision of support for voluntary community activities and targeted funding and other financial incentives such as rates rebates.

3.2.7 Degree of documentation

Apart from regulatory initiatives, it appears that few catchment-related initiatives are formally documented across all segments of the "plan/do/check/review" cycle (see below). Formal council ICMPs are often written up but are not always independently reviewed. They may not always include process-related information such as the time and costs of the planning process as well as financial provision for operations, monitoring and review.

Part of the reason for the difficulty of accessing any information on ICM initiatives is that some plans comprise part of the "grey literature" of council agendas and reports, or professional conference proceedings that may not be readily found on websites. Moreover, reviews are often internal documents and hard to locate for the purposes of projects such as this and what material is available is often written for specific purposes that do not necessarily include those within our brief.

The same problem is encountered when reviewing catchment-related projects: information from community groups and NGOs (e.g Whaingaroa, Landcare Trust, Trees for Survival, Styx, IKHMG). These groups often have websites which may or may not contain downloadable documentation, but initiatives supported by short term funding usually don't have websites. In such cases, while key people may be able to be interviewed for some time after the project ends, such information is easily lost over time.

3.2.8 Sources of funding

The source of funding usually varies according to the scale of the initiative and the lead agency (levels of funding are alluded to in Sections 4.6 and 6.1.5):

- regional ICM initiatives are usually ratepayer funded through the usual LGA funding procedures of the long-term council community plan though in the case of Auckland, significant additional funding has been available through Auckland Regional Holdings and in some cases central government funding has also been made available, e.g. to help government stakeholders take part on the Hauraki Gulf Forum
- iwi and community initiatives are often self-funded until they can gain some wider traction from the relevant territorial or regional council, including through access to council-based funds for supporting environmental initiatives
- sector initiatives are usually self-funded
- local community projects can receive funding through SFF or SMF grants as well as in-kind support from NGOs like the NZ Landcare Trust and the regional or territorial council.

3.2.9 Planning cycle focus

Not all catchment-related initiatives are based on a plan, formal or informal. Much of the literature made available for this project focused on the "plan" segment of the "plan/do/check/review" cycle, with initiatives being too recent to have gone very far down the implementation ("do") track.

The Mahurangi Action Plan focused on the "do" segment of the planning cycle, while reviews (e.g. Cole and Lees, 2008) concluded that prior planning and consideration of objectives and measures would have been beneficial.

Most (but not all) consider the "check" phase (monitoring) but have not yet progressed to the stage where outcomes can be reported, and while there seems to be growing awareness of the benefits of "review" only a small proportion of the literature focuses on programme review based on monitoring results. This may reflect the short duration of projects as well as the comparative inaccessibility of the literature.

Overall, and generally in line with the findings of the PUCM team (Ericksen et al, 2003a) there appears to be more effort invested in the plan and do segments, with less in the check (monitoring) and even less in the review segments.

This makes it difficult for sponsors of plans, programmes and projects to assess their effectiveness and for researchers and policy-makers to access this information in a cost-effective way.

However, growing pressure on water resources is seeing a shift towards better measurement. In the rural sector, irrigation uses almost 80% of all water allocated in New Zealand (half of it in Canterbury) (MfE, 2007) and the need for efficient water use in the primary sector is correspondingly significant. One of our interview respondents noted that with the approaching expiry of mining privileges, water users are forming irrigation companies that are closely focused on identifying best practice water application methods and rates and setting up metering and reporting systems to ensure compliance with water use limits and restrictions. This information would then be forwarded to the regional council for compliance monitoring and ongoing water availability assessment.

The Primary Sector Water Partnership (2008) is also strongly focused on improving the efficiency of water use in order to "promote sustainable freshwater management in the land-based primary sector".

3.3 A review of recent rural catchment research

Dodd et al (2009) conducted a review of the results, outputs and outcomes of recent rural catchment-based research in New Zealand. Although the scope of the report excluded projects with limited research involvement (findings relevant to research are discussed in Section 10.7.2), the findings are similar to those made in the above summary of findings from Table 4:

- the projects reviewed vary greatly in their approach to common elements of ICM, e.g:
  - o processes of oversight and engagement of non-research stakeholders
  - o degree to which they address complexity through integration of research
  - o spatial and temporal scale
  - o breadth of land use and management comparisons
  - o variety in communication/education/extension approaches used
- under-represented elements include long-term integrated studies and the participation of Maori, including social research on Maori interests

- all the projects have a strong focus on land use effects on water quality in the broad sense and the use of a geographic (catchment) boundary to examine all the interactions between land use, water quality and community
- the projects have provided laboratories – a context for component and integrated research which is dominantly biophysical, relative to the lesser contribution of social and economic research at catchment scales
- the projects have provided classrooms – a context for extension and learning
- we now have a burgeoning range of tools (e.g. models, guidelines) to apply to the tasks of forecasting and deliberation. These tools cover the domains of biophysical, social and economic, the integration of these domains and project process aspects
- we now have a wealth of experience across a range of ICM approaches to draw on for designing projects that are "fit for purpose".

Whether other people are able to access the wealth of experience and the tools referred to in the last two points is discussed in Section 6.
We may also add that further under-represented elements (second main bullet point above) include the interests of DoC and MFish for freshwater and coastal fisheries, which are discussed in the next subsection and in Sections 8, 9 and 10.

3.4 Overview of agencies with an interest in ICM

ICM is of direct interest to the NSFW and related programmes of the Ministry for the Environment and the responsibilities under the Resource Management Act (RMA) and the Local Government Act (LGA) of regional councils for the environmental outcomes that ICM can deliver and of territorial local authorities for managing land use which affects water quality and quantity and the associated terrestrial and aquatic ecosystems.

However, other government and statutory bodies also have a major interest in the outcomes that ICM can deliver, including the Department of Conservation (DoC), the Ministry of Agriculture and Forestry (MAF), the Ministry of Fisheries (MFish) and Fish and Game New Zealand. These interests are summarised below.

DoC's "challenge is to manage natural and historic heritage assets for the greatest benefit and enjoyment of all New Zealanders, by conserving, advocating and promoting natural and historic heritage so that its values are passed on undiminished to future generations." The Department's key functions as set out in the Conservation Act are "to manage land and other natural and historic resources; to preserve as far as practicable all indigenous freshwater fisheries, protect recreational fisheries and freshwater habitats; to advocate conservation of natural and historic resources; to promote the benefits of conservation (including Antarctica and internationally); to provide conservation information; and to foster recreation and allow tourism, to the extent that use is not inconsistent with the conservation of any natural or historic resource. The Department has a particular responsibility under Section 4 of the Conservation Act to interpret and administer the Act as to give effect to the principles of the Treaty of Waitangi. This involves building and supporting effective conservation partnerships with Tangata whenua at the local level. The Department also contributes to the conservation and sustainable management of natural and historic heritage in areas for which it is not directly responsible. It does this through its roles under other statutes including the Resource Management Act 1991, the Fisheries Acts 1983 and 1996, the Biosecurity Act 1993, the Forest and Rural Fires Act 1977 and the Crown Pastoral Land Act 1998" (from its website http://www.doc.govt.nz). ICM-related roles include advocacy for freshwater habitat and fisheries such as whitebait and non-quota fish and fish passage, the ability to prosecute in the event of fish kills, the habitats of birds in areas such as braided rivers which are affected by water availability and for marine

mammals and various forms of protected marine areas: these functions mean water bodies need to be managed in ways that accommodate the range of community interests in such catchment-related outcomes.

MAF's mission is "to enhance New Zealand's natural advantage" by, among other things, "protecting our natural resources for the benefit of future generations", with one of its outcomes being "maintained and enhanced economic, social and cultural benefits for New Zealanders from the natural environment" (from its website http://www.maf.govt.nz). It has an interest in sustainable farming which it supports with its sustainable farming fund (SFF) and sustainable forestry. Both farming and forestry have significant impacts on land and water resources as well as New Zealand's sustainability performance.

The Ministry of Fisheries "works to ensure that fisheries are used in a sustainable way and that we have a healthy aquatic ecosystem" so that "all New Zealanders can get the best value from this resource" (from its website http://www.fish.govt.nz). Methods include "researching fisheries, managing the process for access and allocation of fisheries and ensuring that everyone who uses New Zealand's fisheries comply with the rules and regulations that govern and protect them." As well as managing fish stocks sustainably and addressing the effects of fishing on aquatic ecosystems, MFish is increasingly focused on "threats from the land", noting that "soil and nutrient run-off from the land can have huge effects on our coastal ecosystems". It notes that "high sediment levels will reduce the productivity of whole rocky reef ecosystems, and affect catches of important recreational, customary, and commercial species" and that other research will "the effects high nutrient levels are having on the marine environment" including "the effects of runoff from agriculture and intensive dairy operations on coastal ecosystems".

Fish and Game New Zealand is "the collective brand name of the New Zealand Fish and Game Council and 12 regional Fish and Game Councils established in 1990 to represent the interests of anglers and hunters, and provides co-ordination of the management, enhancement, and maintenance of sports fish and game under Section 26B of the Conservation Act 1987. Fish and Game councils are the statutory managers of sports fish and game bird resources and their sustainable recreational use by anglers and hunters New Zealand wide, except in the Chatham Islands and for fishing in the Lake Taupo catchment where it is managed by the Department of Conservation." Fish and Game makes "a major effort to look after streams, water quality and wetlands. Much of this work is done under the Resource Management Act, through hearings with local government. This type of work includes protecting streams and rivers from development and water abstraction, ensuring water quality is protected from illegal dumping and pollution, and that wetlands are protected from drainage. Habitat protection work is the most important part" of its role: "without good habitat there can be no sports fish or game birds, and so no fish and game sports. This work also benefits anyone who values quality water and wetland environments, and the many species that use these places." It also has an interest in river bank management and issues such as didymo (from its website http://www.fishandgame.org.nz). The organisation has taken a strong stand about the adverse effects of dairying on water quality.

The projects reviewed for inclusion in Table 3 and the results of the literature surveys and interviews show that that even for projects with a high degree of integration, the interests of all these parties (where all are relevant) are seldom considered. There is more on this in Section 5.1.1.

The sheer number and diversity of scales and objectives that characterise catchment-related initiatives in New Zealand combine to make it difficult for these responsible agencies to assess what is being done towards achieving their required catchment-related outcomes, how well it is being done and how it could be done better.

Other government agencies also have an interest in outcomes that ICM can potentially deliver across all four wellbeings, for example (there will be others):

- Te Puni Kokiri and the Department of Internal affairs, for Maori and community social and cultural wellbeing
- the Ministry of Economic Development, as catchment management decisions have strong economic implications in allowing or controlling uses of land, freshwater and coastal resources.

Some form of co-ordination, communication and integration is needed to ensure these agencies can make the best use of the widespread interest in ICM and catchment-related initiatives and the progress such initiatives can make towards meeting their respective objectives. There is more on this in Sections 6.3 and 11.

There is also a growing number of vocal sector groups interested in ensuring water is available for productive use in the rural and business sectors as well as those wishing to ensure there is enough for high quality freshwater and saline environments and ecological and recreational purposes. These include:

- environmental NGOs such as the Environmental Defence Society and the Forest and Bird Protection Society
- the Canterbury Water Rights Trust
- Irrigation New Zealand
- the Primary Sector Water Partnership
- the New Zealand Business Council for Sustainable Development.

Both of the latter have issued statements about catchment management that are listed in the references.

There are also several professional associations that play a role in operational planning and management of ICMPs, including (there is more information about some of these in Appendix G):

- NZARM (the New Zealand Association of Resource Management)
- Land Managers Group
- River Managers Group
- Water New Zealand Special Interest and Water Groups
- ICM Network
- IPENZ (Institution of Professional Engineers)/Water New Zealand Rivers Group.

The Land and Water Forum was convened by the government to bring these and other interest groups together. As indicated on its website http://www.landandwater.org.nz/, the Land and Water Forum comprises a range of primary industry groups, environmental and recreational NGOs, iwi and other organisations with an interest in fresh water and land management. The Minister for the Environment and the Minister of Agriculture and Forestry have asked the Forum to advise on how water should be managed in New Zealand and it has been joined for that task by active observers from central and local government. The Forum's task is to:

- conduct a stakeholder-led collaborative governance process to recommend reform of New Zealand's fresh water management

- through a consensus process, identify shared outcomes and goals for fresh water and related land management
- identify options to achieve these outcomes and goals
- produce a written report to the Ministers by 31 July 2010 which recommends shared outcomes, goals and long-term strategies for fresh water in New Zealand.

3.5 Data sources that inform catchment-related initiatives

Sources of data about freshwater quality and quantity and coastal water quality that could provide baseline information and detect changes therein include:

- the database regularly updated for MfE by NIWA of the monitoring data from its water quality network sites (e.g. NIWA, 2009)
- the Ministry for the Environment state of the environment reports, based on information provided by regional councils
- regional and territorial council state of the environment, consent and complaint monitoring data
- information from MfE, MAF, QEII Trust, NGOs and sector groups about uptake and outcomes of SMF, SFF and other funding or sector initiatives
- information from monitoring of freshwater and coastal fisheries and related matters by DoC and MFish
- research undertaken by research institutions on their own behalf or for clients in the public sector.

The difficulty of accessing so many diverse sources of information is discussed in Section 6.1.3.

3.6 Tools that support catchment-related initiatives

Although not a focus of this project, the work also highlighted the wide range of available implementation tools for catchment management – these do not constitute ICM on their own but can support the work done at all four phases of the planning cycle.

Many of the tools found are sector specific, such as the water quality contaminant model developed by the Auckland Regional Council for preparing urban ICMPs, or the dairy-farm tools available on the Dairy NZ website.

FRST has developed its envirotools while the MfE-funded Quality Planning website – http://www.qualityplanning.org.nz/ – has many useful resources, and Statistics New Zealand is doing some indicator work. Research agencies such as NIWA and Landcare Research also have a range of tools useful for ICM, some of which are developed for specific clients.

Tools for iwi include:

- the Ministry for the Environment's Cultural Health Index for Streams and Waterways: Indicators for recognising and expressing Maori values
- the Stream Health Monitoring and Assessment Kit for Maori, originally developed by NIWA and Federated Farmers under the MfE Sustainable Management Fund to allow farmers to assess the influence of farming activities on streams and now modified to make it readily useable by Maori to aid the exercise of kaitiakitanga.

Other tools are available through New Zealand-based websites specialising in integrated natural resource management approaches:

- the Motueka Integrated Catchment Management research programme - http://icm.landcareresearch.co.nz/ - provides a range of papers and lessons from the work undertaken between 2000 and 2010
- the Landcare Research/University of Auckland Low Impact Urban Design and Development (LIUDD) and case study websites http://www.landcareresearch.co.nz/research/built/liudd/ and http://cs.synergine.com/ provide for alternative measures to reduce the adverse effects of urban development on land and water resources and associated terrestrial and aquatic ecosystems
- the Learning for Sustainability site http://learningforsustainability.net brings together resources to help managers address and manage the social and capacity building aspects of integrated resource management and other sustainability issues
- the Sustainable Agriculture/Horticultural Management Systems Network (SAMsn) - http://www.samsn.org.nz/about/ - established in 2000 in response to industry concern about the proliferation of on-farm management systems and the need to ensure that both sustainability and profitability were incorporated into the approach to agriculture and horticulture in the future. It also refers to a number of tools for iwi.

Such tools help local-level policy-makers, catchment managers and land owners and occupiers give effect to ICM initiatives rather than themselves being part of ICM processes. Hence they are not explored further in this report other than being referred to in Section 5 with reference to the need for more widespread and effective information dissemination.

3.7 Themes and ways forward

This rapid appraisal conveys an idea of the wide range of catchment-related initiatives across the country. A more detailed survey that addressed all the fields in Table 4 would lend itself to geospatial layering of the many national, regional, territorial and neighbourhood initiatives, which would be a powerful visual representation of the many excellent programmes under way. However, the time and resource constraints of this review did not allow a comprehensive listing or layered mapping of all ICM-related initiatives in New Zealand.

Regional council and community led initiatives are especially prolific (at their respective macro/meso and micro scales respectively).

Catchment-related initiatives in most parts of the country are rural and most appear reactive, being developed in response to various drivers or triggers such as the pressures of intensive farming especially dairying, rather than providing a proactive framework for managing the effects of land use on water quality and quantity and other catchment-related matters. This is in line with overseas experience (Gustafson and Feeney, 2008).

However trends are emerging for structure plans such as for Long Bay and urban ICMPs to anticipate and avoid, remedy or mitigate the adverse effects of new and existing development on land and fresh and saline waters.

A strong theme is that of Maori and community interest in ICM as a means of solving difficult land and water management issues, often including those related to coasts and fisheries.

Project timeframes mean planning and doing seem to be more often documented than checking monitoring results and reviewing plan effectiveness.

Many macro and meso scale initiatives comprise some form of regulation: even where the catchment management plans themselves are non-statutory, they may provide a justification for policy and plan changes that inform resource consents, for example. Some meso and micro scale initiatives may be conducted within a regulatory context, especially where projects focus on water availability and allocation, which will ultimately be managed by statutory (among other) tools.

The high numbers of interrelated initiatives around the country and the interviewee responses and available literature imply that ICM in New Zealand is probably more honoured in practice than in principle – that is, there are more people doing it than saying they are doing it.

Many of the elements of ICM are present, but there is little formal acknowledgement of this. The interviews and literature indicate that the linkages between issues, within and between organisations and with external stakeholders are often informal and dependent on the modus operandi of individual people. This makes it difficult to ascertain the actual extent of what may be deemed "real" integrated catchment management (at the macro and meso scales) in New Zealand.

Despite the large number of initiatives around the country, therefore, few of those listed would qualify as genuine ICM as widely defined in the literature. Those that could do so also seem to address coastal as well as catchment issues, thereby qualifying as being fully integrated at the macro scale. Examples include:

- the Long Bay Structure Plan on Auckland's North Shore (Section 5.5, Appendix H)
- the Manukau Harbour Water Quality Management Plan (Section 8.5.1, Appendix H)
- the Hauraki Gulf Forum (Section 8.5.3, Appendix H)
- the Integrated Kaipara Harbour Management Group (Section 8.5.4, Appendix H)
- Project Twin Streams in Waitakere City (Appendix H)
- the Whaingaroa Catchment Plan around Raglan in the Waikato
- some of the more broadly-focused urban ICMPs being prepared in Auckland and Christchurch, especially for catchments surrounding estuaries.

The Taupo and Rotorua lakes initiatives also qualify as macro scale, as they address all of the land uses surrounding the lakes in question, and consider also the effects of their discharges into the rivers they feed.

The Manukau Harbour Water Quality Management Plan was a three-year project that was extensively monitored and addressed fresh and coastal water quality, water availability and allocation, cultural values, urban and rural point source pollution, rural non-point source pollution, rural and urban soil erosion, fisheries and more. It formed the basis of many of the now issue-based (as opposed to catchment-based) programmes since run by the Auckland Regional Council.

Of the remainder, Project Twin Streams is one of the few that has progressed to the stage of outcome monitoring, but as yet only short term evidence is available.

The need to assess the effectiveness of local (micro scale) projects at making a measurable difference to catchment-related outcomes at the macro and meso scales is discussed in Section 6.

So thus far (and in line with international literature) the effectiveness of ICM in New Zealand as an approach to managing land and water use issues has not yet always been able to deliver measurable third order outcomes in terms of the indicators of concern.

Of the initiatives listed it seems those with measurable objectives and/or outcomes for freshwater may be in the minority, partly because few initiatives either set measurable objectives or (when they do) frame them so they are capable of being measured; and few have been in operation long enough to be able to reasonably attribute any changes in baseline indicators to the implementation of the methods adopted to achieve the objectives.

A key feature overall is the apparent lack of co-ordination of initiatives at different scales and by different groups, and hence the lack of ability to capture their outcomes in a co-ordinated way and assess their separate and combined effectiveness. This may be the biggest single area needing future attention.

Note that this does not indicate a need for formal integration or centralised control of initiatives, but for a consistent approach to their planning and funding for data capture.

The next section of this report looks more specifically at ICM effectiveness. It uses the preceding information together with existing literature and ICM plans and projects in order to assess the effectiveness of ICM and catchment related initiatives.

Two broad questions inform the discussion:

- how can we document what is being done (first and second order outcomes) and what change in institutional, iwi and community capacity and environmental bottom lines (third order outcomes) result?
- what can we do to make it easier for people to do ICM (at the macro and meso scales) and catchment-related projects (at the micro scale)?

In Sections 4 to 10 we have combined into the discussion both formal regional council macro and meso scale ICM and micro scale catchment-related projects because many of the things that have worked well, the barriers and constraints and principles of governance apply equally to both – and still more so to the need to consider them together for more effective and integrated resource management.

4. What has worked and why

Introduction and overview

This section synthesises and draws out the findings of literature and interviews on what has worked and why in two ways:

- with a summary of factors that contribute to success from in-depth local reviews
- by using case studies from several different ICM and project initiatives, included in full in Appendix H.

This discussion of catchment management effectiveness takes place in a wider context of increasing demand for water, intensifying rural land uses and deteriorating water quality in areas dominated by intensive land uses both rural and urban. MfE (2007, p261) observes that rivers in catchments that have little or no farming or urban development make up about half of the total length of New Zealand's rivers and have good water quality. Water quality is generally poorest in rivers and streams in urban and farmed catchments. Similarly, small shallow lakes surrounded by farmland have the poorest water quality of all our lakes and shallow unconfined aquifers in farmed and urban catchments commonly have high levels of nitrates and bacteria. Similarly, substantial changes in estuarine and coastal habitats are known to have occurred over the last 100 or more years and to still be occurring (Morrison et al, 2008), with estuaries around the country being a focus of concern, as indicated in Table 4.

However, as Sections 2 and 3 highlight, because ICM cannot be thought about as a single entity, it is difficult to generalise about its outcomes and effectiveness at addressing these serious issues.

The sections of this report that follow highlight once again that "effectiveness" and "what works well" have different definitions depending on the school of ICM adopted for a given programme, whether the proponents are primarily seeking ecological bottom lines or improved social processes and outcomes.

ICM programmes with a "resilient communities" focus note a number of factors that need to be in place to meet their objectives. These factors feature strongly in the subsections below, and recent literature yields growing evidence in New Zealand of good process by good people in councils and the community and effectiveness at the community interface.

ICM programmes with an "ecological bottom lines" focus also describe many of the process issues described below, and have an additional focus on robust scientific information, the judicious application of regulatory tools (as evidenced by increasing willingness to take hard decisions about regulating land and/or water use activities in order to address very serious ecological issues and water scarcity) and a growing interest in programme review and assessments of effectiveness.

The findings in this section are synthesised under headings whose terminology is consistent with overseas findings on best practice, with the discussion under each heading being informed by interview results and New Zealand literature (Allen et al 2002a and b; Tyson 2004, Allen and Kilvington 2005; Brown no date; Dodd et al 2009; Edgar 2004; Johnson and Wouters 2008; MAF 1999; Gustafson and Feeney 2008; and Phillips et al in press). Only direct quotes are attributed in the discussion.

The following headings capture the factors most commonly listed or implied as being the most critical factors for success:

- institutional alignment and engagement
- stakeholder/community engagement
- leadership and partnership
- capacity-building
- judicious regulation
- long term funding
- consideration of all four wellbeings
- collaborative monitoring and adaptive management.

Other key matters influencing good catchment outcomes are include scale and governance, which are addressed in Sections 5.1.2 and 9 respectively.

Information is also drawn from the following case studies which are included and referenced in Appendix H:

- the Sherry River
- the Taieri Trust
- six urban stream projects
- the New Zealand Landcare Trust
- the Aorere Catchment Group
- five rural sustainable land management groups.

The section concludes with a discussion about "top-down" or "bottom-up" approaches to catchment-related initiatives, and some recommendations about why the various elements of best practice have worked well.

4.1 Institutional alignment and engagement

Institutions commonly involved in both ICM and catchment-related initiatives include regional councils, territorial councils, iwi groups, university and other research agencies, the Landcare Trust, and key community or stakeholder groups such as Federated Farmers, Fish and Game and nation-wide or local environmental groups. Depending on the funding source and local issues, representatives of government agencies such as MfE, MAF, MFish and Doc may also take part.

Institutional engagement thus means communication and co-ordination between agencies and amongst their joint and several points of engagement with catchment communities, whether proactive or in response to iwi, community or sectoral initiatives.

Such teamwork is important because innovation is more likely to emerge from mixed teams, where they can share different ideas and perspectives on the problem. However, for a team to work well together and develop innovative solutions, they need time to work together and get to know each other and their respective knowledge bases. Many authors and interviewees suggest that this sort of trust can take some years to build up.

Consistent advice over time and between councils and their staff is essential. For example, some interviewees referred to complaints about farm dairy effluent systems focused on the

"moving targets" for best practice advice from council staff which has sometimes involved removing ponds which can provide useful storage during times of wet weather, maintenance of land application systems or emergency milk disposal.

Catchment-related projects will do better when they have the support of the key relevant agencies and the messages coming from their different perspectives are aligned. For example if farm advisors from Fonterra, MAF and the regional councils are giving consistent advice that is endorsed by Fish and Game, then farmers can have more confidence in adopting their advice. They can also be confident that they are meeting a wide range of government and community outcomes in so doing.

MfE's initiative in convening a working group on ICM with representatives from several government departments is thus in line with international and local best practice.

However a co-ordinated approach on the ground as well as at the strategic level is essential: numerous agencies visit farmers and other key land owners to inspect them or ask for information, so co-ordinating such visits and requests makes it more cost-effective for these land owners to interact with agencies.

Self-initiated catchment-related initiatives also find they need key agencies to become engaged in order to maximise the gains of their work. For example, the Taieri Trust identified (Tyson, 2004) that the Regional Council needed to:

- take ownership of implementation of the Trust's findings
- help the Trust look at options and feasibility of various water management initiatives
- improve information management between the Trust, other agencies and the community
- carry out research into issues and concerns raised by the Trust
- step up its implementation and enforcement of the RMA
- provide more leadership.

In another example, Barbara Stuart in her interview said the ongoing support from the Regional Council and Landcare Trust enabled the Sherry River Group to gain funding from the Sustainable Farming Fund and employ their own consultant to assist them to develop individual environmental farm plans and best management solutions tailored to the Sherry River climate.

Stuart also notes that the initial project got off to a very positive start because:

- the initial "Cows in creeks" research findings were shared by the Motueka ICM science team and discussed with landowners at farmhouse meetings
- facilitation and other coordination has been provided through the involvement from the beginning of the NZ Landcare Trust
- having this initial dialogue between council, researchers and landowners was useful to building a collaborative atmosphere from the first farmhouse meeting
- ongoing research involvement to monitor results of the new stock crossings, and then to gain an acknowledgement of that success in the subsequent "Cows out of creeks" report built and reinforced motivation for the joint approach.

However, regional councils need to have the capacity to carry out relevant research to justify setting up or getting involved in catchment-related projects and to respond to information gathered as they proceed. They may not always be able to respond in a timely

manner, though they can programme the necessary work for activities that are consistent with their funding priorities and work plans.

ICM often operates in a context of different and often competing interests, as shown by the current vigorous debates around the country on land use and its effects on water quality and allocation. Feedback from interviewees and the literature (Hooper, 2006) indicates that effective ICM decision-making occurs within an overarching resource management framework with defined objectives and investment strategies: this enables decision-making that is consensual and coordinated across the public and private interests in the catchment.

This is backed up by MAF's (1999) recommendation that in order to improve the effectiveness of sustainable land management (SLM) groups, central government needs to specify nationally applicable objectives for SLM in consultation with local government and farm communities.

Several interviewees also noted that having such support from central government would "lend strength to their arm" in promoting ICM measures that would be able to improve catchment-related outcomes.

4.2 Stakeholder/community engagement

Stakeholder and community engagement is the community dimension of institutional engagement in ICM. Good engagement depends on thorough and participatory identification of stakeholders and community interests (Allen et al 2002a); timely and appropriate contact, liaison and support; and ongoing resourcing of the institutional and community effort required for ongoing engagement.

Group and community based approaches are not new, and there are many good examples. Several social processes contribute to good engagement and while successful approaches generally have been individually tailored to encourage stakeholders' involvement in each situation, there are some common elements that make these participatory approaches work (e.g. Allen et al. 2002a, Aorere Catchment Group 2009, Phillips et al. in press), including:

- building trust
- good communication
- creating a platform to share local knowledge and skills
- creating groups, networks and alliances
- measuring and celebrating success
- having fun.

It's all about relationships – including the institutional and research support discussed in the previous section.

A key point raised by several interviewees was the vital importance of council and other facilitators understanding the business of the communities of concern. For example:

- farm liaison staff need to be able to integrate water, soil and terrestrial and aquatic ecosystem considerations with farm management systems such as stocking rates and location
- industrial pollution staff will get better uptake of suggestions if they can link their environmental requirements with business management systems and processes.

Getting local stakeholders involved in on-the-ground projects is a key element in any definition of successful ICM at all scales. This has been the basis underpinning many SMF and SFF projects, and has also been supported by many regional council initiatives. That this has worked seems to be beyond question. The range of groups that have been started over the past few years is enormous. There are landcare, dunecare, coastcare, streamcare and waicare groups in many parts of the country, as well as other successful groups such as Trees for Survival.

> 'Its is very resource-intensive for regional councils to really engage with the community – but if you want to make a difference, you must adequately resource your staff to work in partnership with the NGOs and local community – it's as simple as that.'

However, the benefits are indisputable: based on five case studies and a literature survey and overview of 19 projects, MAF (1999) found that the impacts of sustainable land management (SLM) groups "included improved relationship with councils: where the groups have been able to involve outside stakeholder groups, particularly regional councils, there have been very real benefits to both farmers and local communities. Whereas land users and regional councils were fundamentally opposed during the early years of some groups, these relationships have, over time, improved dramatically. Through the process of sitting down together and talking through issues, there has been a very helpful increase in the understanding, transparency and accountability of the councils who service rural communities and vice versa. This can provide a mechanism to initiate appropriate action when environmental issues arise" (MAF 1999).

According to MAF (1999), groups work well because their enthusiasm, fostering of debate, demonstration of new practices, and in-kind effort is likely to produce a greater and more effective impact than would farmers paying for information on a one-to-one basis. They provide an effective ready-formed means of raising awareness and discussion on a range of issues and/or providing a vehicle for education. Effectiveness is increased when the groups provide hands-on learning opportunities and can demonstrate clear benefits from new practices and groups are an important means of liaison between farmers/growers and the various agencies that have an interest in the rural community. Groups also provide a mechanism for encouraging social contact and support within rural communities. The importance of this "should not be undervalued for a sector of society that is under considerable economic pressure and experiencing the negative effects of declining services" attributable to the declining populations in rural areas.

Using hands-on involvement by group members to demonstrate new practices is much more effective than researchers or council representatives talking at people from a theoretical base. The wider the context in which issues can be demonstrated, the more effective is the transfer of ideas (MAF, 1999).

Strong motivation is necessary if a group is to enjoy widespread initial support and longevity: in one area it was the 1984/85 drought; for another it was being the first pipfruit monitor orchard plus having a whole range of technical issues requiring resolution (MAF, 1999). Other motivators (triggers or drivers as described in Table 4) include the expiry of old permits, deteriorating water quality and increased competition for water.

Many interviewees and much of the literature note the value to group-based projects of someone with expertise in group facilitation who can encourage people to work together, measure success and stay motivated. For example, MAF (1999) noted that "groups benefit greatly from having a professional co-ordinator. A good group co-ordinator must be self-motivated, prepared to do anything, have good people skills, have a wide range of expertise and knowledge, and be able to bridge the gap between farmers, policy makers, environmental groups and the wider community".

Skilled facilitation is particularly important for natural resource management given the high likelihood of dealing with conflict. To take up these challenges, interdisciplinary science approaches need to include personnel with complementary skills in the management of participation and conflict, and the integration of biophysical and social aspects of collaborative learning (Allen and Jacobson, 2009).

As the Sherry River case study in Appendix H highlights, good facilitation is key to developing the dialogue and relationships that form an integral part of catchment-based work. To gain the constructive dialogue that is highlighted as important in ICM, programmes need access to social process expertise: skilled people who understand the social processes that surround collaboration and engagement. This requires more than just great communication skills – it is also about being able to assist others with their communication, and to be able to help work through the conflict and road blocks that emerge when different stakeholders come together. Experts in social processes can work with technical experts to help plan and adapt engagement processes and to design programmes that meet the needs of the setting and the stakeholders. This holds true for horizontal engagement (agencies to agencies) as well as vertical engagement (agencies to publics).

> 'Our facilitator made all the difference. She was able to bring people together and even the "old guard" mellowed due to her listening skills. We've gone from having real problems to being a cohesive group.'

For effective engagement, this integrating work requires participation from both "decision-makers" (for example council or other agencies making funding or regulatory decisions) and "decision-takers" (the people who must abide by these decisions). As emphasised in Allen and Jacobson (2009), this requires facilitators competent in engagement processes and conflict management.

Having access to a pool of experts in social processes is important to help groups develop strong collaborative processes (particularly in the early stages of group formation) and to work through any conflict. Just as with technical people, these people do not need to be present all the time, but they should be able to help with the design of processes, and to ensure that people running programmes have adequate social process skills. If these people are left out, projects tend to get involved with just "the usual group" of people, and changes are not as effective as they could be.

Long term support is essential for these people so they don't have to waste their time looking for funding or having only a short timeframe in which to try and bring on board people, groups or agencies who are not yet ready to work in a participatory manner.

The benefits that skilled facilitation can bring lie in the social side of ICM process and can be seen through the efforts of such expertise groups such as the NZ Landcare Trust and the Resource Care or Partnership groups in regional councils.

Good communication is also crucial, with sharing of experiences by means such as newsletters, working groups, regional meetings and regularly updated materials on the web (Edgar, 2004).

The improved relationships are fostered still further by social gatherings to note key achievements, such as the mussel chowder lunch for farmers and fishers in the Motueka (see http://www.landcare.org.nz/news-features/celebration-goldenbay/).

> 'Celebrate success! Make it social and fun.' Riley 2009

It is often tempting to combine many roles in a single person but it is better to do this only after considering possible conflict and the complex mix of skills required, according to Allen at al (2002a), who observe that it is not always possible for a group member to be sufficiently withdrawn from the core of the group to act as an effective facilitator, particularly in stages of

conflict or uncertainty over group direction. Similarly, the time demands of a resource person, or the differing skill requirements of that person (such as the necessity for them to bring expert technical knowledge to the group) may preclude their having the energy or ability to act well as a chair or facilitator.

4.3 Leadership and partnership

Allen et al (2002b) and Phillips et al (in press) note the importance of good leadership and the setting of clear goals and clearly defined roles and responsibilities at the start of the process. This is also important in collaborative or partnership processes.

Many interviewees and much of the literature note the importance of expertise in strategic planning, where a facilitator needs to be able to assist groups "to establish clear objectives, outputs, extension strategies, and measures of effectiveness, which meet the needs of both the funding agencies and the farmer/grower community. Having a clear plan developed at an early stage will enable … groups to use more of their funded period to focus on achieving results. It will also provide an opportunity to ensure that activities give increased emphasis to achieving environmental benefits" (MAF, 1999).

The benefits of objectives that are clear, measurable and have widespread support among group members are very apparent (MAF, 1999): one group had a clear objective (to meet council planning requirements) and as a result it quickly became effective. In contrast, another had no clear objectives and "it took over a year for the group to get going".

In collaborative ventures and partnerships, different groups must be well-represented. For example, MAF (1999) noted that "the quality of the farmer leader (group chair) is crucial. This person must be pro-active, respected, and committed to environmental issues".

Where different groups come together, their "horizontal integration" is also identified by Bellamy et al (1999) as an issue for achieving robust ICM outcomes. Establishing strong collaborative management and operational performance relationships that are formalised in some way is essential to ensuring that they achieve their ICM responsibilities in a coordinated, strategic manner that avoids incremental, ad hoc programme delivery which may result in poorly coordinated and measured ICMP outcomes.

According to Allen et al (2002), the purpose of group leadership is to build and maintain the group and achieve its objectives. Leadership in groups can be a fluid concept. At various times in group development, different styles of leadership and types of leadership roles may be more appropriate than others and therefore all members of a group may have a leadership role at some time. However leadership is defined, there are characteristics common to effective leaders, including:

- a sense of responsibility for the group in all its facets (human, financial, task accomplishment) – that is, administrative as well as people skills
- being a risk taker and accepting the risks to maintain strong direction within the group
- being able to communicate clearly the goals and objectives
- using a leadership style appropriate to the situation, and which encourages support and cooperation from the members
- performing to a high personal standard as an example to promote high standards within the group.

Good leadership leads to a good group dynamic, where members demonstrate a strong sense of purpose, and tasks are carried out enthusiastically. It is associated with a high rate

of attendance at meetings and members who are willing to take on increasing levels of responsibility and more- complex tasks (ibid).

4.4 Capacity building

Allen and Jacobson (2009) note that while researchers and policymakers tend to concentrate on the environmental outcomes sought, it is easy to forget that much of the challenge of implementing integrated management within these wider situations lies in promoting change in the behaviour of the different user-groups, departments and even wider communities. The degree of change reflects their capacity for change.

"Capacity" can thus be seen (Allen et al, 2002a) as the ability to make a difference over time and across different issues: it includes task-related factors such as individual and group awareness, abilities and skills; and process-related factors such as support, networking and trust.

Capacity building also incorporates not only human resource development but also intra-organisational and institutional development (Heslop and Hunter, 2007). Shown in Figure 3, a capacity building framework was developed that drew on the work of Brown (2004) and Wakely (1997), as follows:

- human resource development is the process of equipping people with the understanding and skills, and access to information and knowledge to perform effectively. To achieve this the organisational environment must be dynamic and responsive
- organisational development is the process by which things get done collectively within an organisation (intra-organisational). The increasing demand for more flexible and responsive management styles calls for new and very different organisational structures and relationships, particularly within local government. It also calls for new relationships between different organisations (inter-organisational) that have a role of sustainable development. These changes need to be supported by institutional development as it is beyond the capacity of any single organisation or network of organisations to achieve
- institutional development is the legal and regulatory changes that have to be made in order to enable organisations and agencies at all levels and in all sectors to enhance their capacities. Such institutional issues generally need the political and legislative authority of national government to bring about effective change (Wakely 1997). Brown et al (2005) refer to this area of capacity building as external (inter-agency) institutional rules and incentives.

