Tourism, Water, Wastewater and Waste Services in Small Towns

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Ministry of Economic Development
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Executive Summary

This is a two-part report on research completed during 2003/2004 in Hanmer Springs and Kaikoura. The research was conducted by the Tourism Recreation Research and Education Centre (TRREC) at Lincoln University. Hanmer Springs and Kaikoura are small towns and cater for steadily increasing numbers of tourists each year - now in excess of one million visits per year to Kaikoura. The research, funded by the Ministry of Economic Development and Canterbury Development Corporation, included four seven-day snapshot studies (in July 2003, October 2003 and December/January 2004) of water, wastewater and waste services in the townships. Tourists directly and indirectly use the water, wastewater and solid waste services provided by the District Councils in those townships. The research also examines the funding of the water, wastewater and solid waste systems in the township. A particular focus is tourism demand for these services.

Part One of the report studies the rates and charges used at present in each of the townships to fund these services. The rates and charges are critiqued by comparing them to ten criteria grouped under three headings: revenue generation, cost allocation and incentive provision, adapted from Hanemann (1998). The present rates and charges used in Hanmer Springs and Kaikoura have mixed performances against the Hanemann criteria. Hanmer Spring's water charges and Kaikoura's solid waste charges achieve the best scores. A common fault of rating systems is their reliance upon flat charges, or charges unrelated to use of water, wastewater and solid waste services. Toilet pan numbers are used as a base for wastewater charges in many townships. Research at Kaikoura showed that there was no significant correlation between winter water consumption (which reflects wastewater production) and the number of pans for the commercial accommodation providers.

Demand for water, sewerage and refuse services should be priced to reflect their true financial and environmental costs. Most consumers will not be aware of their water costs, as they are just one part of their rate payments. This will encourage the notion of water being a free resource and hence increase opposition to a more explicit charging system. The report recommends that cost allocation should apportion the costs of the service among the different customers in a non-arbitrary manner. It should avoid cross subsidies and it should allocate the full private and social costs to users. Revenue generation should be sufficient to meet all of the costs that a utility encounters when providing its service and should be sufficient, stable over time and the benefits of a more complex funding scheme should be traded off against higher administrative costs.

The principal requirements for improved rates and charges for these services include: greater use of unit pricing; and, linking of wastewater charges to internal water used by each property. More extensive metering of water use in Kaikoura and seasonal variation in charges in both Hanmer Springs and Kaikoura will achieve more accurate cost allocation and provide greater incentives to conserve water during peak demand periods. The report discusses the implications of volumetric pricing of water to residents, and suggests that a change to volumetric pricing for wastewater is likely to help Kaikoura and Hanmer Springs cope with increasing demands on their water and wastewater services. Kaikoura and Hanmer Spring's water demands are cyclical with higher summer use. Many studies emphasise the effectiveness of higher seasonal peak pricing to reduce and manage water demand. The report advocates introduction of two-part pricing and investigation of the merit of seasonal pricing for water and wastewater services.

Industry specific rates or charges have been suggested by some commentators as applicable to tourism. The report argues against this and suggests that well thought through charging systems, with the user pays principle, makes additional charges to specific industries superfluous.

Part Two of the report provides a Toolkit to aid Territorial Local Authorities (TLAs) in the management of water, wastewater and solid wastes in small townships. The Toolkit developed is the culmination of four intensive seven-day snapshot studies completed in Hanmer Springs and Kaikoura during 2003-2004.

The first objective of the Hanmer Springs and Kaikoura studies was to obtain sufficient data to be able to carry out a quantitative evaluation of the tourist impact on water demand, and wastewater production. The second research objective was to identify indicators of tourist flow to enable future monitoring of tourist flows in the townships without the cost and effort of measuring actual tourist numbers.

There are three parts to the tool kit:

- The first part provides a method for a low cost desktop scoping study to evaluate the overall demand the tourism industry exerts on the town's water, wastewater and solid waste services.

- The second part describes a method, using snapshot studies, for more detailed data collection and evaluation of the impact of tourism on the infrastructural services of water, wastewater and solid waste.

- The third part offers a method by which this impact assessment can be used by territorial authorities to plan and design an appropriate charging structure for the services.

Based on the analysis of Kaikoura and Hanmer Springs data, typical normalised (i.e., litres per guest-night) water, wastewater and waste values are given.

As a consequence of the scoping study, the decision may be that a more detailed study is appropriate to assist the Councils in designing improved cost allocation and charging structures. The report provides details of how such a study may be carried out using snapshot studies

The snapshot studies in Hanmer Springs and Kaikoura collected daily data on guest-nights from most accommodation providers, total town water consumption and wastewater production, selected individual property water consumption, door counts at the public toilet and Information Centre and road count close to the townships. Information Centre door count numbers were found to be strongly correlated with Statistics New Zealand Commercial Accommodation data in Kaikoura ($r = 0.99$). Water and wastewater volumes per guest-night were estimated from the data collected for the various accommodation categories. Using these data, the guest-night figures and the daily water and wastewater volumes for the total serviced area, it was possible to estimate the proportional demand of the tourist sector on water and wastewater services. This was also broken down to the different components of the tourist service (accommodation categories and non-accommodation commercial tourist sector). The relative sector demands varied between seasons. The analysis showed that in Kaikoura the winter accommodation providers used about 4.2 percent and 6.1 percent of the water and wastewater service respectively while the non-accommodation tourist related business used about 4 percent and 5.2 percent respectively. These same sector demands for the summer were about; 12 percent (water) and 30 percent (wastewater) for accommodation providers and 4 percent (water) and 10 percent (wastewater) for non-accommodation tourist related business.

Part 2 of the tool kit provides detailed guidelines for a TLA to enable them to collect sufficient data to determine the role that tourism plays in demand for water, wastewater and solid waste services in the townships studied. That information can be used in tandem with rating and charging systems developed using the guidelines also provided in Part Two to fairly allocate costs and provide incentives for careful use of resources. Use of the two Toolkits in the manner described will ensure that TLA are better able to plan for tourism growth and debate how to establish charging policies for these services.

Part 1

Infrastructure Cost Allocation and Charging for Sustainable Services

Chapter 1
Introduction

This is Part 1 of a two-part report on recent research on tourism and infrastructure. The Tourism Recreation Research and Education Centre at Lincoln University conducted the research. The Ministry of Economic Development and the Canterbury Development Corporation funded the research. This project builds on work already undertaken as part of a larger programme 'Planning for Tourism in New Zealand' funded from PGSF. In particular Cullen, R., Dakers, A., McNicol, J., Meyer-Hubbert, G., Simmons, D.G. and Fairweather, J.R. (2003) Tourism: Waste and Water in Akaroa: Implications of Tourist Demand on Infrastructure. TRREC Report No 38 presents a similar analysis and discussion for Akaroa.

The first research objective of the Canterbury studies was to obtain sufficient data to be able to carry out a quantitative evaluation of the tourist impact on water demand, and wastewater production. The second research objective was to identify indicators of tourist flow. The third objective was to study the costs of providing these services to the tourism sector and the rates and other revenue received from the sector to determine if there is any cross subsidisation occurring.

Part 1 introduces the research and reports on the outcomes that relate to the third objective.
Part 2 is a toolkit addressing the first two objectives.

Chapter 2
The Situation

2.1 The Services Provided

2.1.1 Water and Sewerage

Water is used for a variety of purposes: drinking, personal washing, watering gardens, filling swimming pools, by businesses, to wash boats and cars, for public toilets, for fire fighting. Water as a raw resource is often readily available. Quality assured, potable water delivered to households and businesses requires infrastructure and continuing operational expenditure. A number of converging factors are forcing councils to analyse and review the design, funding and management of urban water and waste service. More resources are required (water supply as well as wastewater and solid waste management facilities) to meet increasing demands due to population and/or tourism growth, and additional resources are not always readily found. These issues can be particularly acute in smaller tourist towns with a relatively low number of permanent residents and seasonal demands for higher volumes of water and waste service. While there are substantial costs in delivering the product to the end consumer there are also environmental and social issues to deal with. The costs are related to the infrastructure (headworks, pump stations, pipes) and the treatment of the raw resource and wastewater (filtering, use of chemicals, disposal). Environmental costs of water consumption have to be added to these direct costs.

