5. Land, freshwater and marine resource management issues

A consultation process (by meetings and questionnaires) with stakeholders identified a series of key, closely interlinked resource management questions that relate to the management of land, freshwater, and marine resources (see Philips 1999; Dunne and Likens 2000). They are not an isolated series of questions, but rather a complex set of questions that connect the physical and chemical state of the catchment and associated waters with their biological diversity and functions, and involve an understanding of air–land–freshwater–Tasman Bay interactions and the critical factors that determine these interactions (Fig. 39). These questions also have social and economic dimensions arising from the recognition that resource management issues are not solely technical issues, but community issues as well (Fenemor and Bowden, 2001).

The "big picture" questions are:

- What maintains the productivity and biodiversity of the land and its associated waterways, the near-coastal and marine environment?
- How do biophysical and socio-economic conditions affect productivity and biodiversity of the land, waterways, and the near-coastal and marine environment?

Tangata whenua issues have been specifically identified for the ICM Programme by Harmsworth (2001) and largely reflect relationships, history, politics, legislation, and cultural and spiritual values. Their issues focus on the quality and quantity of the river and its resources, and the health of the surrounding catchment and coastal environment. Key tangata whenua issues were grouped into: (1) relationships and partnerships for planning and policy; (2) loss of mauri (life force) of rivers, streams, and the coastal environment; (3) sustainable resource use; (4) pollution, sediment and contaminated sites; (5) coastal and marine issues; and (6) biodiversity/biosecurity matters.

Resource management issues for all stakeholders can be grouped, for convenience not functionally, into six broad categories: water quantity, sediment,

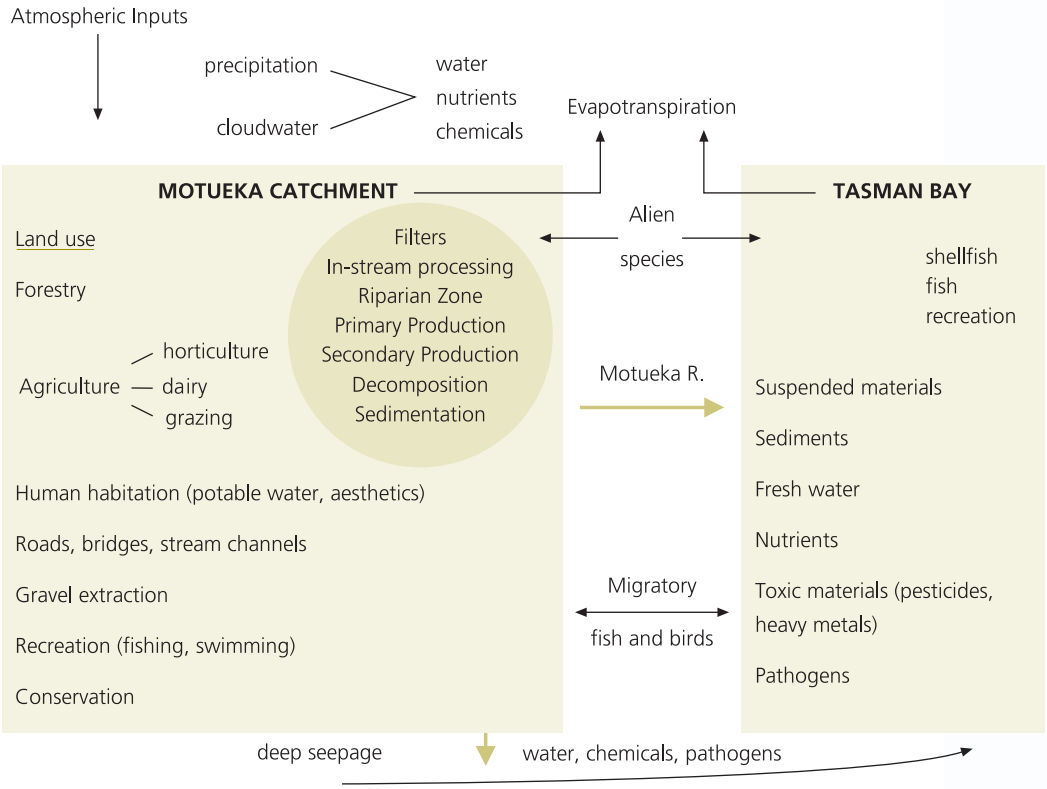


Fig. 39 Conceptual summary of the issues and processes being addressed in the Motueka Integrated Catchment Management Programme (from Dunne and Likens 2000).