Capacity building for the community and professionals has been identified by the Global Water Partnership (2000) as a critical area that requires further effort, and in the Auckland Region, the ARC has long recognised the need to build the capacity of the ICM sector generally to prepare, implement and monitor ICMPs in terms of both technical skills and intra- and inter-organisational capacity.

Capacity can also include attracting enough people into the relevant professions, a key issue with the "greying" of the workforce in critical professions (including engineering) identified by many agencies including New Zealand's EEO Trust (2009).

There is a shortage of core skills required to effect ICM in New Zealand, at all levels of governance and implementation. Each local government body must come up with its own policy and regulation related to ICM, requiring experience, resourcing and skills that not all local governments have access to. Often stakeholders lack the skills and experience to engage meaningfully in the full dialogue expected of them in this field. There is also a shortage of skills in the facilitation and conflict management needed to help communities engage in ICM at a local level. If ICM is to reach its potential as an effective water quality tool, capacity issues need to be addressed.

Many interviewees and the literature describe the need for independent, consistent and long term funding to support the community facilitation and administration components of ICM. They point to the long timeframe required to establish trust, relationships and momentum among stakeholders, as well as to achieve measurable outcomes in the environment. This is all at risk if the funding stream is not long-term. ICM therefore requires long-term and stable commitment if it is to reach its potential.

> 'People are too busy to be volunteers.'
>
> 'You have to be there for a long time to earn your community's trust – then you can say, "We believe we have an issue here, let's do something about it together" and they'll work with you.'

There are also costs associated with changing farming and other key land use practices and these need to be faced in order that the regulator and community can make decisions about how they are paid for. Volunteerism and small budgets will not resolve the water quality and allocation problems in New Zealand. Both regulatory and non-regulatory approaches need enough time and money directed to the right (i.e. prioritised on the basis of good data) issues. There is more on funding in Section 6.1.5.

Iwi and community capacity are further aspects.

Some interviewees commented on the specific requirements to support iwi/hapu in their growing role in collaborative management through the Treaty Settlement process. The Motueka ICM researchers have concluded that iwi-led and iwi-issue-driven collaborative projects are an important incubator for building capacity for iwi and hapu researchers, scientists and stakeholders, and contribute to building strong long-term iwi–science partnerships and increase iwi engagement and interaction in ICM science objectives. They also facilitate a move towards transdisciplinary research where knowledge is created, discussed, and understood from various world-views.

Capacity building is particularly important for community-based ICM participants, practitioners, agencies and technicians (Bellamy et al, 1999) and should be an ongoing process throughout the lifespan of the ICM process as the planning and management needs and outcomes mature. Capacity building may occur either as direct, targeted extension or education programmes, or more organically through direct contact between experts and non-experts.

Where communities are resourced to take part in ICM-related activities, a number of beneficial capacity outcomes can be expected, including those identified by Brown (2006a):

- inclusive participation and active involvement in groups and networks is maintained
- on-going learning, skills development and training is supported
- access to and use of technical information is improved
- institutions are aligned to regional sustainability.

Effective groups often do very well at creating awareness, information sharing and better relationships in their local catchments and can go on to catalyse a range of catchment-based projects (Tyson, 2004).

A key part of any capacity building programme is easy access to information and this is discussed in Section 6.1.4.

An often overlooked component of capacity building is the need to incorporate succession planning for ICM community representatives and institutional staff (Bellamy et al, 1999). This is driven by the recognition of "burn out", particularly by community based ICM

participants who are often very community-minded and heavily engaged in multiple participatory roles.

Succession planning is equally important for public and private sector technical experts, especially where organisational restructuring and ageing workforces conspire to remove respected practitioners from ICM practice.

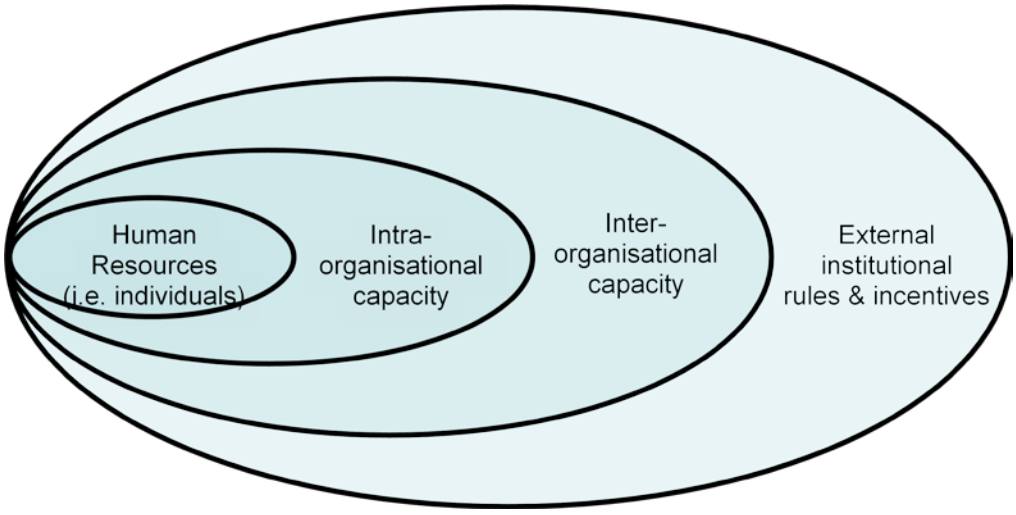
In cases of both burnout and staff turnover, the use of alternative or proxy participants in the capacity building process will mean (Bellamy et al, 1999) that there is minimal loss of progress if critical participants step away from the ICM process at any time.

Capacity building is also a two-way process, whereby technical or policy experts pass knowledge to political leaders, industry, iwi, NGO participants, individuals and the broader community but that knowledge is also transferred from these "non-technical" participants back to the technical experts.

If ICM is to proceed down the partnership/collaborative path, it will increasingly need to focus on building the capacity of people to take part through a range of mechanisms that work for them.

Figure 3 A capacity building framework

Source: Heslop and Hunter, 2007 (adapted from Brown et al, 2005)



Heslop and Hunter informed their capacity building framework by working with case study councils to identify:

- approaches used to upskill individuals
- processes used within the councils to strengthen organisational capacity
- processes used by councils to build capacity externally
- ways in which councils work together to share resources and learnings
- the range of policy tools – their development, integration and implementation.

Taking the example of promoting low impact urban design and development (LIUDD, which may be seen as a part of ICM), capacity building initiatives to support change in one of the case study councils included:

- a process of communicating the need for change both internally and externally
- focusing on developing good working relationships with key stakeholders such as the development community and environmental groups
- undertaking communications training for staff – this assisted the dialogue process during the process of changing the Code, and also assists in implementing the new approach by equipping individuals with the skills to work more effectively with external stakeholders to find common agreement on approaches
- training sessions for internal and external personnel, including in the principles of urban design. This joint training also helped to build inter-organisational capacity
- inviting speakers to talk about LIUDD for both internal and external audiences
- establishing new internal processes, such as the Design and Review Process, that support internal communication and strengthen the ability of staff to work together
- supporting an organisational culture of collaboration where staff are encouraged to work together and talk about issues that cross departmental boundaries
- including cross-team expectations and requirements in all job descriptions
- notifying a series of changes to the District Plan to reinforce the new approach to subdivision and development.

An analysis of six urban ICM projects in Auckland (Tiffany Bush, Friends of the Oakley and Whau Creeks, KERP (Kaipatiki Ecological Restoration Project), Tamaki Estuary Protection Society and Project Twin Streams – Scott, 2007) found that factors that enhanced community engagement in group activities and building group capacity and partnerships with local government and industry are closely linked. Factors identified as critical to successful capacity building included:

- leadership (political or organisational)
- targeted planning and communication
- a willingness to identify and engage existing community organisations
- adequate resourcing, knowledge and skills of the sponsor organisation and its personnel
- flexibility and creativity to engage the community's different motivations for participation
- local projects that give regular opportunities for people to connect with and become involved with caring for their local area.

The analysis (Scott, 2007) showed that groups had built varying levels of working relationships with councils, from participation in consultation processes to active partnerships on catchment management. The analysis also highlighted that the availability of resources is an aspect of capacity that was critical for building effective partnerships with local government.

4.5 Judicious regulation

For achieving measurable ecological objectives, effective and targeted regulation is regarded by most of the interviewees and international literature as an essential component of ICM and the framework within which all voluntary initiatives are supported.

The overarching integrative vehicles for achieving all the outcomes sought by central, regional and territorial government, sector and environmental interests and communities are national and regional policy statements and other national requirements. While national and regional policies are not enforceable in themselves, they do inform the development of regional and district plans, which have enforceable provisions, and also of enforceable bylaws and resource consents. While proactive land use controls in district plans based on land use capability and water body sensitivity are the ideal, this is not always possible in a timely way, as land use change can happen much more quickly than the RMA processes allow.

While ICM is a non-statutory process, it results in the development of a suite of methods to address catchment issues, and these often include statutory methods under the RMA or LGA such as resource consents or the provision of built assets.

Regulated sectors understandably see that "rules and regulations have a place but should only be used as a last resort and only where there are adequate resources to ensure compliance" and "externalities … which need to be addressed" (MAF 1999). The "threat of possible regulation is often all that is needed to bring home the economic impact to farmers and cause them to change their behaviour" (MAF 1999).

There is more on regulating farmers in Section 6.6.2 and Appendix H, but in brief, MAF (1999) found that:

- there is very little support for the use of regulations from farmers, professionals, or agribusiness: farmers "know that" regulations are inefficient as a means of engendering changes in behaviour because of the wide differences in circumstances between farms
- despite this, regulation is needed as a safety net to ensure that environmental baselines are met. Before regulations are imposed, central and local government needs to educate and research the issue in partnership with farmers and the rural communities
- regulation should only be considered where the environmental benefit or cost relates to someone other than the farmer, i.e. where there are externalities. Where the cost or benefit accrues to the land-user the voluntary approach coupled with education and demonstration is likely to be a more cost-effective approach. The groups are a source of practical self-regulation as alternatives to regulation.

In any case, regulation is best introduced as part of a community consultation process aimed at allowing communities to reach shared understandings of the issues and management options. It is usually supported by a range of voluntary or supporting methods including grants and other forms of assistance to landowners, such as farm planning advice, funds or resources for riparian planting, educational materials about point source urban or rural pollution control and the like.

However, the Auckland Regional Council in its 2009 state of the region report noted (p296) that "Many of the negative trends highlighted in this report occur despite regulatory efforts by the ARC and other authorities. This illustrates that while regulation is important (and has probably been critical to arresting decline in the state of some natural resources) the mitigation of impacts possible through individual consent practices is limited. In reality, consented activities will still contribute to many of the environmental problems we face. This means that effective environmental management will always require more than simply requiring, considering, issuing and enforcing consents for individual activities. It will require

careful planning (where trade-offs are made at a higher level), community and landowner engagement, public investment, inducements and initiatives. In doing so, we must carefully consider where the costs and benefits for these types of interventions lie to ensure that they are fairly and equitably allocated between the public and private sectors, without loading costs onto future generations."

4.6 Long term funding

The level of funding depends on whether work is being done at the macro, meso or micro scale, but both need a commitment over appropriate timeframes in order to fully engage public and private sector participants and deliver measurable outcomes.

Macro and meso scale ICM requires sustained financial investment in financial and human resources over the planning, implementation and review phases (Bellamy et al, 1999). Funding is often provided over a five to seven year timeframe, whereas perceptible changes to resource condition often occur on much longer timeframes (for example 20-50 years or more). The success of ICM is therefore susceptible to changes in funding arrangements and may be subject to political timeframes. Securing long-term commitment by government and community investors is therefore essential for ICM to succeed (Bellamy et al, 1999), or there is a risk that funding may be jeopardised unless funding bodies explicitly recognise that ICM outcomes may occur over longer timeframes.

At the micro scale, MAF (1999) found that the effectiveness of the groups seemed to be related more to group structure and approach than to the amount of funding received, but that their research indicated that a minimum of $25,000 per annum is required to run a group effectively.

Also at the micro scale, Brown (no date) for the Aorere Catchment Group observed that the "funding timeframe needs to be extended beyond six years. Increased awareness of sustainability issues is happening, but changes in behaviour take time and observable changes in the environment can take much longer. Experience to date suggests that it takes up to three years to establish a functioning group and a further three years to achieve tangible environmental outputs. Thereafter environmental outcomes become apparent over the next 20-30 years. Funding is needed over this latter period to monitor the changes and feed this information back into the process."

However funding can include the use of financial tools both positive and negative. Financial incentives were seen as the most effective way of encouraging change, particularly when economic risk is high (e.g. subsidies for tree planting on hill country). All groups see the need to protect vulnerable areas but this comes at a cost. Fencing riparian strips or areas of bush, or planting trees to protect against tunnel and gully erosion can be expensive while providing no economic return. Effective measures to assist with meeting or reducing these costs (e.g. subsidies on materials, rate rebates) would encourage an uptake of these practices (MAF, 1999).

As the experience in the Mahurangi shows (Morresey et al, 2010), councils are seen by communities as "being there for the long haul". Although the Auckland Regional Council had initiated the Mahurangi Action Plan as a five-year funded project with the aim of handing it over to the community at the end, it found there was no such thing as "the community" of the catchment. Together the council and the community realised the best results would be gained from developing a long term working relationship for the future and are currently engaged in jointly developing a 20-year strategic plan for the catchment and harbour.

This has implications for both ICM in the formal regional sense as well as for local catchment-related projects (see also Section 10 for more discussion on this topic). While seed or set-up funding can help get things started, few people in rural or urban communities

can remain solely responsible for long-lived programmes without the long term support of their catchment managers – the regional councils.

Through their ten-year work programmes and funding processes in the long term council community plan (LTCCP), they can justify expenditure and capture the funding they need, including that needed for working with the other relevant institutions and to enable the community to work with them (refer also Section 6.1.5).

A particular need is for more explicit and targeting funding of monitoring, including of regional councils' capacity to monitor the interventions and outcomes of other agencies engaged in initiatives that contribute to beneficial outcomes in catchments. Similar funding of plan, programme and project reviews is also vital.

Other elements of funding programmes identified by MAF (1999) for sustainable land management groups included:

- contestable and transparent funding, with SFF funding criteria negotiated on a local level to ensure particular community priorities are not subsumed by national imperatives
- clearer environmental objectives, outcomes and monitoring methods as part of SMF funding approval, which need to be simple and easily applied.

4.7 The four wellbeings

The four wellbeings – social, economic, cultural and environmental – are core to the RMA and LGA, as well as other catchment-related legislation. One aspect of "integrated" catchment and coastal planning and management is addressing a diverse array of variables across all four wellbeings.

ICM has a greater chance of success if socio-economic issues have been identified during the planning process and acknowledged and accepted by the community, and more research/data is often required to identify these socio-economic issues (Bellamy et al, 1999).

Community and internal/external stakeholder and iwi engagement can help catchment managers to identify, prioritise and monitor catchment issues, management options and community outcomes across all four wellbeings.

Multi-criteria analysis is routinely used by council asset managers and engineers to ensure that all four wellbeings are considered. However, they "have knowledge about many diverse issues but when they make decisions they have an understandable tendency to focus on their primary sphere of responsibility. Other stakeholders … can be encouraged to provide their experiences and knowledge of other bottom lines and community outcomes" (Feeney et al, 2007).

Councils working with communities also need to realise that they may need to help people address concerns not necessarily germane to the catchment issue in order to establish good working relationships – for example having to deal with long-standing wheelie-bin problems associated with an apartment block before being able to engage the residents in stream restoration (Heijs, 2010; Campbell et al, 2010).

In order to improve effectiveness of sustainable land management groups, MAF (1999) recommended that their goals should tie together economic and environmental sustainability objectives, in order that these objectives mutually reinforce one-another. It also stated that "environmental sustainability should not be compromised in the quest to improve the financial viability of farms or orchards".

MAF also noted that funding agencies and group initiators should recognise that land-users are more likely to adopt better environmental practices where they can see a clear benefit (short, medium or long-term) to the economic sustainability of their operation and that objectives and activities should make a clear link between environmental and economic benefits.

Explicitly addressing all four wellbeings is thus an important contributor to effective ICM at all scales.

4.8 Collaborative monitoring for adaptive management

The importance of having a programme of monitoring and evaluation that encourages learning and adaptation amongst project participants and includes communication with other catchment projects was put forward as a key underpinning ICM element by Mike Dodd and colleagues (2009). As Johnson and Wouters (2008) point out, an example of this is where stakeholders are involved in active learning through an iterative process of collaboratively creating an action plan, implementing the action plan, gathering data, reflecting on the success of the actions and, finally, using lessons learnt during the process to redesign their action plan.

The Sherrry River example in Appendix H shows how monitoring can lead to action to address an issue, and towards an empowered group of stakeholders keen to find out more to continue an adaptive management process.

New tools for iwi environmental monitoring (see Section 3.6) open up additional ways for iwi engagement in ICM.

However, agencies need to understand the many different values of community-based monitoring programmes and may have to take a more active role in capacity-building. Comments on these from responsible agencies often indicate that while it's "nice" that people get out and do this monitoring and learn more about the environment and become vigilant "watchdogs", they sometimes add that "we can't rely on the data because we don't have any quality control over it".

Adaptive management is key to the success of ICM programmes and monitoring is key to adaptive management. As Gustafson and Feeney (2008) found from an international literature review: "institutional arrangements (such as the roles and responsibilities of various governments; their agencies; private sector investors and participants including industry, non-government organisations; and the broader community) must be able to adapt to changing conditions e.g. economic, environmental, social and political. Management plans and their implementation need to incorporate sufficient flexibility to adapt to new information, new scientific findings, changing legal and political landscapes and evolving resource and funding arrangements."

The quality planning website has a great deal of excellent information about best practice integrated monitoring that is readily applicable to ICM, based on real case studies of inter-agency monitoring.

4.9 "Top-down" and "bottom-up" approaches

Ian Brown (2006) has reviewed the effectiveness of catchment-wide (ICM) and individual land-owner initiatives (Environmental Farm Plans, or EFPs) separately and together. Although we had access only to a draft report, the findings are very interesting and are summarised below.

The work involved a desktop review of the effectiveness of EFP and ICM programmes with the following terms of reference.

i. To clearly define what EFP and ICM programmes are and what the expected outcomes of the respective programmes are.

ii. To identify the rate of change achieved through EFP and ICM programmes and any gains in environmental outcomes.

iii. To compare the relative effectiveness and benefits of EFP and ICM programmes

iv. To undertake an assessment as to what EFP and ICM programmes can realistically be expected to deliver.

EFPs and ICM were both defined as methods of achieving voluntary change to reduce the impacts of land management activities on natural resources, with their success depending on the rate of uptake and the implementation of participating land users:

- EFPs (that is, micro scale initiatives) range in complexity and sophistication from the simplest, which provide a list of recommended environmental works to be completed, to the most complex which model the effects on the whole farm business and the viability of activities implemented to address environmental issues
- ICM (macro and meso scale) typically involves all stakeholders in a river catchment working together to identify concerns, obtain information on the areas of concern and formulate agreed action plans to achieve agreed environmental gains.

Differences between the two approaches are apparent in terms of scale, complexity of issues addressed, the approach to implementation, plan preparation and the focus on physical works. Despite these differences there is also a lot of common ground particularly in relation to the desired outcomes.

Brown's comments on the difficulties of finding good formative and summative data to evaluate the effectiveness of EFPs and ICM reflect our own findings and those of other reports and are included in Sections 6.3 and 6.4.

His review found that both the environmental farm planning and integrated catchment management approaches have their merits. What is less clear is the relative effectiveness of the two approaches.

Brown therefore assessed the separate and combined effectiveness of on-farm plans (micro scale) and ICM (macro and meso scale) in terms of their effectiveness at achieving programme outcomes, and the results are summarised in Table 6.

For each of the programmes he reviewed, Brown provided a 1-3 rating against each of the programme outcomes in terms of effectiveness of the approach as a means of achieving the particular outcome. The rating used was a qualitative assessment:

1 = limited effectiveness as a means of achieving outcome

2 = moderately effective as a means of achieving outcome

3 = very effective as a means of achieving outcome.

The analysis is based on a reading of the literature of examples of programmes that have been successful in achieving one or more of the programme outcomes. It assumes that the respective programmes are well managed and all of the steps that are necessary for the programme to succeed are taken.

It is acknowledged that this type of analysis will always be open for debate and that examples exist that are exceptions to the ratings given. Nevertheless the table does demonstrate the areas of strength of the respective programmes.

Table 6 Comparing effectiveness of micro with macro/meso initiatives

Programme outcomes	EFP	ICM	Both
Strong partnerships developed between stakeholders	1	2	3
Community lifestyle maintained or improved	1	3	3
Improved social harmony and reduced conflict on environmental issues	1	2	3
Cultural values recognised and protected	1	2	3
Costs and benefits of resource management shared equitably	1	2	3
Inclusive participation and active involvement in groups is maintained.	1	3	3
Water quality and ecosystem health at or above level set through community	1	2	3
Environmental flow requirements of streams maintained.	1	2	3
Biodiversity values recognised and maintained and/or enhanced.	2	2	3
Economic viability of enterprises and industries is improved	2	1	2
Infrastructural assets protected and damage from adverse events minimised	2	1	3
On-going learning, skills development and training is supported	2	3	3
Access to and use of technical information is improved.	2	3	3
Institutions are aligned to regional sustainability.	2	3	3
Areas of high erosion risk land protected.	2	1	3
Off-site environmental impacts of activities minimised.	2	1	3
Water leaving property at/above the standard of that entering the property.	2	1	3
On-farm lifestyle maintained or improved	3	1	3
Soil condition and health maintained and/or enhanced	3	1	3

The table demonstrates that the strength of the EFP approach is in the achievement of on-farm works that lead to improvement in environmental condition. This is not surprising given that the land user has a direct interest in the outcome and in maintaining and/or enhancing their asset, and as Brown notes, many assessments demonstrate that significant gains can be made at the property level. The first question this raises is, are these gains sufficient to meet the catchment outcomes?

In order to start answering this question, Brown notes that the table demonstrates that the real strength of the ICM approach is in relation to social outcomes (this is also noted by other authors reviewed in this report), where the community-based approach has proved successful in creating awareness and creating a good deal of acceptance of the landcare ethic. It enables information and resources to be shared. It also has the strength in that it recognises local knowledge and enables farmers to set their own priorities and strategies. The landcare ethic is one of the cornerstones underpinning the ICM approach.

The second question this raises is (as discussed in Section 2.2.1 of this report on the "ecological bottom lines" and "community resilience" approaches to ICM), "are these social outcome gains, (ie improvement in awareness of the issues, development of partnerships etc), leading to changes on the ground – that is, in measurable catchment outcomes?"

Information from projects such as the Wairarapa erosion control programme (and the Whaingaroa ICM project at Raglan) would suggest that at least some of them are. However, some programmes report on the ground gains in some areas of the programme (e.g. stream enhancement plantings), but, he says, (p19) "these are not necessarily the gains that will lead to significant improvements in overall catchment outcomes. Most programmes give no indication as to whether environmental outcome gains have been made."

Brown (2006a) cites the Lake Tutira catchment in Hawkes Bay as an example that points to some deficiencies in the individual property plan approach without the wider catchment perspective: King and Brown (1991) found that while significant gains could be made in reducing the erosion risk by planting on individual properties, property size and farm viability considerations were "always going to constrain" gains at the catchment level.

He concludes that the fact that the outcomes for EFP and ICM programmes are similar, albeit operating on different scales, suggests that the two concepts are not necessarily mutually exclusive but rather are complementary: they are in effect "tools" in the same toolbox which can be adapted to a particular situation. He notes that many ICM examples provided in the literature actually include an EFP component and good reasons can be found to suggest why in many instances a complementary approach is preferable to a single plan approach.

Brown thus asserts that one of the most important inferences from the table is (p19) "that the most comprehensive outcome gains can be made through a combination approach involving individual environmental farm plans set within an ICM framework".

This finding is likely to apply to micro scale initiatives for other land uses and activities that take place within a macro or meso scale catchment programme.

4.10 Themes and ways forward

It can be seen that many of the elements of success discussed above are closely related to each other.

The preceding discussion also yields growing evidence in New Zealand of:

- good process by good people in councils and the community
- a great deal more about effectiveness at the community interface
- a growing interest in programme review and assessments of effectiveness
- increasing willingness to take hard decisions about regulating land and/or water use activities in order to address very serious ecological issues and water scarcity.

This indicates that practitioners and stakeholders are growing in confidence with ICM processes, although does not in itself mean that ICM initiatives are yet delivering measurably improved ecological outcomes.

The sections of this report that follow highlight once again that "effectiveness" and "what works well" have different definitions depending on the school of ICM adopted for a given programme, whether the proponents are primarily seeking ecological bottom lines or improved social processes and outcomes.

Those ICM programmes with a "resilient communities" focus note a number of factors that need to be in place to meet their objectives. These factors feature strongly in the subsections below, and recent literature yields growing evidence in New Zealand of good

process by good people in councils and the community and effectiveness at the community interface.

ICM programmes with an "ecological bottom lines" focus also describe many of the process issues described below, and have an additional focus on robust scientific information, the judicious application of regulatory tools (as evidenced by increasing willingness to take hard decisions about regulating land and/or water use activities in order to address very serious ecological issues and water scarcity) and a growing interest in programme review and assessments of effectiveness.

Institutional engagement means communication and co-ordination between agencies and of their joint and several points of engagement with catchment communities, whether proactive or in response to iwi, community or sectoral initiatives. This is important because catchment-related initiatives are more effective when:

- they have the support of the key relevant agencies
- the messages and information coming from their different perspectives are aligned
- ICM decision-making occurs within an overarching resource management framework with defined objectives and investment strategies: this enables decision-making that is consensual and coordinated across the public and private interests in the catchment
- such a framework, provided by government, supports catchment managers and communities in making difficult decisions.

Stakeholder and community engagement is the community dimension of institutional engagement in ICM. Trust will arise out of good communication and shared understandings of different needs and points of view. This is important because catchment-related initiatives at all scales (macro, meso and micro) are more effective when:

- local stakeholders are involved in on-the-ground projects
- groups are supported by good facilitation, which is key to developing dialogue and relationships and working through the conflict and road blocks that emerge when different stakeholders come together
- good communication is enabled amongst people and groups
- social gatherings allow everyone to have fun and celebrate success.

Good leadership, including of collaborative or partnership processes, is important because catchment-related initiatives are more effective when:

- clear goals and roles are set at the start of the process
- different groups have effective representatives
- group leaders build and maintain groups so they can stay motivated to achieve their objectives.

Capacity-building is vital because much of the challenge of implementing integrated management lies in promoting change in the behaviour of the different parts of the respective agancies, different user groups and wider communities. Factors that enhance community engagement in group activities and building group capacity and partnerships with local government and industry are closely linked. Catchment-related initiatives often have to last a long time, so this is important because they are more effective when:

- adequate provision (amount and duration) of resources is made for the development of people and organisations

- iwi and communities are supported in their capacity to take part in ICM processes
- succession planning is considered for ICM community representatives and agency staff, who can easily "burn out", as well as for public and private sector technical experts who may move on as a result of organisational change
- capacity building is recognised as a two-way process, whereby technical or policy experts pass knowledge to political leaders, industry, NGO participants, individuals and the broader community but that knowledge is also transferred from these “non-technical” participants back to the technical experts. This also encourages transdisciplinary research, where knowledge is created, discussed, and understood from various world-views – thus promoting the harmony and longevity of ICM initiatives.

Judicious regulation is regarded by most of the interviewees and international literature as an essential component of ICM. This is important because catchment-related initiatives are more effective when regulation:

- is introduced as part of a community consultation process aimed at allowing communities to reach shared understandings of the issues and management options
- provides a framework within which a range of voluntary or supporting methods are provided to help achieve measurable ecological objectives.

Long term funding promotes more effective catchment-related initiatives because:

- the macro and meso scale ICM requires sustained financial investment in financial and human resources over the planning, implementation and review phases, yet funding is often provided over a five to seven year timeframe, when perceptible changes to resource condition often occur on much longer timeframes (for example 20-50 years or more)
- at the micro scale, experience suggests it takes up to three years to establish a functioning group and a further three years to achieve tangible environmental outputs, while environmental outcomes become apparent over the next 20-30 years, so funding is needed over this latter period to monitor the changes and feed this information back into the process
- seed or set-up funding can help get things started, but few people in rural or urban communities can remain solely responsible for long-lived programmes without the long term support of their catchment managers – the regional councils
- explicit long term funding of monitoring and review will support regional councils’ capacity to monitor the interventions and outcomes of other agencies engaged in initiatives that contribute to beneficial outcomes in catchments.

The four wellbeings – social, economic, cultural and environmental – are becoming more important. Catchment-related initiatives are more effective when:

- socio-economic issues have been identified during the planning process and acknowledged and accepted by the community
- community and internal/external stakeholder engagement helps catchment managers to identify, prioritise and monitor catchment issues, management options and community outcomes across all four wellbeings
- catchment management goals tie together economic and environmental sustainability objectives
- land-users can see a clear benefit (short, medium or long-term) to the economic sustainability of their operation and objectives and activities make a clear link between environmental and economic benefits.

Collaborative monitoring promotes adaptive management. This promotes more effective catchment initiatives because:

- it encourages learning and adaptation amongst project participants and communication with other catchment projects
- it leads to an empowered group of stakeholders keen to find out more to continue an adaptive management process
- monitoring is key to adaptive management and adaptive management is key to effective ICM.

"Top down" together with "bottom up" approaches promote more effective catchment-related initiatives because:

- the strength of the on-site approach is in the implfementation on-site works that lead to improvement in urban and/or rural environmental condition
- the strength of the ICM approach is in relation to social outcomes, where the community-based approach has proved successful in creating awareness and creating a good deal of acceptance of the "care" ethic
- the most comprehensive outcome gains can be made through a combination approach involving individual land owner action set within a strategic ICM framework.

These and similar findings can help make it easier for people and agencies planning programmes and projects at a range of scales to catchment-related interventions to both be – and be documented as being – more effective.

5. Barriers to development and adoption of catchment-related initiatives

Introduction and overview

This section draws upon literature and interviews to identify the barriers to the development and adoption of ICM approaches.

Strictly speaking, a barrier would be defined as a "thing that totally prevents something from happening or means it comes to an end earlier than anticipated" – which may mean we hear little or nothing about them. In practice and as a result of different people's terminology, barriers will overlap with constraints, so there is a porous divide between this section and the next.

Barriers have been comprehensively identified in international and local literature, indicating that understanding of best practice in helping and facilitating communities has been well-developed for the last twenty-odd years (see for example Allen et al, 2002a).

Barriers thus appear to relate more to the capacity of ICM and project managers to access best practice information and the funding and other resources to apply it.

Many barriers are the "other face" of the elements of effective ICM discussed in the preceding section. This is especially so at the macro and meso scales where it becomes more important to gain wider intra- and inter-institutional, stakeholder and community engagement, leadership, partnership, regulation and long term funding up front in the "plan" phase.

These things are also important at the micro scale but may be less likely to prevent the setting up of a catchment-related initiative, especially by a local enthusiast.

Along with lack of consideration of all four wellbeings and provision for or carrying out of monitoring and adaptive management, the weakness or absence of these elements also act as constraints to effective ICM and are discussed in Section 6.

The barriers identified broadly relate to the "plan" phase of the planning cycle, as it is here that things are more likely to pose a barrier to getting to "first base", as the development and adoption of macro or meso scale catchment initiatives are the necessary precursors to their implementation.

While barriers may crop up at the "do", "check" and "review" phases, they are discussed in the next section as constraints. For example, there is wide recognition of what needs to be done, including monitoring and review, and while some attempt will usually be made to provide for these, political and capacity issues may constrain the level of effort able to be invested.

Barriers are listed under the headings below:

- the problem of integration
    - concepts
    - capacity
    - co-ordination
- the problems of scale (big areas, big problems)
- the problem of time
- institutional capacity barriers.

Funding is discussed in Section 6 as a constraint rather than a barrier: some initiatives may never get off the ground due to lack of funding, but in many cases some funding can be accessed for a shorter time or narrower version of the original project.

5.1 The problem of integration

5.1.1 Concepts

ICM is a conceptual view of land and water management that several interviewees noted sits well with Maori understanding and other holistic approaches. However, the ICM literature and practice we reviewed across New Zealand make it clear that not all programmes and projects that are described as ICM meet commonly accepted criteria for "integrated" catchment management (such as those listed in the definition used for this project), nor do all ICM practitioners share the view that these criteria are achievable, necessary or even ideal ICM qualities.

This mirrors the global debate on integrated water resource or river basin management.

Everyone interviewed for this project described their work as being "about integration" – yet even among the self-identified ICM programmes in New Zealand, there is little consistency about what "integrated" means.

The fundamental component of catchment management is the integrated management of the effects of land use on water.

Based on people's responses and the local and international literature surveyed, the degree of integration around the activities associated with the management of the effects of land use on water can also include one or more of the following, which could be considered under items 1-5 listed in the "planning" phase (1.1) of Table 3:

- all relevant sectors and stakeholders in a catchment (e.g. health and employment)
- integration between iwi/hapu and various levels of government
- integration of the "silos" within a unit of local government
- engagement of a variety of central government departments
- vertical integration down decision-making levels (central, regional, local)
- integration of the planning, engineering and various scientific disciplines
- the linking of policy, action and science
- integrating the objectives of the community with those of local government
- integrating "bottom-up" with "top-down" initiatives
- integrating issues, solutions and actions across multiple agencies and communities
- integrating regulatory with a wide range of non-regulatory methods
- integrated management across mean high water springs to include outcomes in the saline receiving environments that fresh waters ultimately enter
- assessing management options and outcomes across all four wellbeings of both the Resource Management and Local Government Acts (RMA and LGA)
- integrating methods and outcomes under both the RMA and LGA
- integrating outcomes under related legislation such as for conservation, biodiversity, biosecurity, natural and cultural heritage and fisheries management
- integrated data collection and geospatial capture of the range of initiatives under way.

However as indicated in Section 3.2.5, many interviewees saw the practical difficulties of incorporating even some of these aspects as a barrier to genuinely "integrated" catchment management.

> 'It's impossible to integrate everything. If you try to do everything you will fail. Conversely if you tackle just one in isolation will also fail.'

> 'The river is the integrating mechanism. The river is where we set our objectives and targets. We have our definition of ecological objectives. The community has social and economic objectives. The purpose of the ICM is to generate a set of actions that achieves all three objectives.'

In sum:

- the issue is that the term "integrated" poses a barrier to the comparability of catchment-related initiatives, probably more than to the practice of catchment management itself
- the implication is that it is difficult to "compare apples with apples" when the term "integrated" is used to describe initiatives that many people would not call ICM, and is not used to describe others that many would call ICM
- what would make it easier for people to do more effective ICM?
    - semantic problems like this are very difficult to overcome, but the terminology adopted in Section 2.1 and Section 3 may help people to use the terms more consistently, namely CMPs and ICMPs at the macro and meso "catchment" scales; and catchment-related initiatives at the "project" level and the micro scale defined in Section 3, as well as nation-wide programmes
    - the list in this subsection of things that can be integrated may encourage people to consider what aspects of integration are relevant to their proposal, and to be more explicit about them. Some may be already included but only implicitly, while a prompt may encourage others to be accommodated for low marginal effort. Integration across MHWS[2] and all four wellbeings are two examples which are already effectively required by legislation.

5.1.2 Capacity

There is a range of beliefs about what is desirable and practical. Those supportive of extensive integration believe that fresh water management is linked to multiple components of people's lives and therefore needs to be integrated into each of these levels for anything meaningful to eventuate. Others however felt that extensive integration is impractical and leads to project impasse.

> 'This project was easy – we had few stakeholders, it was less diverse and over a small area. It's when you add more and more areas that it gets complex. Too complex.'

All those interviewed stated that it was essential to ensure all divisions of a council were engaged in ICM programmes to ensure consistency of planning, policy and resource allocation.

There are however real constraints on the capacity of councils and communities to integrate several issues into one catchment plan. For example, Environment BOP researched the issues facing the Tauranga Harbour (Lawrie 2006) and found that sedimentation was the most serious and pressing, so has set up a catchment management process to address it.

The council may well find that having made successful inroads with the issue will provide a robust platform for pursuing the other issues, singly or together, over time.

[2] While there are exceptions around river mouths about where the coastal marine area (CMA) begins, for the sake of simplicity, this report will use MHWS to indicate the jurisdictional boundary dividing coastal areas off from land management.

In sum:

- the issue is that councils and other agencies may have a very clear understanding of the concepts and need for "integrated" catchment management but be daunted by it, or not have or be able to acquire the capacity to capture the resources (first order outcomes) needed to do it. This relates to the capacity matters considered in Section 1.3 of the "plan" phase (first order outcomes) in Table 3
- the implication is that there may be more widely integrated and more effective ICM if ICM had a higher profile or stronger mandate
- it would be easier for people to do more widely integrated and more effective ICM if there were:
    - a stronger mandate for more formal and "integrated" catchment management at the macro and meso scale
    - more focus on measurable environmental bottom lines to be achieved
    - a better understanding of the capacity needs for this so the necessary resources can be provided.

5.1.3 Co-ordination

Many regional councils and sector groups address particular issues across a region or across the country. This raises the question of how well these activities are integrated into catchment contexts.

For example, the people in two regional councils (one North Island and one South) who are responsible for running urban erosion and sediment control programmes both considered that such programmes were not ICM, although they agreed that an integrated management plan for a specific catchment would address sediment runoff from large earthworks and the development of small building sites. They also acknowledged that the results of effective interventions as part of their programmes may or may not be picked up by region-wide state of the environment monitoring programmes.

By contrast, one regional council sponsor of an industrial pollution abatement programme noted that they had started off by targeting discharges of particular concern (in this case, from electroplating), then moved into "working with the willing", and finally came to a catchment-based approach because it allowed them to be fairer and more systematic.

> 'People kept saying to us "Why aren't you tackling the guy down the road? He tips more stuff down the drain than I do." So now we tell them we're inspecting every property around the river.'