Increasing water consumption results in additional direct and environmental costs. If the water demand does not reach the supply capacity level, only the flow related costs will increase with consumption, which can include a higher rate of depreciation of the infrastructure. If the water supply capacity needs to be increased, further infrastructure is needed, which will increase both kinds of costs. Provision of potable quality water to large numbers of households and businesses can be separated into several components including water collection, storage, treatment, reticulation, metering and delivery. Water and wastewater services are largely private goods with little spill-over effects. Households and businesses connect their wastewater pipes to the community sewage system and the wastewater is piped to a treatment site.

Hanmer Springs has a reticulated water supply with 923 connections. Originally water was drawn from Rogerson River, 3 km west of Jack Pass. This intake was built in 1925. Additional abstraction galleries were installed in 1961 and 1978. Since 1997, most water is taken from the Dillon Creek. Storage capacity is around 14000 m^3. Gravity feeds 87 percent of the connection with the remaining 13 percent being pumped. There are a few restricted rural connections. Water receives chlorine treatment at a Council water treatment plant. The Hanmer Springs wastewater service consists of a sewer network draining to a treatment system consisting two existing facultative ponds (in series), (installed in 1971). The outflow discharges to the local Chatterton River.

The first reticulated water supply for Kaikoura was from Lukes Creek and was commissioned in 1935, making water available to 250 connections. In 1957, extensions to the water supply were undertaken, including construction of an infiltration gallery on the Waimangarara River, a gravity supply main, and construction of the 950m^3 Peninsula Reservoir. Upgrading and extension works have been undertaken from 1979 to the present day. Presently the two water sources are the Waimangarara Stream and a groundwater bore located on Mt Fyffe Road. Both supplies are treated with chlorine. There are three water storage facilities for Kaikoura providing a combined storage of all reservoirs of 2520m^3. Kaikoura has 1328 water connections and 1439 wastewater connections.

The Kaikoura sewage system was constructed between 1981 and 1983 and is composed of a number of gravity-reticulated catchments connected via pump stations. Treatment occurs at the oxidation pond and land disposal system, located approximately 4km north of the town centre. The treatment system is covered by resource consent with a 35-year term, which expires in 2031.

2.1.2 Solid Wastes

Kaikoura District Council operates a landfill located on Kaikoura Peninsula which is managed by Innovative Waste Kaikoura Ltd. A kerbside recycling scheme operates in the township collecting cardboard, plastics and metal from households. Kaikoura used to have kerbside collection of landfill refuse by a contractor. Households were required to purchase stickers for their refuse bags and there was no limit on the number of bags per week per household. However, the demand for kerbside landfill collection dropped significantly with the introduction of this system. The revenue from the sticker sales did not cover the contractor's costs. Subsequently, Kaikoura District Council abolished kerbside collection of landfill refuse. At present households collect their solid waste and have to deliver it themselves it to the landfill site. At the gate they are charged per bag or other volumetric unit. Commercial businesses can do the same or pay a contractor for pickup of their wastes for disposal at the landfill site. KDC has a target of zero waste to landfill and has introduced several policies that have reduced disposal to landfill by 58 percent (S Grant pers. comm. 18/3/03). Parts of the collected recyclables cannot be recycled at this stage. If not fed into the recycling circle the waste gets separated (paper, metal, plastic), pressed in woolsacks, and stored at the landfill site for possible future recycling.

Hurunui District Council adopted a Zero Waste policy in March 2000. Hurunui Recycling operates from Amberley and offers kerbside recycling to Hanmer Springs residents. Green back kerbside collection in Hanmer Springs has grown from 170 bags per week in 2002 to the current 400 bags per week. In addition to this service, a local council contractor collects rubbish which is stored at a small transfer station sited about 5 km south of the township before being transferred to the Christchurch landfill site. Minimal recycling (mainly cardboard) is done at the Hanmer Springs transfer site.

2.2 Local Government Funding Policies

- Water utilities are allowed to collect charges and rates in order to recover their costs, but not to earn profits. New Zealand local government funding policies are constrained by several pieces of legislation including the Local Government Act 2002 and the Local Government (Rating) Act 2002 which came into force mid-year 2003. Some key features of the current legislation include the following points:
- Territorial Local Authorities (TLAs) may levy rates and charges based upon Land Values, Annual Rental Values and Capital Values of rateable properties.
- Differential rates are permitted.
- Uniform annual charges are permitted.

- Water, sewerage and solid waste systems must be fully funded by charges levied on users of those systems.
- Where an identifiable group of ratepayers benefit from a Council action, that group should meet the costs of the service provided.

Any charging system should be designed with respect to the Local Government Act 2002 and the Local Government (Rating) Act 2002. Territorial Local Authorities have reacted to the guidelines and constraints imposed by the relevant legislation, and have chosen in some cases to introduce a large number of different rates and charges.

2.3 Cost and Rate Structures in Kaikoura and Hanmer Springs

Water, sewerage and refuse collection services are generally characterised by a high proportion of fixed to variable costs when compared to other types of businesses. Conservative estimates of the fixed to total cost ratios for Kaikoura and Hurunui District Councils are 60 percent for water services, 70 percent for sewerage and 95 percent for refuse collection (management accounts data, 2003). The high fixed costs proportion needs to be kept in mind when designing service charges. Most of the fixed costs for water and sewerage services derive from infrastructure investments which are impossible or very hard to reverse. Examples are dams, water treatment plants, pumping stations, sewage treatment plants and disposal systems. Pipes can more easily be dismantled and are usually a less obvious modification of the environment. Any investment into new infrastructure due to an increase in demand, therefore, not only imposes major costs to the serviced community, but can also involve major environmental impacts. Similarly establishing modern solid waste disposal sites requires significant investment to ensure that environmental damages are minimised. Hence, demand for water, sewerage and refuse services should be priced to reflect their true financial and environmental costs.

In Kaikoura, the water charges for residential customers are not linked to the amount of water used. Commercial customers pay the same fixed charges as residents, plus a volumetric charge per cubic metre of water used. Kaikoura District Council (KDC) has contemplated volumetric water charges for residents. They were not implemented because it was perceived that the costs of implementation, meter reading and administration outweigh the benefits of volumetric charges. Refuse and recycling costs are covered by fixed payments plus different volumetric charges for residential and commercial ratepayers.

Hurunui District Council (HDC) implemented volumetric water charges for all its serviced ratepayers, including at Hanmer Springs, in a two-step procedure. In 1996/1997 a two-part tariff was introduced. A fixed charge covered the use of the first 300 cubic metres of water and a variable charge applied to every subsequent cubic metre. Since 1999/2000 all ratepayers pay a (lower) fixed charge and a variable charge for every cubic metre of water usage. Water meters are read annually and the charges apply equally to all ratepayers.

Chapter 3
Calls For Change

Communities increasingly face problems with their water supply as resident population and visitor numbers increase. In Kaikoura there is limited potable water available and earlier efforts by KDC to locate further potable water were largely unsuccessful. More recent investigation has identified a promising water source (S. Grant pers comm. 18.3.03). Increased demand for water is expected in the township as new tourist accommodation facilities, an associated golf course, and further residential sections are developed. The Kaikoura wastewater treatment facility has reached it capacity and requires extension to cope with future demand.

Hanmer Springs has adequate water supplies at present, but the water requires chlorination to meet water quality standards, and increasing use means increased costs to HDC. In addition, Hanmer Springs has experienced increased residential and commercial building activity which will increase the pressure on the current infrastructure.

Table 1 compares the total estimated person-nights[1] and day visitors for both Kaikoura and Hanmer Springs for the year 2003. These estimates are based on the snapshot studies described in Part 2 of this report. Overnight tourists account for 36 percent and 70 percent of the total person-nights for Kaikoura and Hanmer Springs respectively. It is the overnight visitor who places a demand on the town's services.