water quality, aquatic ecology, riparian management, and Motueka Catchment – Tasman Bay interactions. There is a strong element of linkage between most of these issues.

5.1 WATER QUANTITY ISSUES

Water availability has been a major concern in the Tasman District for many years, and it is likely to become increasingly important in the Motueka Catchment as land use intensifies, and population and water demand grow. In much of the eastern and lower elevation areas of the catchment the demand for water exceeds natural supply and there is a reliance on irrigation water to sustain intensive, productive land uses such as horticulture. The importance of rivers for their environmental values has been increasing, against a backdrop of increasing extractive demand. Groundwater is an extremely important source of irrigation water and protection of groundwater recharge is fundamental to maintaining this resource. Forestry occupies a large part of the catchment, with potential to occupy considerably more, and is known to reduce total water yield (compared to pasture) at the small-catchment scale. Current policies set restrictions on the expansion of forestry in some areas because this could reduce water availability for existing water users.

Key research questions concern the influence of land use on water yield and sustainable allocation limits for surface and groundwater:

- How do individual, local land-uses affect the availability of ground and surface water locally and over the entire catchment?
- What is the influence of tall woody vegetation on the total and seasonal amount of streamflow, and groundwater recharge, particularly at larger-catchment scale?

- What is the influence on streamflow of groundwater pumping from the valley floor?
- What are the mechanisms of groundwater recharge (particularly in the upper Motueka and Moutere groundwater recharge areas) and how are they influenced by land use? Have these effects changed over time?
- What are the historical and likely future trends in water use and water demand?
- What is the most defensible way to plan for the allocation of water resources among alternative uses in the event of shortages, and between in-stream and abstractive uses?
- What is the best minimum-flow regime to protect the trout fishery?
- How can water that is surplus to in-stream needs most efficiently be allocated between users?
- Are there options for increasing the amount of water available for users, or the efficiency of water use?

how can we best balance competing out-of-stream and in-stream water needs?

5.2 SEDIMENT ISSUES

The west bank of the Motueka River has large areas of steep terrain underlain by the highly erodible Separation Point granite. Much of this area is currently covered in plantation forest, with some to be harvested in the near future. The erosion associated with timber harvest may result in a major increase in sediment delivery to the Motueka River and the Tasman Bay coastal system, affecting water and habitat quality, biodiversity and fisheries. Land-use controls on vegetation modification and forest-harvesting practices are in place on the granite terrain. Erosion can also be a significant issue on Moutere gravel terrain. Forest harvesting can result in elevated sediment concentrations in streams (Graynoth 1979). Much of the soil conservation work under the Motueka Catchment Control Scheme has been targeted at streambank stabilisation and gully control on Moutere gravel in pastoral areas. While there have been a number of studies examining the impact of forest harvesting on erosion rates, little is known of the relative magnitude of longer-term erosion rates under forestry (through a full rotation) and pasture, or of the relative magnitude of natural and induced erosion.