In urban areas, city-wide water supply, stormwater and wastewater networks interact with each other, with other networks such as roads and with fresh and saline receiving environments. In these areas, the management focus may be city-wide rather than catchment-specific, as in Auckland City, although the outcomes are expressed in key categories of receiving environment around the isthmus.

Moreover, Section 4 shows there is a plethora of sector- and project-based initiatives that are not self-identified as and could not be deemed to be "integrated catchment management" in a formal sense, but do nevertheless contribute to beneficial outcomes in catchments. They include local community riparian or dune-planting projects with various sources of funding and volunteerism, nation-wide soil conservation and riparian programmes such as The Landcare Trust or Trees for Survival, or sector-based programmes such as the Dairying and Clean Streams Accord. Other groups such as Irrigation New Zealand and the Primary Sector Water Group are also active on water-related issues.

While the organisations involved in such issue-based initiatives generally appear to document their activities well, the missing element seems to fall between the documentation of plan implementation and the documentation of plan outcomes, or between second and third order outcomes.

In sum:

- the issue is that the vast array of on-the-ground initiatives intervening in land use activities that affect water quality and quantity are integrated to a greater or (mostly) lesser degree with more formal ICM plans and programmes focused on specific catchments or receiving environments
- the implication is that the lack of documentation and linking of efforts is proving a barrier to resource managers' ability to detect quantifiable, attributable improvements in water-related environmental bottom lines
- it would be easier for people to do more effective ICM if:
    - o there were better documentation of first and second order outcomes (1.1 and 1.2 in table 3) activities and linking (integrating) them with the identification and interpretation of drivers, pressures and state of the environment monitoring results, in order to help identify factors contributing to changes in water quality or water use efficiency
    - o catchments were seen as place-based integrators of multiple land and water management efforts: this could help with capturing of information about what is being done within key agencies and by all parties active in a catchment (there is more on this in Section 10.8) and monitoring of the third order outcomes that result
    - o there were a stronger mandate for ICM, to make it easier for regional councils (the logical agency to do this) to capture the resources they need for such monitoring.

5.2 The problems of scale

Concerns about scale relate to spatial extent of catchment-related initiatives and the size of the problems they aim to address.

5.2.1 Big areas

It is clear that not all initiatives that aim to make a difference to water and soil outcomes in New Zealand use macro scale catchments as their organising units. There is widespread agreement that such an approach is ideal, but in practice, many local bodies and other implementing agencies find that the entire macro scale catchment unit as defined in Section 3.3 is too large, that they do not have the resources to manage whole catchment programmes effectively and that communities themselves don't always recognise catchment boundaries.

> 'Mountains to the sea has a nice biophysical sense but it's meaningless to people and their sense of community. Working in sub-sets is often better.'
>
> 'Farmers at the top of the catchment had never thought that what they did on their land might affect the scallop fishery miles away out in the Bay.'
>
> 'You need a mix of scales – large to small, using a suite of best practice.'

The largest initiative in New Zealand at present is that in the Hauraki Gulf (see Section 8) and the large number of players, many diverse issues and large areas of land and sea involved make this a long (ten years so far) and challenging process of engagement, alignment and agreement in order to agree on issues, priorities and a plan of action.

However, even in single meso-scale catchments, scale can be an issue, with large distances in some single river basins making for resource-intensive work. In his review of the Taieri Trust, Tyson (2004) noted that the "primary barrier to project information, education and communication efforts aimed at improving environmental health has to do with the large size of the catchment that it is attempting to service. Issues are large and well entrenched and the diversity of issues and wide range of motivations exhibited by residents make it difficult to focus limited project resources in an equitable and effective manner throughout the catchment."

5.2.2 Big problems

Several interviewees also commented on the scale of the freshwater quality issues in New Zealand. Some regional council catchment managers despair of being able to make a difference to the ongoing decline in lowland stream water quality.

Interviewees noted that sedimentation with its fencing and riparian revegetation solutions is at the "easier" and "less expensive" end of the scale, and people focus on this while the issue of nutrient leaching into lakes, rivers and streams is the "environmental time-bomb".

Less visible and with a much longer time-frame for results to become apparent, it is harder to motivate landowners to act voluntarily on this issue. It requires careful and costly scientific monitoring to confirm both the causes and extent of the problem. The problem is also costly to resolve as its solution impacts on farming profitability both in terms of productivity and land value, in turn making voluntary approaches to solutions unlikely to be taken up by farmers.

> 'I'd be terrified if our soils were converted to dairy.'

Two components to the nutrient problem were described:

1. Solutions to nutrient problems will usually require reducing farming productivity (such as reducing stocking numbers and the volume and frequency of fertilising). Farms are large commercial businesses seeking profitable return from significant investment on highly valuable land. This presents an unlikely scenario for voluntary reduction in productivity for elusive environmental outcomes.

   > 'The simple things are reducing the sediment load, getting the cattle out of the river. Voluntary mechanism can help with this, if your goal is simply to "make it better". But if success has an ecological bottom line then people are going to have to give up production.'

   > 'They've done all the easy things but still that stream is a long way from an acceptable condition. ICM concepts can be limited to success on the easy targets.'

2. Unlike sedimentation, leaching of nutrients into surface and underground waters is an "invisible" problem – a problem that takes many years, possibly decades, to become apparent. ICM practitioners reported difficulty in motivating farmers to act voluntarily on environmental issues that are not apparent in day-to-day activities.

Several interviewees commented that these difficulties have led to a failure to understand or to debate openly the most critical of freshwater quality issues facing New Zealand.

> 'We've waited too long to acknowledge or address these problems. Now it's a time-bomb.'

Several interviewees noted that local government is particularly ill-placed to address such issues, citing conflicts of interest where regulators also represent the regulated.

> 'Farm owners make up 1% of the NZ population but 38% of regional councillors.'

> 'We need a credible threat of regulation but regional councils are never going to do this. We need something that's not accountable to a board of farmers but to national standards.'

> 'Local district councils can be very pro dairy-conversion because of the money coming in.'

This also points to the limitations of ICM as it is currently practised by agencies, with its emphasis on community control over land-use decision-making and voluntary mechanisms.

> 'With ICM we've got a small solution to a big problem. For example, the Waikato River – the treaty settlement provides $7m a year to restore the river. But the actual cost of restoring the Waikato will be over a billion. Landcare groups just won't be enough.'
>
> 'ICM can identify most issues but not always solve them. It's hard to argue with people who see they can make three times more money to convert their farms.'
>
> 'An open national debate is required on the size of this problem.'

Many interviewees commented on the lack of big-picture strategic thinking underpinning the design of ICM.

> 'We're traditionally poor at thinking through the big issues.'
>
> 'They (*regional council staff*) have difficulty in articulating the big picture because the picture is too big and complex. They just don't have the skills for this.'
>
> 'Money is being applied on an ad hoc basis – big buckets of it, but it's not addressing the real problem.'
>
> 'Project design needs to recognise that there are plenty of leverage points. Good planning is about wrapping these back into the bigger picture – the programme is an integrated suite of activities and projects. Not everyone is good at this.'
>
> 'The fencing subsidy is counterproductive because it determines the pace in which the river's getting cleaned up, and it keeps everyone focused on the small easy problems.'

Without big picture thinking, there is a real risk that a series of small projects won't actually address or resolve the real problems.

In sum:

- the issue is that some catchments are extremely large and some issues are very serious. Both make it hard for ICM initiatives to get real traction, especially when a serious issue affects a large catchment, such as where dairying affects private property and profitability "rights". Some observers commented that lack of a consistent and strategic approach nation-wide and a traditional reluctance to interfere in land use decisions has allowed some issues to become dauntingly large, and that without big picture thinking, there is a real risk that a series of small projects will be undertaken that won't actually address or resolve the real problems
- the implication is that the forums and the research for debating and addressing such issues have not perhaps been available or effective since the 1980s reforms that abolished the Water & Soil and Town & Country Planning Divisions of the Ministry of Works and Development (Gustafson and Feeney, 2008) and that while the groups discussed in Section 3.4 are now becoming more numerous and active, it is this hiatus that has allowed issues to escalate
- it would be easier for people to do more effective ICM if:
    - there were a more consistent nation-wide focus on the planning, legal, policy and capacity matters (first order enabling conditions) outlined in items 1.1-1.3 of Table 3
    - a wider national debate on the role of land use controls for the purposes of more sustainable and equitable allocation of fresh water and fresh and saline water quality with a focus on priority land uses
    - forums such as the Land and Water Forum as well as research agencies were able to allow a national debate on and commitment to improving ecological bottom lines, as this would strengthen regional councils' mandate and hence resourcing for ICM

- early information about the effectiveness of the different approaches of Environment Waikato and Environment BOP to nutrient issues (land use controls vs trophic status indicators) and other examples of alternative approaches to common issues were made available to others
- other means of exchanging information about "what works and what doesn't" were readily available to catchment managers.

5.3 The problem of time

"It is unrealistic to expect a project like the [Taieri Trust] to have significant and direct impacts on specific biological indicators of environmental health in three years," as Tyson (2004) observed in his third-year review of the project.

Many such micro-meso scale initiatives are funded for one to three years from various sources including the SMF and SFF funds, as well as various regional council and community grants, so Tyson's comment is very telling: short term funding poses a real barrier to project effectiveness, especially in terms of the longer term third order outcomes that are usually the real objective.

However, Tyson did note that it "is realistic to expect improvements in stakeholder awareness and knowledge of issues and networks to be established that will in time result in actual environmental improvements" – though this of course depends on the availability of ongoing support.

Macro and meso scale ICM initiatives often face the same funding problems: several interviewees noted that it is easier to get funding from within councils and from external funding agencies for research than for ongoing management.

In sum:

- the issue is that short term funding (budget capacity as outlined in item 1.3.6 of Table 3) is the norm for micro scale catchment-related initiatives, and to a lesser extent, for macro and meso scale initiatives
- the implication is that initiatives at all scales may sometimes be less effective in delivering the longer term third order outcomes that are usually the real objective; and/or that the capacity is not provided to document these outcomes as part of the project itself or of the regional state of the environment monitoring framework
- it would be easier for people to do more effective ICM if there were:
    - a better nation-wide understanding of the timeframes needed to achieve particular outcomes, especially for issues that are already serious or likely to become so
    - a greater focus on the need to fund long term implementation, monitoring and review as well as research, prioritisation and planning
    - better provision to capture first, second and third order outcomes.

5.4 Institutional capacity barriers

In environmental management generally, the more immediate barriers to effective ICM are organisational and social rather than technical (McLain and Lee 1996; Gregory et al. 2006, Allen and Jacobson 2009): such lack of capacity manifests as institutional cultures within research and policy-making agencies that work against genuinely participatory approaches.

Reasons vary widely but such capacity lacks can manifest as lack of awareness of or belief in the value of such approaches, or lack of skills, confidence or time (staff/funding) in applying them.

A key reason why this is so is that institutions seldom operate as learning organisations. Most are risk averse and, like those studied by Carl Walters (1997), prefer to look credible at all times. Performance management structures and funding structures also favour those who appear certain, with funders preferring to back projects that claim to have certain outcomes, rather than those that admit they are trying to learn their way through a complex problem. Sadly, if an organisation is prepared to admit they are dealing with uncertainty, then they run the risk of looking bad alongside their more "certain" counterparts.

"Audit culture" is a term introduced by Cris Shore of the Anthropology Department of the University of Auckland (Shore and Wright, 1999) that describes this situation very well. The authors observed the effects on higher education of mechanisms introduced over the previous two decades for measuring "teaching performance", "research quality" and "institutional effectiveness." They note that although these mechanisms are intended to ensure "accountability", a principle justified on the grounds that those who spend taxpayers' money should be accountable to the public, it has resulted in a reductionist, coercive, punitive, disabling and ultimately counter-productive model. Similar thinking is evident in New Zealand local government institutions, so the authors' recommendations apply to the context in which ICM is carried out; namely that (p571) "trust and autonomy: need to be restored to the relevant "professions, that uses qualitative, multiple and local measures and is based on public dialogue."

Similarly, in 1990 Ericksen observed (p55) that funding difficulties included the central government funding criteria that slowed work and encouraged short-term piecemeal projects rather than longer term catchment-wide land use management planning.

In sum:

- the issue is that managers in modern institutions value certainty more than learning
- the implication is that catchment management initiatives are less likely to integrate different aspects that may be beneficial and that "safer" but more limited options are more likely to proceed, so genuinely "integrated" catchment management is not attempted
- it would be easier for people to do more effective and more integrated catchment management if:
    - the concept of organisational learning were more widely acknowledged and endorsed
    - case studies were disseminated to promote learning and how to apply it more so as to develop a more open debate and learning culture
    - case studies were disseminated of successful organisational change and the timeframes, mechanisms and resources needed to bring it about.

5.5 Regulatory barriers: case study of North Shore City

Regulatory mechanisms can pose challenges to councils and communities wanting to introduce more sustainable forms of urban development. Three papers by Heijs (2008, 2009 and 2010) are summarised in Appendix H. They describe some of the experience of the North Shore City Council with trying to introduce low impact urban design for more sustainable water management – as mandated by the Auckland Regional Council – into its land use, asset management and stream and beach care programmes, with particular reference to the experience with Long Bay.

Long Bay lies north of North Shore City and has a number of unique features such as a prominent ridgeline, a high quality stream, a regional park and a Marine Reserve. In an Environmental Court Ruling in 1996 Long Bay was allowed to be urbanised but under strict conditions. As a result, the Long Bay Structure Plan, of which stormwater management is an important component, has been in the making for over 15 years. The Council was keen to protect and where possible enhance the existing natural environment, and there were a number of appeals against the Structure Plan provisions. The case was heard before the Environment Court in 2007 and at the time of writing this report the decision is not yet out.

In 2004, the Council agreed on a Stormwater Strategy that included introducing low impact urban design (LIUDD) into new and existing developments. The stormwater team's process of introducing LIUDD began with convincing other parts of the council (e.g. councilors, management, planning, roading, parks/open space, communication, consenting) that it was a sound idea: interestingly, councillors were more receptive and senior managers more risk-averse. Other stakeholders included the Auckland Regional Council, the development industry and the community itself.

The District Plan then had to be changed, research and pilot/demonstrations conducted and guidelines and practice notes prepared.

Heijs distinguishes between "things we want to do", like recognising benefits across all four wellbeings, staff education, industry and community liaison – and "things we have to do" – meeting the requirements of the RMA, Building Act, Building Code, Regional Plan, District Plan, Structure Plan and technical guidelines of the Auckland Regional Council and the North Shore City Council itself.

The Long Bay Structure Plan was the first where land use planning and catchment planning were developed simultaneously in order to protect the natural environment by careful management of the land development process. It was recognised that complying with, more general regional guidelines and the District Plan provisions for other parts of the City, was not sufficient to protect and enhance the very sensitive and high quality receiving water environments. A low impact design (LID) was included in the proposed structure plan, with a number of catchment management measures that included:

- avoiding or minimising land modification and urbanisation and related earthworks of those parts of the catchment that have sensitive receiving environments
- protection of headwater streams as an important contributor to the health of the stream system
- concentrating urbanisation in areas where the effects are minimal or can better be managed
- "fit-for-purpose" stormwater management requirements related to the receiving water environment and land use
- use of on-site stormwater management practices such as rain tanks and bio-retention, to minimise changes to stormwater runoff from the site, including roads. The use of rain-tanks also contributed to the reduction of water demand, another sustainability objective
- use of a stormwater treatment train approach.

Although the internal and external consultation needed to develop these measures was demanding and time-consuming, the RMA processes were worse. While "the theory is great", Heijs found that in practice, making plan changes was extremely expensive due to legal arguments, and considers that "the argument for the greater good was lost".

He says that "such institutional barriers and difficulties with the legal framework provide barriers for councils wanting to do the right thing. Because the RMA is an enabling act and

effects based, it is not always helpful to assist councils in meeting the four wellbeing-outcomes required by the LGA in an efficient way. Processes are prohibitively expensive and have uncertain outcomes."

Heijs observes that "the good part of the court case outcome was that, from a water management point of view, the outcome was very successful. The [Judge] accepted the LID and the rationale applied to justify this approach. He clearly rejected the branch-by-branch approach and the 'leave it to the individual consent' approach that was proposed by the developer. One example was that the Court often used the map showing the streams and stormwater sub-catchment as a reference in its decision." Another interesting example was that the judge did not accept as the baseline "the current water quality in the lower catchment, caused by poor land management by the developer … Sustainable water management, as an input and major driver to land use planning, was accepted!"

The "downside" of the court case was, in his observation, "the process which was, although very interesting, frustratingly long and prohibitively expensive. This raises questions around the legal framework and possible implication for other similar cases in the country."

The legal and institutional barriers Heijs identified related to the time-consuming process and heavy legal costs.

The Council spent approximately $1.5 million on the technical work related to the 3-waters management throughout the Long Bay Structure plan process. This excludes legal fees and fees outside stormwater management area such as land use planning, geotechnical advice, transport, archaeology and so on.

Such expense and uncertainty often deter the Council (and, Heijs suspects) many other councils, from taking or defending appeals. Yet, he observes, North Shore City is one of the bigger councils in New Zealand and much better able to financially support lengthy and complicated processes.

As he observes, although both Acts refer to the four wellbeings, the RMA is an "enabling" and effects-based Act, whereas the LGA is outcomes-based, requiring councils to deliver on community outcomes. Heijs notes that these two Acts are "at odds" or at least require a "very innovative approach" in writing outcomes into District Plan requirements. The RMA has good intentions, but is very difficult to implement, requires lengthy and expensive processes, prohibitively expensive and does not deliver on LGA requirements. Outcomes to date in North Shore have "shown that our District Plan and consenting processes have failed to adequately protect our streams and beaches, yet the process of changing it is also protracted and expensive".

In sum:

- the issue is that RMA has good intentions, but catchment-related decisions can be difficult to implement, require lengthy and prohibitively expensive processes and may not always deliver on LGA requirements
- the implication is that expense and uncertainty may often deter councils from taking or defending appeals, even the bigger ones that are better able to financially support lengthy and complicated processes
- according to Heijs, based on his experience overseas, it would easier for councils to do more effective ICM if land-use planning processes were made more efficient by basing them more on community outcomes rather than RMA effects. One example is the way "speculation" is avoided by valuing the land against "past land use" instead of against "potential land use", thus significantly reducing "the financial incentive to take cases to court".

5.6 Themes and ways forward

"Too big, too hard, too little time, and money" sums up the findings of this section, indicating that institutional capacity is a key barrier to more "integrated" catchment management.

Barriers at the "plan" phase of the planning cycle relate to the many things that can be integrated, lack of resources to address issues and the big picture/strategic scale and over the long timeframes that big catchments and serious issues need.

Such barriers mean that people in government, councils, sector groups and the community will sometimes tackle a manageable portion of the work rather than the whole thing; or take another approach to it than ICM or community engagement; because of lack of resources to overcome barriers associated with scale and intra- and inter-organisational integration and a lack of capacity to do this in appropriate ways.

In practice, many agencies find that the entire macro-scale catchment unit is too large, that they do not have the resources to manage whole catchment programmes effectively and that communities themselves don't always recognise catchment boundaries, making it harder to work with them.

To summarise, things that would make it easier for people to do more effective ICM include:

- more consistent terminology around macro, meso, micro and national or sector initiatives, to facilitate comparison of "apples with apples"
- wider debate on matters that can explicitly and cost-effectively be integrated into catchment management, such as integration across MHWS and all four wellbeings which are already effectively required by legislation.
- better provision for the capture of first, second and third order outcomes of all catchment-related activities and linking (integrating) of them with the identification and interpretation of drivers, pressures and state of the environment monitoring results, to help identify factors contributing to changes in water quality or water use efficiency (seeing catchments as place-based integrators of multiple land and water management efforts, as outlined in Section 10 could help with capturing of information about what is being done within key agencies and by all parties active in a catchment and monitoring of the third order outcomes that result)
- a more consistent nation-wide focus on the planning, legal, policy and capacity matters outlined in items 1.1-1.3 (first order enabling conditions) of Table 3
- forums for a national debate on and commitment to improving ecological bottom lines
- early information about the effectiveness of the different approaches of Environment Waikato and Environment BOP to nutrient issues (land use controls vs trophic status indicators) to help other regions decide on approaches to use
- other means of exchanging information about "what works and what doesn't" that are readily available to catchment managers
- better understanding of the timeframes needed to achieve particular outcomes
- the concept of organisational learning being more widely acknowledged and endorsed
- land use planning processes being made more efficient, for example by basing them more on community outcomes rather than RMA effects.

Much of the above would be addressed by government affirmation of the significance of ICM: it would give a stronger mandate for more formal and "integrated" catchment management at the macro and meso scale, a better understanding of the capacity needs for this so the necessary resources can be provided and could boost the ability of councils

to build and share capacity amongst each other, and with research institutions, iwi and communities, sector interests and other stakeholders.

6. Significant constraints to effectiveness of ICM

Introduction and overview

This section identifies the significant constraints to the effectiveness of ICM initiatives in terms of the elements against which their effectiveness can be assessed, which were developed in Section 2.2.2 and Table 3.

We have defined here a constraint to effectiveness as being "something that makes an initiative less effective than it could otherwise have been because of 'not enough of a good thing' and/or 'too much of a bad thing'".

Many of the barriers noted in Section 5 thus often also act as constraints to effectiveness.

It is also noted in Section 6.3 that the effectiveness of many initiatives (especially small projects) can not be assessed because of the lack of measurable objectives and the lack of a monitoring programme, especially for outcomes that may not be expressed for some years.

Some significant constraints are identified and discussed for both ICM and catchment related projects in terms of the broad criteria listed in Table 3 as phases of the plan/do/check/review cycle:

- plan:
  - silos within and between organisations
  - lack of time and culture (capacity) for collaboration
  - lack of clear research needs and sharing
  - lack of a shared information system
  - insufficient funding, short and long term
- do:
  - the timeliness and alignment of regional and district instruments
  - lack of institutional co-ordination
  - people turnover and burnout
  - lack of practical integration of understandable research
  - lack of practical tools
  - lack of uptake by some land owners
- check:
  - lack of baselines and benchmarks
  - absence or vagueness of objectives
  - lack of provision for capture of third order outcomes
- review:
  - lack of summative reviews
  - the difficulty of adaptive management and the need for a learning culture.

The difficulty of securing long term commitment to ICM is addressed, then the results of selected case studies in Appendix H are summarised at the end.

Many constraints operate at all stages of the planning cycle (for example lack of institutional co-ordination can confound action on the ground as well as monitoring and review even

though it is discussed at the "plan" phase), though they are separated out for convenience into phases where they perhaps have the strongest influence.

6.1 Constraints at the planning phase

6.1.1 Silos within and between organisations

The diversity of things that can be considered ICM was highlighted when we found we would have to interview up to three or four different people in each regional council to find out what activities the council and other community, sector or NGO groups were doing. Key people such as policy planners, soil conservators, river engineers, water allocation and water quality staff, farm liaison staff, natural heritage (terrestrial and aquatic ecologists plus plant and animal pest control) staff and community liaison co-ordinators are all housed in different parts of most regional councils – reflecting the wide scope of ICM and the need for intra-organisational integration.

This makes it difficult in practical terms for staff in big organisations to readily liaise with each other, and as shown in North Shore (see papers by Heijs) and Auckland City (Paterson and Menzies, 2004) this means that many years are needed to truly develop an approach that is fully endorsed and implemented across all of their divisions.

In their work with agencies and community groups, Allen and Jacobsen (2009) found that there are often considerable institutional barriers to working effectively across "silos" or with community groups. One interviewee ascribed this to "patch protection".

Ericksen's 1990 analysis of past attempts at creating innovative water and land management structures showed the first two of the three common problems inhibiting comprehensive and integrated water and soil planning and management in New Zealand were professional biases of staff in responsible agencies and institutional demarcation between agencies with supposedly shared interests.

While by the late 1980s there were specific links between planning and water and soil legislation and "opportunity for working hand in glove on common problems like flooding", operationally this failed for a variety of reasons. To overcome this, legislation relevant to TAs on water matters was progressively strengthened. However a major issue was the belief among TAs that land use management even for avoiding a problem as serious as flood hazard would limit development and therefore rateable income for use in stimulating further growth (ibid, p74).

The protracted consenting and appeal process surrounding the district plan changes and structure planning needed to enable the development at Long Bay (North Shore City Council) while protecting the adjacent marine park show, as discussed in Section 5.5, that the difficulties of managing the effects of land use on fresh and coastal waters persist.

The Auckland Regional Council in its 2009 state of the region report noted (p298) that "in many ways the information in this report confirms that we have exhausted the easy opportunities for environmental improvement, just as we should have. Like other cities in New Zealand and around the developed world we are at the cusp of a new era in environmental management. The relatively easy-to-deal-with point sources of pollution have been regulated and cleaned up …Over the next decade we face the task of addressing the more challenging diffuse sources of pollution. … Particular examples of concern include run-off from land into surface or ground water following rainfall or the cumulative contribution of many home fires burning during winter. This new focus will necessitate greater landowner and stakeholder engagement to manage land use practices more effectively.

"This may also involve looking 'up the pipe' to focus on what happens before a discharge occurs and controlling contaminants at source (such as low impact design to stormwater

and land management, which is a more proactive and more cost effective way to reduce pollution). In rural areas it will mean much greater scrutiny of land management practices. These diffuse discharges mean we need greater integrated management across land and water resources. This is not a new concept but we have yet to fully realise its potential. In essence it means we need to manage the land to take care of the freshwater and marine environments. Managing the marine environment starts at the top of our highest ranges and hills."

Such integrated ("big picture") thinking is undermined by poor integration across components of programme design and delivery within councils. Interviewees from many councils reported that planning often takes place in isolation from both field staff and politicians and policy designers. This lack of connection in turn leads to a lack of understanding of the purpose and place of ICM at the higher levels of governance, making integration more difficult across the divisions of local government, as well as leading to uncertainty about long-term funding for ICM initiatives.

> 'Our planners think the plan is for them to do and then they don't take much interest in how it's implemented.'
>
> 'The Council is politically driven and the commitment to work with communities may change. A long-term agreed mandate to work with communities is important.'

As noted by Heslop and Hunter (2007) having a culture that supports internal communication is an essential ingredient to support change. The lack of internal co-ordination and integration is often one of the major barriers to implementing new approaches and ideas and is a key element of implementation.

Inter-agency processes can also slow progress: Tyson (2004) noted a lack of involvement by the three territorial authorities in the Taieri catchment and the slow pace of engagement by relevant government departments as real constraints to the project's effectiveness. These many be explained by any number of reasons including different priorities and capacity constraints.

Some interesting questions arise about the structure of local government, a major player in ICM. Several comments from interviewees and anecdotal information of the researchers related to the likely differences in the ability to deliver effective ICM in unitary authorities compared with regional and territorial councils working together. Some say it is easier to deliver in a unitary structure; others observe that "environment always goes to the bottom of the list because it's not like TA-style service delivery".

Former council staff have commented on council structure as a constraint to effective ICM. One noted that resource-based structures (e.g air, land and water, with all functions from research and policy to compliance and enforcement integrated within each division) are more enjoyable and effective to work in, while function-based structures (research, policy, planning, consenting, compliance) make it harder. Other researchers have informally observed this could be an interesting area of research.

In sum:

- the issue is that it is difficult to work across divisions within organisations especially when they are large, geographically spread and lack a communication culture, and also hard to promote inter-agency communication and co-ordination
- the implication for ICM is that its pace and effectiveness are slowed
- it would be easier for people to do more effective ICM if case studies were disseminated of effective intra- and inter-organisational communication and the timeframes, mechanisms and resources needed to bring it about.

6.1.2 Lack of capacity for participatory and collaborative processes

Capacity in this sense takes the widest of the meanings in Section 4.4, including constraints on participatory and collaboration processes arising from awareness, culture and time.

As indicated in Section 5.4, organisational and social constraints to effective ICM include (McLain and Lee 1996; Gregory et al, 2006; Allen and Jacobson 2009):

- a tendency to discount non-scientific forms of knowledge
- a failure to provide social processes that build shared understandings among diverse stakeholders.

These constrain the effectiveness of ICM and catchment-related initiatives by (usually unintentionally) excluding people from a process that affects them and to which they can add value.

There are several reasons why this happens. A key reason is that institutions seldom operate as learning organisations, for the reasons outlined in Section 5.4 and pose many difficulties for working effectively across "silos" or with community groups, as outlined in Section 6.1.1.

Moreover, initiatives throughout catchments will often involve people working in groups and mixed community and organisational teams. Such participatory processes require people with particular skills, resources and capability, outlined in Section 4.2.

However, these people do not always exist either in the community or sector involved, or in the organisations running the processes, while others may not have worked in participatory processes before, so it takes time for them to learn. In addition, agencies that do have the skills may find that good staff are spread too thinly, thus restricting the amount of work they can do.

Nevertheless, as shown in Section 4, the outcomes of participatory processes that are done well *do* justify the learning required.

A common concern expressed among interviewees was the short time frames of most ICM initiatives. It is stressed that building relationships, establishing trust and understanding the stakeholders' positions is a time-consuming component of ICM start-up. This stage is regarded as essential to the effectiveness of an ICM programme and it is important that it is given both the time and the budget to be achieved.

Organisational and social barriers to ICM are also noted in the findings of Chris Phillips and colleagues from the Motueka-ICM project (see also Section 5.4). Trust, mutual respect for others' views and the ability to work alongside each other arise from creating the space for dialogue. These authors note that without continual and ongoing attention to relationships, the probability of either non-completion or project derailment becomes greater.

Further, without attention to the development of a "common language", communication between individuals can often be at cross-purposes, leading to unexpected outcomes and interpretations (Phillips et al, 2010). These have the effect of slowing project progress due to misunderstandings that need time to emerge and then to be clarified.

One regional council employee working as a co-ordinator of many groups engaged in catchment-related projects noted that partnership with the NGOs is essential – and it takes a lot of time – and therefore money. Intensive 1:1 engagement is vital to maintain the effectiveness of these groups over time. Moreover, if an ICM initiative is addressing issues in a macro-scale or large meso-scale catchment, then many small cottage meetings are

needed, and this can be very resource intensive. However, as farmers and other community stakeholders won't travel long distances to parts of the catchment with which they don't identify, they won't attend larger meetings in one or two places. So, although one or two big meetings can appear more cost-effective approach (from a council or agency perspective) in the end it doesn't pay off.

In sum:

- the issue is that capacity constraints including lack of awareness, appropriate culture and time, constrain the effectiveness of ICM and catchment-related initiatives by (usually unintentionally) excluding people from a process that affects them and to which they can add value
- the implication is that organisational, iwi and community capacity needs building to promote cost-effective and productive participatory and collaborative processes
- it would make it easier for people to do more effective ICM if there were wider awareness of the practicalities of capacity-building, such as providing the time and budget needed for it to occur (the enabling factors in Table 3).

6.1.3 Lack of clear research needs and sharing

Edgar (2004) noted that information problems often begin at the research stage, with poorly developed ICM research priorities at the national level (the Government's recent changes to Crown Research Institute roles may help this). He also noted the number of ICM research programmes currently under way in New Zealand and our long history of catchment management research dating from the International Hydrological Decade (1964-1975) and before.

A systematic attempt to develop a set of priority research needs could inform further enquiry, allow for better consideration of the transferability of research findings to different catchments and reduce the duplication of effort between individual (discrete) research enquiries being conducted in different regions around the country.

Dodd et al (2009) conducted a review of the results, outputs and outcomes of recent rural catchment-based research in New Zealand (the scope of the report did exclude catchment management projects with limited research involvement). The review aimed to derive key lessons of use to policy developers, policy implementers and researchers seeking to operate within an integrated catchment management (ICM) framework.

Fourteen location-specific studies were included, as well as some non-specific studies. The compilation of Dodd's report relied on analysis of published literature and interviews with senior researchers involved in studies conducted or updated in the last ~20 years. Thus, the report should be considered as an analysis of the role of research in the application of ICM in New Zealand, rather than an analysis of ICM.

Key lessons representing the dominant themes arising from the catchment studies reviewed by Dodd et al (2009) are summarised below under the following headings:

- environmental management (biophysical outcomes)
- social and cultural processes
- economic benefits and costs
- research at catchment scales.

Environmental management (biophysical outcomes):

- homogenization of stream structure and habitat (e.g. water temperature), leading to reduced aquatic faunal diversity across catchments, is a key degradation process which must be reversed to restore environmental values
- variable or critical source areas – sites with impacts disproportionate to their size – can either contribute differentially to contaminant loads (e.g. livestock crossings, flood irrigation) or have key roles in mitigating losses (e.g. headwater and riparian wetlands). Such sites are priorities for cost-effective protection/remedial action
- contaminants can take various flow paths (e.g. surface vs. groundwater) which need to be identified to understand and mitigate the associated lag effects on receiving water bodies
- stock exclusion from waterways is highly effective at reducing direct inputs of pollutants and thus effecting large proportional reductions in contamination
- the continuity of riparian vegetation in time and space, interacting with stream order, is critical for mitigating land use effects on habitats and contaminant loads (where they pass through the zone of influence of the plants)
- extreme weather events have disproportionate effects on soil and water quality in the context of long time scales, and interact with different land cover patterns to produce variable recovery rates
- land use has far-reaching effects on downstream and offshore ecosystems
- the use of information generated by land-use comparisons and associated modelling (as opposed to that derived from actual land use change) for planning land use change has limitations in terms of unanticipated transition effects and their interactions with other dynamic drivers (e.g. climate and economic cycles)
- variable time lags in environmental responses to management are a feature of catchment-scale processes and must be considered in planning
- there are a number of factors that drive additional time lags in the on-ground application of environmental management practices by land managers.

Social and cultural processes:

- catchment-scale natural resource issues cannot be resolved within any single property and require landowners to work cooperatively with each other and with the responsible agencies to identify environmental priorities and organise the necessary resources to achieve desired outcomes
- two distinct types of communities ("communities-of-place" and "communities of interest") should be recognized in designing participatory approaches to integrated catchment management. Some catchment scale issues may be addressed by only focusing a study upon the local residents (communities of place), and other issues may need everybody with an interest in the waterway to be included (communities of interest)
- integrated collectives need participation from both "decision-makers" (those who "have the final say" on what will be done) and "decision-takers" (who have to do it, "like it or not") for effective buy-in, which requires facilitators competent in conflict management
- the most effective way to encourage change in landowner behaviour and the adoption of preferred management practices is for agency staff to work one-on- one with the people involved
- good relationships are important. This takes time and therefore reliable resourcing (i.e. funding over an appropriate term).

Economic benefits and costs:

- restrictions in farmer's ability to intensify production represents a large financial limitation to them, this being the primary means available to them to maintain short-term profitability in the face of continually rising costs and variable product prices
- economic drivers are not the only determinant of goals and adoption of new management practice: factors such as lifestyle, competence, social norms are also important
- the cost-effectiveness of all best management practices varies greatly depending on the context in which they are applied – i.e. soil types, existing management systems, sensitivity of the receiving environment and financial drivers; and depending on the rigour with which they are applied
- the costs to catchment communities of land use change can be considerable but are seldom fully assessed, e.g. school closures as people move away.

Research at catchment scales:

- one research discipline cannot undertake a catchment research project. Taking a balanced multi-disciplinary approach underpins "integrated" catchment-scale research
- water quality monitoring data sets of at least 5 years are required to make meaningful statements about trends
- having a defined structured process for engaging a range of stakeholders (including governance, research and education) is a critical part of an integrated approach
- non-researcher participants are often unaware of the environment in which science operates, and need to appreciate aspects of this environment to ensure their expectations are realistic. Conversely researcher participants need to appreciate that there are other ways of gaining, and sources of, knowledge
- catchment-scale research is better placed to contribute to positive outcomes when it embraces new ways of managing science beyond the traditional hypothesis-testing replicated, controlled experiments and the linear extension processes familiar to biophysical scientists. Key concepts include trans-disciplinary programmes, collaborative learning and adaptive research.

The report also included the following recommendations:

- a complementary analysis of non-research focused ICM projects should be conducted to gain a more complete picture of key lessons for the application of ICM to sustainable land and water management [this report partly addresses this need in Section 3 and Table 4 though not in a quantitative way]
- policy development must recognize and account for key features of the spatial and temporal dynamics operating at catchment scales, specifically the variability of driving processes in space and time and the existence of spatial and temporal lags. These dynamics imply the need to avoid policies aimed at standards or targets applied everywhere at all times and which address a localised or immediate issue but ignore known remote impacts
- an ICM initiative needs to incorporate five fundamental tasks in the project design:
  1. understand the issues, associated social dynamics and the drivers for change
  2. develop a catchment strategy
  3. precipitate action to bring about solutions
  4. monitor and evaluate implementation
  5. run an effective program in order to achieve the first four objectives

- in planning ICM projects, funding time frames should be aligned with realistic time scales for running an effective program to achieve the objectives – for example assessing the impacts of land use change took 10 years after the commencement of the Whatawhata project
- future catchment-scale research should address some gaps – filling the long-term research gap and balancing effort across sustainability domains (i.e. more focus on economic, social and cultural)
- social research within catchment research projects should go beyond the behaviour of individual landowners and their practices to the way those individuals behave when they are interlinked to their communities of geography or interest.

In 2004, Nick Edgar suggested that one possibility could be "to reformulate the Co-operative Research Centre approach being used in New Zealand and Australia to support environmental science provision. The CRC approach involves partnerships between central and regional government, research providers (e.g. CRIs, CSIRO, Universities and private organisations), industry and community groups. In Australia, the federal government offers matching dollar for dollar funding support to the contributions provided by other research agencies. This ensures that specifically appropriable research outcomes to particular geographic areas (where the research is conducted) will have some national transferability and relevance. It also ensures that regionally applied research funding is leveraged by contributions from central government for the national good" and that forming a "national Co-operative Management Centre for ICM in New Zealand would further the CRC research focus to include the application of catchment research provision to sustainable resource management. A CMC approach is a useful model to consider the wider range of ICM recommendations that would need to be considered if national co-ordination of ICM was to extend beyond the basic sharing of ICM experiences. These recommendations include the areas of ICM definition, managing ICM information, ICM policy development, ICM Research and ICM advisory services."

These findings on research needs echo those of others in this report.