Increasing water consumption and high peak loads will make further infrastructure investments necessary if these issues cannot be mitigated. Research has shown that awareness campaigns only last for a limited time period, mainly during severe supply shortages (NZBRT 1995). Forced restrictions, such as banned hose use, have the same short run effect and usually come into place when their use is most needed. The inability of the aforementioned methods to cope with increasing demand and high peak loads often makes it necessary to look for other options.

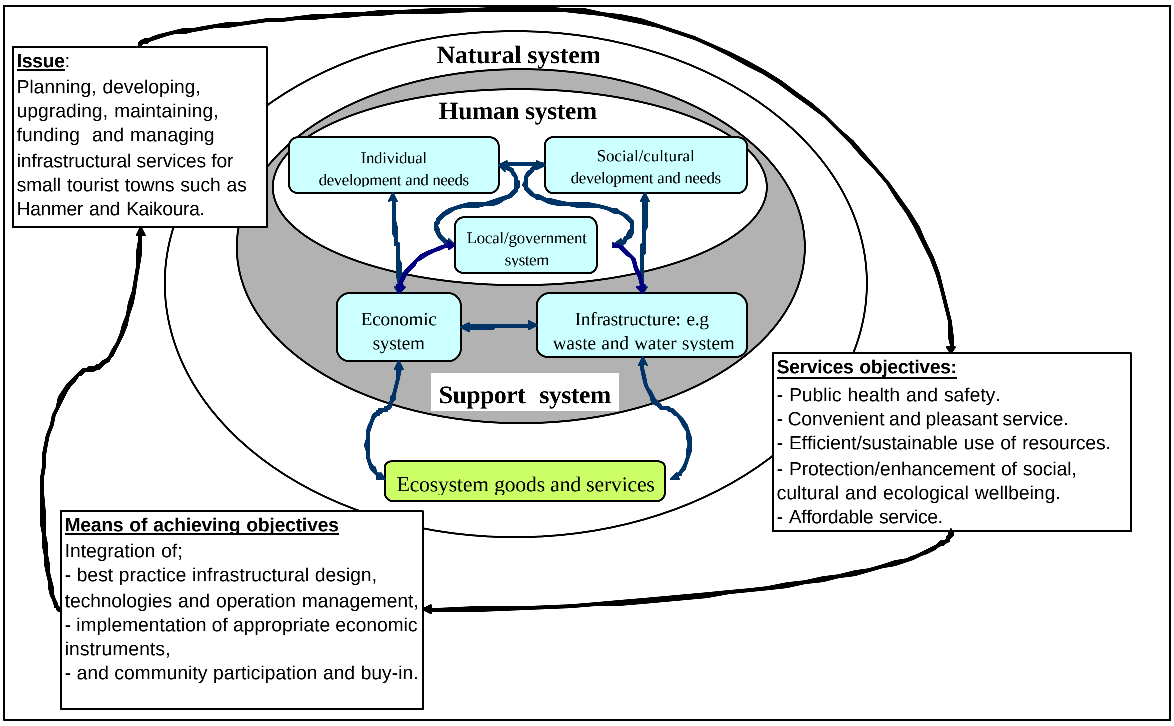
Sustainable management of water, waste and wastewater services requires a systems approach. Hartmut Bossel's conceptual "global model" recognises that human systems are embedded in support systems, which are both embedded in the natural ecological system (Figure 1). This model may assist in seeing where infrastructural services and economic systems fit, and the links and relationships between these and other components that make up our social, cultural, structural and ecological environment. If the objective is to provide the best sustainable service the strategy that is most likely to succeed, long-term, is one that analyses and optimises all contributing factors.

1 A person-night is equal to one person staying one night within the serviced area of the town

Table 1
Estimated Person-nights and Daytrip Visitors for 2003

	Kaikoura	Hanmer Springs
Permanent residents	693500	244200
Total commercial accommodation	342000	355000
Holiday home	56300	177400
Daytrip visitors	802900	112900

Figure 1
Linkage Between Human Systems, Support Systems and Ecological Systems



In New Zealand the Parliamentary Commissioner for the Environment (2001) identified opportunities for progress as:

- Demand management and least cost planning: economic instruments and community awareness and education programmes.
- Integrated catchment management
- Integrated design and management of water services – building efficiencies measures, recycling and linkages with allied services; in particular the 3 waters, potable water supply, stormwater and wastewater

In the case of Kaikoura, and maybe Hanmer Springs also, the image of being a sustainable and "green" tourist centre is becoming increasingly important to their marketing profile. This being the case then services such as potable water supply, stormwater, wastewater and waste servicing will ultimately need to demonstrate that they meet sustainability criteria. Such criteria may be, for example:

- Maintain high standard of public health and safety.
- Protection of property.
- Natural and other resources must be used sparingly and efficiently.
- Adopt bio-mimicry (i.e., recognising that nature itself provides the perfect model).
- Protect biodiversity and ecosystems.
- Eliminate hazardous substances.
- Socially and culturally appropriate service.
- Provide a long-term affordable service.

What is clear is that for Hanmer Springs and Kaikoura, their water supply, wastewater and waste services fall short of some of these criteria. In the case of existing infrastructure, the opportunities in terms of physical engineering design and technology are more limited than in the case of greenfields development. The opportunities for these communities are likely to be in terms of:

- Infrastructure maintenance
- Infrastructure upgrade and or replacement
- Specific areas of new greenfields development

Sound engineering can make a number of contributions to sustainability of water and wastewater systems by employing appropriate design (incorporating demand management), technology selection and operational management, of the physical infrastructures. Opportunities may exist if these services are designed, upgraded, extended and managed using the concept of integrated services, and whole of life costing of the service. Integrated services recognise that sustainable urban water systems require total water cycle thinking, meaning looking for synergies between water, stormwater, and wastewater.

Next to the costs of a service, deriving from the infrastructure, the demand for a service has to be evaluated, which is resembled by the economic system in Bossel's figure. There is substantial evidence from numerous studies showing a marked and sustained reduction of peak demand and annual usage of water on an international and national level (Bailey, 2002; OECD, 1999). Most studies also show a higher reduction in peak demand than in annual demand, due to a higher percentage of discretionary water use at peak periods with savings ranging from 15 percent to 50 percent (for example see Jordan, 1999; Foxon et al., 2000). Auckland City Council reports 35 percent higher use of water for non-metered customers, Wellington Regional Council estimates a 20 percent reduction of water use through metering, Rotorua reports 35 percent lower water use annually and 50 percent lower use during summer for metered customers. (PCE, 2000; MED, 1999)

Though there is a perceived political resistance against such a charging regime, a Parliamentary Commissioner for the Environment report identified pricing and charging for water services as a key issue (PCE, 2000). The political resistance to flow-based charges is most likely due to the lack of knowledge about the proposed form of water charges and fear about the commercialisation of water services. Additionally, equity reasons are brought forward, arguing that low income/high usage customers would be disadvantaged by the introduction of volumetric charges. Counter arguments are, for example, that low-income customers are not necessarily high usage customers, that the removal of the cross-subsidisation of residential to commercial customers will reduce the financial burden spread across all residents, and that long-term personal and system water conservation might leave many ratepayers better off. Though some businesses are already metered, Ministry of Economic Development (MED) (1999) argues cross-subsidisation from residential customers to commercial customers is almost certain, but its magnitude is not. In Banks Peninsula District for example, Akaroa holiday homeowners and residents are paying a disproportionate share of the water and wastewater rates (Cullen et al., 2003). Section 6.1 provides further elaboration on costs and benefits of water metering. It is worth noting that electricity companies have been criticised for introducing a higher proportion of fixed charges with the effect of disadvantaging low-income groups.

Banks Peninsula District Council introduced residential water meters in Akaroa during 2002 and has set a positive example for fostering the acceptance of metering. They organised workshops with the community to increase the awareness of the water supply system in Akaroa and to provide them with solution options. The result has been a wide acceptance of the necessity of universal metering coupled with excess water use charges (ESR, 2002). Similarly, HDC introduced volumetric water charges for ratepayers in 1998 and there is stated to be widespread support for this charging approach (G. Elliot, pers com 7.3.03). While this consultative approach might be a major challenge for bigger communities, it emphasises the importance of good communication skills to successful introduction of volumetric water charging regimes. It can be noted that Metrowater Auckland justifies the switch to metered watering on their website by labelling it as 'fairer'. Noticeably Christchurch City Council has installed water meters on all rateable properties in Christchurch, but has so far chosen not to introduce volumetric water charges for residential properties.