Gravel has traditionally been taken from many areas of Motueka riverbed. Natural gravel supply to the river is low due to geological factors, with the Wangapeka and Baton catchments being the major sources of gravel to the lower reaches of the river. The Moutere gravel and granite subcatchments do supply gravel, but it breaks down quickly in the river. The limestone and marble subcatchments supply little gravel to the river. Progressive changes in policy implemented during the 1990s have incrementally restricted both the amount of gravel that can be extracted and the places where it can be extracted. Despite evidence to the contrary, there is concern among some members of the community that the changes in policy are not only limiting their gravel supply but also making the riverbed shallower and potentially increasing the chances of flooding. However, river cross-section surveys indicate overall that the opposite is occurring. As well, bank stabilisation and gravel extraction activities have led to channel deepening and thus the need for more bank stabilisation. Gravel removal in the upper and lower part of the river has likely reduced the supply of gravel downstream and has been identified as the cause of bank erosion in both the upper and lower reaches of the river. There is sufficient evidence to indicate that adverse economic and environmental effects will result in the longer term if gravel is extracted at a rate significantly greater than the sustainable level. The changes in riverbed morphology may also influence habitat quality for trout, native fish and invertebrates. It is possible that gravel extraction in the river also exacerbates coastal erosion of the gravel beaches at Kina and Ruby Bay, although this effect is considered likely to be minor.

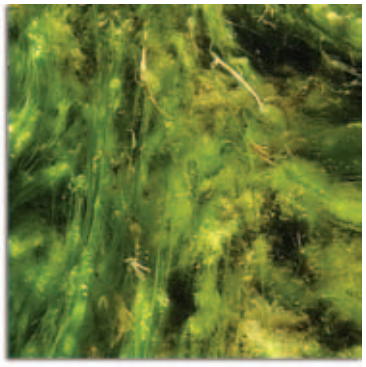
Key research questions relate to fine-sediment supply, and gravel supply and extraction:

- What are the relative rates of long-term erosion on Separation Point granite, and other rock types, under different land uses?
- What is the relative influence of occasional severe rainstorms, geology, and land use in determining sediment generation and delivery?
- Under what conditions does forestry on the Separation Point granite increase erosion rates, and what are the best management practices to minimise the risk of accelerated erosion?
- How strongly connected are the hillslope sediment supply and fluvial sediment transport systems?
- What is the time scale for sediment movement through the fluvial system?
- What effect does fine-sediment supply, gravel supply, and gravel extraction have on the quantity and quality of in-stream habitat, and on the trout fishery?
- Is riverbed morphology, and channel and bank stability influenced by gravel extraction?

- Are alternative gravel extraction and/or supply strategies available to reduce downstream impacts?
- Are coastal erosion problems related to gravel extraction?

what are the key sources of sediment, and how does sediment influence fish populations?

what determines water quality, and is it changing through time?



5.3 WATER QUALITY ISSUES

Although streamwater quality in the Motueka Catchment is generally good, there is concern among some residents and marine resource managers about concentrations of nutrients (primarily nitrogen) and faecal indicator bacteria (and associated pathogens) in the downstream reaches of the river and Tasman Bay. Increased concentrations of human pathogens are a potential issue in Tasman Bay with respect to shellfish quality, not only in the delta region where cockles and a variety of clams occur, but also further offshore where scallops and dredge oysters are harvested commercially. Aquaculture management areas that have been established in the Motueka plume region for the development of mussel farming could also be affected by a reduction in bacteriological water quality. Specific sources have not yet been identified, but the pastoral industry and irrigated horticulture (at least partly due to leaking septic tanks) are suspected, direct human sources may be important (e.g., sewer pipe breakage has impacted cockle harvest in the past), and the role of dairying (particularly in view of the potential for expansion of dairying) may also be crucial. Other potential contaminants (e.g., pesticides, hydrocarbons, heavy metals), although not a particular water quality issue at present, could also theoretically become significant in conjunction with changing land-use practices.

Key research questions concern the impact of land use on water quality:

- How much does water quality vary throughout the Motueka Catchment and the receiving waters of Tasman Bay?
- What are the relative influences of geology and land use in determining water quality?
- How important are headwater and tributary conditions in influencing water quality and quantity throughout the catchment?
- Are there any trends in water quality of the Motueka River and its tributaries?
- In which parts of the rivers are changes occurring?
- Are these changes associated with land use or management, and do they impact on downstream freshwater and marine ecosystems, resources and values?
- What are the most effective mitigation measures?