In sum:

- the issue is that ICM research priorities are poorly developed at the national level, and need to include outcomes across all four wellbeings
- the implication is that ICM needs to be more multi/trans-disciplinary and results need to be better tailored for use by policy developers, policy implementers and researchers seeking to operate within an ICM framework
- it would be easier for people to do more effective ICM if there were a discussion on research needs and priorities that would help the relevant agencies carry out macro and meso scale ICM more cost-effectively and have a rationale for working out which micro scale initiatives should be supported within that context.

6.1.4 Lack of a shared information system

A large knowledge base already exists for most of the issues that catchment managers deal with. Years of experience have provided land and water managers, other resource users and policy makers with a wealth of knowledge of their local systems.

However, a common problem noted during this research is that a lot of this information is not readily available to interested parties on what other people are doing, research being commissioned or undertaken or examples of best practice.

Much valuable information is in people's heads, and is rarely well documented, meaning it is unavailable to decision-makers or ICM or local project managers on a collective basis. Similarly, much of the valuable knowledge that scientists have accumulated is fragmented and held in different databases.

Bringing local and scientific knowledge systems together could provide land managers and the wider community with a valuable knowledge base to help decision-making. This was also supported by Edgar (2004), who noted that there needs to be a focus on information management, including an inventory of all ICM-related projects, including community-based ICM projects as well as catchment initiatives that are being driven by central and local government, research providers and industry.

Edgar also noted a need to identify the range of ICM-related resource conserving tools and resources that are available for landholders, community groups and resource management agencies to use, including end-user assessment of these tools is required to determine their suitability for such target audiences as community ICM practitioners and regulatory authority staff. Among those listed are land, water and biodiversity monitoring methodologies; riparian and waterway restoration guides; catchment planning techniques; predictive ecosystem models; and guidelines for incorporating indigenous and traditional knowledge into ICM processes.

One model in this regard is the ICM-Motueka research programme website - http://icm.landcareresearch.co.nz/. This site aims to provide documentation of all the research being undertaken in the programme, and ensures that it is provided in the public domain. The Internet is now acknowledged as a useful platform for knowledge sharing, particularly for managing complex environmental information. As Allen and Kilvington (2005) point out a major strength of the Internet is that it allows people to create, annotate, link together and share information from a variety of media, including text, graphics, images, audio and video.

The New Zealand Landcare Trust and SAMsn websites (see Section 3.6) aim to do the same.

This raises additional issues about how to develop such information systems in ways that will enhance their likelihood of uptake. When information or knowledge-based systems are developed in conjunction with end-user groups, the technology is often more innovatively designed around social, economic, or cultural values and needs, and may acquire a sense of ownership by groups such as community, agency, land manager or indigenous groups (Harmsworth, 1998, Allen and Kilvington 2005). For this to happen science must be developed and integrated within the wider decision-making contexts of the organisations and groups involved in natural resource management.

In turn, this emphasis on the use of information will help ensure that data and information will be managed in ways that make it easier to share. What is important is that monitoring data and information are developed in such a way that they can be easily and usefully shared and readily used.

However, Edgar also noted that promotion of the availability of such ICM resources and specialised training would also be necessary, especially for some of the more technical ICM tools, if people are to make good use of them.

However, most funding agencies – and indeed, management agencies – focus on the creation and application of new knowledge rather than its transfer. That said, if best practice is documented, people are more likely to be able to find the information and use it. Another common complaint is that practical experts like doing the work but not documenting it, and this is a particular worry in sectors affected by the “greying” of the workforce. Use of video

interviews and demonstrations may help here, especially if there is a central repository of such information.

Good examples of interactive information systems in New Zealand include the:

- nzwaste list-serve and the Water New Zealand web forum, where practitioners from the public, private and not-for-profit sectors can email each other new information and ask questions
- Quality Planning website, where best practice is documented and regularly updated.

As also indicated in Section 8, such initiatives would help catchment managers gain direct access to useful knowledge without having to rely on fragmented bases of data and experience. This is also a key element of putting in place the adaptive management approach discussed in Section 6.4.

As identified in an earlier survey (Gustafson and Feeney, 2008 citing Hooper, 2006), the development and unrestricted access to a well developed, accurate, up-to-date information and monitoring system a critical linkage of the institutional arrangements supporting ICM to inform management agencies and support the decision-making process: ownership and access to the data are critical, especially where the ICM process needs to coordinate between different public sector agencies or private sector organisations, where there may be resistance to the sharing of data across organisational boundaries.

Such unrestricted data access and effective data management is important in informing the ICM process because good science informs the planning authorities' modelling and spatial representation of ICM options, which are costed and linked to the strategic planning, decision-making and funding systems and to subsequent implementation, management and monitoring (Hooper, 2006).

Again, this is part of the capacity requirements that support the putting in place of the first order outcomes associated with best practice that are listed in Table 3.

In sum:

- the issue is that although a great deal of information is available, much of it is in people's heads or fragmented across different databases
- the implication is that people and organisations often "reinvent the wheel" by commissioning research instead of being able to find existing information, and by "learning the hard way" on the ground, resulting in a lot of duplicated effort around the country
- it would be easier for people to do more effective ICM if there were:
    - an inventory of all ICM-related projects, including community-based ICM projects as well as catchment initiatives that are being driven by central and local government, research providers and industry – preferably in a geospatial framework as recommended in Section 6.3.4
    - a systematic attempt to develop a set of priority research needs including how to make research findings more transferable to different catchments
    - a centralised, multi-agency, regularly updated and very well-publicised database of related resource conserving tools and resources that are available for landholders, community groups and resource management agencies, including existing and proposed research and videos of experienced practitioners whose expertise won't otherwise be captured.

6.1.5 Insufficient funding, short and long term

Funding affects implementation but must be secured at the planning stage (1.1 in Table 3).

It has been included as a constraint rather than a barrier, as people will usually do their best to get what funding they can, but seldom have as much as they would like.

Catchment and asset managers are competing for funds in a constrained funding environment in which regional and territorial councils must deliver a wide range of diverse services. This can make it difficult for them to gain as much funding as they would like for macro and meso scale ICM.

Similarly, many local project managers at the micro scale find they spend increasing amounts of time preparing funding applications from the many different sources available in order to make sure they can carry on. Some sources will only fund a project for one, two or three years, at which point many of the projects may still be building community engagement with objectives and activities.

Some funding conditions also limit what can be achieved: Tyson (2004) notes that "financial restrictions by the MfE that prohibit the [Taieri Trust] from purchasing fencing and planting materials limit the project's ability to develop model demonstration sites in the catchment and provide landowners with incentives for enhancing waterways."
Some of the funding sources available for local projects include:

- environmental initiative funds through regional councils and sometimes territorial local authorities as well
- nationally delivered funding through the SSF and SMF, which mainly targets rural catchments
- the Royal Society of New Zealand's Science and Technology Promotion Fund to further develop technology transfer opportunities between science providers and the wider catchment community
- other sources such as the Tindall Foundation (see Table 4), lottery grants and various local and national charitable organisations.

As an example, Buchan (2007) notes that WWF through the Tindall Foundation's Heritage Protection Fund (HPF) "typically provides funding of between $2,000 and $20,000 to projects that meet its criteria. Since 1999 over $1,300,000 has been disbursed by the HPF on behalf of The Tindall Foundation. About 45 per cent of these projects are Maori-based, and involve local iwi and hapu. On an annual basis it is estimated all these projects contribute more than 500,000 volunteer hours to conservation (WWF-New Zealand website, www.wwf.org.nz – January, 2007)".

HPF grants assist with typical expenses such as (ibid) "labour costs; pest eradication and associated expenses; plant propagation and associated expenses; and equipment and materials necessary to ensure the success of a conservation project. Grants for the cost of labour are usually restricted to the wages for supervisors of groups of volunteers as this is seen to greatly enhance the effectiveness of the volunteer effort. Alternatively, it may be the wages of those carrying out a specialised task that cannot be undertaken by volunteers, for example weed eradication on cliff edges or marine surveys. The funding of salaries and wages sets the HPF apart from many other sources of funding for community environmental restoration projects and, in two of the three projects investigated for this research, that funding has proved crucial to success."

Edgar (2004) noted the need for resourcing to achieve outcomes, suggesting that successful short-term local projects could be given funding preference over start-up

initiatives where there is on-going support from stakeholders to continue the work. He noted that more consideration is needed of the role that central government can have in directly supporting ICM capacity-building in partnership with local government and the community. Funding support for local ICM project co-ordinators is a case in point: without the funding provided by regional and territorial local authorities and industry sponsorships there are very few avenues for providing on-going support for ICM project co-ordinators in New Zealand. This is also true of many of New Zealand's current biodiversity protection and enhancement initiatives. This leads to a heavy reliance on voluntary community contributions that can lead to tensions where communities and individuals are already stretched to capacity.

Aspects of funding referred to in interviews were the significant resourcing required to invest in:

- gathering good data
- addressing big problems such as nutrient leaching or large-scale flooding.

Both of these are expanded on below. Funding for administration and community capacity for engagement in ICM is discussed in Section 4.4.

High cost data

Part of the high costs of ICM relates to the science research that is required to clarify issues and baselines and to justify recommended interventions.

> 'ICM is quite a rates burden – these are long term issues that need long term funding.'
>
> 'The benefits go way beyond the community, way beyond the farm gate, so we should be getting national funding.'
>
> 'We need to identify a long-term strategy for primary production science and then fund it.'

Several interviewees noted the expense of collecting good quality information on which to assess and model land or water use, soil erosion, flooding, pollution and stormwater management issues and responses. Some councils have to recalibrate models because nationally available data such as HIRDS is not suitable for use in their region. Good baseline information at an appropriate scale such as from LIDAR or aerial photo surveys, about land use capability, or for long-term environmental monitoring is the backbone of good ICM at all stages of the planning cycle.

> 'There are a lot of agencies out there who could use this information but not all regions with pressing issues can afford it. Information from one quality survey could be sold to lots of different agencies, but someone needs to co-ordinate this.'

Again, this is a long term problem, with Ericksen pointing out the lack of finances for good catchment analysis and management in 1990.

High cost solutions

In rural farmland, particularly dairy farming, nitrogen leaching into waterways is a high-cost problem to resolve. For urban areas, stormwater issues involving sedimentation, industrial pollutants and heavy metals are also costly to address. Interviewees raised questions about these problems: Is the true cost of resolving these problems known and acknowledged? And who should pay?

> 'Managing Auckland's stormwater will cost between $2-3 billion. This scares people. But if it's a road we just throw money at it. There needs to be some honest discussion about the scale of the problem.'

Interviewees openly acknowledged the special challenges that nutrient leaching poses. A view was expressed that it is unreasonable to impose the costs of resolving this problem on

the current generation of landowners (see also the discussions on costs in Section 4.6 and equity in Section 7.5). Because of the time lag in nutrients presenting in waterways, the current nutrient overload in freshwater has been generated by previous generations of farmers. The significant costs required to reduce productivity on farms today (to prevent on-going pollution) should therefore be borne or at least heavily shared, by the central government. This is especially true because specific environmental standards are coming in after farmers have invested in their land and businesses. It is not clear where the very large sums of money required to compensate farmers and adequately address the problem will come from. A new approach to funding generation is likely to be needed (such as charging for water).

Contrary to that view, other interviewees expressed the belief that farming is big business and that if it was any other industry it would be required to pay its own way out of polluting practices.

> 'So the current farmer loses the capital gain he was hoping for on his land. And it's their view they should be paid to stop polluting the environment. That's unethical and irrational.'
>
> 'You're paying to support someone making 4% on a $4 million property? There are serious equity issues here.'

Interviewees holding these views felt that the burden could be shared by allowing farmers "plenty of time for adjustment" to new environmental standards, and to "provide clear signals that the new standards are coming".

> 'When we set the nitrogen leaching bottom line there was lots of objection. They thought we'd limit farming initiative and creativity but the opposite is true. These kinds of farmers are now coming in to the catchment and the others are leaving because they can't compete. Creativity now has the competitive advantage. You have to be a much cleverer farmer.'
>
> 'Change is difficult but in any other business they wouldn't have been allowed to get to this point anyway.'
>
> 'Dairy farmers just have to get up with the play – organic farming reaps more dollars than conventional farming. We really need some decent data that actually totals up the full economic costs of continuing how we currently farm compared to a change.'

As with other programmes such as industrial pollution prevention in Auckland, Wellington and Christchurch, the Environment Waikato farm ICM pilot project found higher levels of success were gained when there was one-on-one assistance provided to the farms by farm advisors as part of the project.

Funding of community capacity is discussed in Sections 4.4 and 4.6. Questions of the public/private benefits of funding onfarm improvements are discussed in Section 7.5.

This report has not investigated the actual investment made by major agencies such as regional and territorial councils in macro and meso scale ICM, as the definition of ICM is too wide to enable comparison of like with like and this information is often not readily available. Moreover, while a wider-ranging exchange of information amongst agencies could be useful to compare the relative cost-effectiveness of different management methods, the issues, research and information needs, degree of stakeholder engagement and management methods selected vary widely, again making comparison difficult. The publicly contestable funding mechanisms available under LGA procedures and referred to above imply that expenditure is appropriate to the level of community need and willingness to pay, but ability to pay is in some cases a concern to catchment managers.

In sum:

- the issue is that it is often difficult to gain enough money for a long enough time to make a different to catchment problems: many initiatives at all scales are funded for one to three years from various sources

- the result is that short term funding and the proportion of project time needed to continually renew funding pose a real constraint to project effectiveness, especially in terms of the longer term third order outcomes that are usually the real objective
- it would be easier for people to do more effective ICM if:
    - o central government played a role in directly supporting ICM capacity-building in partnership with local government and the community
    - o there were more co-ordinated approaches to collecting expensive but essential data that could be shared
    - o there were a forum for sharing ideas on the ability of councils and other key agencies (e.g. the relevant government departments) to fund the level of intervention needed to address the different issues the various regions face, as well as the relative cost-effectiveness of different methods used
    - o there were a consensus on funding for works needing to be done to address environmental externalities of land use activities both rural and urban.

6.2 Constraints at the doing phase

6.2.1 Timeliness and alignment of regional and district instruments

Land use change is strongly linked to water resource management and is a key area for potential conflict if land use planners and communities are not involved in ICM from the beginning.

Interviewees commented on the ongoing "glaring failure" of the resource management agencies in their inability to come to grips with and really understand the big picture of the link between land use and water – especially the capability of land to be used for different activities (as also indicated in Section 5.1.2).

> 'We don't even use land use capability assessments to properly control land use in a planning context, yet the country was all mapped on this basis years ago!'

However as we have seen in Section 5.5 and as identified by Hunter and Winefield, (2006) and Heslop and Hunter (2007) the current policy context constrains the timeliness of some interventions. Making or changing plans under the RMA can be a lengthy, litigious and costly process. Many interviewees mentioned the cumbersome nature of the planning process, especially the difficulty of making clear links between land use and water when grappling with the varying roles of district and regional planning documents.

Where land use is changing rapidly (in particular conversion to dairying) interviewees spoke of the current lack of policy responsiveness to deal adequately with the associated environmental impact.

> 'The policies we're working under were drafted in the early 90s and took 15 years to develop. The world has changed rapidly and substantially in that time – they don't mean anything anymore. It's very hard and very slow to make adjustments.'

> 'We had 30,000 hectares of forestry cleared very rapidly –and warning that there's another 40,000 to come. The money put into dairy conversion was astonishing. We had no environmental rules to address that. To change the rules is expensive and time consuming.'

Interviewees from regional councils facing these severe environmental challenges spoke of the difficulties of anticipating land use changes when writing plans and the impacts on that of the regulation they have available to address emerging issues.

> 'District councils can bring in bylaws very quickly – central government can bring in legislation overnight with no consultation, but we have no choice [about the time-consuming manner in which we go about changing regulation].'

> 'If you're in year one or two of a planning cycle you'll need to wait another 8 years before you can change the policy.'

So, while in theory the most effective place to bring about policy change to promote the uptake of new approaches is through plans and policies produced under the RMA, in practice Heslop and Hunter (2007) found it is easier to use methods under the LGA or the use of 'strategic influences' – tools that sit outside the legislative framework such as growth strategies, structure plans, ICMPs, engineering standards, land development codes of practice, urban design guidelines and the like.

The result is that it takes too long to embed strong or enforceable ICM provisions into regional policy statements and regional and district plans, especially for rapidly emerging issues, while the alternatives may lack teeth. Such legal or policy matters are listed in 1.2 of Table 3, and are an important factor enabling more effective ICM.

In sum:

- the issue is that despite the knowledge and experience of the relevant professions, it is still very difficult to effectively manage the link between land use and its effects on water-related issues
- the implication is that the responsiveness of the available regulatory instruments
- it would be easier for people to do more effective ICM if there were:
    - greater awareness of alternative methods and inclusive processes under RMA and LGA that can produce results in the short term when needed
    - a stronger national mandate and good scientific and other information that will support regional and territorial agencies in addressing pressing issues in a more timely manner.

6.2.2 Lack of institutional alignment and co-ordination

The obverse of the good institutional alignment noted as an element of best practice in Section 4.1 is lack of institutional alignment and co-ordination, both vertically between local, regional and central level and horizontally at all levels – as well as between the different instruments developed within organisations under different legislation, especially RMA and LGA instruments.

Regional and territorial councils are required to prepare policy and management tools under both the RMA and the LGA (as well as other legislation), but as noted by Heslop and Hunter (2007), the purpose and intent of these Acts are different and it can be a challenge for councils to achieve alignment between RMA policy objectives and LGA community outcomes objectives expressed in the LTCCP. There are also issues of alignment between the policies of different levels of local government – regional councils and territorial local authorities, as well as within the internal policies of one council (including plans prepared under the RMA, codes of practice, funding policies and various guidelines such as urban design guides).

Interagency co-ordination is central to integrated catchment management. However many interviewees and authors (see for example Peart 2007a and b; and Britton, 2003) noted this was an area of weakness, especially across MHWS – largely because staff don't have time for regular engagement with professionals working in related areas.

Another interagency issue identified by Tyson (2004) in the lower Taieri was disagreement about whose responsibility it is to fix various problems, with locals considering that the territorial council was responsible for fixing "drain water problems caused by septic

discharge", but that the council had not been sufficiently engaged in the project activities to date.

MAF (1999) noted that a "number of different organisations are now attempting to monitor environment/quality/food safety issues. The lack of co-ordination between these organisations imposes a high cost on farmers' time and causes very negative responses towards the idea of monitoring. Agencies such as MAF, MfE, councils, fertiliser companies, meat companies, and marketing organisations … need to co-ordinate their requests for base data." Agencies "such as MAF, MfE, councils, fertiliser companies, meat companies, and marketing organisations need to co-ordinate requests to farmers for base data. Much of the information they require is common and should only be collected once". This could then meet a range of research and planning needs for the different institutions using the information.

Similar comments apply to industrial sites, which may receive compliance monitoring visits from many agencies as well as visits by several different officers from a regional and in some case the territorial council as well.

In sum:

- the issue is that more effective ICM is slowed or hampered by a lack of institutional alignment and co-ordination, both vertically between local, regional and central level and horizontally at all levels – as well as between the different instruments developed within organisations under different legislation; staff also find it hard to liaise with staff from other agencies even though they know this is important and valuable – again, this reflects the capacity gaps listed in 1.3 and 2.1 in Table 3
- the implication is that ICM becomes more time-consuming and less efficient because staff have to make or change key instruments or work around their inconsistencies. On the ground, lack of co-ordination takes up the time and goodwill of key land owners with multiple unco-ordinated interactions
- it would be easier for people to do more effective ICM if there were a stronger national mandate for greater interagency liaison so that adequate resourcing could be provided to enable staff to better co-ordinate both strategic planning and on-the-ground interactions of related agencies with land owners.

6.2.3 Turnover and burnout

Turnover and burnout of key people in institutions, groups and communities constrain the consistent effectiveness of catchment-related initiatives.

Staff turnover in councils and agencies is often cited as a problem by those working in community groups. Staff changes interrupt the continuity of relationships with other organisations and community groups and negatively affect institutional memory. This diminishes the organisation's capacity to learn over time and makes it difficult for partner organisations and community groups to operate consistently over time.

"Burn out" is a risk for iwi and community-based ICM participants, who are often very community-minded and heavily engaged in multiple participatory roles. This can also be true of staff in councils and other institutions.

In sum:

- the issue is that while good people are crucial for effective ICM, they can move on and burn out for a range of reasons

- the implication is that there is loss of progress and knowledge when critical participants step away from the ICM process at any time
- it would be easier for people to maintain consistently effective ICM if there were more support for key people in institutions, iwi and community groups over the long term (capacity) and formal succession planning carried out as part of the capacity planning needs in Table 3 for major programmes.

6.2.4 Lack of practical integration of understandable research

MAF (1999) noted that "many non-group farmers are discouraged from participating in sustainable land management group activities because of the highly technical nature of many discussions. Field days should focus on practical demonstrations and hands-on experiences. Research driven by farmers is more easily understood and applied than research driven by research institutions. When farmers drive research, their interests prevail, but this is not always so when the research is driven by scientists. The incentives facing these two groups are at times quite different and the two approaches produce different results. Research does not have to be high-tech and expensive. The planting of a variety of trees and shrubs to test survival rates and effectiveness for controlling land slips in a variety of situations seems an obvious focus for groups facing this problem. However none of the groups seemed to be undertaking this task. A similarly simple activity, which was also not being done, is the checking of weed growth in streams as an indicator of hillside runoff causing nutrient pollution."

The case study "How much is enough? Benchmarking second and third order outcomes for riparian plantings and soil conservation" in Appendix H shows how researchers can provide simple useful findings that catchment and project managers as well as land owners can readily apply.

In sum:

- the issue is that highly technical discussions can deter some land owners from taking part in catchment groups or applying the results
- the implication is that key research projects need to be informed by end users and demonstrated on site in order to promote wider uptake
- it would be easier for catchment managers to encourage and land owners to adopt more effective ICM if research was informed by end users and given to them in a form they can readily use.

6.2.5 Capacity gap in practical skills and tools

Edgar (2004) identified considerable potential for further training and development of community capacity on a range of issues, including not only ICM but related resource management issues such as:

- catchment planning techniques
- environmental monitoring, including for land, water and biodiversity
- riparian and waterway restoration and management
- pest management
- biodiversity
- land, stream, wetland management
- predictive ecosystem models

- flora and fauna identification and life histories.

Training in the following generic skills was also requested by Landcare participants Edgar surveyed:

- group learning
- partnership development
- changing behaviours and perceptions
- how to involve the community
- how to support/motivate community volunteers
- integrating science into community action
- working with industry/business
- indigenous approaches and consultation, including guidelines for incorporating indigenous and traditional knowledge into ICM processes
- extension tools, facilitation, information transfer techniques
- integrating social and economic dimensions
- project management
- use of databases and GIS techniques
- integrated environmental management.

However, Edgar noted that funding further investments in developing human capital and skill sharing opportunities is a major issue.

MAF (1999) identified a need for technical assistance for farmers to help them farm more sustainably: "some directions on simple low-cost ways to trial and monitor new techniques, especially those designed to achieve environmental sustainability, would assist in the uptake of such practices."

This comment also relates to other land use activities, and there is evidence of the development of practical tools for more efficient water use (e.g. the tools on the SAMsn website and other listed in Section 3.5) and the development of guidelines for erosion and sediment control, more sustainable stormwater management and industrial pollution control by several regional councils around the country, including the Auckland Regional Council and Environment Canterbury, as well as Christchurch City Council's Waterways and Wetlands Guideline.

In sum:

- the issue is that there is a large capacity gap in the community in ICM and resource management skills, as well as a wide range of generic skills related to people, project and information processes
- the implication is that there is a lack of shared learning, so this capacity gap makes ICM slower and less effective than it potentially could be once communities gain these skills
- it would be easier for people to do more effective ICM if there were a central repository of resources (including people) on which project managers can draw to meet identified capacity gaps, including surveys to help them highlight these gaps and choose which resources they need first.

6.2.6 Poor participation in ICM initiatives

Low participation can constrain the effectiveness of ICM initiatives where full or high participation is needed to achieve a particular environmental outcome, such as water quality. In such cases, regulation may be needed – but as shown in the case study on the Dairying and Clean Streams Accord in Appendix H, not even enforcement can always gain full participation.

Capacity and cussedness contribute to poor participation: some people can't take part and some people won't.

Many stakeholders are too busy with other things to participate in ICM activities. In some cases they may be too busy with work, family or other commitments – in others they are already at capacity responding to agency requests for community input. But equally for some stakeholders it is because they are busy with volunteer work in other issues like health or education: it is often the case that people who are known to be effective are often approached by a number of organisations to help promote a range of different beneficial projects.

Lack of wider community involvement was identified by MAF (1999) as a barrier (we are deeming it a constraint) to the effectiveness of sustainable land management groups. Its five case studies and survey of 19 rural projects observed a "distinct lack of involvement in the groups by members of the wider community. Their involvement would be beneficial, as issues of concern to non-farmers would be covered, particularly issues involving environmental externalities. Such involvement would also foster a better appreciation by the wider community of the constraints facing farmers in implementing sustainable land management practices.

"The predominance of economic viability issues addressed by the groups appears to have discouraged non-farmers from attending meetings, e.g. conservation organisations and school teachers interested in environmental issues. In general, the wider community tends not to see issues discussed by sustainable land management groups as being within their sphere of interest. Without a clear link between the interests of land-users and the wider community, these groups do not appear to be good vehicles for involving non-land-users in issues concerned with land-use sustainability. However, the groups do offer valuable opportunities for land-users to meet and discuss a whole range of issues facing the rural community."

Others have noted (e.g. Tyson, 2004) that productive actions by landowners may be hindered by negative attitudes toward the agencies that are involved.

Other constraints to land owners in implementing change were identified (MAF, 1999) as:

- when farm returns are poor there must be a focus on economic issues to ensure the survival of the farm family. Under such circumstances, farmers are more likely to respond to an environmental issue when they see that to do so produces an economic benefit to their farm. In all case studies except Hawkes Bay (where the key barrier to change was a lack of technical knowledge, addressed above), the major barrier to changing land management practices in order to achieve environmental sustainability was an over-riding financial constraint.
- there is a distinction between environmental effects that have economic implications for farmers, and environmental effects which are borne externally to the farm, e.g. impacts on downstream water quality. In the latter case there is often little incentive for farmers to address these issues [externalities are discussed in Section 11]
- external factors (especially weather) can undermine the efforts of farmers to address environmental sustainability. The risks associated with tree planting on hill country are

very high and there is a significant chance that poles will either die during droughts, or be carried away in slips during major Bola-type storms

- suspicion of the motives behind the agencies promoting the establishment of sustainable land management groups is often an initial barrier to participation, particularly where there is no immediate environmental issue threatening the farm. It often takes 18-24 months before confidence is gained and the groups get down to addressing the issues. The set up time is much shorter where there is a pressing environmental issue because the objective is more obvious and the need for measuring progress more readily accepted.

Concern about the ability of individual farm plans to deliver on catchment outcomes was also expressed by Campbell (1991, in Brown, 2006a). He contended that there was a strong imperative for developing ways to plan and implement change, particularly at catchment and regional scales, to provide a strategic framework for resource allocation, because voluntary EFP programmes rely to a large extent on their uptake by so called "innovative" farmers. He notes that "the trickle-down adoption process is inadequate for cases where the only acceptable rate of adoption of an improved practice is 100%, for example in dealing with pests, weeds, disease or water quality".

Brown (2006a) cites examples that point to some deficiencies in the individual property plan approach without the wider catchment perspective:

- in the Lake Brunner Catchment on the West Coast of the South Island, Russow et al (2006) found that while individual farmers were making significant progress on their own properties, progress towards the achievement of catchment outcomes was hindered by an individualistic approach
- in the Washpool catchment in South Otago, water sampling at property boundaries demonstrated that gains on one property could quickly be offset by problems on another property in the catchment: in effect (McKeague, pers comm., as cited), one or two under-achievers could have a significant effect on the overall outcome.

There is more on this in the discussion on equity in Section 7.5.

In sum:

- the issue is that in some cases, partial participation is inadequate for cases where the only acceptable rate of adoption of an improved practice is 100%, for example in dealing with pests, weeds, disease or water quality
- the implication is that sometimes even with the best practice provision of first order outcomes, catchment or project managers will be unable to deliver a second order outcome of full participation because of lack of time of or positive response from landowners and communities. Low responses may also demotivate good performers
- it would be easier for people to do more effective ICM if there were wider community endorsement of the outcomes it can and must deliver
- a national mandate, interagency commitment and judicious regulation supported by education, positive and negative financial incentives and other methods would support this.

6.3 Constraints at the check (monitoring) phase

The growing number of local projects set up by enthusiastic communities or by national sector groups and NGOs shown in Section 3 raises the risk that outcomes will not be adequately documented into the frameworks described in Section 2 that are necessary to track improved environmental outcomes at the macro or meso scales. While this may not

constrain the on-the-ground effectiveness of catchment-related initiatives, it does constrain the ability of managers to document and attribute changes in environmental bottom lines to them.

Heslop and Hunter (2007) noted that monitoring "is a critical part of good management and is required under the RMA and the LGA, although the timeframes differ. Ideally, the whole monitoring framework should be coordinated so that reports are consistent and information only needs to be gathered once. Consideration needs to be given to what is being monitored and whether this could contribute to the results of such monitoring reports being a key driver for promoting [ICM] in order to improve environmental outcomes – what is being measured and for what purpose."

If first, second and third order outcomes are to be documented, regional councils, the key responsible agencies, need to be resourced to support or conduct any necessary monitoring of the outcomes of region-wide or local action by groups supported by themselves or other agencies.

Constraints at this phase thus reflect flaws in both principle and practice:

- lack of adequate provision for monitoring in the planning phase
- lack of capacity to carry out monitoring whether provided for or not.

According to Gustafson and Feeney (2008), a "pivotal element of successful planning and adaptive management is cost-effective and meaningful monitoring, to enable documentation of both plan implementation and plan outcomes. Key questions that monitoring needs to answer are:

- "did we do what we said we would? In other words, how well are we implementing our plans (outputs)? [second order outcomes]
- "did it make a difference – are the [third order] outcomes as anticipated?
- "what else is going on – what other trends are present or emerging? [synergistic or confounding factors shown in Figure 2, which enhance or constrain the results of interventions]
- "does it make sense? – how accurate were our assumptions about cause and effect in selecting our methods in our plan? How well do we understand the environmental, social, cultural and economic systems and processes that we are attempting to influence?" This equates to reflection and review for adaptive management.

Among other things, collaborative and integrated monitoring should also (ibid):

- integrate LGA and RMA outcome monitoring by regional and territorial councils
- inform the development and monitoring of resource consent conditions, to ensure they are aligned with policies and outcomes in the relevant laws, plans and strategies
- pull information collected by iwi, sector and community groups into a joint monitoring framework.

In this subsection, we comment on general findings from New Zealand-based literature surveys and interviews (our own and those of others) and then go into detail on the main aspects of poor monitoring.

6.3.1 Findings from New Zealand literature survey

Our initial New Zealand literature review assessed selected initiatives in terms of the elements of good practice ICM in Table 3 in order to ascertain the extent to which it was possible to determine the effectiveness of the interventions described.
The series of tables in Appendix D show the raw data. From these, the following observations were made:

- few of the initiatives had progressed to the stage of generating measurable outcomes
- most had specified measurable outcomes in different ways, though many of these would be categorised as first or second order outcomes rather than third order outcomes (environmental bottom lines for ecological or water efficiency)
- things that worked well largely coincided (in principle if not in exact wording) with the elements of best practice noted in Table 3. Initiatives could be deemed to be more successful/effective if the tables had more entries in the three columns "How well did it work? What worked well? Why did it work?"
- regulation and use of economic measures appeared to be associated with more effective initiatives, particularly when allied with good support for and engagement with stakeholders
- barriers and constraints related to poor planning, lack of resourcing, unwieldy enforcement mechanisms, narrow scope and lack of integration internally within the lead agency and externally with iwi and other sectoral or community interests.

In addition, the effectiveness of many initiatives scrutinised for selection and in the end chosen for review could not be fully assessed from the available literature because it was not all written for the purpose of project review.

Other key reasons derived from the literature and interviews for the lack of measurable outcomes include:

- objectives are often not framed in measurable terms, especially for the third order outcomes which the initiatives were presumably set up to achieve
- data from short-term initiatives, especially those supported by independent groups or other agencies, is not captured for ongoing inclusion in long-term regional council environmental monitoring programmes
- some longer-term initiatives have not been operating long enough for outcomes to be distinguished from noise in the data caused by short term changes
- ongoing intensification of land uses makes it difficult to assess how much worse things could have been if catchment interventions had not been in place.

Edgar (2004) also noted from his national survey of ICM initiatives the need for more formal and systematic attempts to develop project performance criteria before start-up.

In the rural sector, irrigation uses almost 80% of all water allocated in New Zealand (half of it in Canterbury) (MfE, 2007) and the need for efficient water use in the primary sector is correspondingly significant. One of our interview respondents noted that with the approaching expiry of mining privileges, water users are forming irrigation companies that are closely focused on identifying best practice water application methods and rates and setting up metering and reporting systems to ensure compliance with water use limits and restrictions and make sure the water "goes round" as much as possible. This information would then be forwarded to the regional council for compliance monitoring and ongoing water availability assessment. The Primary Sector Water Partnership (2009) is also strongly focused on improving the efficiency of water use in order to "promote sustainable

freshwater management in the land-based primary sector". A trend towards better monitoring of water use rates and efficiencies is thus emerging (see also Section 6.6).

The following subsections supplement these findings with the results of other New Zealand-based research into ICM and catchment-related projects.

They look at the following aspects of the constraints on good monitoring:

- lack of environmental baselines and benchmarks
- absence or vagueness of objectives
- lack of provision for capture of third order outcomes.

Although they are discussed at this "check" phase, it is clear they reflect lack of adequate consideration in the "plan" phase of initiatives, especially item 6 under 1.1 in Table 3.

6.3.2 Lack of environmental baselines and benchmarks

Baseline environmental data answers the programme question "Where are we now?" and benchmarks based on research, best practice or guidelines help answer the question "Where do we want to be?" in order to inform the setting of objectives that are not pointlessly low or unrealistically high.

The 1999 MAF assessment of sustainable land management initiatives noted that:

- "baselines need to be established before environmental work begins
- "the lack of baseline data [and use of benchmarks] means that objectives are often set based on perceptions rather than on specific and measurable improvements. As a result, improvements are difficult to demonstrate. This reduces the incentive for farmers to change [this would apply to other land users too]
- "groups are hampered by a lack of hard data on the size and impact of naturally occurring environmental change compared with that which is man-made (e.g. hill country erosion is a natural process that has been accelerated through deforestation). Farmer observation suggests that much of this land erosion is a natural process. In the South Island high country, erosion and subsequent deposition of material offset natural uplifting. There is a need to measure natural environmental change. We saw no evidence that this is taking place."

Geographic variations mean each region may have different benchmarks when setting, for example, low flow levels/durations/frequencies, or water quality and other ecological outcomes. This means that regional councils need to play a bigger role in helping other players set appropriate objectives based on robust and locally relevant benchmarks.

These can be set for second as well as third order outcomes, as is shown in the riparian case study included in Appendix H.

In sum:

- the issue is that the lack of baseline data and use of benchmarks means that objectives are often set based on perceptions rather than on specific and measurable improvements
- the implication is that as a result, the effectiveness of interventions and the delivery of improved environmental bottom lines are difficult to demonstrate, reducing the incentive for land owners to change

- it would be easier for people to do more effective ICM if there were:
    - wider awareness of the need for and value of baselines and benchmarks
    - case studies showing how simple they can be
    - capacity in regional councils to support their own programmes and those of others with respect to locally relevant and nationally consistent baselines and benchmarks.

6.3.3 Absence or vagueness of objectives

Assessments of ICMPs in the Auckland Region have shown (Kouwenhoven and Feeney, 2009) that most objectives are framed in ways that makes it impossible to measure progress towards or achievement of them.

According to Ericksen et al (2003a), Olsen (2003), UNEP/GPA (2006) and Kouwenhoven and Feeney (2009), a robust plan should contain:

- clearly defined issue/s
- measurable objectives that match the framing of the issue
- implementation methods that clearly align with both of the above
- indicators (both qualitative and quantitative) that enable plan implementation and progress towards and/or achievement of the objectives to be measured
- undertakings about monitoring and reporting of monitoring results and plan effectiveness review.

Objectives should relate to both process and outcomes – that is, first, second and third order outcomes. However the resilient communities school of ICM aim to solve issues by way of community engagement and the building of trust. For example, it is notable that the objectives of the Taieri Trust relate to the processes of getting to that point (and their achievement can be documented), in order that the enabled community fully understands the issues, and can then set about identifying solutions for third order outcomes which will by that time be able to be framed in measurable terms.

By contrast, of the three projects evaluated by Buchan (2007) – the Whaingaroa Harbour Care project in Raglan, Te Rangitahi o te Whenua Trust in Torere and the Yellow-Eyed Penguin Trust in Dunedin – none had mechanisms in place to measure their environmental outcomes.

In sum:

- the issue is that many objectives are framed in ways that makes it impossible to measure progress towards or achievement of them
- the implication is that there is a lack of capacity for framing objectives in ways that enable them to be measurable
- it would be easier for people to do more effective ICM if examples of measurable objectives for first, second and third order outcomes were more widely available.

6.3.4 Lack of provision for capture of third order outcomes

Catchment interventions are by definition aimed at making some kind of specified difference to catchment – third order – outcomes. Few of these are well documented, especially for smaller short-term projects.

This reflects constraints identified earlier, especially the lack of measurable (or sometimes indeed, any) objectives; lack of capacity of councils and NGOs; lack of provision for capture of third party outcomes and lack of a shared information system.

Other difficulties include:

- lack of clarity in the literature, which often conflates or substitutes indicators of successful process (first and second order) with those of effective (third order outcomes
- the lack of simple, robust indicators referred to in Section 6.2.4, e.g. checking weed growth in streams as an indicator of hillside runoff causing nutrient pollution (MAF, 1999)
- the many different agencies and groups active on the ground
- the apparent lack of an overall geospatial and monitoring framework into which their actions and outcomes are captured
- the long time frames before the outcomes and hence the effectiveness of many interventions can be measured.
- difficulties of any documenting whether individual project outputs make a measurable difference at the larger river, or catchment scale and the need to capture the cumulative effects of many such separate projects.