Waste disposal methods have attracted considerable attention in the Canterbury region during the past three years. The Christchurch City Council landfill site is nearing the end of its life and a new site has been identified at Kate Valley in Hurunui District. The finite nature of landfill sites, and the true costs of identifying, owning, and operating landfill sites are increasingly being recognised by residents and businesses as the CCC and other TLA signal the likely charges for waste disposal at the new site. Several TLA including HDC and KDC have made a commitment to zero waste to landfill and KDC has volumetric charges for disposal at their landfill.

Chapter 4
Changes to the Infrastructure

Driven primarily by depleting potable water resources, a number of municipalities in Australia are realising that there is an urgent need for change in the design and management of urban water services. The Australian Science and Technology Council (ASTEC), as early as 1995, advocated an integrated approach to urban water servicing. Subsequent organisations such as CSIRO Urban Water and the Institute of Sustainable Futures are actively researching integrated urban water and wastewater services for both developing urban areas and for rural catchments.

Sydney Water Corporation has a special interest in more sustainable options for the design and management of integrated water and wastewater services, particularly in the case of greenfields development. They are involved in researching the options for new sites (e.g., Edmondson Park) and managing and monitoring built sites (e.g., Rouse Hill).

> *Reduction of demand from storages is a key corporate driver for Sydney Water. Sustainable urban water services can contribute significantly to this reduction through development of approaches promoting demand management and source substitution. This translates to increased resource use efficiency and reduced wastewater production, and therefore has the potential to deliver significant savings in reduced infrastructure cost (Mitchell et al., 2002).*

The conclusions of their Edmondson Park study are worth summarising. They found that some options achieved:

- significant resource efficiency gains – up to 70 percent reduction in water use over the business as usual model.
- relatively marginal cost differences between options.
- for some options a one-third reduction of demand over the business-as-usual-wastewater service.
- extensive stormwater reductions were also possible.

What are the engineering design and technology selection opportunities? It is likely that the opportunities for a specific town are best identified in a process of consultation and discussion between key interested stakeholders in the town and technical and engineering people with a sound knowledge of both conventional and new and innovative systems. In general terms examples of "improved" water and wastewater engineering design and technology options that may be relevant are:

- Onsite rainwater collection and storage for non-potable uses: Benefits are reduced demand on town water and reduced stormwater flows.
- Water saving technologies at the source – i.e., in the home, office or industry. Up to 30 to 40 percent saving are possible in terms of the types of water technologies used. In Australia, voluntary water efficiency labelling on household technologies was introduced by the Australian Water Resources Council in October 1994, using a droplet-shaped label with three gradings – A, AA and AAA (the most water-efficient). Recently, Environment

Australia released a discussion paper on making this mandatory. The relevant standard is AS/NZS 6400:2003 Water efficient products – Rating and labelling.

- Recycling of treated wastewater for non-potable uses such as toilet flushing and garden/lawn irrigation.
- Integration of stormwater and treated wastewater with aquatic ecosystems – for example wetlands and stream augmentation.
- Nutrient and water recovery from wastewater for productive purposes e.g agriculture, forestry, nurseries.
- Distributed (or decentralised) wastewater services instead of a centralised wastewater service. The benefits of this design are;
    - Because small-bore reticulation is generally used, this eliminates stormwater infiltration and the consequent very high peak flows to the treatment plant.
    - Improved opportunity for water recycling.
    - Because such systems are more local there is more incentive and opportunity for the implementation of demand management technologies and practices at the source.
    - More responsive to a town's development and demographic dynamics.
    - Capital and operating costs expenditure can be staged as development progresses.
    - More resilient to natural and other hazards.
    - Large volumes of final effluent are not concentrated to one point.
    - Permeable surfaces can reduce stormwater quantities and enhance urban landscape and ecosystems.

All the above options are not necessarily going to be applicable to Hanmer Springs or Kaikoura. Hanmer Springs has an adequate supply of town water, at this stage, therefore water use efficiency measures are unlikely to be a high priority. However drinking water quantity in Kaikoura is under stress at peak times. In terms of quality, several local people in Hanmer Springs have expressed concern; their main concern being that the taste of chlorine was sometimes very strong. The Ministry of Health (MOH) Drinking Water Register, 2003[2], rated Hanmer Springs as “ungraded” and Kaikoura source and treatment grading was D (unsatisfactory, high level of risk).

Clearly the cost of the above measures must be analysed. It is a question of how this analysis is done. These costs should be analysed in terms of whole-of-life costing for the integrated system. For example, if a distributed wastewater service is to be evaluated for a new development in Kaikoura and demand management technologies designed into the system then the cost analysis should include not only the wastewater servicing system but also the costs and benefits with regard to stormwater and water supply – which are interdependent on such a system. Furthermore, the social, cultural and ecological costs and benefits should be factored into such an analysis.

2 www.moh.govt.nz/moh.nsf/wpg_Index/Publications-Drinking+water+in+New+Zealand+Publications

Chapter 5
Cost Allocation and Pricing

5.1 Hanemann's Criteria

Hanemann (1998) introduces evaluation criteria for the design of water rates and charges which will also incorporate wastewater funding and can also be applied to the funding techniques for the coverage of refuse costs. Hanemann provides three main criteria for designing water rates, namely revenue generation, cost allocation and provision of incentives. These three main criteria themselves encompass several subsidiary components. Revenue generation should be sufficient to meet all of the costs that a utility encounters when providing its service. Therefore, revenue generation should be sufficient, stable over time and the benefits of a more complex funding scheme should be traded off against higher administrative costs. Table 17 lists the main and subsidiary criteria.

Cost allocation should apportion the costs of the service among the different customers in a non-arbitrary manner. It should avoid cross subsidies and it should allocate the full private and social costs to users. In this case social costs will include environmental damage, for example caused by supply of water including reduced instream flows during periods of peak demand or caused by refuse disposal.

Further funding systems should provide incentives for efficient water use or disposal volumes. Statically efficient water use internalises the full costs of water supply at any point in time, meaning direct as well as environmental costs. In this sense the quantity and time of water usage are chosen optimally. Dynamically efficient water use accounts for the development of water usage over time. To this extent water charges should incorporate future costs as well ensure an efficient growth of water demand. These concepts are transferable, with necessary adaptations, to refuse volumes at any point in time and their development over time.

Finally the incentives should encourage water conservation, or reduced refuse volumes, and the charging rate scheme should be transparent to users to ensure the correct interpretation occurs of incentives set by the service utility (Hanemann, W.M., 1998, p139).

Charging policies in use at present, and proposed charging polices, can be tested against those criteria. The breadth of questions posed by the criteria indicates that it will be very difficult for any one charging system to score highly against all criteria. Selection of preferred charging policy is likely to require trading off performance on one criterion against performance on one or more other criteria.

5.2 Ministry of Economic Development Criteria

The Hanemann criteria provide general guidance when designing a services' charging system. The Ministry of Economic Development (MED, 1999) states more explicit cost recovery and pricing principles. For the cost recovery principles the prices for water services charged to each customer should be set such that they are:

- equal to or greater than the incremental cost of supply. This means that no customer is supplied at a loss or subsidised.

- equal to or less than the stand-alone cost of supply. This should ensure that no customer is overcharged, either to increase profitability or to cross-subsidise other customers.

Applying these pricing principles the prices for water services charged to each customer should be set such that;

- the marginal costs of supply are recovered by volumetric charges, as this encourages efficient resource use.

- the remainder of the costs are recovered by fixed prices (1st best); and/or regressive pricing and/or Ramsey pricing. This is intended to minimise or prevent any distortion to the marginal costs pricing signal.