5.4 AQUATIC ECOLOGY ISSUES

The Motueka River has a world-famous trout fishery, but in the last decade trout numbers appear to have declined. However, there is no consensus on the reasons for this decline. Prior to European settlement and the introduction of trout, the Motueka probably sustained a diverse and abundant native fish fauna. Populations of native fish and of invertebrate biota are receiving attention as an increasing number of scientists and community groups are joining iwi in placing great value on the older, more diverse, biota of the river.

Key research questions concern both the introduced trout fishery and native fauna (vertebrate and invertebrate):

- What are the reasons for the decline in the trout fishery?
- What have the trends in riverbed morphology and substrate composition been and how have they affected the trout fishery?
- How does fishing pressure affect the trout fishery?
- What is the spatial and temporal distribution of native fauna, and how are these patterns influenced by land use?
- What is the variation in the amount and quality of aquatic habitat and biodiversity throughout the Motueka Catchment and how is this variation affected by land use and climatic events?
- How important are headwater and tributary conditions in influencing water quality, water quantity and aquatic habitat throughout the catchment?
- What are the main sources of food (energy) that drive the ecological community in the river?
- How important is organic matter from land and/or freshwater for the functioning of the coastal marine ecosystem?
- Are small areas of unsustainable land use having large effects on the whole catchment?

how does land use affect native and introduced species?

can riparian management be used to improve water quality?

5.5 RIPARIAN MANAGEMENT ISSUES

Riparian zones provide habitat for terrestrial fauna, and through their supply of shade, organic debris, and bank complexity they can affect aquatic habitat, both positively and negatively. The nature of the riparian zone and its use by landowners can also influence influxes of sediment, nutrients, and microbial contaminants to streams. There is increasing recognition among some residents, river users, and regulators about the benefits of riparian vegetation along river channels in the Motueka Catchment. Floodway management has also affected riparian zones in the major tributaries and main stem. There is little agreement on, or even information about, the distribution of various riparian zone conditions, their effect on water quality and the quality and functioning of aquatic ecosystems, or

their role in providing habitat for birds, pests and other terrestrial biota. No consensus has yet developed about preferred conditions for the riparian zones in various parts of the catchment. There is no doubt that the state of the riparian zone has altered dramatically with the widespread vegetation clearance and river management that has occurred in the Motueka River since European settlement.

Key questions concern the nature, distribution and functioning of riparian zones:

- What are the values of near- and in-stream habitats and how are these affected by land and river management?
- What types of riparian zone occur in the Motueka Catchment, what is their distribution and biological (terrestrial and aquatic) significance, and how does the width and structure of the riparian zone affect its function?
- Which areas could benefit from changed riparian management and which are presently satisfactory?
- How can weeds and pests be managed if farm animals are excluded from riparian areas?
- What would be the benefits of improved riparian management, what improvements should be given priority, and where should rehabilitation be focused?
- Which native plants can be used for the dual role of bank stabilisation and riparian function?

5.6 CATCHMENT – TASMAN BAY INTERACTIONS

The Motueka Catchment is the major source of freshwater and land-derived nutrients into Tasman Bay, and is therefore a major influence on productivity in the bay. The coastal and marine waters influenced by the Motueka plume of fresh water have significant existing fishery values (scallops, fin fish, cockles), and the potential for an increase in marine farming activities (for scallops, mussels, oysters).

Key research questions concern the influence of land use on the quantity and quality of freshwater delivered to the marine environment; understanding the functioning of the food web within Tasman Bay; and the opportunity for, and effects of, marine farming on water quality:

- How important are organic matter, sediment, and nutrients delivered from the land for the functioning of the coastal and marine system?
- What are the risks to marine farming from activities on land?
- What are the factors that control primary and secondary production in Tasman Bay (notably fish and shellfish)?
- What are the dynamics of water circulation and biogeochemical processing in the near-coastal and coastal zones?
- What is the sustainable carrying capacity for marine farming?
- Where and how could marine farms be most sustainably developed?

how does land-use influence marine water quality and fish?