Unless they are well connected into a regional council or national agency (government or NGO) and their respective environmental monitoring programmes, the third order outcomes of short term projects will not be documented.

Both project and council staff need the capacity to consider how the information will be captured, ideally within the systems already in place in regional councils, which are responsible for integrated management. This can be difficult when many programmes and projects are initiated by other agencies.

Regardless of whether a project ends after three, five or ten years, the relevant regional council needs to know about what it did and make appropriate provision to capture these second order and if significant, third order outcomes.

Participatory evaluation as explained by Allen at al (2002a) and described in Appendix H can make a major contribution to capacity building and learning. It recognises that it is important for all stakeholders to have ways to evaluate the participatory process in which they are involved, for example funders need evidence that their investments are paying off and need intermediate indicators of success (e.g. within the time frame of funding cycles) for process-oriented initiatives such as capacity building, while other stakeholders giving their time to help the particular effort (e.g. land managers providing information, agency staff facilitating projects) need evidence that their input is having an effect, at the least, to maintain their motivation for continued involvement. This involves clear objectives and indicators of success that promote accountability, and which can be monitored and evaluated by the relevant participants and decision makers at all levels.

Many people feel daunted by the LGA requirement (more honoured in the breach than in the observance) to monitor outcomes under all four wellbeings. In a review of the Central Papakura ICMP, Feeney et al (2009) realised that catchment managers regularly assess ICM options across all four wellbeings as part of their multi-criteria analysis, but that some of these outcomes were the responsibility of other parties within or beyond the council. This meant that a simple matrix could show which wellbeings are promoted by each option, and can sometimes reveal opportunities for a selected option to be slightly modified so as to produce other benefits as well as those intended. These other council divisions or agencies can then monitor these actions and outcomes if desired.

In sum:

- the issue is that few third order and third party ICM outcomes are well-documented, especially for short-term micro scale projects, unless they are well-connected into a regional council or national agency (government or NGO) monitoring programme

- the implication is that there is a lack of capacity for an overall geospatial monitoring framework into which actions and first, second and third order outcomes of the many initiatives of the many players in catchments are captured across all four wellbeings
- it would be easier for people to do more effective ICM if there were appropriate provision for and interagency co-ordination of this, including by funders of catchment-related projects as part of their project funding criteria, to capture these outcomes, including by participatory monitoring and evaluation.

6.4 Constraints at the review phase

6.4.1 Lack of summative reviews

Brown (2006) notes that the literature "makes the distinction between formative and summative evaluation. Formative evaluation assesses programmes in terms of inputs and outputs [first and second order outcomes], while summative concentrates on [third order] outcomes. So far most evaluations of natural resource management projects have been formative because of the difficulties associated with measuring what are often long term outcomes. Summative evaluation and review in natural resource management have been widely neglected, with a substantial gap between theory and practice.

"Within New Zealand, and internationally, a reasonable amount of formative evaluation data is available for environmental farm plans. However very little data is available from a summative evaluation perspective. Reference is made in the literature to positive environmental outcomes resulting from conservation works such as tree planting. This data comes directly from the evaluation of the effectiveness of works rather than from evaluations of the effectiveness of the environmental farm planning process.

"Despite the lack of a direct link between the farm planning process and positive environmental outcomes, good results are reported from a number of regions from many years of farm planning activities. The proviso on the examples given is that the farm plan itself has only been the start of the process. Success has come from a number of factors including on-going commitment and support and the development of close working relationships between the councils and their landholder clients."

Brown identifies (p11) that monitoring of environmental farm plans focuses on what we would deem second order outcomes (the number or coverage of plans by agricultural area, problem area or problem land type; implementation of plans as a measure of actual uptake; and long term changes of farm management practices) rather than "the effectiveness of implemented plan recommendations in terms of actual environmental outcomes", or what we would deem third order outcomes.

The sheer scope of more integrated macro and meso scale ICM programmes also makes them difficult to evaluate:

- the evaluation of the effectiveness of integrated programs in resolving or ameliorating natural resource use and management problems, is one of the more neglected areas of integrated resource management (IRM) research (Bellamy et al, 1999 in an international review)
- progress has been made in recent years in terms of establishing evaluation frameworks for various programmes but to date there is a paucity of hard data on outcome performance, particularly in the environmental area (Brown 2006a).

Noting that a "lack of summative evaluation data is also the norm for integrated catchment management programmes", Brown (2006a) says that "progress has been made in recent years in terms of establishing evaluation frameworks for various programmes but to date there is a paucity of hard data available on outcome performance particularly in the environmental area. Information is available through the literature showing positive gains in terms of social outcomes in areas such as improved communication between stakeholders,

greater awareness of issues, improved management skills and capacity to complete the task", but (p15) despite "the enormous interest in the ICM concept that has developed in recent years there is a paucity of information available on the effectiveness of the process in terms achieving improved environmental outcomes". While there are some examples where progress towards project outcomes is reported, in most cases Brown found that this information remains "reasonably general and largely anecdotal" in nature.

These general findings are in keeping with international evaluation reviews that point out that of the relatively few attempts at evaluating natural resource management programs, most concentrate on first order changes (Bellamy et al, 1999; Olsen et al, 2003). Several evaluations go beyond input measures to discuss the operation of management processes, although the measures in these studies are almost always limited to the opinions of the parties involved (Bellamy et al, 1999). Some studies focus predominantly on the processes themselves on the grounds that related outcomes are improved community decision-making processes themselves. The greatest difficulty for integrated resource management programme evaluation remains that the critical outcomes are those that are long term.

Confounding factors also exist for long term projects needed for effective ICM: lessons from one large-scale landscape level case study (Allen and Jacobson, 2009) highlighted that in cases where the management goal is long term, social goals change in response to external political and economic events. Because of this it is difficult to assess programme effectiveness.

Doug Horton and colleagues (2009) point to the challenges of measuring partnership-type activities, such as those implicit in ICM. As partnerships operate on the boundaries between traditional organizations, conventional approaches to organisational assessment are of limited utility. Different partners often have multiple and conflicting objectives. This means that traditional models for evaluating goal attainment are often hampered. The evolution of partnership objectives and operational modes further complicates partnership evaluation, as it becomes more an art of tracking progress toward moving targets than one of measuring clear, pre-determined indicators based on well defined planning targets.

Similar concerns and experiences reservations were raised in our interviews, including the long time it takes to get results and the difficulty of attributing changes to the effects of specific interventions.

Because of the evolving and holistic nature of the concept of IRM, evaluations of IRM programs or processes require criteria from the biophysical, social, economic, and institutional/policy perspectives, and need to recognize the interrelationships between these evaluation criteria. As Bellamy et al (1999) point out this requires a multifaceted evaluation methodology that provides a general analytical framework within which:

- an evaluation can be planned to account for the broad range of issues encompassed by the integrated resource management concept, as well as objectives of documented policies
- the nature of IRM as an evolutionary process of managing change is recognised.

A significant problem for this and other reviews of ICM is the paucity of quality independent evaluation of ICM programmes in New Zealand. This is especially problematic for a focus as important as New Zealand's fresh and coastal waters and a subject as elusive and with as many definitions as ICM.
Independent review is an essential strategic planning tool for any initiative. It allows an implementing agency to evaluate its performance, ensure it is successfully targeting the core problem, assess the impact and effectiveness of its work, challenge its assumptions and improve the quality of its next programme. Review needs to be closely linked to

learning, so that review findings are returned to organisation in a manner that ensures changed and improved performance and knowledge.

It is likely that much of the debate around ICM would be addressed if more independent review was undertaken.

> 'Projects are not being properly reviewed. We're not learning from ICM as a country.'

While research agencies were openly engaged with review, no regional council we interviewed had completed a full and formal independent review of its ICM programmes. Many interviewees commented that this was because of political reasons.

> 'Councils don't do reviews. They're frightened of results; staff are worried that the management and politicians will cut the programmes.'

Others felt that it would be difficult to review something as complex as ICM:

> 'We haven't done a formal review. I suppose there are people around who could do it but they might come from an academic perspective.'
>
> 'How do you ascertain community engagement? If 50% of your interventions fail, does that make the project a failure?'

or that it would be too costly:

> 'It's a resource issue. We should've done this from the start but it wasn't funded.'
>
> 'Monitoring is very expensive. The amount of money that can go into it is mind-blowing.'

Others stated that "if you have effective community engagement, the communities themselves will adequately judge your work".

The few formal reviews that have been done of ICMPs (e.g. Kouwenhoven and Feeney, 2009) have focused on the quality of ICM plans with the aim of improving how they are written, so that their implementation, outcomes and effectiveness are capable of being monitored. However the plans reviewed are only now being implemented.
This is in line with experience with other plans. However, some councils are tackling plan outcome/effectiveness monitoring, for example (Jan Crawford pers. comm.):

- some use just one method e.g. interviewing staff about what works and what doesn't
- others try something more quantitative or at least a few different methods
- one example of mixed methods is the independent review of the New Zealand Coastal Policy Statement commissioned by DoC
- other councils have picked a specific part of a plan for more detailed evaluation; for example, Auckland City monitored the outcomes of its Isthmus Plan impermeable surfaces requirements, which aim to reduce the effects of runoff volumes on the stormwater asset and freshwater receiving environments.

There is a list of plan effectiveness reports on the Quality Planning website at http://www.qualityplanning.org.nz/monitoring/effective-monitor.php#bpe.

Effective monitoring and review – including independent review – enabled by well-written plans are essential tools for ICM. They allow an implementing agency to evaluate its performance, ensure it is successfully targeting the core problem, assess the impact and effectiveness of its work, challenge its assumptions and improve the quality of its next ICM programme iteration – that is, as dicusssed in the next section, to practice informed adaptive management.

In sum:

- the issue is that a lack of summative evaluation data is thus the norm for integrated catchment management programmes (as it is of other kind of plans in New Zealand), making it very difficult to gain an overview of their effectiveness, so that collectively we are not learning as fast as we could about what really makes for effective ICM (including learning from things that go less than well)
- the implication is that the capacity gap when it comes to review reflects lack of awareness of its value and the skills to do it cost-effectively, lack of resourcing and a pervasive "audit culture" that makes people fearful of embarking on the review process, especially if they suspect their results are less than brilliant
- it would be easier for people to do more effective ICM if there were:
    - better provision and capacity building for framing and documenting first, second and third order outcomes in order to provide good data for formative reviews, which can enable early adjustment to initiatives, and for the summative reviews that enable capture of longer term third order outcomes and ongoing programme adjustment
    - a participatory approach to monitoring and review
    - a shared information system about methods and results of reviews.

6.4.2 The difficulty of adaptive management and the need for a learning culture

In order to be truly constructive and valuable, reviews need to be a part of a suite of explicit and supportive processes of organisational and community learning (capacity building), so that review findings can be used by organisations and stakeholders so as to ensure changed and improved performance and knowledge – an adaptive approach to catchment management.

A number of interviewees commented on the lack of a learning culture and learning opportunities in the ICM field. Local government in general was not seen as providing a learning environment for ICM, with its culture of not reviewing and of shying away from open and robust debate about programme success and failure.

The need for, and challenges of, implementing a learning-based and adaptive management approach was a theme of many reviews including Edgar (2004), Allen and Kilvington (2005), Dodd et al. (2009), and Allen and Jacobson (2009).

It was widely felt that there needs to be a national forum of some sort to compile ICM activities and information, to foster networks, encourage new partnerships, and provide training to build national capacity. This could tie in with an adaptive approach to catchment management. Such an approach would see ICM activities at all levels as mechanisms for learning. Future initiatives could be designed so that learning could occur from both successes and failures. Sharing information could help reduce uncertainties, and contribute towards the development of a best practice toolbox as part of a shared information system.

Integrated resource management (IRM) programmes are managing interrelationships among dynamic biophysical, social, economic, and institutional/policy systems. As Bellamy et al (1999) point out, this requires a multifaceted evaluation methodology that provides a general analytical framework within which, among other things, the nature of IRM as an evolutionary process of managing change is recognised.

Hooper (2006b) has defined a series of stages in the evolution of an adaptive river basin organisation, from being an initial/functionary organisation through an emerging auto-adaptive organisational phase towards being a mature auto-adaptive organisation implementing effective integrated river basin management, for which Hooper has developed twenty benchmarks. The five stages consist of various activities, with only mature auto-

adaptive organisations carrying out all of them:

- water and natural resource data collection and processing, systems modelling, planning, stakeholder consultation and issue clarification
- project feasibility, design, implementation, operation and maintenance, raising funds, ongoing community consultation and awareness raising
- allocating and monitoring water shares (quality and quantity and possible natural resources sharing), cost sharing principles
- policy and strategy development for economic, social and environmental issues, community awareness and participation
- monitoring water use and shares, monitoring pollution and environmental conditions, oversight and review role for projects promoted by partners, monitoring and assessing the health of the basin's natural resources, monitoring the sustainability of resource management, review of strategic planning and implementation of modified plans.

Hooper (2006c) has developed 115 indicators for mature/auto- adaptive river basin organisations, grouped into the following ten categories:

- co-ordinated decision-making
- responsive decision-making
- goals, goal shift and goal completion
- financial sustainability
- organisational design
- role of law
- training and capacity building
- information and research
- accountability and monitoring
- private and public sector roles.

These stages and many of the categories of indicators describe the requirements of and need for adaptive management, and also neatly align with the phases of the plan/do/check/review cycle in Figure 1 and the elements of best practice in Table 3. Based on these indicators, the findings of this report would indicate that few projects in New Zealand have yet progressed to the stage of full adaptive management, though they may have the necessary systems in place.

Participatory evaluation as explained by Allen at al (2002a) and described in Section 6.3.4 and Appendix H enables programmes to be responsive to changing community needs, and thus needs to provide appropriate evaluative processes to foster ongoing learning, correction, and adjustment by all stakeholders.

If future ICM initiatives are designed so that learning could occur from both successes and failures and the information is shared to help reduce the uncertainties referred to in Section 5.4 on institutional capacity, this would contribute to a number of positive capacity outcomes, including contributing to the shared information/best practice system referred to in Section 6.1.3; fostering the development of a learning (as opposed to an audit) culture; and providing a robust basis for adaptive management.

In sum:

- the issue is that the ICM field lacks a learning culture and learning opportunities, with local government in general not providing a learning environment for ICM because of its culture of not reviewing and of shying away from open and robust debate about programme success and failure
- the implication is that it is more difficult to use review information in an open and constructive environment so as to practice learning-based and adaptive management approach, so that the loss of this information feedback loop means ICM may not be being used to its full potential
- it would be easier for people to do more effective ICM if there were:
    - wider institutional endorsement of learning as a positive process of building organisational and community/stakeholder capacity and commitment
    - stronger links between programme review and learning as part of the adaptive management needed to carry out ICM as part of an evolutionary process of managing ongoing change
    - a system for building the capacity for and sharing the learnings of such processes.

6.5 The difficulty of securing a sustained commitment to ICM

Ecological time frames are longer than the life of resource consents; longer than the three, six and ten-year planning cycles that regional and territorial councils use to secure funding in their LTCCPs; longer than the ten-year life of statutory plans; longer than the three-year electoral cycles and LTCCP reviews; longer than the 1-3 year funding periods of most community-based or research funding; and longer than the annually contestable financial plans that councils must prepare.

Changes over all of these timeframes – as well as periodic organisational restructuring and changes in management – make it very difficult for councils and communities to be confident that the long term programmes they know are needed can gain sustained commitment.

Not all community or iwi representatives can hold successive agencies to a vision – and this is where a higher level mandate from a regional council or central government can be invaluable for maintaining ICM.

> 'Policy can be powerful! It can hold everyone to account.'

Several interviewees noted the benefit of being able to say to their elected representatives and communities that what they were doing was mandated by national policy, and this makes it more likely that programmes such as ICM will be well-planned, resourced, reviewed – and renewed.

In sum:

- the issue is that it can be very difficult for councils and communities to be confident that the long term ICM programmes they know are needed can gain sustained commitment from successive elected representatives, managers and budgets
- the implication is that programmes may be weakened or prematurely terminated
- it would be easier for people to do more effective ICM if there were a sustained government mandate for ICM to maintain the long term support that some programmes need.

6.6 Selected case studies

At the time of writing several major initiatives relevant to effective water management emerged and are briefly summarised here with the aim of illustrating some of the difficulties discussed above that face those engaged in promoting more effective catchment-related interventions:

- efficient use of freshwater: the Office of the Auditor-General's report
- ecological bottom lines for freshwater: the Dairying and Clean Streams Accord
- linking interventions with monitoring outcomes: the Auckland Regional Council's state of the environment report
- how much is enough? Benchmarking second and third order outcomes for riparian plantings and soil conservation.

Detailed summaries are in Appendix H. Key findings from each are overviewed below.

6.6.1 Efficient use of freshwater: the Office of the Auditor-General's report

The Office of the Auditor-General (OAG) carried out a performance audit (2010) of local authorities (TAs) to form a view about how well prepared the country is to meet the likely future demand for drinking water based on a representative sample of eight local authorities. Of these, three were managing their drinking water supplies effectively to meet forecast demand for drinking water, three could be doing better and two were managing poorly.

While most of the eight TAs were clearly taking sustainable development into account, the actions they had chosen were not comprehensive: none had a fully integrated approach to dealing with sustainable development and supplying drinking water.

The OAG observed that these findings were "generally consistent" with the Office's 2008 findings on the quality of performance reporting. It may be remarked that they are also generally consistent with the findings of this report.

6.6.2 Ecological bottom lines for freshwater: the Dairying and Clean Streams Accord

The Dairying and Clean Streams Accord is a ten-year agreement signed in May 2003 between the Ministry of Agriculture and Forestry, the Ministry for the Environment, Fonterra and Local Government New Zealand (on behalf of regional councils) aimed at achieving "clean healthy water in dairying areas".

It sets out five measurable targets relating to excluding cattle from water bodies, effluent discharge compliance, nutrient management and fencing of regionally significant wetlands. Progress is measured by the results of Fonterra's On-farm Environmental and Animal Welfare Assessment, which has a 99% participation rate, and regional council monitoring of compliance with regional plans and resource consents (it may be noted that both of these are second order outcomes and that the adoption of the Accord's actions by individual farmers also needs to be linked to water quality monitoring results in dairying catchments – the third order outcomes that are the Accord's ultimate objective).

The Accord is a voluntary agreement, but two methods of enforcement are available; the normal compliance inspection and enforcement procedures in place in all regional councils, which do prosecute persistent or serious offenders and Fonterra's threat to refuse to accept milk from non-complying farms (it was reported on National Radio's Morning Report on 18 March 2010 that this has been done twice in the last year).

The 2008/9 snapshot revealed that while some progress was made toward achieving three of the Accord targets, the number of farms where effluent discharge complied with resource consents and regional plans dropped to its lowest level since 2003, with an average of 15% "significant" non-compliance with regional council rules (maximum 27% in Northland) and rates of full compliance varying regionally from 39% in Northland to 96% in Taranaki.

Interestingly, the latest report notes that only seven of the 13 regional councils had defined and identified their regionally significant wetlands and of these, only three have met the 2007 target. (This is likely to indicate capacity gaps within councils.)

These results indicate that sector-based voluntary agreements, especially when supported by guidelines and financial measures, can improve performance but won't address all non-compliance. However, wide variations in enforcement capacity between regions also shows that the provision of regulatory and enforcement mechanisms is not in itself sufficient to ensure improved performance and hence improving environmental quality (second and third order outcomes respectively).

6.6.3 Linking interventions with monitoring outcomes: the Auckland Regional Council's state of the environment report

The Auckland Regional Council's 2009 state of the environment report highlights some clear issues for ICM. It uses the DPSIR model (driver, pressure, state, impacts, responses) in order to (p8) enable complex social, economic, historical and scientific information to be woven together. However, the conclusions note (p296) that the "complexity of natural systems is such that we may never know as much as we would like to about the state of our environment. We are only just beginning to understand the intricate relationships between species, populations and ecosystems, and also the interactions with people, both immediate and cumulative."

One of the issues this raises is the attribution problem previously noted: in complex environments such as cities and regions experiencing Auckland's rate of growth and consumption it can be hard for state of the environment monitoring to identify the effects – and effectiveness – of issue- or place-based management programmes, especially where "after we have intervened it will take time, often decades, for results to be apparent in monitoring data" (p297).

Logic models (Hellberg et al, 2009) can help to expose logical gaps, flaws and assumptions, but targeted programme monitoring and review is also vital. Chapter 6 of the report addresses this by assessing the effectiveness of the management responses by looking at compliance as well as state of the environment monitoring to answer the question "Is it working?"

6.6.4 How much is enough? Benchmarking second and third order outcomes for riparian plantings and soil conservation

Riparian management projects are being undertaken across New Zealand in an attempt to reverse some of the impacts of land use on waterways, as Parkyn and Davies-Colley (2003) observed, usually involving fencing out livestock and planting trees along stream margins to create buffer zones in the expectation that this will "help deal with problems including channel instability, degraded aquatic habitat, and water pollution from diffuse inputs, as well as improve aquatic and terrestrial biodiversity."

The authors asked if these small strips of land within a much larger agricultural landscape can really solve all of these problems, and if so how long does it take. Overall, streams within buffer zones showed quite a few improvements compared to the control reaches and

improvements could occur quite quickly.

While the authors concluded that riparian management can improve both water quality and habitat for aquatic life, they noted several points for project proponents to bear in mind when setting their expectations of riparian management:

- it won't happen overnight! Water quality may improve quickly, but restoration of shade and temperature, and thereby stream aquatic life, could take decades
- what are the farmers upstream doing? If upstream reaches are unprotected by fences and/or buffer zones, restoration efforts will be affected by livestock access and the lack of contaminant filtering and shade
- is there native forest in the headwaters or nearby? Biodiversity in the stream and riparian area may only improve if there are sources of aquatic animals and pathways for them to recolonise the stream (e.g., adequate microclimate for the adult aquatic insects that fly).

The authors concluded by noting that the key to improving water quality and restoring ecological diversity is *connection* and that rehabilitation of streams is most likely to be successful when planting in riparian zones begins from the headwaters and progresses down through the catchment to produce a long, continuous buffer.

This advice is corroborated by one long-time regional council co-ordinator of various community groups, who noted that in order to "get riparian restoration working properly", needs include simple and practical tips about how much planting to do and where to achieve the most cost-effective outcomes (suggestions are listed in Appendix H). He also noted that community groups do have a role but it is limited: supporting them is very resource-intensive for regional councils and while they do raise awareness of actions for beneficial environmental change, the practical results are most obvious among younger farmers and in small catchments.

Ian Brown in his review of the effectiveness of environmental farm plans and ICM (2006) found that most information about third-order outcomes came from meta-analyses such as that of Hicks (2002), who collated all available New Zealand information on the benefits of various conservation practices to support Environment Waikato's Project Watershed. Brown cites (p14) the environmental outcomes found by Hicks, and these are in Appendix H.

These examples show that the vexatious problem of attribution (was it our interventions that caused a change in the environmental parameters of concern?) can be overcome to some extent by using such studies as benchmarks for second order outcomes (how much work is enough?) and their relationship to observed third order outcomes (how much difference did we make?).

6.7 Themes and ways forward

Well-documented barriers and constraints help point us towards best practice. Overcoming them in part requires use of the frameworks identified in Part A of this report. These include approaches to planning, goal setting and other ways of creating a supportive atmosphere for change. Approaches to ensure learning, information sharing and motivational techniques underpin constructive stakeholder responses will also help achieve coordinated changes in practice. And finally there are lessons to support improved evaluation and review – which in turn supports an adaptive management approach.

To summarise, things that would make it easier for people to do more effective ICM include:

Capacity

- central government playing a role in directly supporting ICM capacity-building in partnership with local government and the community
- wider awareness of the practicalities of capacity-building, such as providing the time and budget needed for it to occur (the enabling factors in table 3)
- dissemination of case studies of effective intra- and inter-organisational communication and the timeframes, mechanisms and resources needed to bring it about
- a stronger national mandate for greater interagency liaison so that adequate resourcing could be provided to enable staff to better co-ordinate both strategic planning and on-the-ground interactions of related agencies with land owners
- a forum for sharing ideas on the ability of councils and other key agencies (e.g. the relevant government departments) to fund the level of intervention needed to address the different issues the various regions face, as well as the relative cost-effectiveness of different methods used
- a sustained government mandate for ICM to maintain the long term support that some programmes need support for key people in institutions, iwi and community groups doing ICM over the long term (capacity) and formal succession planning carried out as part of the capacity planning needs in Table 3 for major programmes.

Research and data sharing

- a systematic attempt to develop a set of research needs and priorities that would help the relevant agencies carry out macro and meso scale ICM more cost-effectively and have a rationale for working out which micro scale initiatives should be supported within that context
- research that is informed by end users and given to them in a form they can readily use, to make it easier for catchment managers to encourage and land owners to adopt more effective ICM, including how to make research findings more transferable to different catchments
- more co-ordinated approaches to collecting expensive but essential data that could be shared
- a centralised, multi-agency, regularly updated and very well-publicised database of related resource conserving tools and resources that are available for landholders, community groups and resource management agencies, including existing and proposed research and videos of experienced practitioners whose expertise won't otherwise be captured
- a central repository of resources (including people) on which project managers can draw to meet identified capacity gaps, including surveys to help them highlight these gaps and choose which resources they need first.

Methods, priorities and outcomes

- a stronger national mandate and good scientific and other information that will support regional and territorial agencies in addressing pressing issues in a more timely manner
- greater awareness of alternative methods and inclusive processes under RMA and LGA that can produce results in the short term when needed
- a consensus on funding for works needing to be done to address environmental externalities of land use activities both rural and urban
- wider community endorsement of the outcomes that ICM can and must deliver: a national mandate, interagency commitment and judicious regulation supported by education, positive and negative financial incentives and other methods would support this.

Measurable objectives and monitoring

- wider awareness of the need for and value of baselines and benchmarks together with case studies showing how simple they can be
- capacity in regional councils to support their own programmes and those of others with respect to locally relevant and nationally consistent baselines and benchmarks
- better provision and capacity building for framing and documenting first, second and third order outcomes in order to provide good data for formative reviews, which can enable early adjustment to initiatives, and for the summative reviews that enable capture of longer term (third order) outcomes and ongoing programme adjustment
- examples of measurable objectives for first, second and third order outcomes being more widely available
- appropriate provision for and interagency co-ordination of the documentation of third order and third party ICM outcomes, including by funders of catchment-related projects as part of their project funding criteria, including by participatory monitoring and evaluation
- provision of an overall geospatial and monitoring framework into which the actions and first, second and third order outcomes of the many initiatives of the many players in catchments are captured, and which provides a live inventory of all ICM-related projects, including community-based ICM projects as well as catchment initiatives that are being driven by central and local government, research providers and industry.

Review, learning and adaptive management

- a participatory approach to monitoring and review
- a shared information system about methods and results of reviews.
- wider institutional endorsement of learning as a positive process of building organisational and community/stakeholder capacity and commitment
- stronger links between programme review and learning as part of the adaptive management needed to carry out ICM as part of an evolutionary process of managing ongoing change
- a system for building the capacity for and sharing the learnings of such processes.

7. Barriers and constraints to iwi and community support for ICM initiatives

Introduction and overview

This section pans back somewhat to outline the "big picture" of ICM, and then summarises barriers and constraints to widespread iwi and community support for and buy-in to ICM initiatives from interested parties, both inland and coastal, including the degree to which they are involved in both setting goals, taking part in activities and engaging in monitoring and review for adaptive management as part of the ICM initiative.

There are many different leverage points from which agencies, councils and other stakeholder groups can begin to address catchment management issues. While these initiatives are very different from each other at first glance, they all typically frame their goals as progress towards more sustainable forms of catchment or regional management. This translates into objectives that aim to improve:

- the bio-physical environment (e.g. improvements in water quality or reduced erosion or flooding) and/or
- the quality of life of the local communities (e.g. improved economies, reduced conflicts among user groups, control of poor practice).

ICM initiatives that aim to achieve these dual goals must (Olsen, 2003) be designed to be:

- sustainable over long periods of time, often several decades
- capable of being adapted to often rapidly changing conditions
- able to provide the mechanisms to encourage or require particular forms of resource use and collaborative behaviours among institutions and user groups.

These all impose constraints of different kinds on the ability of catchment managers to achieve their dual goals.

As Edgar (2004) noted, "one of the strengths of ICM is also one of its weaknesses. The concept is so broad, that taken at its widest meaning, it requires integrating social, economic and environmental dimensions of catchment management.

"ICM may be contemplated in at least three ways. First, it can imply the systematic considerations of the various dimensions of water management: groundwater and surface water quality and quantity. At this level of integration, management attention is focused on joint consideration of such aspects as water supply, waste treatment and disposal and water quality.

"Second, ICM can imply that, while water resources are a system, it is a component that interacts (is integrated with) other systems. In that respect, it implies the interactions between water, land and the environment. Management interest becomes focused on such issues as flood protection, erosion control and the control of nonpoint source pollutants.

"At the third level an even broader approach to ICM implies the context of interrelationships between water and social and economic development. At this level the approach stresses the relationship between environment and economy. Management interest turns to the role of water in producing such things as hydroelectricity, and in manufacturing goods and providing a transport infrastructure. ICM fits well with sustainable development frameworks.

"The complexity and difficulty of trying to sustain a comprehensive approach, an integrated approach, to catchment management over these three levels can often be overwhelming. In the same way that trying to define sustainable development, sustainable management or

ecologically sustainable development has required considerable resources and little consensus. Having a working definition for ICM is difficult to achieve because people come to ICM with different experiences and expectations. The following quote from Robert C Ward, Colorado State University, is an example of this:

> *"Calls to integrate water management activities into a more holistic approach are increasingly heard. The goal appears to be to find a more effective way to meet the constantly evolving water-related needs of society today. The terms being used to describe this new approach to water management vary. Integrated Resource Protection, Integrated Watershed Management and Ecosystem Management are but a few of the terms. To some, these words elicit a sigh of, "Here we go again!" While to others the words reflect a major paradigm shift in water management. Still to others, the terms imply a threat to "take" water from existing uses and give it to other uses."*

Where people can identify specific water quality improvement through ICM interventions, in rural areas they primarily link it to the reduction of sedimentation e.g. by stream fencing and riparian planting. In urban or developing areas, people link it to fewer incidences of stream pollution from uncontrolled earthworks, industrial or building-related spills or sewage overflows, as well as improved amenity from stream improvements such as riparian planting.

While these advances are welcome, there is also a sense that they are at the "simple" end of the range of complexity of water quality and allocation issues that face New Zealand. As discussed in Section 5.2.2, the "environmental time bomb" of nitrate and phosphate leaching into waterways was described by several interviewees as too complex to be resolved by a voluntary, community-based approach to ICM.

Other barriers and constraints affecting the degree to which iwi and communities support ICM are the other face of the elements of best practice noted in Table 3 and Section 4, as well as the barriers and constraints in Sections 5 and 6. Key among these are:

- conflicting or inconsistent messages from key agencies, or the absence of key agencies from local engagement
- poor identification of stakeholders, including by overlooking key groups or leading individuals
- failure of agencies to provide good facilitators or to give them enough time and resourcing to engage effectively with iwi and communities on the agency's or agencies' behalf
- failure of agencies to provide or support the capacity of iwi and communities to engage with them and ICM, or to provide it for a long enough time to build trust and traction
- failure of agencies and/or iwi and communities to formulate clear goals, measurable objectives and clearly defined roles and responsibilities at the start of the process
- lack of widespread understanding of the many aspects of capacity that need to be developed to allow organisations, iwi and communities to engage more effectively in ICM, including intra- and inter-agency capacity, human resource development, iwi and community development, professional capacity-building and succession planning
- lack of understanding by agencies of the many different motivations iwi and communities have for engaging in ICM, including across all four wellbeings
- fear of or opposition to regulation by sectors in the community
- lack of adequate and long term funding within agencies and for iwi and communities
- institutional distrust of community and cultural knowledge and information

- lack of community identification with a catchment because of its sheer size, meaning they don't realise or believe that collective activities can affect distant water bodies (such as was shown in the Motueka)
- communities may share institutional feelings of apathy or despair about the scale of catchment problems or consider ongoing environmental deterioration an inevitable "cost of progress" that is compensated for by greater economic wellbeing
- communities may be deterred from taking part if they consider it will "just take too long" to make a difference to the issues, especially if they don't see small gains being made towards it emerging from regular monitoring
- communities may not understand the science behind and hence the need for ICM
- there may not be enough readily applicable or credible tools for them to use
- they may not trust the agencies or their motives for wanting to engage with them.

This section expands upon the following points that have not been specifically addressed from the iwi and community point of view, or can usefully be expanded upon here:

- what is "the community"?
- a time-constrained community
- engagement with community
- science and community
- equity in space and time
- trust.

7.1 What is "the community"?

As Mike Dodd and colleagues (2009) observe, the communities associated with catchments are not able to be as clearly defined as the catchments themselves. "Communities of people that relate to particular geographical centres and have boundaries (structural or physical) separating them from communities with other geographical centres can be considered "communities-of-place". The members within some communities-of-place will relate strongly to each other and easily work together on shared projects, and some will not. In contrast with communities-of-place, some catchment projects involve functional communities or "communities-of-interest", gathered around a single issue or set of issues (such as caring for the waterways in a specific catchment) where some of the members are not resident in the geographic area."

Similar findings were reported in the Mahurangi by Cole and Lees (2008), where farmers saw the on-going role of the Auckland Regional Council as project coordinator as essential: no other agency was seen as having the mandate to manage the Mahurangi Action Plan (MAP) and rural landowners themselves "do not form a community that can effectively take ownership of the project." It became apparent that there is no identifiable single "Mahurangi community": there are "many different communities of interest represented in the catchment area along with a broad range of individuals and families that do not necessarily identify with any specific local interest groups. The most critical conclusion for the future of MAP from discussions with residents and interest groups in the Mahurangi is that they do not have the time, resources, desire and/or mandate to take ownership of the MAP project. They see MAP as best managed by ARC. They are, however, interested (at varying levels) to be engaged in a broader catchment management planning process, with the majority of representatives believing this process to be of high importance for the harbour's health."

Several interviewees also noted that farming is becoming more corporate, and farm managers may not have the support of their employers to take part in local initiatives, especially voluntary ones.

Moreover, communities can change as alliances change, and individual members can be members of different communities at the same time. None of this is particularly unusual, or out of character, for people. What it does mean is that managing relationships is of necessity an ongoing commitment for effective ICM. Moreover, as indicated in Section 4, managing relationships is an active process that needs skilled personnel, time and budgetary resources.

That said, and as also found in the Mahurangi, Stuart (pers comm 2010) found that the Sherry River Catchment Group meetings help create a bigger picture for all those involved: "it is not just about any individual farm, but it is about a number of farms and land uses in the context of a whole catchment. Equally importantly the project has linked the wider catchment community. It has created new opportunities for dialogue between farmers and upstream forestry managers and council river supervisors about the impacts of the different land uses in the catchment, including e.coli run-off, sediment sources and willow maintenance."

By contrast, earlier sections (e.g. 3.2.1, 3.2.2, 4.4, 6.1.2) have shown that iwi are very conscious of catchments and coastal water bodies at a holistic scale and are increasingly taking on collaborative roles (more on this in Section 9.3). They are thus a key partner for catchment managers in their own right and also in cases where "the community" is too diffuse.

In sum:

- the issue is that catchment managers can not always identify communities associated with catchments, or that landowners may not form a community that can effectively take ownership of a project, or there may be many different communities of interest represented in a catchment area along with a broad range of individuals and families that do not necessarily identify with any specific local interest groups
- the implication is that it may take a considerable time (and budget) to work out how best to gain appropriate community representation or engagement to enable iwi and communities to support ICM
- it would be easier for iwi and communities to support and engage in more effective ICM if pilot research were done to identify the nature of each "community" or sets of players in a catchment and their understandings of the "catchment" and its issues and the need for their involvement so as to agree with iwi and community how and why engagement should take place.

7.2 A time-constrained community

As indicated in Sections 4.4 and 6, many iwi and stakeholders are too busy with other things to participate in ICM activities. In some cases they may be too busy with work, family or other commitments. But equally for some it is because they are busy with volunteer work in health or education issues: individuals who are known to be effective are often approached by a number of organisations to help promote a range of different beneficial projects.

The wider uptake of iwi- and community-based processes leads to a heavy reliance on voluntary contributions which can lead to tensions where communities and individuals are already stretched to capacity.

> Keep the process open - people can join in or pull back according to their life challenges and time availability. It is never too late to come on board and there will be changes in farm ownership and staff along the way. Communicate well with your members. Riley 2009

As noted previously, especially in Section 4.4, there is a need to invest in building the capacity of organisations, iwi and communities in order for them to be able to take part in participatory and collaborative processes for ICM.

In sum:

- the issue is that even willing groups and individuals may not always be able to take part in ICM to help catchment managers identify and work with iwi and community concerns, aspirations and skills
- the implication is that iwi and community representation or engagement may be too little to give catchment managers the feedback, information, endorsement or mandate they need
- it would be easier for iwi and communities to support and engage in more effective ICM if adequate provision were made for building their capacity (including through funding) to take part in ICM.

7.3 Engagement with community

Best practice observations agree that the effectiveness of ICM reflects the degree to which iwi and communities are involved in both setting goals, taking part in activities and engaging in monitoring and review for adaptive management.

However, in reality the range of formal and informal mechanisms for such engagement can be daunting for agency staff and iwi and communities alike. Anecdotal evidence from Auckland indicates that council staff are reluctant to engage informally with communities on ICMPs because "we'll just have to go through it all again when we change the district plan, so we're just doubling the time and the expense".

Likewise, the many avenues for iwi and communities to "have their say" through RMA and LGA processes can be equally daunting. They include statutory processes that set the framework of ICM in New Zealand, such as national policy statements and other tools, regional policy statements, regional coastal plans, regional and district plans, structure plans and major resource consent applications under the RMA, as well as the LGA processes relating to work programmes and their funding requirements in LTCCPs and annual plans. For groups interested in coastal waters as well as fresh, there are other management plans and procedures under the aegis of the other agencies indicated in Section 3.4. Well-resourced sector and environmental groups can consistently and effectively engage in all of these processes. Not all iwi and communities can do this.