Both principles, however, still leave room for cross subsidisation, a problem of current charging systems which is meant to be reduced or eliminated. The MED principles and Hanemann's criteria leave open the question about the grouping unit, the split of the common costs and implementation issues. In Chapters 8 and 9 the current and proposed charging systems are evaluated against Hanemann's criteria, but the MED principles should be kept in mind during the evaluations and the design of a different charging scheme.

5.3 Fixed and Variable Cost Allocation

Generally, variable costs should be charged on a volumetric basis and fixed costs should be part of the fixed payment. However, this principle could be amended for reasons such as equity considerations, perception of risks to funding or to provide increased water conservation incentives. On the one hand, we have clear cases such as volume based costs (variable) and administrative costs (fixed). On the other hand, other types of costs leave more room for interpretation. Any short-run fixed costs become variable in the long run. Examples are connection costs, infrastructure building and maintenance, opportunity costs, depreciation, loan costs and environmental costs, if included. These could count as variable cost, since they can be calculated for every month and with respect to certain capacities, or they could count as fixed costs, since they cannot be avoided in the short run.

5.4 Intertemporal Cost Allocation

Consumer groups in the United Kingdom argued that it would be fairer to finance the investment programme for water services through borrowing so as to spread the cost over the lifetime of the capital assets in order that the current generation of consumers do not subsidise future consumers (Bailey, 2002, p396). The NZBRT (1995) argues that usage costs, here variable costs, should include any capital costs brought forward by the demand, meaning the present value of all of the avoidable or incremental costs, whether they are incurred today or in the future, that are attributable to today's demand. This would represent a full volumetric charge.

In addition to identifying fixed and variable costs one has to consider the allocation of the fixed costs across all customers. Section 6.2.2 provides further discussion of these issues.

5.5 Marginal Costs

From an economic efficiency standpoint, marginal costs are the preferred option as a basis for the calculation of water charges. However, there are two main problems associated with marginal cost pricing: the possibility of under-funding, for example through economies of scale or common costs, and the difficulty of calculation, meaning the unit breakdown. Marginal cost pricing is not feasible for refuse disposal services as the high ratio of fixed costs to total costs, is likely to result in total revenue falling well short of total costs.

True marginal cost pricing could mean considerable variations in unit pricing. Variations in unit pricing make a system complicated to understand by customers and will deter users from water saving. Hence, marginal cost pricing can become ineffective. Nevertheless, the aim should be to get close to marginal cost pricing, for example with a two-part tariff including block charges. This will be discussed in the following chapters.

Chapter 6
Volumetric Pricing

The complexity of marginal cost pricing makes it necessary to look for other pricing options. Volumetric charges provide a wide variety of pricing options and make it possible to come close to marginal cost pricing. This section introduces the benefits and problems of volumetric charges and it provides an overview of possible volumetric charging schemes.

6.1 Issues of Volumetric Pricing for Water

Examples of usage dependent prices comparable to water are retail electricity prices. Here we often see a combination of fixed and flow charges. Electricity meters are regularly and frequently read and the option exists of day/night and seasonal pricing. The wide use and acceptance of meters for electricity leads to the notion that a similar solution is possible for water usage. Communication skills are likely to be of importance in ensuring support for metered pricing.

6.1.1 What does it involve?

Volumetric pricing for water involves installation of water meters, reading, billing and care of water meters. Discharged water (sewerage and stormwater) from properties is not metered, but a correlation between water demand and wastewater discharge may allow a reasonable estimation of the amount of sewerage produced per property. Hunter Water Corporation (Australia) estimates an approximate 50 percent of water use as discharged water, Anglian Water International (UK) estimates 90 percent, and Metrowater for Auckland estimates 77-79 percent but for the calculation of wastewater rates it uses 75 percent for residents and 100 percent for businesses (NZBRT, 1995; Metrowater, 2003).

Akaroa data suggests that this correlation between water use and wastewater is weak, the reason being the distortion caused by stormwater infiltration during wet weather and in dry weather the distortion caused by external water demand such as garden and lawn irrigation. In Akaroa's case, heavy rainfall increased wastewater volumes 23-fold over dry weather flows. The snapshot studies showed that internal water consumption[3] and tourist industry wastewater production is related primarily to total guest-nights within the serviced area. The ratios of daily wastewater yield to daily water consumption for 2003 for Kaikoura were analysed. These varied from 1.4 to 0.23. This suggests it would be risky to assume one annual correlation between water and wastewater flows. Nevertheless, the correlations are seasonally stable. This will have to be respected when designing water and wastewater rating schemes. The current lack of data for Hanmer Springs negates any conclusions at this stage. As in the case of Akaroa, it is highly likely that for both Hanmer Springs and Kaikoura, wastewater flow can be highly inflated with stormwater and groundwater inflow and infiltration.

3 Internal water consumption refers water consumed by facilities inside the building (laundry, kitchen, bathrooms, toilets, etc). External water consumption refers to water consumed outside the building (garden irrigation, car/boat washing etc.

6.1.2 How Much Does Volumetric Pricing Cost? Are There Any Social Costs?

For New Zealand we can use information from the Christchurch City Council and Metrowater Auckland as a guide to monetary costs of metering. Christchurch charges the customer in a one-off payment of $370 for a new connection, including meter, box, valve and related costs. However, the initial bulk installation of all existing Christchurch households was cheaper than this charge. The economic life of meters is assumed to be 20 years. Maintenance of meters is reactive. For their annual reading for approximately 100,000 properties they employ four to five full time meter readers. Their water rates cover current cost, including depreciation on assets. The yearly water allowance is calculated on the basis of the capital value and for water usage above the allowance $0.33 per cubic metre are charged. Only one out of 20 Christchurch businesses pay for excess water demand.

Metrowater Auckland charges one-off $580 for a new 20mm connection, which covers all residents and some businesses, and $435 for a new irrigation connection, which applies to garden connections. Bigger connections come at a higher cost, $710 for 25mm and $995 for 32mm. Their service charge covers the maintenance of the individual accounts and amounts to $30 each for water and wastewater per connection. Special meter reading and demanded meter testing is charged at $25 each.

Where demand is approaching a capacity constraint, meter installation costs may be cheaper than the capital expenditures required for building new reservoirs, the associated land and distribution network costs and the subsequent sewerage costs. (Bailey, 2002, p.410)

Social costs could occur due to reduction of cross-subsidisation. If residents overall were cross-subsidised they could end up with a significantly higher bill. This would be especially harmful in income groups which might not be able to afford higher bills. However, cross-subsidisation of businesses by residents seems more likely (MED, 1995). This increases the likelihood of reduced water bills to households. Nevertheless, there could be individual losers within the residential customer group.

6.1.3 What Are the Social and Environmental Benefits?

Water savings due to leakage identification, a reduction in water use and better management of (peak) demand may circumvent the necessity of new water capacity infrastructure and treatment, and bring associated environmental benefits.

Universal metering helps to identify the volume and location of unaccounted-for water on private property and especially losses through system leakage. Though the largest leaks are most likely to be found outside of private property, only with the right (monetary) incentives will customers seek out and fix private leaks. For Wellington, the estimated savings through leak detection are around 25 percent of the total water usage (MED, 1999). Water flow due to leakage is estimated at 30 percent for Kaikoura (Connell Wagner, 2003).

Metered pricing sets an incentive for users to engage in water conservation behaviour, since they gain personal benefits from lower water usage. Under a flat rate there is no penalty for wasting water. There is substantial evidence from numerous studies at both international and national level showing a marked and sustained reduction of peak demand and annual usage of water when metered pricing occurs. Most studies also show a higher reduction in peak demand than in annual demand, due to a higher percentage of discretionary water use at peak periods with savings ranging from 15 percent to 50 percent, for example see Jordan (1999) or

Foxon et al., (2000). Auckland City Council reports 35 percent higher use of water for non-metered customers, Wellington Regional Council estimates a 20 percent reduction of water use through metering, Rotorua reports 35 percent lower water use annually and 50 percent lower use during summer for metered customers (PCE, 2000; MED, 1999).