Because ICMPs and other catchment-related initiatives are non-statutory processes (though they may result in recommendations for various statutory methods to be used), agencies and communities alike may feel concerned about how they relate to such statutory processes and become concerned about the time it might need if they get involved.
In sum:

- the issue is that some agencies lack the capacity to engage with iwi and communities in cost-effective and constructive ways
- the implication is that in some areas, less engagement is done at early stages of ICM when it can be most potentially beneficial and possibly even reduce the extent of opposition at later stages of informal or even statutory processes

- it would be easier for iwi and communities to support and engage in more effective ICM if there were an over-arching national mandate for ICM and clearer understandings of the relationship between non-statutory and statutory methods of engagement and plan implementation.

7.4 Science and community

There is a pressing need to improve the communication of catchment science outcomes to the wider public, according to Edgar (2004), whose work "highlighted how little most communities are aware of catchment research, even with large research initiatives underway in their own catchments. Despite the stated intention (in funder strategies and research provider goals) to make environmental research more interesting and relevant to communities there is lack of evidence of this. Researchers need to consider more hands-on, innovative ways of getting their message across than a reliance on fact sheets, conferences and the provision of remote learning tools (e.g. websites and CD ROMs)."

Edgar's 2004 research also indicated to him a lack of community and agency understanding of the concept of integrated environmental management that resulted in considerable time engaged in trying to define ICM and in trying to explain to communities its value and power. He considered that "although such discussion can be informative, it can also take up a great deal of time and energy, with the potential to further overwhelm the audience! Some simple acceptance of ICM as a construct, open to interpretation regarding its scope and application, would reduce the amount of time spent debating semantics and intangible philosophies and allow more attention to be focused on the issue at hand – how to best implement the construct that is ICM."

As Andrew Fenemor and colleagues (2008) note, while catchment management requires biophysical science such as hydrology, modern catchment management has moved beyond simply looking for top-down management and engineering solutions. Catchment managers still need knowledge about biophysical processes such as water yields, sediment loads and aquatic ecology. But they also need to understand community values and community aspirations for their place in the catchment, and engage stakeholders in resource management. These bring in social, cultural and economic (including political) dimensions to management.

In turn, this means changes for the way that some science programmes are delivered. Phillips et al (2010) concur with (Roux et al, 2006) that to effectively respond to the challenge of managing complex social-ecological systems that "scientists cannot afford to remain detached experts who deliver knowledge to managers, but must assume the roles of collaborative learners and knowledge generators in a science–management partnership".

It is also important that expectations are managed, and that science and non-science stakeholders understand each others' perspectives. Dodd et al (2008) highlight that non-researcher participants are often unaware of the environment in which science operates, and need to appreciate aspects of this environment to ensure their expectations are realistic. "Researcher participants, who are often inclined to a world view where they are the objective knowledge providers, need to appreciate that there are other ways of gaining knowledge. This includes differing research approaches (e.g. biophysical vs. humanities) and sources (e.g. stakeholder experience)."

Identification of "a real-life problem, recognised by stakeholders, is critical for moving from a technical/scientific/academic study to achieving change" (ibid).

This is supported by MAF's 1999 observations cited in Section 6.2.4 that the highly technical nature of many discussions discouraged some people from participating in

sustainable land management group activities and that research driven by farmers is more easily understood and applied than research driven by research institutions, especially when conveyed by practical demonstrations and hands-on experiences.

That said, "bring in other experts to interact with your group, they learn a lot in addition to you gaining specific information in their specialty," says Gretchen Robertson of the Taieri Trust, but keep the "experts on tap not on top".

"We really need to understand the land/water interface a lot better than we have done and realise the impacts land management has on our waterways. It was interesting to hear Mike Scarsbrook say that sedimentation is the biggest threat to our waterways, and we saw another example of this on a farm tour that had peat lake depths decreasing because of this. The sediment traps the farmers built are very effective at mitigating this. Acknowledge the problem/s and learn how this affects other land or water based businesses. In our case the aquaculture group; we have learnt a lot about their compliance constraints – testing regimes, quality control; effects of sediment, nutrient and bacteria on the shellfish; costs and returns; effects of floods on water quality... And we have met these people and visited mussel farms (see link below to our mussel chowder lunch)" (Riley, 2009).

However collaborative research is risky for researchers, as Philips et al (in press) point out: the lessons addressed in their paper were "sometimes learned the hard way, i.e. we didn't necessarily anticipate and address each lesson up front but had to learn through criticism and feedback." The benefit was that "many environmental problems can only be solved through the creation of new knowledge and through social processes that engage the research and management domains" and that this has been "a major benefit of the research programme".

They learned seven key lessons that may help others learn of the benefits and difficulties that confront scientists and stakeholders involved in undertaking similar research:

- clarify the goal and work with key people
- manage expectations
- agree on integrative concepts and face the challenge of epistemology (theories of knowledge)
- leadership
- communicate in an atmosphere of mutual trust and respect
- acknowledge that different modes of learning mean that a wide range of knowledge products are needed
- measure and celebrate success.

Researchers are also learning how to work with Maori concepts of the natural world, as evidenced by the work done by Landcare Research on indigenous networks, values, knowledge, development, and participatory and environmental projects (see for example http://www.landcareresearch.co.nz/research/sustainablesoc/social/indigenous_index.asp).

In sum:

- the issue is that most communities have little awareness of catchment concepts and research, even with large research initiatives under way in their own catchments, and may find it hard to interact with scientists
- the implication is that communities may not support research carried out by regional councils, research institutions or other agencies, or believe its findings, especially if these affect their land use activities and they consider they have not been sufficiently

involved. This means the way science is delivered needs to change, with scientists no longer remaining "detached experts who deliver knowledge to managers, but must assume the roles of collaborative learners and knowledge generators in a science–management partnership" with catchment managers, iwi and communities

- it would be easier for iwi and communities to support and engage in more effective ICM-related science and research if lessons such as those of Phillips at al (in press) are widely disseminated, e.g. via a central information repository, and appropriate capacity is provided for all parties to do this, including research and funding communities.

7.5 Equity in place and time

Even in the most reportedly successful ICM programmes, there are landowners who hold out, who for a variety of reasons will not engage in voluntary environmental efforts with the rest of their community.

For example, the literature review found that in an ICM pilot project in two catchments in the Waikato, only half of the farms targeted ended up with farm plans (Environment Waikato, 2009). There are other examples of low participation in Section 6.2.6.

Some interviewees believe that eventually community opprobrium will draw the most reluctant landowners into a local scheme, but most ICM practitioners and researchers interviewed for this report said regulation is needed to ensure 100% compliance. Anything less is inequitable and will hold up restoration of waterways.

> 'A sense that rules are coming anyway is very helpful to getting farmers onside.'
>
> 'Long term we aren't going to be able to do whatever we want to do on our own farms.'

However the Dairying and Clean Streams Accord case study in Section 6.6 and Appendix H shows that even regulation that is strongly supported by several agencies and practical tools does not always gain 100% participation.

Questions of public/private benefit also continue to arise. In 1990 Ericksen observed (p55) that funding difficulties included the reluctance of uphill land owners to fund work that would benefit lowlanders and vice versa.

This debate persists: comments were also made by interviewees about how communities may perceive the benefit of public investment in improvements on private land. However a search of the website of the Ecological Economics Research Centre New Zealand (EERNZ) revealed no New Zealand literature on the community benefit of public investment in improvements on private land, for example, where farm subsidies are made available for fencing, planting and other farm works needed to improve water quality. Although economic returns to the public have been demonstrated in comparable overseas cases (see for example Hatfield Dodds, 2003), several interviewees saw little evidence of value in such initiatives.

Moreover, issues such as maximisation of current economic benefit at the cost of ongoing losses of soil and biodiversity, over-extraction of water (especially slow-recharge aquifers) and degradation of water quality raise questions of intergenerational equity that are at the heart of the sustainability debate.

In sum:

- the issue is that there is little institutional and community understanding of the wider economic benefits of public investment in "improvements" on private land or what ratio of public:private investment is desirable for a given public benefit

- the implication is that ICM might be less utilised than it could potentially be as a framework for debate about environmental externalities and the wider benefits to communities of today and tomorrow of addressing them
- it would be easier for iwi and communities to support and engage in more effective ICM if there were a wider understanding of its value, and possibly also if more funding were therefore available (based on a national and regional consensus about public:private investment) to help both rural and urban land owners and occupiers reduce their adverse environmental effects.

7.6 Trust

A consistent theme through all the preceding discussions and that recurs in forthcoming sections is the need for all parties involved in ICM to trust each other.

Initial suspicion of the motives behind the agencies promoting the establishment of sustainable land management groups is often an initial barrier to participation and it often takes 18-24 months before confidence is gained and the groups get down to addressing the issues (MAF, 1999).

> 'The biggest thing is to get the trust of the community – if they believe you're telling them the truth then they shoulder the issues with you and we make good progress.'

While such barriers can be overcome, it takes time, commitment and resourcing, especially where there are negative attitudes toward the agencies involved: people need time to work together and get to know each other and their respective knowledge bases. Many authors and interviewees suggest that this sort of trust can take some years to build up.

In sum:

- the issue is that the sponsors and funders of many ICM initiatives overlook or underestimate the need to invest time (and the necessary budget) in building a track record of trust with the community
- the implication is that in extreme situations, isolated short term initiatives may end up creating more suspicion or lack of faith in the long term commitment of sponsors to iwi and communities, hence being counter-productive
- it would be easier for iwi and communities to support and engage in more effective ICM if pilot research into community attitudes were done to identify the extent of the investment needed to overcome any negative attitudes or address the reasons for these.

7.7 Themes and ways forward

In sum, while communities can and do drive genuine ICM initiatives and large numbers of local projects, they may not always have the time or the interest to respond to the needs of catchment managers.

Communities may also be dispersed over large distances and communities of place do not necessarily correspond with communities of interest.

Real or perceived equity issues may arise where some targeted individuals fail to support an initiative (voluntary or regulatory), or where sustainability investments that aim to deliver public benefits also deliver improved property values.

Sustained commitment to building relationships based on communication, respect and trust is thus needed, including with and by the science community, interpreting issues, actions and public and private benefits.

To summarise, things that would make it easier for iwi and communities to support more effective ICM include:

- doing pilot research where desirable:
    - to identify the nature of each "community" or sets of players in a catchment and their understandings of the "catchment" and its issues and the need for their involvement so as to agree with iwi and community how and why engagement should take place
    - into community attitudes to identify the extent of the investment needed to overcome any negative attitudes or address the reasons for these.
- having an over-arching national mandate for ICM and clearer understandings of the relationship between non-statutory and statutory methods of engagement and plan implementation
- disseminating lessons about conducting ICM-related science and research, e.g. via a central information repository, and providing appropriate capacity for all parties to do this, including research and funding communities
- promoting a wider understanding of the value of ICM, and possibly also if more funding were therefore available (based on a national and regional consensus about public:private investment) to help both rural and urban land owners and occupiers reduce their adverse environmental effects

8. Catchments and coasts

Introduction and overview

This section overviews current ICM-related initiatives and research around the country in terms of what consideration they give to the impacts of catchment management practices on coastal marine areas, including fisheries and biodiversity values.

This involves the different parties all together "looking up" from the sea and "looking down" from the land, yet as writers such as Peart, Britton and Brookes (cited below) have noted, it has proven particularly difficult to integrate their responsibilities.

Although Table 4 is not a total headcount, most of the catchment-related initiatives listed are above MHWS, with a minority spanning waters on either side of it. There is, however, evidence of growing interest in the effects of land use and freshwater quality and quantity on coastal water quality and ecosystems.

This section considers:

- the split between land, freshwater and the coast
- the many agencies with interests in catchments and coasts
- Maori and other coastal management initiatives
- projects on the coastal fringe
- case studies of integrated catchment and coastal management
- research and management needs.

8.1 The split between land, freshwater and the coast

The impacts of land use on estuarine and coastal habitats have been documented for many years, but as Morrison et al (2008) observe, these "environmental impacts have happened over the same time frame as that of the establishment, and subsequent over-fishing of, coastal fisheries, and have driven population trends in the same direction i.e. in a negative direction, for most species (but not all). Such impacts are currently poorly understood, with most fisheries research having been directed at the fished species themselves, in terms of factors such as how many there are, growth rates, age structures, and fishing removals, and the integration of these variables into numerical single species population models. The possible impacts of environmental and habitat degradation on these fished populations has been largely ignored" (p1).

The material quoted below is taken from Gustafson and Feeney (2008).

The interagency constraints between regional and territorial councils (Section 5) are "echoed in the key findings of an independent review of the 2004 New Zealand Coastal Policy Statement (Rosier, 2004). The review found that while overall, it has had a positive effect on coastal management in New Zealand and has generated debates about our national priorities for coastal management and is effectively implemented through Regional Policy Statements and Regional Coastal Plans but is only partially effective in influencing district plans and only generally referred to in resource consent applications.

"Britton (2003) states that while the RMA emphasises integrated management, mean high water springs (MHWS) was set as the RMA jurisdictional boundary between regional and territorial authorities, dividing coastal areas off from land management, and as a result, integration of the management between land and sea has not been achieved particularly well.

"Most RCPs [regional coastal plans] and District Plans were drafted simultaneously and there were a number of barriers to achieving integrated plans at that early stage. Not surprisingly, most of the coastal pressures arise on land and the effects of land use activities then impact on the CMA [coastal marine area] (e.g. subdivision, water quality, structures). Likewise, most activities in the CMA occur within a short distance of MHWS. In the future, Britton considers that regional councils and territorial authorities will need to be "smarter" about the way they integrate their plans to ensure the land based activities are controlled in a way that does not impact on the CMA, particularly in relation to natural character, erosion (a natural process for significant parts of New Zealand's coast) and water quality (elderly inadequate septic tanks and community services which do not adequately address the swings in population from winter to summer demands). Britton considers that regional councils also need to be more cognisant of the associated land based effects resulting from CMA 5 planning and decision-making and anticipates that in the future, a far greater emphasis will be placed on coastal environment plans, to enable better linkages between the land and water issues. Britton notes that some regional councils had already taken this approach, to varying degrees, in their "first generation" plans.

"Britton concludes by saying that "it is expected that the next generation of plans will be more focused on activities, on applying zoning to water space and on better addressing the land-water interface and that there will probably be a more focused policy framework and the scope of the plans is likely to be different, as they seek to ensure better integration across the line of MHWS, which could lead to better integration with other regional and/or district plans."

"One of the other big problems for coastal management has always been determining how much development is appropriate" (Peart, 2007a). "Views have changed over the years through changing public appreciation of the coastal environment and developing scientific knowledge and understanding of natural processes affecting the coast. The question now is whether the pattern or form of development is sustainable, whether it has had adequate regard to natural processes and ecosystems across both land and sea and whether it is achieving integrated or holistic management of the resources affecting the coast."

Based on case studies of the Kaipara Harbour and Hauraki Gulf, Peart (2007a) concludes (like Britton 2005 and Brookes no date) that New Zealand's current coastal management system is fragmented and suffers from inconsistent objectives and management approaches. Her specific criticisms are that:

- "the legislative framework has developed in an ad hoc manner and without a clear vision of how integrated coastal management might be delivered at a regional level;
- "there is a wide disparity in the extent to which key elements of a successful integrated coastal management system are being implemented in the various management spheres;
- "levels of information and resourcing to support effective coastal management are insufficient;
- "the 'jurisdictional apartheid' resulting from the basic tensions in the RMA between TAs seeking to 'protect' land and assets [that are predominantly in private ownership] for development, and Regional Councils [and DoC seeking to protect natural resources that are of public benefit by] upholding the NZCPS, and where relevant, regional policy statements and regional plans there is no legislative framework to support integrative initiatives when they do occur;
- "although spatial planning at a regional level is well established under RMA, it is less well used in other coastal management regimes: some significant resource management activities are outside the jurisdiction of the RMA, or have overlapping

management regimes. These include the harvesting of fish, shellfish and seaweed stocks which are managed under the Fisheries Act 1996, the logging of indigenous forests on private land which are also managed under the Forests Act 1949 and marine pollution from ships and offshore structures which is also managed under the Maritime Transport Act 1994. The RMA does not, therefore, provide a fully integrated resource management regime; and

- "the separation of land and sea planning because of the lack of an holistic approach appears to have resulted in New Zealanders "giving up" on preservation of natural character along a lot of our coastline (e.g. Northland, Auckland, Bay of Plenty, Coromandel) and therefore the imperative to manage it as an integrated living biophysical system has almost vanished.

"Essentially it seems that coastal management has focused on development on beaches and extractive or occupational uses of saline waters (e.g. fishing, shellfishing, moorings, ports, dredging and so on). There has been a growing realisation that land uses throughout the nation from the central ridgelines to the coast affect inshore and wider coastal ecosystems, with some statutory documents acknowledging this, such as the Auckland Regional Policy Statement and Coastal Plan, as discussed above.

"However, the specific management of land uses for the purposes of maintaining the health of the freshwater and saline ecosystems in which their effects are expressed has yet to become mainstream."

Land managers need better access to information on the effects on fisheries of land use activities on coastal waters sensitive to significant inputs of freshwater, as it increases their understanding of the extent and importance of the issues. These include (Morrison et al, 2008):

- the effects of sedimentation, arguably the most important land-based stressor in New Zealand. Effects are caused by both suspended sediment and deposition and associated decreases in water clarity (which may also be driven by nutrient effects). Impacts include direct effects on the species themselves, such as clogging of the gills of filter feeders and decreases in filtering efficiencies with increasing suspended sediment loads (e.g. cockles, pipi, scallops), reductions in settlement success and survival of larval and juvenile phases (e.g. paua, kina), and changes in the foraging abilities of finfish (e.g. juvenile snapper). Indirect effects include the modification or loss of important nursery habitats, especially those composed of habitat–forming (biogenic) species (e.g. green-lipped and horse mussel beds, seagrass meadows, bryozoan and tubeworm mounds, sponge gardens, kelps/seaweeds, and a range of other "structurally complex" species). For instance, while we still have much to learn, recent work using otolith chemistry strongly suggests that west coast North Island snapper populations from Cape Reinga to Wellington are largely sourced from the Kaipara Harbour (98% of 2003 year-class). Within this harbour, juvenile snapper are found in association with nursery habitats composed of horse mussel beds and seagrass (especially sub-tidal) meadows. These habitats are known to have been impacted by historical land-use practices and continue to be under pressure, especially from sedimentation from the surrounding catchment. This means that the carrying capacity (for snapper) of the system that supports the fishery may have declined substantially over the past 100 years. In addition, the coastal stock has been fished down to a low biomass, with most of the old and large fish being removed, so that the fishery is now reliant on just a few year classes. This has reduced the resilience of the stock, so that several sequential years of poor recruitment could result in a fisheries collapse. Prior to this, a large reserve of many age classes would have "buffered" the stock for several decades. Thus, the stock is under at least two types of stress. Similar issues are likely to exist for other harvested species that have nursery grounds close to shore

- eutrophication has the potential to create profound cascades of effects into marine ecosystems, including loss of seagrasses and eventually macrophytes (though these may initially be favoured), increases in phytoplankton blooms that reduce light levels reaching the sea- floor, and subsequent oxygen depletions as blooms die and increase detrital levels on the seafloor, and large-scale losses of benthic prey assemblages that support finfish fisheries. "Filters" on these processes include tidal streams, the degree of water transport across different areas, and the presence of large numbers of filter-feeding bivalves. Loss of such bivalve populations, e.g. from over-harvesting or sediment impacts, may exacerbate other land-based stressors such as eutrophication, through reducing the resilience of local systems. Little work has yet been done on the potential impact of eutrophication on coastal fisheries in New Zealand, though it may be modest relative to other areas of the world
- other stressors include organic pollution, heavy metal contaminants, mangrove spread, the influence of significant freshwater extraction on river plumes and interactions between these stressors together with pressure from over-fishing.

Land and water managers may also benefit from more knowledge of what fisheries are most at risk, especially commercially, recreationally, culturally or ecologically significant inshore shellfisheries and finfisheries (especially in estuaries).

While observing that it is not currently possible to tease out the relative magnitude of past, present and different effects, Morrison et al (2008, p69) observe that "broadly speaking, we would expect to see greater magnitudes of impact on species that are found in those areas (and associated habitats) most vulnerable to land-based impacts, such as estuaries, sheltered coastal embayments, and where large rivers empty directly onto the coast. These may include species that spend most or all of their life cycles in such areas (e.g. shellfish such as cockles, pipi, and to a lesser extent paua, kina, and scallops), or that have nursery phases utilising such areas, depending on the context of the wider ecosystem (e.g. snapper, trevally, grey mullet, short-finned eels, and tarakihi in more structurally complex habitat elements; and sand and yellow-belly flounder on less structured sand and mud substrates).

"However, not-with-standing quite large quantitative data gaps, we would suggest that impacts have in fact been quite profound, based on present-day observations of some species, habitats, and systems. More obvious ones may include the substantial loss of seagrass meadows (especially sub-tidal elements) from wider regions where they are known to support significant finfish nursery functions (e.g. from Manukau, Whangarei, Waitemata and Tauranga Harbours), and reductions in the availability of harvested species such as cockles and pipis from areas that are not thought to have been over-fished. As also noted by Airoldi and Beck (2007) for European systems, many other habitats (especially in the sub-tidal) may have been subject to very substantial losses from human-driven impacts, but the available information is scattered and anecdotal, if any indeed exists at all."

The very clear relationship between freshwater inputs and marine water quality is noted in a draft Auckland Regional Council technical publication, (Auckland Regional Council, no date) which says "the greater the contribution of freshwater the lower the overall [marine] water quality". That said, where sustained efforts are made and in the absence of confounding land uses, where freshwater inputs to estuaries improve in quality, results in estuarine biodiversity do appear to follow, as work in the Auckland Region shows (Kelly, 2007 and Morresey et al, 2010 – discussed in Section 8.4). This indicates a need for better monitoring of drivers of change in freshwater quality and quantity, pressures, states, interventions and third order outcomes for fresh waters and the marine receiving environments they enter; or integrating monitoring across MHWS.

Peart (2007a, pages xxvii, 33 and 266ff) concludes with a list of recommendations aimed at better integration of catchment and coastal management, including to:

- improve agency alignment of coastal management outcomes, objectives and approaches, especially for integrated ecosystem-based management among territorial, regional and ministerial (e.g. Ministry of Fisheries), with more decentralised decision-making by central government agencies and a clearer statutory relationship between MFish and regional councils
- a clearer statutory basis for the role of Tangata Whenua in coastal management
- build a climate of trust that will allow more experimental approaches as a result of better stakeholder engagement, public participation, conflict resolution and participatory decision-making
- promote the development of a best practice guideline and provision of funding to build capacity for such engagement
- better use of spatial planning at compatible scales to enable better interagency co-ordination and public participation, and to achieve better interfaces amongst the various plans and better integration across MHWS
- better use of strategic planning based on improved information
- a comprehensive monitoring framework that promotes better consistency and integration between existing programmes and helps to progressively fill knowledge gaps
- better resourcing to enable all the above.

In sum:

- the issue is that there are longstanding, serious and intensifying effects of land use and freshwater quality and quantity on coastal water quality and ecosystems, but existing statutory management tools are fragmented and poorly co-ordinated. More research is needed to ensure management methods address real causes and effects
- the implication is that there will be increasing conflict between users of land and freshwater and users of coastal and marine resources until such issues are addressed – and that macro-scale ICM is needed to do this
- integrated management of coasts and catchments would be easier if there were:
    - better alignment of management tools above, below and across MHWS
    - wider institutional and public awareness of the value of ICM in addressing resource conflicts and sustainable resource management across MHWS
    - better access for land managers to information on the effects on fisheries of land use activities on coastal waters sensitive to significant inputs of freshwater, to increase their understanding of the extent and importance of the issues
    - a stronger national mandate for considering the effects of land and freshwater use on coastal waters and resources.

8.2 The many agencies with interests in catchments and coasts

As well as the regulatory line along MHWS that separates regional coastal plans from other regional plans, other government agencies have an interest in the effects of land use activities in fresh and saline waters.

The Department of Conservation has a policy and regulatory role in the coastal marine area, as does the Ministry of Fisheries, yet these agencies have traditionally had little involvement in catchment management for the purposes of managing inshore and offshore water quality and ecosystems.

It is also of note that Part 6 of the Freshwater Fisheries Regulations 1983 makes provisions on fish passage, as so many of our native fish need access between fresh and salt water, while under Section 7J of the 1987 Conservation Act, the Department of Conservation (Doc) may also prepare freshwater fisheries management plans, having regard to any sports fish and game management plan prepared under Section 7L for that area by any Fish and Game Council. These matters also need to be considered as part of an integrated approach to managing catchment-related issues.

Yet many ICM initiatives, including those driven by the threat to marine ecosystems such as the Mahurangi, link loosely if at all with freshwater and coastal fisheries interests – it's just another layer of complexity that catchment managers find too demanding.

However, as the discussion in Section 8.1 has shown, the functional interconnectedness of land and all waters makes it essential for greater interagency communication and integration across MHWS.

The development of close working relationships at government level as evidenced in the working party formed on ICM will exert a positive influence in this respect.

In sum:

- the issue is that the functional interconnectedness of land and all waters makes it essential for greater interagency communication and integration across MHWS
- the implication is that more institutional capacity will be needed to allow this to occur
- integrated management of coasts and catchments would be easier if there were a stronger national mandate for greater institutional alignment and co-ordination in ICM at the macro scale that played out in more involvement at the meso- and micro scales.

8.3 Maori and other coastal management and protection methods

Maori have long adhered to traditional management and conservation methods and tools such as rahui, taiapure and mataitai are now becoming more common within formal legal frameworks:

- a rahui is a ban or prohibition on collecting resources, a harvest ban. When a rahui is placed on a river, lake, forest, or harbour, people are banned from using some resources. For example, a rahui might ban people gathering shellfish from a beach, for various reasons. Many Maori tribes use the practice of rahui to conserve or replenish a resource, according to Te Kete Ipurangi (TKI) – The Online Learning Centre (http://www.tki.org.nz/)
- a taiapure is a local management tool established in an area that has customarily been of special significance to an iwi or hapu as a source of food or for spiritual or cultural reasons (s 174 of the Fisheries Act). Taiapure can be established over any area of estuarine or coastal waters to make better provisions for rangatiratanga and for the rights secured under Article Two of the Treaty. Taiapure provisions are contained within Sections 174-185 of the Fisheries Act 1996. All fishing (including commercial fishing) can continue in a taiapure and this tool offers a way for Tangata Whenua to become involved in the management of both commercial and non-commercial fishing in their area. There are now eight taiapure approved around the country, and further applications are being considered (http://www.fish.govt.nz/en-nz/Maori/Management/Taiapure/default.htm)
- mataitai reserves are created in areas of traditional importance to Maori for customary food gathering. Within them, Tangata Whenua are authorised by the Minister of

Fisheries to manage and control the non-commercial harvest of seafood through a local committee. A tangata tiaki/kaitiaki can recommend bylaws to manage customary food gathering in keeping with local sustainable management practices, and issue customary food authorisations. Mataitai reserves are permanent, though the bylaws can change over time. Once a mataitai reserve is established, commercial fishing is not allowed unless recommended by the tangata tiaki/kaitiaki. Maori and non-Maori may fish in mataitai reserves (http://www.doc.govt.nz/conservation/marine-and-coastal/marine-protected-areas/other-protected-areas/mataitai/).

Other marine protected areas include the following, which are run by the Department of Conservation (DoC):

- marine reserves
- marine mammal sanctuaries
- marine parks
- other protected areas including the matiatia and taiapure noted above as well as areas of significant conservation value and wildlife sanctuaries and refuges.

Generally, the Department's monitoring shows significant increases in populations and marine environmental values within existing marine reserves http://www.doc.govt.nz/conservation/marine-and-coastal/marine-protected-areas/). New Zealand's marine environment is more than 15 times larger than its terrestrial area, and our Exclusive Economic Zone is fourth largest in the world. However, only a small percentage of this environment is currently protected. The New Zealand Biodiversity Strategy, launched by the Government in 2000, has a range of actions to improve how New Zealand can protect its marine biodiversity. One of the Strategy's goals is to develop a representative network of marine protected areas comprising 10% of the marine environment. Through this network, the strategy wants to ensure a full range of the habitats and ecosystems that represent native marine biodiversity is protected and maintained in a healthy functioning state.

The experience at Long Bay shows that the presence of a protected marine area immediately next to a proposed development can focus the mind of iwi and the community, developer and regulator on what is needed to reduce adverse effects.

DoC thus has a clear interest in ensuring that land uses are managed in a way that is consistent with sustainable outcomes in reserves as well as in the coastal marine area generally.

In sum:

- the issue is several management tools are available to protect and conserve coastal and marine areas and that more of these are needed to reach a target of creating a representative network of marine protected areas comprising 10% of the marine environment
- the implication is that ICM could make better use of community-based models above and below MHWS to engage wider support from iwi and communities about better management of land and freshwater for the purposes of better management of coastal and marine resources
- integrated management of coasts and catchments would be easier if institutions, iwi and communities were more aware of the range of management, conservation and protection tools available for use above, across and below MHWS, perhaps by way of the information sharing system already recommended.

8.4 Projects on the coastal fringe

Large numbers of community groups all round the country run coastal clean ups and dune-care/replanting activities, while landscape and development issues are a great focus too (for example the Environmental Defence Society, EDS). These are briefly discussed in Section 3 along with other catchment-related initiatives, and also in Section 9 (Governance).

Again, while not comprising ICM, coastal projects do contribute to beneficial outcomes, and their activities need to somehow be considered within an integrated catchment and coastal management and monitoring framework.

In sum:

- the issue is that projects on the coastal fringe may be poorly integrated into land and water management processes above and below MHWS
- the implication is that the wider ecosystem benefits and other third order outcomes of such projects may not be being documented and the role of their proponents in supporting wider catchment and coastal outcomes potentially overlooked
- integrated management of coasts and catchments would be easier if projects on the coastal fringe were integrated into the systems recommended in Section 6.3.3 for capturing third party and third order outcomes.

8.5 Case studies of integrated catchment and coastal management

Five integrated catchment and coastal management (ICCM) initiatives are summarised in Appendix H:

- the Manukau Harbour Action Plan
- the Mahurangi Action Plan
- the Hauraki Gulf Forum
- the Integrated Kaipara Harbour Management Group (IKHMG), Kaipara
- informing aquaculture decisions: the Motueka ICM Research Programme.

Iwi aspirations and drivers, multi-agency co-operation, the need for good science and effective action on the ground are some of the key themes of these five case studies. Collectively, they display many (if not all) of the elements of success listed in Table 3 and show how they build the capacity of project sponsors and participants alike for effective ICCM – integrated management of land and waters across MHWS and across interagency roles.

8.6 Research and management needs

"River basin management, coastal management and management of large marine ecosystems cannot independently solve many of the challenges posed by intensifying human activity and ecosystem changes" (UNEP/GPA, 2006, p1).

Morrison et al (2008) conclude by suggesting further research on key land-based stressors on coastal environments that is designed to help uncover and address impacts important for both land and fisheries managers to address. Suggested needs include:

- fundamental and systematic inventorying of fisheries species / habitat associations for different life stages, including how changing habitat landscapes may change the relative production of different fished species
- better knowledge of connectivity between habitats and systems at large spatial scales, where impacts at one location may have far-field cascades into distant areas through subsequent fish movements
- the role of river plumes
- the effects of land-based stressors both directly on fished species, and indirectly through impacts on nursery habitats including plants (e.g. seagrass meadows, kelp forests, maerl beds) and animals (e.g. mussel beds, bryozoan and tubeworm mounds, sponge gardens)
- a better spatially-based understanding of the integrated impacts of land-based and marine-based stressors on coastal marine ecosystems
- associated spatial mapping and synthesis to provide both decision support management systems
- research tools that can help direct and interpret new research initiatives.

With climate change predicted to increase both the frequency and intensity of storms and rainfall events, and intensification of land use, Morrison et al observe that the relevance of addressing such issues is likely to increase.

Land and water managers may also benefit from more knowledge of what fisheries are most at risk, especially commercially, recreationally, culturally or ecologically significant inshore shellfisheries and finfisheries (especially in estuaries).

There is anecdotal evidence from local people in the Mahurangi (Clare Feeney, pers comm) and the Whaingaroa (http://www.harbourcare.co.nz/what-we-do) that the provision of whitebait spawning platforms and riparian planting has increased whitebait catches, and it would be good to be able to support this with targeted research.

In sum:

- the issue is that more research and more dissemination of research is needed
- the implication is that considering coastal receiving environments and shellfisheries and finfisheries may focus the mind of catchment managers, iwi and communities in ways that are beneficial for land, freshwater and coastal resource users, as well as generating more interest and support for macro scale ICM
- integrated management of coasts and catchments would be easier if there were better sharing amongst all the relevant agencies with responsibilities above and below MHWS of research needs, initiatives and results, perhaps by way of the information sharing system already recommended.

8.7 Themes and ways forward

While the RMA emphasises integrated management, mean high water springs (MHWS) was set as the RMA jurisdictional boundary between regional and territorial authorities, dividing coastal areas off from land management. Together with the many other pieces of legislation and agencies with responsibility above and below MHWS, this means that integration of the management between land and sea has not been achieved particularly well. The specific management of land uses for the purposes of maintaining the health of

the freshwater and saline ecosystems in which their effects are expressed has yet to become mainstream.

However it seems that initiatives that address coastal issues are well-represented among New Zealand ICM endeavours, with some plans such as those for Doubtless Bay, the Hauraki Gulf and the Kaipara Harbour all addressing the impacts of land use, catchment management practices and marine-based activities on coastal marine areas, including fisheries and biodiversity values, as well as the associated cultural and economic values.

To summarise, things that would make it easier for better consideration of the impacts of catchment management practices on coastal marine areas, including fisheries and biodiversity values, include:

- better alignment of management tools above, below and across MHWS
- better access for land managers to information on the effects on fisheries of land use activities on coastal waters sensitive to significant inputs of freshwater, to increase their understanding of the extent and importance of the issues
- wider institutional and public awareness of the value of ICM in addressing resource conflicts and sustainable resource management across MHWS
- a stronger national mandate for:
    - considering the effects of land and freshwater use on coastal waters and resources
    - greater institutional alignment and co-ordination in ICM at the macro scale that played out in more involvement at the meso- and micro scales
- institutions, iwi and communities being more aware of the range of management, conservation and protection tools available for use above, across and below MHWS, perhaps by way of the information sharing system already recommended
- projects on the coastal fringe being integrated into the systems recommended in Section 6.3.3 for capturing third party and third order outcomes
- better dissemination of case studies of past successes in integrated catchment and coastal management and the learnings from current ones
- better sharing amongst all the relevant agencies with responsibilities above and below MHWS of research needs, initiatives and results, perhaps by way of the information sharing system already recommended.

9. Governance: how it helps and hinders ICM

Introduction and overview

This section examines how different governance arrangements and processes help or hinder ICM initiatives. It defines governance and then overviews some key themes that can usefully be drawn to expand upon previous discussions:

- government leadership
- partnerships
- regulatory and non-regulatory methods.

Good governance also depends on good information, so the information in Section 6.1.3 is also relevant here.

9.1 What is governance?

Governance in its widest sense refers to how any organisation or groups of organisations and/or people, including nations, are run, including processes, systems, and controls that promote fairness, transparency and accountability[3] while working to achieve their stated purpose. Effective governance of integrated water resource management – ICM – is (Global Water Partnership, 2003) open and transparent; inclusive and communicative; coherent and integrative; equitable and ethical; accountable and efficient.

ICM by definition involves a range of players, so ICM-related governance is about creating an environment that enables the desired changes in practice to be supported, adopted and enacted by the different stakeholder groups involved. Hence policy and strategy must be grounded in the realities of those stakeholders.

When our interviewees talked about best practice governance, it was generally in the sense of:

- supportive governance that links a range of policy mechanisms to the situation in hand
- good planning, to provide good guidance and clear goals.

There is also more thinking on indigenous contributions to governance drawn from cultural concepts such as kaitiakitanga (e.g. Kamira, 2003). While she was referring to health data, Kamira explored kaitiakitanga and its distinctive contribution to our thinking in ways that could optimise benefits to both Maori and non-Maori. Experience recounted in this report show this could also apply to ICM.

Hooper (2006b) defines governance "as a decision process involving multiple players at different levels – individual water users, government agencies, private sector interests, non-government organisations and lobby groups, and those who do not have a distinct 'voice' because of poverty or accessibility, and therefore lack access to powerful decision-makers in the water sector."

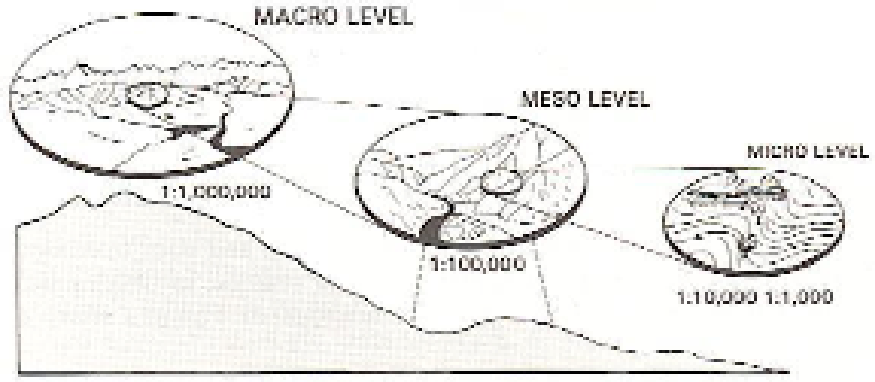
He notes that "effective governance in the water sector is not linear, prescriptive and logical; rather it tends to be adaptive and 'messy', responding to the dynamic nature of the political and economic forces operating at the time, and in response to changing environmental conditions (floods, hurricanes, droughts). Adaptive management is good governance and is advocated as the desired approach".

[3] Source: http://governance.tpk.govt.nz/utilities/glossary.aspx (accessed May 2010).

Thinking about governance from a geographical perspective allows us to recognise the basin as a decision "commons" operating at three interrelated levels, says Hooper, as shown in Figure 4.

Figure 4 Catchments as a decision-making commons

Source: Hooper (2006b)



Seen in this way, which reflects the macro and meso scale at which "formal" ICM is conducted while encompassing the micro scale of many catchment-related initiatives, the development of good integrated catchment management governance then requires co-ordination mechanisms between these three levels: between the relevant agencies, private sector, individuals and non-government organisations.