The effects of price changes on water demand are significant as well. Price elasticity for households range from –0.2 to –0.4, with considerably higher values during summer and for industrial and agricultural sectors (OECD, 1999). While there are no studies reporting price elasticises for the New Zealand market, a response of consumption patterns to a change of price and/or a change of the charging system can be assumed. Beyond possible short-term water conservation through a change in behaviour, we could expect substitution effects away from water intensive plants and products. If significant reductions of water use are achieved, the construction of increased water supply capacity might be circumvented which will add to saved monetary and environmental costs.

A high ratio of fixed to variable cost for water supply might reduce private water saving benefits of metered pricing if the ratio is reflected in the charging system, for example in a two-part tariff with a high fixed payment. Management accounts data from Kaikoura and Hurunui District Councils suggests fixed costs for water and wastewater services comprise 60 percent and 70 percent respectively of total costs. These are high ratios compared to the ratios for other industries and services, but it leaves room for use of volumetric charges. A local authority might choose not to rely upon the ratio of fixed to variable costs in the charges but to recover some of the fixed costs via flow charges. Further, the fixed costs could be split into block payments as well, as discussed below in Section 6.2.5. The water conservation incentive might be of modest size if water charges are only about one percent of household income (Bailey, 2002). As well households may have limited information about the effects of their water usage on their household water bill.

If significant reductions of water usage are achieved, the construction of increased water supply capacity might be circumvented which will avoid some monetary and environmental costs. Environmental costs, which could be avoided or mitigated, are various. Abstraction of water from streams will reduce in-stream flows, potentially threatening stream ecology. Excessive draw down of underground aquifers can have a major impact on the sustainability of the resource, can result in salt-water intrusion for costal settlements and can damage the structure of the aquifer. Inefficient water pricing in industrial applications can lead to excess use of water to dilute effluent. High rates of water use mean high levels of wastewater have to be returned to the environment, increasing the likelihood of environmental damage. Prices set below costs for effluent disposal may lead to pollution of waterways (NZBRT, 1995). Environmental costs are difficult or even impossible to estimate. Nevertheless, the inclusion of a low estimate might be superior to no inclusion at all. The returns from inclusion of environmental cost could be used to fund projects to mitigate water supply impacts, to implement preventive methods, to subsidise water saving behaviour (for example a below cost sale of low flush toilets and advanced shower heads), to fund educational campaigns and the like.

6.1.4 What Are the Personal Benefits?

Personal change of behaviour is more likely to occur with metered charges than with flat rates. Users will exert more control over their own water use, and identify and reduce leakages. The outcome will be monetary savings to individuals.

6.1.5 What Are the Personal Costs (besides share of implementation costs)?

The household might have to find and purchase substitutes for high water use appliances, gardening tools and plants, they have to put effort into finding leaks, and they have to learn new habits. Non-potable water demand can be substituted with harvested rainwater and/or recycled treated wastewater. An example of this is Rouse Hill near Sydney (Sydney Water, 2003).

A study for the Wellington metropolitan area suggests that only 1.5 percent of all households might face true hardship if they faced increased water costs (Brunsdon Cathie December 1993, p.13). Water costs usually represent a relatively low proportion of industrial and commercial costs and of household income, in the latter case the national (UK) average being little over one percent (Bailey, 2002, p.376).

When changing the water charging system the groups of customers with increased water bills would have to be identified and these would have to be assessed whether they might face financial hardship. Possible actions against hardship could be income support, depending on benefits received, and support of households with special medical needs.

6.2 Options for Volumetric Water Pricing

6.2.1 Volume and Customer Costs

Spreading the water use operating costs is relatively uncomplicated, since they can be allocated to cubic metres of water and wastewater. Similarly uncomplicated is the allocation of user dependent operation costs such as reading, billing and administration. One-off costs such as new connection costs are simple to allocate as well, since the source of the costs can be readily located.

6.2.2 Fixed Costs

Allocating fixed costs/common costs require more thought to achieve an efficient and equitable system. For a full flow charge all water supply costs would be broken down to charging units, usually cubic metres. In such a case the incentive for high water users to reduce consumption would be the greatest. However, the water utility would have to face higher financial risk compared to a scheme where most or parts of the fixed cost are covered through fixed charges. If the incentives for water demand reduction are intended to be kept high while reducing the financial risk, blocks of fixed charges increasing with water use could be chosen. Please see section 'block charges' for further detail.

Very little financial risk is involved when some method of customer grouping irrespective of water utilisation is chosen. Grouping keys would be determined through one or multiple customer characteristics: location, residential/commercial, type/size of business, size of household, income/profit, benefit income, size/value of property and the like. The choice of grouping keys will depend on the water utility's goals, legal feasibility and accepted level of sophistication. As noted in a different context, a more sophisticated system might hinder the level of acceptance and understanding by the customers and therefore achievement of any goals set by the utility.

Whiteman and Walmsley (1996) suggest the following cost allocation system: headworks capital costs allocated by customer, headworks treatment costs allocated by volume, main trunk costs allocated by customers connected to the specific trunk, pumping station costs allocated by the customers behind the pumping station, peak load costs allocated by all customers dependent on volume, and billing and administration allocated by customer. Whereas the division seems plausible in general, it is not clear how the capital and the trunk costs should be divided between the customers. Their fire-fighting capacity costs seem to be distributed randomly and the use of property values as a grouping key are suggested with the possibility of making commercial users pay relatively more.

6.2.3 Ramsey Prices

Ramsey prices require the mark-up on prices to be set inversely to the elasticity of demand. Hence they might be problematic and politically infeasible for water as the first units should be very expensive. This would not only mean that an efficient and low water user needs to pay relatively more, but it could also have adverse incentive structures.

6.2.4 Seasonality

Water demand is cyclical with higher use in summer as well as morning and early evening. Data from the Kaikoura water system supports the higher summer use. There is no information available neither with respect to daytime fluctuations, nor for Hanmer Springs daily or monthly water use. In the case of the three tourist towns studied, (Akaora, Kaikoura and Hanmer Springs), seasonality in water consumption was drive primarily by seasonal patterns in guest-nights (day visitor impact was minor) and seasonal external water demand (landscape irrigation in particular). Guest-night profiles are discussed in detail in Part 2 (Section 15.5.2). These profiles may be determined from Statistics New Zealand's commercial accommodation surveys for districts. Where the district data do not accurately reflect the serviced area of the town, other indicators may be used. The three studies mentioned demonstrated that there was good correlation between total guest nights and the town's Information Centre door counts. Snapshot studies can be used to determine the impact of other seasonal influences. (Refer to the Toolkit, Part 2).

The incorporation of peak demands would grant a better reflection of the monetary and environmental costs involved in the supply of water during peak times. Various studies emphasise the effectiveness of higher seasonal peak pricing to reduce and manage water demand. However, further sophistication with respect to the time-of-the-day or weekend/weekday usage does not seem to be necessary, as water utilities record relatively small fluctuations (Hanemann, 1998, p.161). This reduces the technical and reading requirements of the meters.

Given that seasonal pricing is chosen, the number and length of season has to be decided. Meters will be read at the end of each period and a bill send out. With continued practice and computer support the amounts charged should increasingly reflect the underlying costs and seasons.

The level of the prices should depend on the necessary capacity for the respective season. As Kahn (quoted in Hanemann, 1998) states:

> *Any attempt to shift capacity costs to the off-peak demands, by raising prices for that service above its own separate, incremental cost… will cause available production capacity at that time … to be wasted, and would cut off purchasers willing to pay the additional cost of serving them. Any reduction of the peak … price below full joint*

cost … would stimulate additional purchases at the peak, requiring additions to capacity that would not be made if buyers had to pay the full opportunity costs of the additional resources required to supply them.

This argument could be used to charge different fixed components of the water charges throughout the year. While it might be efficient it adds a further degree of complication, at least for the customer and, therefore, multiple fixed charge components should be investigated with regards to this trade-off.