As Hooper observes, this is not easy, nor does it happen without direction.

In the New Zealand context, this would involve integrating the work of the many different groups listed in Table 4 into a catchment-based governance framework in order to progress towards what Hooper would call a "mature auto-adaptive river basin organisation" (refer Section 6.4.2) – or an integrated inter-agency governance structure such as those outlined in Section 8.5 and Appendix H for the Manukau and Kaipara Harbours and the Hauraki Gulf.

Regional councils (including unitary authorities) are the agency with the most direct responsibilities for integrated resource management, and they operate at all catchment scales, from macro to micro. While they don't do all the work, they are the logical unit for collating information from catchment-related initiatives at the macro, meso and micro scale in a way that can be forwarded "upwards" to the relevant government and nation-wide sector or NGO agencies and "downwards" to territorial authorities, utility operators and local communities and community groups.

To manage such governance steering processes, environmental policymakers around the world are increasingly using a range of different policy approaches (e.g. regulatory, economic and voluntary approaches) to promote action on environmental issues. Each mechanism has specific strengths and weaknesses, and successful approaches will tailor a mix of mechanisms to individual situations. However, as Young et al (1996) observe, all of these mechanisms work best when used in combined with supporting collaborative activities such as sharing information, social learning and motivational approaches. Thus, collaborative activities underpin a range of catchment approaches, including regulatory and voluntary.

A collaborative and participatory approach to setting up enabling policy, guidance and funding that will drive the shape of wider catchment management practice is also borne out by other contemporary governance literature (e.g. ESRC 2000; de Loë 2009). Furlong and Bakker (2008) suggest that this includes setting a vision that is long term and developed cooperatively among stakeholders. This vision should embed the longer-term aim of catchment management and align it with related desired environmental, agricultural, and conservation outcomes. These authors also point to the importance of involving a range of actors in decision-making and governance. This requires action from all levels of government, and delegates powers to lower levels to facilitate broader programmes and minimise conflicts.

It is evident that establishing workable institutional and governance arrangements before the ICM process starts is one of the most critical elements in achieving successful ICM.

In sum:

- the issue is that as Bruce Hooper observes, good governance "is not easy, nor does it happen without direction"
- the implication is that there is a need for a wider debate about governance, including Maori forms of governance, and its importance as part of the "plan" phase of the policy cycle
- it would be easier for people to do more effective ICM if Hooper's macro, meso and micro scales were used as a unifiying framework within which to integrate the work of the many different groups listed in Table 4 into a catchment-based governance framework in order to progress towards what he would call "mature auto-adaptive" and inclusive catchment management.

9.2 Government leadership

Most of the interviewees stated the need for central government leadership and direction on freshwater policy. (Note: The National Policy Statement for Freshwater Management was made public after the interviews were complete and our interviewees did not have had a chance to consider it.)

Several interviewees believe it is important to have a national clear statement of the goal of ICM to provide direction at a local level for what can be an elusive practice and target. They noted that because ICM has no statutory planning status there is no regulatory push to prioritise its practice or funding.

> 'We're not required by law to do ICM but everything else we do *is* required – so if we have to make cuts ICM is what gets cut.'

Interviewees hoped that national guidelines will determine nationally significant issues and would provide explicit guidelines for freshwater quality as well as for ICM planning and stakeholder engagement.

This leadership is seen as important in order to:

- provide national consistency and support for the initiatives of individual councils against sometimes extremely powerful pressures for land and water use changes
- benchmark regional council activities
- reduce the inefficiency and duplication of effort of each council having to come up with its own standards and policies.

In sum:

- the issue is that ICM as a non-statutory and therefore optional process has to compete with required work and is consequently vulnerable to underfunding
- the implication is that ICM offers a spatial synthesis of a wide range of activities and players from macro to micro scale, but this powerful opportunity may sometimes be lost due to pressure on resources (capacity) to carry out mandatory work
- it would be easier for people to do more effective ICM if there were clear central government leadership and direction on ICM.

9.3 Partnerships

As noted in section 4.2, a major factor in effective ICM is the extent to which local communities can collaboratively design and manage their own institutional arrangements: it attracts stakeholder involvement at all phases of the planning cycle and promotes the exchange of knowledge between iwi, communities, sectors and agencies.

Partnerships are a form of governance that are becoming more formal and effective for New Zealand ICM, though some people view them with suspicion or anxiety.

Factors that contribute to successful partnerships between environmental management agencies and community groups in New Zealand were analysed by Allen et al (2002). Key findings were:

- the need to foster shared understanding of individual viewpoints and group participation: each individual or group experiences the world slightly differently, they may react differently to what may to be the same situation. This highlights the importance of getting people together to establish a shared understanding of any problem situation and the potential pathways for action. When people feel that they have had the opportunity to participate in planning future change, they are likely to buy into the changes that may be required of them
- complementary approaches are required to promote action, based on educational initiatives: this recognition has led researchers and policy makers to rethink environmental policies and the role of regulation. Regulation is not a linear process where policy makers enforce a particular policy with a distinctive and well-defined effect. Policy success depends on many factors and particularly on the cooperation of different groups of society. International environmental policy trends are recognising the need to creatively utilise the multiple mechanisms available (regulatory, incentive, voluntary, and property right) in designing approaches to promote action on environmental issues. Each has specific strengths and weaknesses. However, the effectiveness of all depends on a supporting framework of education, awareness raising, understanding and ownership
- while stakeholder participation is a key operational principle of contemporary sustainable-development policies, programmes, and projects, involving different groups in participatory initiatives is a complex and ongoing process with no universal single approach or method. It takes time, resources, understanding and perseverance, but the end result should be a development process that involves people from different groups – and their ideas, skills and knowledge. Participation in this way can contribute heavily to sustainability, make environmental activities more effective, and simultaneously contribute to building the capacity of those groups involved to continue and grow the initiative. However, promoting participation implies a different way of working, the use of different approaches and methods, and different expectations
- participation needs to be effective at all levels of involvement: it can be practised simultaneously at different levels of decision making. It is most useful to think of three

levels of participation: national, institutional and programme, and projects on the ground. Because environmental programmes are designed to be responsive to changing community needs, one of the most pressing challenges is to develop participatory and systems-based monitoring and evaluative processes that allow for ongoing learning, correction, and adjustment by all parties concerned

- it is important to give attention to both task and process: effective collaborative initiatives pay attention to both task and process, and so meet the needs of the different participants in both these areas. The task can then be defined as what those involved have to do (e.g. reduce waste), whereas the process is concerned with how people and groups/teams work together, maintain relationships, and achieve agreed outcomes. It is then important to measure and evaluate the progress of both task and process.

The process is one of transformational change, and it requires group cultural change that spreads to others: in the end, participatory initiatives on the ground involve people working in groups and teams. Accordingly, an understanding of how to initiate and foster these social units is essential for delivering participation, as outlined in previous sections. However, to foster a more collective approach to environmental management that is capable of transformational change, we have to do more than just work together on specific projects. Transformational change requires individuals and groups to develop the capacity to move beyond the completion of task-bounded activities. They must catalyse change within their immediate membership first, and spread that culture to others in their communities over the longer term. Supporting groups in this way requires an understanding of group processes and stages of development, attention to factors such as group abilities and skills, and the use of appropriate participatory monitoring and evaluation processes.

As part of the above analysis, Allen et al. (2002) distinguished between:

- agency-led partnerships
- community-led partnerships
- joint partnerships.

Their research suggested that joint partnerships have the greatest capacity for long-term sustainability: partnerships that share resources and decision-making power lead to the most effective long-term commitment to changing environmental management outcomes.

This is highly congruent with the need to integrate all four wellbeings into ICM, where social and cultural outcomes are valued and become a key part of the vehicle for delivering the desired environmental outcomes.

Thinking in terms of macro, meso and micro scales lends itself ideally to identification of stakeholders who may be appropriately engaged at each scale by way of the appropriate collaborative models – formal, informal and so on.

The range of issues that could be addressed would in all likelihood expand to accommodate the issues raised at each of these different scales, depending on the issues and visions of the stakeholders who self-engage at each scale. It seems that the principle of collaboration or partnership can most probably be applied to the full suite of issues encompassed by integrated catchment and coastal management regardless of the degree of associated regulation.

The management literature emphasizes that issues of partnership, governance and accountability are interrelated (Horton et al. 2009). Working in partnership can improve accountability to the individual partners involved. However, as Doug Horton and colleagues

point out it can also complicate accountability, because of the diverse, and in some cases conflicting, interests and accountability requirements of the different partners.

Many examples of collaboration discuss community-based stream bank planting and similar initiatives. However, while sectors like farming and business are often heavily regulated, regulation can also be accompanied by dialogue and partnership. The collaborative models would vary depending both on scale and also on the needs and capacity of the different stakeholders, ranging from formal memoranda of understanding to very informal liaison (Courtney, 2005; Craig and Courtney 2004).

Craig and Courtney note that partnerships are part of a wider debate about what should be done at what level: a debate about decentralisation and accountability and who should be responsible for what, e.g. should responsibility be at national, regional or local level?

Partnerships therefore need to be seen in the bigger context of:

- Treaty partnerships
- joining up government and service delivery at regional and local levels
- joining up accountability, especially shared across government at the local level
- local government's mandate for promoting wellbeing and community outcomes through their long term planning processes
- government's relationship with the community and voluntary sector
- decentralisation and devolution.

Benefits include:

- multi-sector/agency approaches to complex, interlinked problems facing communities
- more locally responsive services
- more long term community buy in and involvement in local social development projects, services and outcomes
- greater sharing of resources, both monetary and non-monetary.

Issues include profound fragmentation of service delivery and accountability, raising the real need to find ways to keep local action accountable and coordinated. There is also a risk that unrealistic expectations and unreasonable responsibilities can be heaped (or dumped) into partnerships, along with a lack of support.

Partnerships and collaborative approaches to ICM can emerge from both a "top-down" and a "bottom-up" approach. Experience reviewed in this report indicates that communities can get started and then successfully engage with the regional council, as in the Whaingaroa, where short term funding enabled the local people to get started, then they needed to persuade Environment Waikato of the merits of the case, and ensure it could provide ongoing funding by justifying the expenditure in its LTCCP. Likewise, regional councils may identify an issue and over time engage the community in a sustained programme, as in the Mahurangi.

Much valuable consideration needs to be given to issues including Maori perspectives, mandates and representation, the need for strategic brokers (people that glue others together), getting from contracts to "relationship agreements", understanding the dynamics and tactics of joining up and partnership, potential gains and risks from decentralisation, and the resources and other support that need to be in place (Courtney, 2005; Craig and Courtney 2004). Conflict resolution and mutual capacity-building are also identified as key

needs for all parties, and this echoes the findings of Brown (2004, 2006a) that councils need to build the capacity of elected representatives and staff for meaningful engagement in order to achieve more sustainable urban water management.

For example, in acknowledging the special position of Tangata whenua in the region, Environment Waikato encourages staff to work with hapu and whanau at an operational level and as part of its "partnership" approach with Maori, is formalising relationships with local iwi through Memoranda of Agreement. Agreements have now been signed with the Ngati Tuwharetoa and Hauraki Maori Trust Boards and are available on the council's website.

Going further than memoranda, a Treaty of Waitangi claim settlement enacted by Parliament on May 6, 2010 enabled Tainui and the Crown to jointly govern, restore and protect the Waikato River in a co-management process, in which ICM has considerable potential for use.

In sum:

- the issue is that partnerships are a form of governance that are becoming more formal and effective for New Zealand ICM, though some people view them with suspicion or anxiety
- the implication is that although research suggests joint partnerships have the greatest capacity for long-term sustainability, they may be under-utilised due to lack of capacity of iwi, communities and agencies to consider or support them
- it would be easier for people to do more effective ICM if case studies of partnerships were more widely available, possibly through the information-sharing system recommended in previous sections.

9.4 Regulatory and non-regulatory methods

ICM comprises both regulatory and non-regulatory approaches. This subsection highlights their complementary nature while focusing on how non-regulatory methods support regulation.

In recent years, there has been a rethink about the role of regulation in environmental policy (Allen et al, 2002; de Loë, 2009). Regulation is no longer seen simply as a tool for enforcing a policy that has a certain and well-defined effect. Instead, the complexity of managing across multiple social perspectives is acknowledged, and policy success is seen to depend on the co-operation of different groups within society. There is more on this in Section 10, but it is clear that this acknowledges the role of governance as the "art of steering societies and organizations" (Plumptre and Graham, 2000).

To manage this steering process, environmental policymakers around the world are increasingly using a range of different policy approaches together, for example by combining regulatory, economic and voluntary approaches to promote action on environmental issues. Each mechanism has specific strengths and weaknesses, and successful approaches will tailor a mix of mechanisms to individual situations.

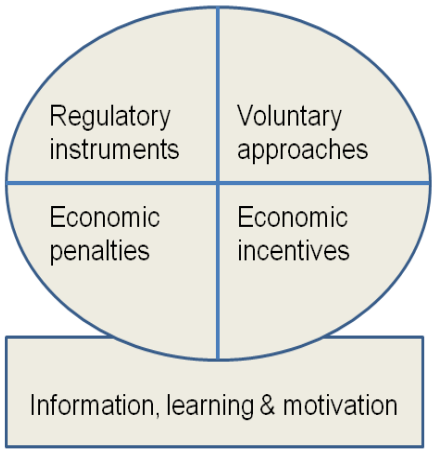
However, as Young et al (1996) observe, all of these mechanisms work best when used in combined with supporting collaborative activities such as sharing information, social learning and motivational approaches. Thus, collaborative activities need to underpin all management approaches and mechanisms, as shown in Figure 5.

Applying learning from pest management to ICM, a collaborative and participatory approach to setting up enabling policy, guidance and funding that will drive the shape of wider pest

management practice is also borne out by other contemporary governance literature (e.g. ESRC 2000; de Loë 2009). Furlong and Bakker (2008) suggest that this includes setting a vision that is long term and developed co-operatively among stakeholders. This vision should embed the longer-term aim of sustained change in pest management and align it with related desired environmental, agricultural, and conservation outcomes. These authors also point to the importance of involving a range of actors in decision-making and governance. This requires action from all levels of government, and delegates powers to lower levels to facilitate broader programmes and minimise conflicts (Furlong and Bakker, 2008).

Figure 5 Major types of policy instruments and their relationship to information, learning and motivation

Source: Adapted from Young et al, 1996



Both the literature review and interviews indicate that ICM operates most effectively where there is a balance between regulatory, economic and voluntary mechanisms. However, it does not appear that there is any optimal balance: the indications are that the balance should be determined in conjunction with the context, situation and communities involved.

Factors influencing how ICM practitioners determine this balance include:

- the perceived value of community support
- the complexity of the issue
- equity
- the availability of regulatory methods that will achieve the desired outcome
- the perceived effectiveness of non-regulatory methods and supporting tools
- the specific ecological, social and development circumstances of each catchment.

Regulation has proven to be a politically complex response and not one that local government has been eager to use. It requires the ongoing support of a range of non-regulatory measures including research, policy, education and/or training and ongoing two-way communication (Feeney, 2009). Moreover, the RMA was intended to devolve decision-making to the regional and local level (Ericksen et al, 2003b), so it is not surprising that contrasting approaches to similar catchment-related issues can be seen around the country, depending on agencies'

perceptions of the availability of regulatory methods, regional political pressure from land and water users, and the perceived effectiveness of non-regulatory methods.
There is a wide range of non-regulatory options, some of which are listed in a report in preparation for the Hauraki Gulf Forum (Trotman, 2010, in prep). The draft report notes that the "uptake of non-regulatory approaches at government level is currently hindered by a lack of clear description, understanding, resource needs and evidence of effectiveness. To invest in these approaches, decision-makers, funders, environmental managers and the tax- and rate-paying public need to be convinced of their merits in helping to achieve identified environmental outcomes. The report was commissioned to fill a gap in this information base.

Such choices are also influenced by the specific ecological, social and development circumstances of each catchment, so that each will locate itself in a different place along the regulatory – non-regulatory spectrum.

From the literature and the interviews, low-regulatory ICM approaches are often used at the "softer" end of water quality/allocation issues such as sedimentation. "Soft end issues" are characteristically less expensive to resolve (riparian planting and fencing) and highly visible (muddy rivers and harmed shellfish beds). Even so, regulatory ICM programmes do not ensure all landowners comply with desired standards.

Resolution of the most serious water quality issues in New Zealand (including nutrients) requires significant changes in agricultural practices – changes that impact on productivity and land value. These changes are not likely to take place in New Zealand to the necessary degree without effective policy.

Recent findings from the Clean Streams Accord and other State of Environment reports cited in Section 6.6 show that voluntary mechanisms alone are not effective in achieving ecological bottom lines for fresh water. However other experience shows that a mix of mechanisms (regulatory, economic and voluntary approaches) needs to be used. Each mechanism has specific strengths and weaknesses, and successful approaches will tailor a mix of mechanisms to individual situations. However, as some reviewers observe, all of these mechanisms work best when used in combined with supporting collaborative activities such as sharing information, social learning and motivational approaches.

Effective regulation that has sufficient impact on nutrient and sediment runoff to meet ecological bottom lines is unlikely to be enacted by local government without clear national guidance and "proof of principle" (that is, credible and attributable monitoring results) from the bold measures taken in the Taupo and Rotorua Lakes. The issues are complex, fast changing, large in scale and scope, and fraught with regional conflicts of interest. It requires national government leadership for efficiency and effectiveness.

Communities may also be engaged through the statutory process, signifying perhaps the blurred boundaries between the non-regulatory and regulatory aspects of ICM. For example the literature review revealed that in the case of the Hurunui Community Water Development Project, an ICM project predominantly for the benefit of water allocation integration, the project managers elected to engage with the community, supporter, objectors and legislators through the Environment Canterbury Natural Resources Regional Planning (NRRP) process. Matters of grave importance to the objectives of the Hurunui project – such as the establishment of low flows – were being debated in the NRRP process, suggesting that in this case (albeit now superseded by the appointment of Commissioners), collaborative visioning and management can be done though involvement in a wider regional planning context.

The decision of the Hurunui community water development project to enact their integration objectives through the statutory process suggests that the integration of regulatory and non-regulatory ICM processes may be at the heart of truly effective ICM.

Many policy makers shy away from regulation because seems too hard or too harsh, but if the *process* of introducing regulation follows identified best practice, then the overall acceptability – or obvious necessity – of the mechanisms adopted and the *outcomes* desired will be more willingly endorsed by the community.

Every community will thus determine where it sits on the spectrum or regulatory-non-regulatory approaches. It seems that if there is clear national guidance, then government can leave the flexibility to the regions and localities to work out how they want to meet them, with the understanding that regulation is a critical component of the package.

Both regulatory and non-regulatory methods need planning, management, ongoing resourcing, monitoring and review. There is little rigorous information available to help land use and catchment managers assess a range of options and the associated costs.

Both regulatory and non-regulatory methods also involve building social capital (trust, networks, cooperation), financial capital (funding, resources) and human capital (skills, experience, wisdom, leadership) and aligning these elements to improve environmental outcomes.

Among many other things, non-regulatory activities can include (Trotman, 2010):

- Maori management methods and practices
- strategies and plans
- care groups and other environmental or community groups
- sector-based groups
- community-based monitoring and research programmes (schools, communities, Maori)
- pest control and planting/wetland/dune restoration, wetland restoration
- best practice guides and technical advice
- public education by a wide range of means and channels
- financial incentives (e.g. rates relief), funding programmes, subsidies for conservation
- collaborative forums, community engagement, consultation processes, networks, various collaborative models including co-management, memoranda of agreement
- submissions, presentations, media campaigns.

In this way it can be seen that together, regulatory and non-regulatory approaches have the potential both to build community resilience and contribute to measurable ecological outcomes.

In sum:

- the issue is that while ICM operates most effectively where there is a balance between regulatory, economic and voluntary mechanisms, that balance should be determined in conjunction with the context, situation and communities involved. As intended under the devolved approach in the RMA, contrasting approaches to similar catchment-related issues can therefore be seen around the country. However, as Trotman (in press) observes, “uptake of non-regulatory approaches at government level is currently hindered by a lack of clear description, understanding, resource needs and evidence of effectiveness”

- the implication is that neither regulation nor non-regulatory methods may be being used to their full potential, separately or together, to deliver measurable ecological outcomes for ICM
- it would be easier for people to do more effective ICM if there were:
    - better understanding of various regulatory and non-regulatory methods and their needs for planning, management, ongoing resourcing, monitoring and review
    - case studies of the processes used to introduce regulation, the non-regulatory supporting measures provided, the time, budget and skills required and their effectiveness at delivering measurable environmental improvements.

9.5 Themes and ways forward

Governance is something you have whether you consider it or not. The discussion in this section shows that it is beneficial to think carefully about appropriate levels and forms of governance – the environment that enables the desired changes in practice to be supported, adopted and enacted by the different stakeholder groups involved in a multi-stakeholder decision-making process.

The many players, different levels and dynamic natural, political and economic forces involved mean that effective governance in the water sector tends to be adaptive and "messy", with the different scales acting as a decision-making "commons" operating at three interrelated levels; the macro and meso scale at which "formal" ICM is conducted and the micro scale of many catchment-related initiatives.

To summarise, things that would promote good governance in ICM include:

- use of Hooper's macro, meso and micro scales as a unifying framework within which to integrate the work of the many different groups listed in Table 4 into a catchment-based governance framework in order to progress towards what he would call "mature auto-adaptive" and inclusive catchment management
- clear central government leadership and direction on ICM
- case studies of partnerships being widely available, possibly through the information-sharing system recommended in previous sections
- better understanding of various regulatory and non-regulatory methods and their needs for planning, management, ongoing resourcing, monitoring and review
- case studies of the processes used to introduce regulation, the non-regulatory supporting measures provided, the time, budget and skills required and their effectiveness at delivering measurable environmental improvements.

10. ICM: meeting iwi and community aspirations for catchments and coasts?

Introduction and overview

Drawing on the preceding sections, this section assesses the usefulness of integrated catchment management in enabling iwi and communities to determine and work towards achieving their joint aspirations for water in their catchment and linked coastal marine areas.

Before beginning the discussion, the views of Phillips et al (in press) are germane. They note that over recent decades, the challenges facing landowners, resource managers and scientists have multiplied: "where once our rural environments were viewed simply as productive landscapes dominated by single sectors (such as dairy, horticulture, forestry), many new players have emerged to voice their views on issues such as landscape, recreation, conservation and tourism (Parliamentary Commissioner for the Environment, 2004; Allen and Kilvington, 2005). This is particularly true for large-scale landscape and ecosystem management issues where the decision-making environment is increasingly characterised by multiple stakeholders, many perspectives of resource management, and where science and other information is subject to diverse and contested interpretations (e.g., Blackstock and Carter, 2007; Giller et al, 2008; Macleod et al, 2008). Indeed, the concept of 'resource management' itself can be criticised for its extractive connotation of the environment as a 'resource' to be 'managed'. To advance sustainable land and water management, practitioners now seek approaches like integrated catchment management (ICM) that accommodate multiple perspectives and draw on multiple sources of information (Cullen, 1990; Allen and Kilvington, 2005)."

This places a high burden of expectation on ICM and what it can deliver.

Moreover, as we have seen, a consistent theme emerging for the literature and interviews is the lack of data, especially (though not exclusively) from small projects, enabling assessments of what ICM has delivered do far. This can reflect a lack of time for the desired outcomes to emerge, but can also reflect a lack of documentation. This necessitates much research into individual projects to find out what was intended, what was done, how it was done and how well it worked; which means that information not collected in a timely way by such research runs the risk of being lost.

Among the exceptions are the ICM project review by Edgar (2004), a Year Three evaluation of the Taieri Trust (Tyson, 2004) and the ongoing evaluations of the Taieri Project, Project Twin Streams and the Mahurangi Action Plan.

In an attempt to capture some of the undocumented information, three reviews of catchment-related initiatives have been carried out in recent years (MAF, 1999; Buchan, 2007; and Dodd et al, 2009) and reported on in earlier sections.

This section of the report builds upon all these findings supplemented with interviews to come up with some widely applicable findings under the following headings:

- process and outcomes
- outcomes across all four wellbeings
- collaborative visioning with iwi and communities.

It concludes with an overall assessment of how much of a difference ICM does and could potentially make towards helping communities meet their aspirations for catchments and coasts.

Institutional, iwi and community capacity to work together to identify and progress towards realising their outcomes are crucial, and are discussed in Section 4.4. Better integration of players and tools across MHWS is also crucial, and is discussed in Section 8, while the governance aspects of working with iwi and communities are discussed in Section 9.

10.1 Process and outcomes

Identifying and meeting iwi and community expectations for catchments and coasts requires a broad scope of integration, particularly processes used to integrate:

- iwi/hapu and government
- silos of local and central government
- decision-making levels
- policy, action and science
- management methods, including regulatory and non-regulatory
- catchment and coastal/marine issues above, below and across MHWS.

Many of the "factors of success" for good ICM identified in the global and national literature relate to plan process, that is, first and second order outcomes. Summarised in Table 3 and Section 4, they have been found to be present in "successful" initiatives, though they do not all need to be present for an initiative to be effective.

The key things that must be present for a plan's third order outcomes – and consequently its effectiveness – to be assessed, relate to measurability.

However, of the three projects partly funded through the WWF Habitat Protection Fund selected for in-depth outcomes evaluations (the Whaingaroa Harbour Care project in Raglan, Te Rangitahi o te Whenua Trust in Torere and the Yellow-Eyed Penguin Trust in Dunedin), none had mechanisms in place to measure the environmental outcomes from these projects, let alone the social and economic outcomes (Buchan, 2007). The report notes that most of the information on the benefits generated by the three projects is qualitative rather than quantitative. None of the three projects had mechanisms in place to measure the environmental outcomes from these projects, let alone the social and economic outcomes.

Buchan concluded, in line with findings of this report, that in order to ensure all benefits (and adverse effects) are explicitly identified, monitoring mechanisms need to be integrated into project design at the outset. That is, clear identification of issues and outcomes is essential before iwi, communities and agencies can work out if aspirations are being met.

Despite such shortcomings, recent literature (e.g. Allen et al, 2002; Aorere Catchment Group, 2009; Phillips et al, in press) confirms such growing evidence of:

- good process by good people in councils and the community
- a great deal more about effectiveness at the community interface
- a growing interest in programme review and assessments of effectiveness
- increasing willingness to take hard decisions about regulating land and/or water use activities in order to address very serious ecological issues and water scarcity.

Such findings indicate that catchment managers, advisers, communities and stakeholders are growing in confidence with ICM processes, and this is a very positive development that augurs well for the future. However, there is less competence, though emerging interest, in third order outcomes with respect to environmental bottom lines.

In sum:

- the issue is that ICM should be planned and implemented to meet iwi and community aspirations and that such good process makes a significant contribution to good outcomes, but that outcomes (especially third order outcomes with respect to environmental bottom lines) are seldom specified or measurable
- the implication is that ICM is likely to be making a bigger contribution to meeting iwi and community aspirations for catchments and coasts than is suggested by much of the readily available information, but that iwi and communities could participate more in defining their aspirations, as well as implementation, monitoring and review
- it would be easier for ICM to help iwi and communities meet their aspirations for catchments and coasts if there were an ongoing conversation amongst key parties about ICM as an explicit and synthesising vehicle for the many outcomes to which they aspire and good examples of cost-effective methods for identifying aspirations.

10.2 Outcomes across all four wellbeings

Iwi and community outcomes and government agencies' obligations to meet them traverse all four wellbeings, so sponsors of all kinds of catchment-related initiatives at all scales need to consider them. Many agencies are in fact required to do this under the legislative requirements of both the RMA and LGA to identify community outcomes and report back to the community on progress made towards their achievement.

Many interviewees noted that while regional councils have focused on the environmental and economic wellbeings (such tradeoffs are usually explicit either in policy or LTCCPs), now that they are really maturing into their role they are more confident about looking into the social and cultural wellbeings – that is, integrating wider considerations into resource management into ICM.

Examples include the Whaingaroa Environment Catchment Plan and the work of the Raglan Harbour Care Group and Project Twin Streams, where there is extensive integration between the environmental objectives (in both cases for both improved stream and harbour water quality) and socio-cultural objectives as well as economic ones.

One interviewee also noted that his organisation was currently working on a set of values which links Maori values and others to show what is happening within a river system e.g. health of tuna (eels), the number of swimming holes, the presence/absence of algal growths and the like because it brings the state of the resource closer to the level of the user compared with a list of chemical analyses which most of them cannot relate to.

As noted in Section 4.7, catchment and asset managers routinely use multi-criteria analysis to assess catchment management options against the four wellbeings, and are beginning to involve iwi and community stakeholders in such work to ensure that the outcomes are formulated with their input and captured for documentation and programme review.

Among the social, cultural and economic wellbeings captured as part of environmental initiatives identified in Buchan's (2007) three case-studies and endorsed in her review of

previous research in this area were:

- social and psychological benefits for volunteers
- increased social capital through the strengthening of connections between community groups, business interests, and local and central government, as well as the development of leadership, organisational skills and confidence
- personal development and increased quality of life through the learning of new skills and the opening up of recreational and socialising opportunities
- raised awareness of the natural environment enriching people's life and work experience
- reduced pest damage for commercial growers (including forestry companies) as well as domestic gardeners
- increased viability of Maori traditional medication through the protection and propagation of rongoa plants
- support for the regeneration of Maori culture through the production of plants used in traditional craft making including flax for weaving
- the generation of new income-earning employment opportunities, opportunities for work experience and development of employment skills
- economic benefits for local businesses through increased customer numbers and the creation of new business opportunities.

Buchan goes on to note that "Benefits for socially dysfunctional youth and the agencies charged with their care were particularly evident in all three case studies. All three, to a greater or lesser extent, were providing a vehicle for addressing social dysfunction in youth – helping to bring about behaviour change, improved attitudes, and increased social wellbeing for youth through engagement with the natural environment. Two provided clear evidence that becoming involved in environmental restoration can increase farmers' quality of life and work environment, providing greater job satisfaction and an increased sense of wellbeing through working more in harmony with nature."

While the report focuses on the social, cultural and economic benefits generated by environmental projects, Buchan notes that environmental restoration projects "can also generate adverse effects such as increased traffic generation on local roads leading to the project area and constraints on the activities of adjacent landowners and existing resource users". However, the report concludes that "compared to the benefits generated, these effects are usually of a minor nature and can often be mitigated or even avoided by proper impact assessment and planning as part of project design"; and that, "if the potential social and economic benefits from environmental restoration projects are recognised more overtly, and specifically provided for in the design, funding mechanisms and project implementation, benefits to the individuals involved and to the communities in which these projects are located are likely to be increased."

Collaborative projects such as those in the Motueka and by Heijs, Campbell et al (2010) and Scott (2007) show that communities do not "divide up" their aspirations along the tidy lines of intra- and interagency demarcations, and that sponsors of catchment-related initiatives consequently need to acknowledge all of the aspirations expressed by iwi and communities. In some cases this may mean they have to work with key stumbling blocks to engagement that are not directly related to catchment outcomes, in order to build the good working relationships needed for effective catchment-related engagement. Internal and external funders need the flexibility to be able to accommodate this when necessary.

Any natural resource management programme can be expected to deliver a wide range of outcomes under the other wellbeings, as shown by Ian Brown (2006a). His analysis indicated that the overall outcomes of both on-farm plans and ICM programmes can be expected to be similar. Adapted from work undertaken by Zammitt et al (2000) into the development of an evaluation framework for natural resource management, Brown lists a range of outcomes that recognise the triple bottom line approach of environmental, social, and economic sustainability.

Table 7 lists these in terms of the four RMA and LGA wellbeings, together with those Brown expected to be delivered by environmental farm plans and ICM programmes.

Brown notes that the list "is not meant to be a comprehensive listing of all [environmental farm plan] and ICM programme outcomes but rather an indication of the type of outcomes that these programmes can achieve. Similar outcomes are likely to apply at farm and catchment level, any differences being largely a matter of scale of application."

The table's wording would enable communities to relate to fairly easily to the outcome areas described. Moreover, as Brown also notes, indicators "can be applied to all of these outcomes and together these provide a guide upon which the effectiveness of EFP and ICM programmes can be evaluated."

The case study in Appendix H of Project Twin Streams in Waitakere City is an example of a collaborative project that has provided for explicit outcomes across all four wellbeings and regular programme reviews to enable the council togetherwith its iwi and community partners to assess progress towards their achievement.

Table 7 Outcomes of natural resource management programmes

Source: Adapted from Brown, 2006

Wellbeing	Natural resource management programme outcomes
Environmental	Environmental quality/ecosystem health & integrity maintained & improved, e.g, by: • water quality and ecosystem health at or above level set through community and/or farm targets • water leaving the property at or above the standard of that entering the property • environmental flow requirements of streams maintained • soil condition and health maintained and/or enhanced • areas of high erosion risk land protected • off-site environmental impacts of activities minimised • biodiversity values recognised and maintained and/or enhanced
Social	• strong partnerships developed between stakeholders with their focus on improved environmental quality • on-farm and community lifestyle maintained or improved • improved social harmony and reduced conflict on environmental issues
Cultural	• cultural values recognised and protected
Economic	• efficient water use • maintained productive capacity of the soil resource • strengthened value-added opportunities • costs and benefits of resource management shared equitably • economic viability of enterprises and industries is improved • infrastructural assets protected and damage from adverse events minimised

In sum:

- the issue is that ICM contributes to a range of outcomes across all four wellbeings but the results are seldom documented, especially in quantitative terms and for third order environmental outcomes
- the implication is that the potential for ICM to contribute to all four wellbeings is potentially underestimated (this is likely to be particularly true in catchments where a strong single-issue driver exists) despite that fact that iwi and communities do not "divide up" their aspirations along institutional lines
- it would be easier for catchment and coastal managers to meet iwi and community aspirations for catchments and coasts if:
    - they identified at the start of any initiative baseline indicators across all four wellbeings, even for single issue initiatives. This would provide invaluable data for future evaluations when the strengthened working relationships amongst agencies, iwi and communities enable other issues to be progressively addressed over time
    - examples of measurable outcomes across all four wellbeings, particularly for third order environmental bottom line outcomes, were more widely available.

10.3 Collaborative visioning, decision-making and management

The only way for agencies to identify the wide range of outcomes hinted at in the preceding subsection (and which will vary from catchment to catchment and community to community) is to engage with iwi, communities and other stakeholders to identify what outcomes across all four wellbeings they wish for their catchment – a principle enshrined in all of New Zealand's resource management legislation, especially the RMA and LGA.

This means appreciating different world views, forms of knowledge and aspirations – and different ways of expressing them. As indicated in previous sections (e.g. 4.4, 6.2.4, 7.4) not all catchment-related agencies have the capacity in terms of skills or confidence to interpret how communities express their views in ways that lead to constructive engagement in the process of identifying and working towards measurable outcomes for catchments and coasts.

Moreover, in order to meet iwi and community aspirations for catchment and coasts, the sponsors of catchment-related initiatives need to consider how land and water use affect fresh and saline waters, and what interagency alignment and co-ordination is needed to meet these aspirations (see Sections 6 and 8). This means that collaborative visioning, decision-making and management involves the responsible agencies in their separate and combined interactions with iwi and communities, and may mean sharing or blurring legislative and jurisdictional boundaries.

Iwi and community involvement will however often result in better integration across MHWS, as coastal issues commonly trigger their interest in ICM, and their impatience with arcane interagency distinctions promotes better alignment and co-ordination.

For all this to occcur, and as outlined in Section 4.4, iwi, communities and catchment managers all need capacity building and resourcing to identify issues and outcomes, then plan, do, check and review the methods agreed to meet community aspirations for catchments and coasts.

Engagement has been discussed in Section 7.3 and this section supplements that discussion.

10.3.1 Iwi

ICM is a conceptual view of land and water management that several interviewees noted sits well with Maori understanding and other holistic approaches.

A number of those we interviewed pointed to the increasingly important role that iwi are playing in the management of our fresh and coastal waters. ICM sponsors needs to be particularly mindful to ensure the perspectives and contributions of Tangata whenua are included.

Maori have long been advocates and practitioners of ICM with a specific focus on coastal matters. A strong theme in this report is that of Maori and community interest in ICM as a means of solving difficult issues including those related to coasts and fisheries. A number of traditional management and conservation methods and tools such as rahui, taiapure and mataitai are now becoming more common within formal legal frameworks such as the various forms of marine protected areas administered by DoC.

The experience of successful multi-party and multi-issue integrated catchment and coastal mangement plans such as the three-year Manukau Harbour Action Plan in the late 1980s could usefully inform current and future initiatives across MHWS.

Many iwi and community groups directly engage in a range of coastal protection and enhancement activities, and while such projects do contribute to beneficial outcomes, their activities need to be captured within an integrated catchment and coastal management and monitoring framework.

However, Dodd et al (2009) identified in Section 3.4 that long-term integrated studies and the participation of Maori (including social research on Maori interests) are under-represented in ICM research programmes. Future work thus needs to include the documentation of traditional uses, values and ways of understanding interaction of people and the natural environment. And more can be done to take advantage of the understanding and experience that iwi have with collective approaches to resource management.

> 'ICM projects will come and go but iwi are there for the long term. They're not leaving.'

Some interviewees commented on the specific requirements to support iwi/hapu in their growing role in collaborative management through the Treaty Settlement process. The Motueka ICM researchers have concluded that iwi-led and iwi-issue-driven collaborative projects are an important incubator for building capacity for iwi and hapu researchers, scientists and stakeholders, and contribute to building strong long-term iwi–science partnerships and increase iwi engagement and interaction in ICM science objectives. They also facilitate a move towards transdisciplinary research where knowledge is created, discussed, and understood from various world-views.

Several interviewees noted that the Tainui and other forthcoming Treaty settlement processes will dramatically change the way resource management decisions are made, opening the door to collaborative planning processes. In many parts of the country iwi/hapu are already engaged in ICM programmes or will soon be. Treaty settlements are placing iwi in a central decision-making role with respect to land and water resources.

Several interviewees commented that where iwi/hapu have limited capacity available to them, they are disadvantaged as active and knowledgeable participants in the ICM process. They are also often engaged with other complex issues related to health, education and iwi development, resulting in stretched resources to cover all fields of engagement. An active programme of capacity development and support can be required to ensure the full participation of iwi/hapu in ICM.