6.2.5 Block Charges

Possibilities for allocating variable and/or fixed costs of water and wastewater supply include block charges. It is assumed that wastewater charges are also linked to user's water demands. In combination with a two-part tariff this would mean that the customer pays a fixed charge irrespective of water use and volumetric based charges for the water demanded. The volumetric charges would be calculated per cubic meter of water and one price per cubic metre would apply for all usage within a block of water. The charges can and should be calculated separately for every block. If the upper limit of the first block was set at 100 cubic metres and a customer consumed 120 cubic metres, the charges for the first 100 cubic metres would be calculated at the lower rate. As mentioned before, the fixed charges could also be dependent on the season or the specific block of water use to reflect direct and environmental costs more appropriately.

Block charges should reflect capacity constrains and the goals of the water utility. In the case where the aim is reductions in water demand and there is little spare capacity, increasing or rising block charges are suggested. With increasing block charges the price per unit volume, and the fixed charges if chosen, would increase with every block of water demanded. With decreasing block charges the price for water demand decreases with increased water use which contradicts the water-conserving goal.

Increasing block tariffs may be justified on increasing capacity costs and negative externality grounds. Negative environmental externalities can be caused by over-abstraction and pollution resulting from discharge of wastewater (Bailey, 2002). Hence, increasing prices will encourage water-conserving behaviour and reduce environmental externalities.

Rising block tariffs also serve the purpose of granting low-income groups access to an amount of water sufficient for normal living at an affordable rate (Bailey, 2002; OECD, 1999). Further measures for targeting certain groups of society, whether residential or commercial, could be incorporated in the calculation of the fixed charges.

6.3 Issues and Options for Volumetric Charges for Refuse

The first issue when designing refuse charges is to find a workable volumetric measure. Many councils across the country provide an allowance of a 50-litre rubbish bag per household per week and charge for this service via an annual flat charge. If a household uses more than the yearly allowance of 52 bags it has to purchase extra bags from the council. Residents of Hurunui District Council are allowed two shopping bags of refuse per week, which is essentially the same as a 50-litre bag. Kaikoura District Council charges residents $2/bag self delivered to the landfill site on the southern edge of the township.

Commercial ratepayers in Kaikoura pay per m^3 either self delivered or delivered by contractors to the landfill site. Hurunui District Council requires commercial firms in Hanmer Springs to collect and dispose of their refuse individually, and their service provider bills them either by volume or by weight. Since commercial customers are subject to a user-pays principle for their refuse the following comments are mainly applicable to residential customers.

Weekly allowance schemes with an annual payment for refuse is equivalent to the flat rates observed in some localities for water and wastewater charges, and these have similar problems. Flat rates do not provide incentives for waste reduction for most households. The payment with the annual rates hides the costs to the household as they recognise the total payments more than the costs of each individual bag. Therefore, an improved system would allow for different amounts of weekly household refuse and would foster refuse reduction via volumetric, visible payments.

To reduce the stress on landfills, waste reduction should be promoted. One way of achieving waste reduction would be by offering different sized bags at different prices. If the bags are purchased individually or in lots through the retail market instead of by a payment with the rates and the issue of bags with vouchers, the actual costs to the household will become more transparent and the household could adjust more easily to changes in their waste production. This would provide a clear monetary incentive for households to bring down their amount of waste.

Chapter 7
Tourism and Water Use

We have argued in favour of user-pays-principle and marginal cost pricing. This would not discriminate between any types of customers. However, there has been considerable discussion in New Zealand about the possibility of industry specific rates or charges as a means to achieve more social equity. Tourism has been proposed for special treatment by some commentators. Reasons in favour, and against singling out the tourism industry for higher water charges in communities with a high tourist to resident population ratio are evaluated below.

7.1 Against

Tourism is a major driver of the economy and should not be put under increased pressure. Tourism plays a major role in the New Zealand economy through employment, foreign exchange earnings, investment and regional development. Statistics New Zealand (2003) report that in the year ended March 2000, tourists spent an estimated $13.2 billion in the New Zealand economy. Those expenditures provide a major revenue source to central government via GST and other charges. An estimated 94,000 full-time equivalent employees were directly engaged in tourism over this period. Making tourism operators pay more than other commercials might restrain the growth of the sector and therefore harm the economy as a whole (Geddes, 2002). Other businesses probably profit from intense tourism as well, so a single commercial rate might be sufficient as opposed to differentiating between different commercial users.

The NZBRT (1995) sees no economic reasons why old and new customers should be distinguished when using joint facilities. In particular, all customers should pay for a capacity expansion, since the last old and the first new user are equally responsible for the expansion. However, this counteracts the user-pays-principle.

A well thought through charging system, respecting the user pays principle, makes superfluous an additional charge to specific industries.

7.2 In Favour

Domestic and international tourists place a temporary stress on the water distribution system. This financial and environmental burden has to be carried by the permanent residents and businesses. Though tourism businesses might pay for excessive water use they are paying the same fixed charges as any other business. Hence, tourists are most likely subsidised in their water use. Tourism is growing throughout New Zealand and will therefore place an even higher burden on the residents and non-tourism businesses in the long run.

It might be argued that domestic tourists pay for their water use at their respective residences. However, with a high influx of non-residents many tourism centre are likely to be put under higher pressure for their water supply, especially during the (domestic) high season of travel, than are places where the ratio of tourists to residents is in general lower. High water users within the tourism industry who impose higher financial and environmental burden on a community could justify sophisticated differentiation in charges.

Geddes (2002) has commented …'As if any council anywhere in NZ is going to kill the goose that is helping to lay the golden tourist egg.' International research literature suggests that tourists may pay up to six dollars out of seven of 'tourist taxes', with the remainder falling on businesses (Hiemstra and Ismail, 1993). Other authors caution this estimate may be considerably higher than the true situation (Mak, 1988; Hultkranz, 1988; McMahon, 1999). There are no estimates of the likely incidence of a 'tourist tax' in New Zealand but they are likely to vary between locations due to level of competition and availability of substitutes of the service taxed (Cullen et al., 2001).

Chapter 8
Evaluation of the Current Water Charging Regimes

8.1 General

Most Local Authorities use a flat rate collected with the general rate or a uniform annual charge (UAC). This is a relatively easy method to recover costs, since the total costs are spread over the community with a relatively simple formula, for example linked to the land value, the capital value or the number of household members, and not the actual water usage. Such a cost recovery system sets no incentives to conserve water, since the benefits of conservation are mainly social and not private.

A flat rate system has further been criticised for disregarding equity considerations and the user-pays-principle. A land or capital value-based system assumes the reflection of wealth and relative water use in the land or capital value. This is not necessarily true, for example see Bailey (2002, p.403). Businesses with the same rateable value might have different water usage, for example through the need of cooling and washing, and a pensioner who has paid off the house during a life-time might otherwise not be wealthy, and might make little use of water, wastewater and solid waste disposal services.

Most consumers will not be aware of their water costs, as they are just one part of their rate payments. This will encourage the notion of water being a free resource and hence increase opposition to a more explicit charging system. Businesses may be more aware of their water costs, however, due to widespread subsidisation of commercial water users, they often do not receive the right signals for water use and conservation.

Table 2 and Table 4 report rates and charges for three illustrative properties in Kaikoura and Hanmer Springs respectively. Table 3 and Table 5 critique those rates and charges against Hanemann's criteria, which are described in Section 5.1 on page 13.

To illustrate how the tables can be interpreted an example is provided - the criterion of non-arbitrary cost allocation: Water charges in Kaikoura do not comply with the principle of non-arbitrary cost allocation as households pay water rates irrespective of their level of water demand. However, parts of the water rates charged to commercial water users are dependent on their level of water demand. Hence, overall Kaikoura's water charges partially fulfil this criterion. Sewerage charges are uniform for households, but for businesses they are dependent on the number of pans present. Wastewater production is highly correlated to interior water use and this study found that the number of pans is a poor indicator for wastewater production. Refuse charges are dependent on volumes of solid waste produced. However, it remains to be proven that the charging structure reflects the underlying costs of the services provided.