However, some aspects of collaborative planning worry iwi/hapu.

> 'Don't try to bring all goals and aspirations together or you'll dilute them. The outcomes then have to based on trade-offs where someone misses out.'

Iwi in the Whaingaroa have elected to stay out of the ICM process because they have begun a process of developing their own hapu management plans (Environment Waikato, no date). This situation can occur where there are active treaty claims in the area over which the ICM project is being proposed or where there are outstanding grievances with central government.

By contrast, iwi in the Kaipara stepped in to take action in response to an apparent lack of interest by the two Regional Councils responsible for it (see Section 8.5.4).

It is likely that further opportunity exists for further and more active engagement with Tangata whenua in both rural and urban ICM as a specific activity. In 2000, Hirini Matunga noted "ecological restoration in the city should not be separated from the social and cultural restoration of the human communities that inhabit the city" and that the possibilities for reinclusion of Tangata whenua in urban biodiversity and ecology "are endless".

Harmsworth (2001) developed a collaborative research model for working with iwi based on a case study in the Waiapu community on Maori community goals for enhancing ecosystem health. A key strand of the work focused on determining the best mix of communication strategies to facilitate dialogue and participation with iwi, and between the community and those stakeholders with an interest in sustainable catchment management.

There is a growing knowledge and understanding of good process for iwi engagement by managers, project leaders and communities generally, and Maori are becoming more active in defining good practice, too (see for example Freeland, 2009). A good understanding the context of the relationship, good planning and good process will contribute to good outcomes. Among other things, Freeland (2009) defines these as:

- relationships defined in the context of legislative requirements, effective treaty-based relationships and recognition of the sustainability needs of Tangata Whenua
- engagement process that gives due consideration and resourcing for the scope of Maori engagement, building and maintaining long term relationships, capacity and capability and Maori contribution to decision-making
- outcomes that integrate Maori world views and specific environmental concerns.

Freeland cites the following as critical issues for Maori; an holistic integrated approach; water – Mana o Nga Wai; water Infrastructure – Mana Whakahaere; water supply; water quality; well-being of receiving environments; and treatment and further usage – all of direct relevance to ICM.

In sum:

- the issue is that because ICM is consistent with the Maori world view, Maori have often driven integrated approaches to catchment and coastal management, but iwi and catchment managers need more capacity to work together and understand each others' world view and ways of working
- the implication is that partnership approaches between iwi, catchment managers and communities have considerable under-utilised potential to harness the high level of motivation that iwi have in improving the state of fresh and saline waters and ecosystems
- it would be easier for iwi and catchment managers to engage with each other and communities in more effective management of catchments and coasts if there were

widely available case studies of what has worked well and lessons learned in order to build their capacity to do so.

10.3.2 Communities

In order to build ownership and maximise participation of the target communities in a given catchment, agencies need to appreciate and where necessary build stakeholders' knowledge and understanding. As outlined in previous sections (especially Section 4) the engagement process requires an independent facilitator and a willingness for all parties to listen, be flexible and be open to change. Ideally, it will lead to collaborative management where vision, decision-making and action are shared amongst community stakeholders.

> 'Ethically we should involve people in their own issues. Collaboration is an important risk management tool, too.'

In fact, the self-identified ICM initiatives across the country vary a great deal in what components of their programmes are collaboratively managed.

> 'Some people think NIWA and Landcare collaborating is an ICM.'

Community engagement is regarded by proponents of both the "resilient communities" and "ecological bottom lines" approaches as essential for effective ICM, but how far the implementing agency is willing to take that engagement in terms of collaborative management depends on the scale of problem being addressed and the culture and politics of both the local community and the agency.

> 'The catchments are huge. We're expected to engage with several thousand people?'

> 'ICM can just be a way of disseminating western science information and expecting good uptake by stakeholders.'

> '50% of our success comes from building the trust of the communities. Now people can see the success of other projects and see our message *is* consistent and we do follow through. So they are happy to work with us on the difficult problems.'

Proponents of the "resilient communities" school believe that the ICM process should maximise community ownership of issues and solutions. Communities should be in the driver's seat to ensure their fullest participation and support. Proponents of the "ecological bottom line" state that this might work only so long as the solutions are not targeting productivity – that is, the opportunity for landowners to increase the financial return on their land use activities.

> 'I can't think of a situation when community aspirations don't match council aspirations. That's unless you have national priorities for a river system, in which case the locals don't agree.'

They also point to the fact that there can be untested assumptions about what a community actually is (also see Section 7.1).

> 'Farming is more and more a business. They're not mum and dad farmers anymore and so we're losing that sense of community. The community is now farm workers and managers, not owners, and they haven't got the mandate.'

> 'We wanted to work with "the community", but we found there are lots of different communities in the catchment, along with all these people and families who don't necessarily identify with any specific local interest groups or even with each other.'

Some local authority interviewees mentioned their concern about losing control of the process if planning was "too collaborative". They refer to both statutory obligations and political mandates that require them to retain control over essential planning services, while others think more can be done.

> 'Councils are frightened the community isn't going to come up with the same plans that councils have already written.'
>
> 'Lots of us are still using the DAD model – decide/advise/defend – instead of the EDD model - evaluate deliberate and decide, together!'

The degree of willingness and the capacity of the communities and stakeholders to be engaged is an essential component of collaborative planning.

> 'They didn't want to come up with shared objectives. They wanted to be told what we wanted. They felt that we were in the end going to tell them what to do anyway.'
>
> 'The city came up with issues and options but the community didn't want that. When they got hold of the information, they figured out the vision for themselves.'

Some interviewees see the Long Term Council Community Plan (LTCCP) as the key vehicle for community consultation, as it allows people to see how it balances all the council's many competing priorities into an overall funding package.

However, statutory processes can also be successfully used as an opportunity to engage the community, as in the Hurunui example summarised in Appendix D, where the community decided to go down a regulatory path in order to meet its objectives.

All ICM programmes in New Zealand have some component of community engagement. There is a wide range of depth and form of engagement and ideas about who the "community" is, but general agreement that stakeholder understanding and support is central to ICM implementation. Without it, programmes attempting to introduce catchment management measures are likely to battle to encourage or enforce them.

> 'You've got to build a constituency base. People just don't understand stormwater issues, why they cost so much, why they're important to fix. You get them involved in the project to increase their understanding and awareness. People don't even know they've got a stormwater system.'
>
> 'Community ownership is important for the project's longevity. These plans are not statutory so they dependent on community ownership. We do have regulatory tools but we don't have the teeth to address key issues like overstocking and stock in streams.'
>
> '"Reverse buy-in" to plans we've already written has been very difficult.'
>
> 'The community don't want to be the farmers' police – they need external regulation to set the rules.'

In sum:

- the issue is that community engagement is regarded by proponents of both the "resilient communities" and "ecological bottom lines" approaches as essential for effective ICM, but how far the implementing agency is willing to take that engagement in terms of collaborative management and agreed methods depends on the scale of problem being addressed and the culture and politics of both the local community and the agency
- the implication is that agencies, iwi and communities all need more capacity to make the best use of the provisions under RMA, LGA and other legislation to identify and work towards achieving their joint aspirations for catchments and coasts
- it would be easier for communities to identify and meet their aspirations for catchments and coasts if there were better interagency alignment, co-ordination and capacity to help them do so.

10.4 ICM: meeting community aspirations?

As stated in the request for proposal, a local ICM approach could be used to:

- identify community objectives (outcomes)

- make the best use of funds, time and local resource management capacity
- focus on a demonstrable improvement in water quality (both fresh water and coastal) and other outcomes for freshwater management desired by the community in question.

So, overall, how useful is (or could be) integrated catchment management in enabling iwi and communities to determine and work towards achieving their joint aspirations for waters in their catchment and linked coastal marine areas?

Most of the examples outlined in the literature describe positive progress being made through ICM programmes, says Ian Brown in his 2006 paper, yet "nevertheless, there remains a lot of rhetoric around what can be achieved and some authors have suggested a degree of caution is warranted, as illustrated in the following extract from Seymour and Ridley (2002):

> *"ICM relies heavily on the conceptualisation that catchments actually fit neatly within a catchment boundary and that all landholders can identify themselves as a member of a 'catchment community.' Many environmental issues and eco-systems themselves do not conform to such boundaries. Furthermore, having the ICM framework in place does not necessarily lead to on-ground action. Whilst there is a lot of information about what ICM is, much less exists about how it operates on the ground. Much is spent on planning but not on 'doing' and there is significant threat of ICM introducing a 4th tier of government."*

Case studies such as in the Manukau and Whaingaroa Harbours, Waitakere City, Sherry River/Motueka and Upper Taieri show an integrated catchment management approach can indeed enable iwi and communities identify and meet their aspirations for catchments and coasts, and engage in discussions about the funding, time and capacity needed to do so.

However other findings of this report also show that there is not enough focus on identifying aspirations, or framing of objectives or outcomes in ways that enable progress towards meeting iwi and community aspirations for demonstrable improvements in water quality and other outcomes for fresh and saline waters to be measured.

As previously indicated, these outcomes may be being achieved, but the monitoring is not always in place to demonstrate this, while overall, much of the nation's state of the environment monitoring continues to indicate ongoing declines in resource quality.

Research and project monitoring do show that ICM can deliver a range of beneficial outcomes under all four wellbeings – social, cultural, environmental and economic. Defining these with iwi and the community enables people to more easily relate to the outcome areas described, and once indicators are applied to these outcomes, the effectiveness of catchment-related initiatives at all scales can be evaluated.

Once coastal waters are brought into the equation, the macro scale becomes the one that 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, monitoring, reviewing and adapting an integrated catchment and coastal plan.

However this is still compatible with a strategic approach that enables communities to focus on what needs to be done first, rather than on all-embracing efforts (Hooper, 2006a) and with the recognition that meso and micro scale ICM can be incorporated into the macro scale (Gustafson and Feeney, 2008).

To some extent the deficiencies of ICM in delivering measurable outcomes so far reflect the observations of Erickesen et al (2003) and more recently McNeill and Holland (2007) that

the vision of the RMA for devolved governance has yet to be fully achieved, largely because of lack of regional capacity and central government support – what McNeill and Holland call (p1) a "patchy capability and performance … both within and between layers of government".

"Wider governance issues are also identified" (ibid, p9): while the authors' survey found "overwhelming support for regional councils as primary environmental managers and for local representation, … the value of local presence and representation would seem to be primarily as a mechanism for holding decision-makers to account, rather than providing a collectively mandated strategic environmental policy direction."

McNeill and Holland note that the perceptions are that councils, while achieving goals, are "failing to get on top of isssues as they arise" (ibid, p9). There is more in NcNeill's PhD thesis (McNeill, 2008).

In sum:

- the issue is that ICM has helped and is helping iwi and communities to determine and work towards achieving their joint aspirations for waters in their catchment and linked coastal marine areas, but like other resource management methods in New Zealand, has the potential to be utilised more effectively
- the implication is that it is not ICM that is flawed, but its uptake, implementation, monitoring and review
- it would be easier for iwi and communities to identify and meet their aspirations for catchments and coasts if there were a nation-wide focus on capacity building and resourcing for iwi, communities, catchment managers and government and other agencies to plan, manage, monitor and evaluate ICM so that it could "get on top of issues" in a more positive and proactive way.

If this occurred, a number of beneficial capacity outcomes could be expected:

- inclusive participation and active involvement in groups and networks
- on-going learning, skills development and other capcity growth of all parties
- better agency, iwi and community access to and use of reserch and other information
- greater institutional alignment and cost-effective action towards sustainability outcomes.

10.5 Themes and ways forward

To summarise, things that would enable ICM to more effectively help iwi and communities meet their aspirations for catchments and coasts include:

- an ongoing conversation amongst key parties about ICM as an explicit and synthesising vehicle for the many outcomes to which they aspire and good examples of cost-effective methods for identifying aspirations
- identification at the start of any initiative baseline indicators across all four wellbeings, even for single issue initiatives. This would provide invaluable data for future evaluations when the strengthened working relationships amongst agencies, iwi and communities enable other issues to be progressively addressed over time
- readily available examples of measurable outcomes across all four wellbeings, particularly for third order environmental bottom line outcomes

- widely available case studies of what has worked well and lessons learned in order to build the capacity of iwi, communities and catchment managers to engage with each other
- better interagency alignment, co-ordination and capacity
- it would be easier for ICM to help iwi and communities meet their aspirations for catchments and coasts if there were an ongoing conversation amongst key parties about ICM as an explicit and synthesising vehicle for the many outcomes to which they aspire and good examples of cost-effective methods for identifying aspirations
- a nation-wide focus on capacity building and resourcing for iwi, communities, catchment managers and government and other agencies to plan, manage, monitor and evaluate ICM could help catchment managers to "get on top of issues" in a more positive and proactive way.

C ICM IN NEW ZEALAND: PRESENT AND FUTURE

11. Summary and conclusions

Introduction and overview

As stated in the request for proposal, a local ICM approach could be used to:

- identify community objectives
- make the best use of funds, time and local resource management capacity
- focus on a demonstrable improvement in water quality (both fresh water and coastal) and other outcomes for freshwater management desired by the community in question.

Accordingly, this report has aimed to meet the following aims of the RFP:

1. gain an understanding of how ICM initiatives have been implemented in New Zealand, and how effective they have been
2. provide information for officials to develop options for how government could enhance the effectiveness of ICM initiatives
3. provide information for officials to develop options for how government could increase uptake of ICM initiatives, where it is apparent ICM represents a beneficial approach to managing water.

In particular, as stated in the RFP, while the philosophy of ICM informs the NSFW programme at a strategic level, the focus of the ICM component of the Supporting Measures project is on establishing **where and how the philosophical ICM approach can be translated into practical, effective and efficient solutions**.

This section therefore overviews:

- catchments as place-based integrators of multiple issues, parties and efforts
- the opportunities identified in this report for enhancing the practicality, effectiveness (real and apparent) and efficiency of ICM.

It informs the above by placing ICM in the context of the intensifying societal debate about managing the access to and effects of resource use generally and water-related uses in particular – an economic context.

11.1 ICM in the wider economic context

The ICM philosophy debate has traditionally been framed in resource management terms: who can use what environmental resources and how should they manage the effects of their use. Rapid intensification of land and resource use and our interpretation of the literature and interview responses indicate to us that a macro-economic frame (which considers the interactions between sectors of economic activity rather than within them) may allow the root issues to be more accurately defined.

Only when issues and their causes are accurately defined can communities collectively identify solutions that will be more likely to achieve their aspirations for catchments and coasts.

In macro-economic terms, all catchment-related initiatives, whether formal ICM or small local projects, are essentially attempting to manage resource allocation or degradation. That is, they are dealing with economic externalities, where the costs of resource use and

its effects are not all absorbed into the costs of production by the land owner or owners generating the effects, and are effectively absorbed by other users or wider communities.

For example, as highlighted in a recent article in the Listener (Macfie, 2010), the rapid increase of dairying in many regions has again highlighted the effects on public goods (the quality and biodiversity of fresh and saline waters) of the export of sediment, nutrients and pathogens and diminished biodiversity and water availability as a result of income-generating activities on privately-owned land.

However, virtually all other land uses impose environmental externalities onto other resources users, both private and community, whether directly or indirectly, for example; industrial land uses through soil contamination and spills; land developers through poor erosion and sediment controls; commercial land uses and home owners through the effects of increased site imperviousness; everyone through the effects of stormwater discharges from roads minor and major.

Classical macro-economics describes such externalities as “market failure” and this among other things has led to the development of alternative economic schools, including ecological economics, which “is concerned with extending and integrating the study and management of ‘nature's household' (ecology) and 'human's household' (economics). This integration is necessary because the conceptual and professional isolation of these two disciplines has led to environmental and economic policies that are in the long term mutually destructive, rather than reinforcing” (Ecological Economics Research Centre New Zealand, EERNZ, website). It is a transdisciplinary field that treats the economy as a subsystem of the ecosystem and accommodates natural, human and economic capital (Jeroen, 2000).

From this perspective, ICM becomes a crucially important method of working towards both a wider societal and a local community consensus about managing resource use and its public and private benefits and effects. Moreover, international research identified in Gustafson and Feeney (2008, Table 2-7) suggests ICM programmes should carry out monitoring to detect signs of market failure, as expressed in resource degradation.

ICM also provides a framework for integrating catchment-wide management with individual onsite measures, an approach that Brown (2006, p21) concludes will out-perform “singular approaches in terms of programme outcomes”.

In this sense, it provides the “common framework” for property level and catchment scale planning described by Brown (2006, p20). Brown concludes by endorsing the suggestion of Seymour and Ridley (2002) that both individual land owners and ICM managers should take the same approach to assessing, monitoring and improving environmental performance by using environmental management systems that set programme objectives and adopt the “plan/do/check/review” cycle of continuous improvement – and that this could “link property-level actions to catchment scale targets”.

While Brown focused on farmers and farm plans in the context of regional council-led ICM, it is clear that the same approach would also apply to other land uses and sector groups and to the work of iwi, community and sector groups in the same context.

ICM could also provide a catchment-specific framework within which the growing number of water-related interest groups could engage with communities and regulators about the public/private dimensions of the debate around water as an economic, social, cultural and ecological resource.

This is extremely important, given the macro-economic context: McNeill and Holland (2007, p9) observed “the shadow of globalization on the policy process … that overseas markets

may increasingly have more de factor coercive power [for economic outcomes] than the regional regulators", as we infer, for environmental and other outcomes.

Even during the timeframe of writing this report, the water debate in New Zealand has become increasingly publicised. The media are taking a closer interest in the issue and there is growing public engagement in the debate, with groups such as Irrigation New Zealand and The Water Rights Trust taking different stands on water, while the statutory group Fish and Game New Zealand finds support from conservation organisations and the general public for its stance on water pollution and its effects on fisheries caused in particular by dairy abstractions and discharges.

The Land and Water Forum was set up to explore how such dialogues could progress more sustainable resource management, and catchments provide a place-based framework for resolving such issues on the ground.

The increased emphasis on spatial planning emerging from local government reform in the Auckland region also favours a catchment-based approach to assessing land use capability and suitability, because the effects of land use are expressed on water and related resources.

At this time of growing pressure on rural and urban environmental resources as a result of ongoing population growth and the pressure for land use intensification and increased economic productivity, the need for an effective approach to catchment management in New Zealand has possibly never been greater.

11.2 Catchments as place-based integrators of many issues, parties and efforts

The wide range of inter-related issues and interventions that are managed and monitored in catchments is one of the factors that has daunted even the most determined of those seeking to manage a catchment in a genuinely holistic way. While some issues can only be effectively addressed at a macro or meso catchment management scale (for example, the sediment inputs into the Tauranga Harbour (Lawrie, 2006)) the catchment as a land and water unit can nevertheless integrate a wide range of catchment-specific, thematic regional or national and very local programmes and projects.

This learning emerged for the Auckland Regional Council during the Mahurangi Action Plan (MAP). Summarised below from Morresey et al (2010), the key learnings revealed that internal council activities together with the external activities of other agencies and community groups can be co-ordinated within the catchment area, even if a formal ICM process is not being followed for them. They are summarised below.

While a narrow single-issue view can encourage focused outputs, this is very different from the understanding enabled by a holistic catchment view. The MAP targeted sediment, but not all sources of sediment, yet local people wanted to be reassured that all the major influences on the Mahurangi's streams and Harbour of other land uses were also addressed, including intensive cropping and industrial areas, as well as sewage, water supply, stormwater and other issues.

From this, the ARC learned that how the work is framed is important, and the bigger the frame in which the work takes place, the better – even if it is very focused work.

The ARC's environmental monitoring narrowed the frame, and the scientific investigations into sediment sources narrowed it further, making it more difficult to gain wider engagement not only of the community but within the ARC itself.

Integration is another aspect of partnership: the MAP helped the ARC learn that it has many internal partners within its own organisation whose normal projects could be integrated where they take place within the Mahurangi. The ARC also learned that different people and organisations in the community are interested in a wide range of other issues in the catchment. The MAP enabled the ARC to learn how a place can be the integrating space within which people can co-ordinate their action on issues.

The ARC originally intended that the MAP would engage all its work-streams including environmental monitoring and research, education and community engagement, and a range of methods including policy, education, incentives and regulation to tackle the sediment issue across all fronts. Learnings from this would benefit other catchment-based restoration projects in the region. However this intention was not supported by a strategy and work plan, and thus concentrated on the incentive-based support for fencing and planting of waterways on privately owned pastoral land.

The land owners themselves were concerned that the MAP was not targeting other key sources of sediment in the harbour such as exotic forestry and urban development. Some people and agencies were also worried about other environmental issues, including sewage treatment and native fish passage. Locals clearly wanted their activities to be framed within a wider sediment control and healthy harbour programme that provides reassurance that particular parties are not being singled out and that progress is also being made on other fronts.

More widely still, the MAP is only one of many initiatives in the Mahurangi. Others are led by the Ministry for the Environment, Department of Conservation, Ministry of Fisheries and other central government agencies, as well as the ARC and Rodney District Council (RDC). They administer many different acts of parliament, of which the Local Government Act (LGA) and the Resource Management Act (RMA) are only two. A wide range of different policies, plans, strategies and approval procedures are in place, and both the ARC and RDC have extensive on-the-ground work programmes and interests in the Mahurangi.

The ARC carries out many environmental functions, including coastal and marine management, park management, pest and weed control initiatives, stormwater design, educational initiatives including Wai Care and the Environmental Initiatives Fund, along with its other policy, regulatory and project activities, while the RDC focuses on the local economy, environment and society by way of its District Plan processes, infrastructure creation and maintenance, catchment management planning, civil defence, libraries and other community facility provision, community development and advocacy. It has also developed the Mahurangi East Integrated Catchment Management Plan, which recommends a range of initiatives that impact on sedimentation. These could inform MAP by getting a consensus on “best practice” if there were a co-ordinated approach on many different issues.

There are also many other locally-led voluntary public initiatives including the voluntary management of small reserves and other public assets; advocacy on environmental issues; awareness raising publications, meetings and activities; community-building events and educational field trips.

But there has been very little co-ordination of all these council-led and community-led activities. Projects, programmes, policy development and regulation have tended to proceed in isolation from one another, with little if any strategic overview or broader catchment-based coordination and planning. Even the MAP was not set up in a clear relationship with the myriad of ARC and other statutory, regulatory and community processes in the Mahurangi.

The ARC learned that the work of people and groups through the MAP and other initiatives could be better co-ordinated by focusing on the Mahurangi and its catchment. Taking this place-based focus could:

- provide a catchment-wide strategic framework in which to integrate knowledge and action so as to better identify all relevant issues and more sustainable long term multi-issue and multi-party solutions
- enable the ARC to play two vital roles; focus on targeted action on specific issues, while facilitating a broader process that brings key partners together within the holistic view needed to guide targeted action
- coordinate activities within the ARC when they are carried out in the Mahurangi, enabling key 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 doesn't have to be resourced to "do it all". This place-based synthesis of the many activities needed for healthy fresh and coastal waters enables a very cost-effective way of working
- synergise with other initiatives of other agencies that could support and enhance one another, so resources and opportunities are not wasted or duplicated and so that people realise their particular issues of interest are being addressed, as well as those of the ARC and other agencies
- enhance community-building opportunities (and therefore more effective project opportunities) by sharing information on progress across the different fronts, so that people are reassured that they are not merely tackling one issue while another possibly more serious one is being ignored
- reduce the risk of losing project continuity, trust and momentum if there are any changes in the staff or structure of key agencies or groups.

The MAP truly matured when it was realised it was an integrator: that the place-based approach can integrate policy, action and monitoring across a wide range of issues within and between large, multi-function organisations, and that this is a way to develop and deliver cost-effective catchment-based projects.

However, reinforcing the findings of Section 4, the experience in the Mahurangi showed that collaborative place-based programs need good people and project 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.

The importance of these skills cannot be over-emphasised, yet they are undervalued in many organisations. The right brokering and leadership of collaborative ventures is essential to keep them vital and effective: defining, nurturing and retaining these skills will be extremely important for the future of the Mahurangi and other catchments in the Region. This was evidenced in the change in approach that occurred with the re-evaluation of the ARC project leader role.

The MAP started with action and ended with planning. It was one of its biggest learnings that while we do basically all "know what to do", catchment managers need to think much more carefully about the management responses to identified problems.

11.4 Summary of opportunities for enhancing the practice of ICM and its potential to deliver measurable environmental improvements

The RFP asked "where and how the philosophical ICM approach can be translated into practical, effective and efficient solutions".

The discussions in this report indicate that ICM can be and to a large degree is being translated into practical, effective and efficient solutions, but that more integration in every sense will enhance this, and better documentation will validate it.

All the many initiatives "out there" aim to make a difference for land and water management and consideration of both process and outcomes is important. Despite this, there is not yet enough readily accessible information to compare very different initiatives with each other or to assess the overall effectiveness of ICM initiatives in terms of water quality improvement and efficient use of water allocation. The many confounding factors such as the many definitions of and approaches to ICM and increasingly intensive land and water use make such an assessment still more difficult.

However, to the extent that the evidence shows – or doesn't show – how well ICM has worked, neither can it show it has failed, especially in light of the lack of consensus on what it is.

A recurring theme in the international literature is that truly successful integrated coastal and catchment management and planning remains elusive (Bellamy 1999, Gustafson and Feeney 2008), and that ICM has a long history of endeavour without a correspondingly long list of successful examples of implementation. Perhaps related to this finding is that the "planning" phase of ICM is often well resourced and completed to a high standard; however on-ground implementation is often less developed and financially supported.

It is not necessarily ICM as a concept and approach that has failed, but the capacity of practitioners to make full use of the supporting processes and tools. If these are strengthened, it seems at least possible (given the intense drivers placing pressures on land and water resources) that outcomes will be better monitored and policies and plans better reviewed to inform continual learning and adaptive management.

Table 8 summarises some of the key elements of best practice.

Table 9 then summarises the findings of the report in terms of opportunities for ICM to get to best practice, and its potential to deliver measurable environmental improvements under the following key themes:

- a national mandate for ICM
- institutional alignment and co-ordination (horizontal and vertical) for ICM
- shared conceptual frameworks
- an agreed research strategy
- commitment to capacity-building
- measurable objectives and monitoring
- review, learning and adaptive management
- forums and a platform for sharing research, data and best practice tools and case studies.

Table 8 The aspiration: key elements of best practice ICM

Institutional engagement – communication and co-ordination between agencies and their joint and several points of engagement with iwi and communities is important because catchment-related initiatives are more effective when:

- they have the support of the key relevant agencies
- the messages and information coming from their different perspectives are aligned
- ICM decision-making occurs within an overarching resource management framework with defined objectives and investment strategies: this enables decision-making that is consensual and coordinated across the public and private interests in the catchment
- such a framework, provided by government, supports catchment managers and communities in making difficult decisions.

Stakeholder and community engagement is the community dimension of institutional engagement in ICM. Trust will arise out and good communication and shared understandings of different needs and points of view. This is important because catchment-related initiatives at all scales (macro, meso and micro) are more effective when:

- local stakeholders are involved in on-the-ground projects
- groups are supported by good facilitation, which is key to developing dialogue and relationships and working through the conflict and road blocks that emerge when different stakeholders come together
- good communication is enabled amongst people and groups
- social gatherings allow everyone to have fun and celebrate success.

Good leadership, including of collaborative or partnership processes is important because catchment-related initiatives are more effective when:

- clear goals and roles are set at the start of the process
- different groups have effective representatives
- group leaders build and maintain groups so they can stay motivated to achieve their objectives.

Capacity-building is vital because much of the challenge of implementing integrated management lies in promoting change in the behaviour of the different parts of the respective agancies, different user groups and even wider communities. Factors that enhance community engagement in group activities and building group capacity and partnerships with local government and industry are closely linked. Catchment-related initiatives often have to last a long time, so this is important because they are more effective when:

- adequate provision (amount and duration) of resources is made for the development of people and organisations
- iwi and communities are supported in their capacity to take part in ICM processes
- succession planning is considered for ICM community representatives and agency staff, who can easily "burn out", as well as for public and private sector technical experts who may move on as a result of organisational change
- capacity building is recognised as a two-way process, whereby technical or policy experts pass knowledge to political leaders, industry, NGO participants, individuals and the broader community but that knowledge is also transferred from these “non-technical” participants back to the technical experts. This also encourages transdisciplinary research, where knowledge is created, discussed, and understood from various world-views – t promoting the harmony and longevity of ICM initiatives.

Judicious regulation is regarded by most of the interviewees and international literature as an essential component of ICM. This is important because catchment-related initiatives are more effective when regulation:

- is introduced as part of a community consultation process aimed at allowing communities to reach shared understandings of the issues and management options
- provides a framework within which a range of voluntary or supporting methods are provided to help achieve measurable ecological objectives.

Long term funding promotes more effective catchment-related initiatives because:

- the macro and meso scale ICM requires sustained financial investment in financial and human resources over the planning, implementation and review phases, yet funding is often provided over a five to seven year timeframe, when perceptible changes to resource condition often occur on much longer timeframes (for example 20-50 years or more)
- at the micro scale, experience suggests it takes up to three years to establish a functioning group and a further three years to achieve tangible environmental outputs, while environmental outcomes become apparent over the next 20-30 years, so funding is needed over this latter period to monitor the changes and feed this information back into the process

- seed or set-up funding can help get things started, but few people in rural or urban communities can remain solely responsible for long-lived programmes without the long term support of their catchment managers – the regional councils
- explicit long term funding of monitoring and review will support regional councils' capacity to monitor the interventions and outcomes of other agencies engaged in initiatives that contribute to beneficial outcomes in catchments.

The four wellbeings – social, economic, cultural and environmental – are becoming more important. Catchment-related initiatives are more effective when:

- socio-economic issues have been identified during the planning process and acknowledged and accepted by the community
- community and internal/external stakeholder engagement helps catchment managers to identify, prioritise and monitor catchment issues, management options and community outcomes across all four wellbeings
- catchment management goals tie together economic and environmental sustainability objectives
- land-users can see a clear benefit (short, medium or long-term) to the economic sustainability of their operation and objectives and activities make a clear link between environmental and economic benefits.

Collaborative monitoring promotes adaptive management. This promotes more effective catchment initiatives because:

- it encourages learning and adaptation amongst project participants and communication with other catchment projects
- it leads to an empowered group of stakeholders keen to find out more to continue an adaptive management process
- monitoring is key to adaptive management and adaptive management is key to effective ICM.

"Top down" together with "bottom up" approaches promote more effective catchment-related initiatives because:

- the strength of the on-site approach is in the implfementation on-site works that lead to improvement in urban and/or rural environmental condition
- the strength of the ICM approach is in relation to social outcomes, where the community-based approach has proved successful in creating awareness and creating a good deal of acceptance of the "care" ethic
- the most comprehensive outcome gains can be made through a combination approach involving individual land owner action set within a strategic ICM framework.

Table 9 Opportunities to enhance the practice of ICM and its potential to deliver measurable environmental improvements

A national mandate for ICM

Things that would make it easier for sponsors of integrated catchment and coastal initiatives (ICCM), iwi and communities to access the long term resources they need include:

- clear central government leadership and direction on ICM, including for greater interagency liaison
- good scientific and other information that will support national, regional, territorial, sector and other agencies in addressing pressing issues in a more timely manner
- national guidelines to help decision-makers levels to come up with innovative ways of meeting regional and local needs, while still achieving nationally mandated outcomes of good management of the adverse effects of land and freshwater use on coastal waters and resources.

Institutional alignment and co-ordination (horizontal and vertical) for ICM

Things that would make integrated catchment and coastal initiatives more efficient and effective include:

- a strong national mandate for greater interagency liaison so that adequate resourcing could be provided to enable staff to better co-ordinate strategic planning at the horizontal level at the national scale
- better vertical alignment of institutions and management tools from national to regional and local levels
- greater horizontal institutional alignment and co-ordination in ICM at the macro scale, including integration across MHWS, and co-ordination of on-the-ground interactions of agencies at the meso scale with each other and at the micro scale with land owners
- better alignment of management tools above, below and across MHWS
- better access for land managers to information on the effects on fisheries of land use activities on coastal waters sensitive to significant inputs of freshwater, to increase their understanding of the extent and importance of the issues and enlist greater iwi and community support for them.

Shared conceptual frameworks

Things that would promote consistent understandings about integrated catchment and coastal initiatives include:

- more consistent terminology around ICM versus catchment-related initiatives, to facilitate comparison of "apples with apples"
- use of Hooper's macro, meso and micro scales as a unifying framework within which to integrate the work of the many different groups involved in catchment-related initiatives into a catchment-based governance framework
- more consistent terminology around outcomes, perhaps based on the orders of outcomes model
- better understanding, especially by funders at all levels, of the timeframes needed to achieve third order environmental outcomes
- an ongoing conversation amongst key parties about ICM as an explicit and synthesising vehicle for the many outcomes under the four wellbeings to which they aspire
- more clarity about the concepts and tools of ecological economics to inform the identification of issues and development of solutions that will enable communities to meet their aspirations for catchments and coasts, and the social, cultural, environmental and economic benefits of their sustainable management.

An agreed research strategy

Things that would make integrated catchment and coastal initiatives more cost-effective include:

- a systematic attempt to develop a set of research needs and priorities at the national and regional scales that would help the relevant agencies carry out macro and meso scale ICM more cost-effectively and provide them with a rationale for working out which micro scale initiatives should be supported within that context
- better sharing amongst all the relevant agencies with responsibilities above and below MHWS of research needs, initiatives and results
- more co-ordinated approaches to collecting expensive but essential data that could be shared
- better framing of research so that it can be informed by end users and given to them in a form they can readily use, to make it easier for catchment managers to encourage and land owners to adopt more effective ICM, including how to make research findings more transferable to different catchments.

Commitment to capacity-building

Things that would make it easier for agencies, iwi, communities and groups to take part in integrated catchment and coastal initiatives include:

- a nation-wide focus on inter and intra-organisational capacity building and resourcing, to help catchment managers and government and other agencies plan, manage, monitor and evaluate ICCM and "get on top of issues" in a more positive and proactive way
- a focus on capacity building and resourcing to help iwi, communities, sectors and groups take part in ICCM processes from visioning and action to monitoring and review
- central government playing a role in directly supporting ICM capacity-building in partnership with local government and the community.

Measurable objectives and monitoring

Things that would make it easier to measure the outcomes of integrated catchment and coastal initiatives include:

- better awareness by all parties of the need to identify baseline indicators across all four wellbeings at the start of any initiative, even for single issue initiatives
- better use of benchmarks to inform the development of measurable environmental objectives
- better provision and capacity building for framing and documenting first, second and third order outcomes in order to provide good data for formative and summative reviews
- better provision for the capture of first, second and third order outcomes of all catchment-related activities and linking of them with the identification and interpretation of drivers, pressures and state of the environment monitoring results, to help identify factors contributing to observed changes
- appropriate provision for and interagency co-ordination of the documentation of third order and third party ICM outcomes, including by funders of catchment-related projects as part of their project funding criteria, including by participatory monitoring and evaluation
- provision of an overall geospatial and monitoring framework in which catchments become place-based integrators of multiple land and water management efforts into which the actions and first, second and third order outcomes of the many initiatives of the many players in catchments are captured. This could provide a live inventory of all ICM-related projects including community-based ICM projects as well as catchment initiatives that are being driven by central and local government, research providers and industry, and capture information about what is being done within key agencies and by all parties active in a catchment and monitoring of the third order outcomes that result. It could also be linked to state of the environment and other sources of environmental data.

Review, learning and adaptive management

Things that would make it easier to assess the effectiveness of integrated catchment and coastal initiatives include:

- a participatory approach to monitoring and review
- the concept of organisational learning being more widely acknowledged and endorsed as a positive process of building organisational and community/stakeholder capacity and commitment
- stronger links between programme review and learning as part of the adaptive management needed to carry out ICM as part of an evolutionary process of managing ongoing change
- a system for building the capacity for and sharing the learnings of such processes.

A forum and platform for sharing research, data and best practice tools and case studies

Things that would make it easier for all parties to share and benefit from best practice and carry out effective of integrated catchment and coastal initiatives include:

A regularly maintained database

- a centralised, multi-agency, regularly updated and very well-publicised database of related resource conserving tools and resources that are available for landholders, community groups and resource management agencies, including existing and proposed research and videos of experienced practitioners whose expertise won't otherwise be captured (the highly successful Quality Planning website provides a good model for this)
- case studies and other information could include:
  - the use of environmental baselines and benchmarks to inform the setting of measurable environmental

objectives
- examples of measurable outcomes across all four wellbeings, particularly for third order environmental bottom line outcomes
- effective intra- and inter-organisational communication and the timeframes, mechanisms and resources needed to bring it about
- the processes used to introduce regulation, the non-regulatory supporting measures provided, the time, budget and skills required, when and how to use them and their needs for planning, management, ongoing resourcing, monitoring and review
- early results about the effectiveness of the different approaches of Environment Waikato and Environment BOP to nutrient issues (land use controls vs trophic status indicators) and other examples of alternative approaches to common issues to help other regions decide on approaches
- what has worked well and lessons learned from catchment-related initiatives at all scales in order to build the capacity of iwi, communities and catchment managers to engage with each other
- lessons about conducting ICM-related science and research and the capacity needed for all parties to do this
- alternative methods and inclusive processes under RMA and LGA that can produce results in the short term when needed
- the range of management, conservation and protection tools available for use above, across and below MHWS
- the balance between public:private investment to help both rural and urban land owners and occupiers reduce their adverse environmental effects
- methods and results of reviews

Online and face to face forums

- a list-serve email list such as nzwaste or the Water New Zealand web forum, where practitioners from the public, private and not-for-profit sectors can email each other new information and ask questions
- regional meetings of ICM practitioners
- capacity-building workshops, including by webinar and podcast that can also be uploaded to the shared database
- yearly or two-yearly conferences.

11.5 Conclusion

Many of the recommendations in Table 9 relate to co-ordination and capacity needs that if met, will help make it easier for people and agencies planning programmes and projects at a range of scales to catchment-related interventions to both be – and be documented as being – more effective.

The functional interconnectedness of land and all waters makes it essential for greater interagency communication and integration above, across and below MHWS. We believe the development of close working relationships at government level as evidenced in the approach to this report will exert a positive influence on other players in this respect.

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