8.1.1 Kaikoura

Table 2
Rates and Charges for Illustrative Kaikoura Properties

For a Kaikoura permanent residential home			
Water rate, uniform annual charge (50% - sections)			$142.23
Water UAC Loan costs			$84.57
Sewerage			$189.09
Refuse and recycling			$83.40
Refuse $2/bag, self delivered			
Parks and Reserves, UAC			$53.68
Public Toilets UAC			$32.07
Total annual			$585.04
For a Kaikoura B&B			
Water UAC			$142.23
Water Loans UAC			$84.57
Water volume charges	$308m^3$	$\$0.45/m^3$	$138.60
Sewerage rate	4 pans		$329.46
Refuse and Recycling			$83.40
Parks and Reserves UAC			$53.68
Public Toilets UAC			$32.07
Total annual			$864.01
For a Kaikoura Motel			
Water UAC			$142.23
Water Loans UAC			$84.57
Excess water charges	$1400m^3$	$\$0.45/m^3$	$630.00
Sewerage rate	20 pans		$1709.46
Refuse and Recycling Waste Charge			$83.40
Parks and Reserves UAC			$53.68
Public Toilets UAC			$32.07
Total annual			$2,735.41

Table 3
Evaluation of Kaikoura’s Charging Systems Against Funding Criteria

Criteria		Compliance Water	Justification Water	Compliance Wastewater	Justification Wastewater	Compliance Refuse	Justification Refuse
Revenue generation	Sufficient	Yes	The collected rates cover all costs.	Yes	The collected rates cover all costs.	Yes	The collected rates cover all costs.
	Stable over time	Yes	Revenue predictable, linked to commercial water use.	Yes	Revenue is predictable & does not change with sewerage use.	Yes	Revenue is predictable & does not vary much with volumes.
	Administration costs and complexity	Costs only	Flat rate for residents, meters read for commercial users.	Yes	Charges vary with number of pans.	Yes	Uniform Annual Charge
Cost allocation	Non-arbitrary	Partial	Commercial users pay by volume used.	Partial	Pan charges for commercial properties.	Partial	Pay per volume for commercials and residents.
	No cross subsidisation	Partial	High residential water users are subsidised.	No	High residential users, and large commercia l users subsidised?	Partial	Pay per volume for commercials and residents.
Incentive provision	Static efficiency	Partial	No water charges for residents, and no peak water charges.	Partial	Pan charges are simple proxy for usage rates	Partial	$2/bag residents, commercials pay by m^3
	Dynamic efficiency	Partial	Water charge on commercial firms may modify long-run use.	Partial	Pan charges may modify long-run use if high enough.	Partial	$2/bag residents, commercials pay by m^3
	Encourage conservation	Partial	No resident charges, but meter charges for commercial firms.	No	Weak incentives for users	No	$2/bag residents, commercials pay by m^3
	Correct interpretation	Partial	Transparent system, some OK incentives	Partial	Transparent system, some OK incentives	Yes	Transparent system, some OK incentives

8.1.2 Hanmer Springs

Table 4
Rates and Charges for Illustrative Hanmer Springs Properties

For a Hanmer Springs permanent residential home

Water rate UAC			$120.00
Water volume charge	$188m^3$	$0.47910/$m^3$	$90.07
Sewerage	1 pan		$67.00
Solid Waste, 2 bags /week allowed			$55.00
Total annual			$332.07

For a Hanmer Springs B&B

Water rate			$120.00
Water volume charge	$200m^3$	$0.47910/$m^3$	$95.82
Sewerage rate	4 pans		$267.00
Total annual			$482.82

For a Hanmer Springs Motel

Water rates			$120.00
Water volume charges	$2316m^3$	$0.47910/$m^3$	$1,109.60
Sewerage rate	20 pans		$1,067.00
Total annual			$2,296.60

Table 5
Evaluation of Hanmer Springs Charging Systems Against Funding Criteria

Criteria		Compliance Water	Justification Water	Compliance Wastewater	Justification Wastewater	Compliance Refuse	Justification Refuse
Revenue generation	Sufficient	Yes	The collected rates cover all costs.	Yes	The collected rates cover all costs.	Yes	The collected rates cover all costs.
	Stable over time	Partial	Revenue changes with water use.	Yes	Revenue does not change with sewerage use.	Yes	Revenue is predictable & does not vary much.
	Administration costs and complexity	Yes	Meter read 1/year for residents & all users.	Yes	Pan based charges	Yes	Uniform Annual charge
Cost allocation	Non-arbitrary	Yes	All users pay by volume used.	No	Pan charges for commercial properties.	Partial	Commercial refuse collected by contractors
	No cross subsidisation	Yes	All users pay by volume used.	Partial	High residential users subsidised.	Partial	High residential users subsidised. ?
Incentive provision	Static efficiency	Partial	No peak water charges.	Partial	Pan charges are simple proxy for usage rates	No	Flat charge for residents
	Dynamic efficiency	Partial	Water charges may modify long-run use.	Partial	Pan charges decline with numbers.	No	Flat charge for residents
	Encourage conservation	Partial	Some incentive for water conservation.	No	Charges independent of output	No	Flat charge for residents
	Correct interpretation	Partial	Transparent system, some OK incentives	No	Non-linear charges, no incentives to reduce output	No	Flat charge for residents

Chapter 9
Proposed New Charging Structures for Water Services

9.1 General

9.1.1 Cost Allocation to Fixed and Volumetric Parts of the Tariff

As argued above splitting the fixed and variable costs between the fixed and flow charges depends on the objectives of the local authority. From a costing perspective the charges should reflect the underlying cost structure. Risk adverse behaviour would mean a higher share of fixed charges than the share of fixed costs. Conservation objectives would favour covering some of the fixed costs with flow charges. Our examples below show that such a scheme also favours low water users such as residential households and commercial users with a low water demand.

The volumetric part of the water charge should include the operational and environmental costs of water abstraction, water treatment, water delivery, wastewater collection, wastewater treatment and waste disposal. It is assumed that direct variable costs are relatively constant across different levels of water demand. Information about the cost structure of water supply is needed to confirm this. The environmental costs are most likely to increase with increased water demand. In addition, the local authority might decide to include some of the fixed costs in the flow charges.

Increased volumetric charges are also justifiable on equity considerations. Increasing block tariffs serve the purpose of granting low-income groups access to an amount of water sufficient for normal living at an affordable rate. (Bailey, 2002; OECD, 1999) A property value-based system assumes a direct relationship between wealth and relative water use. This is not necessarily correct, for example see Bailey (2002, p.403). Businesses with the same rateable value might have different water usage, for example through the need of cooling and washing, and a pensioner who has paid off their house during a life-time might not otherwise be wealthy.

A relatively high first fixed charge is based on the fact that most of the fixed cost can be assigned to the supply of the first unit of water. Nevertheless, additional fixed charges for subsequent blocks of water demand can be justified on the basis of increasing capacity needs with the associated direct and environmental costs. Increased capacity needs are especially severe during peak periods as was observed during the data collection for this research. The amount charged for the first block of water should reflect the greater share of fixed costs in the first unit of water supply. Therefore, it should include administrative costs, basic capacity costs and basic infrastructure costs. The resulting first block of fixed charges will be relatively large compared to the fixed charges for the subsequent blocks.

The size of the first block of fixed charges determines the trade off between revenue security (coverage of costs and revenue stability), with social and environmental aspects, meaning equity and incentive structures. Greater revenue security would be achieved with a larger first block of fixed charges, but this would counteract equity and water conservation goals.

The additional fixed charges for the subsequent blocks of water delivery should start at a low value and then increase. The main reason for such a structure is the stress inflicted on the capacity, after the first unit of water has been accounted for. Higher water users create a greater pressure on the current system and a greater likelihood of need for additional capacity.

9.1.2 Setting the block limits

The choice of the number of blocks is a trade-off between complexity and transparency of true costs. True costs include direct and environmental costs associated with increased water usage. Within one block the customer will be charged a constant per cubic metre price for the volumetric charges plus the respective fixed charges when entering a new block. The size of the blocks should be determined by considering the water demand distribution of different customer groups.

The suggested three blocks system will not perfectly reflect true costs. However, it will improve on cost allocation when compared to the current charging schemes used in both communities. A three-block scheme will achieve water conserving and equity goals reasonably well. Its simplicity will increase its acceptance and understanding by customers.

The first block should be set with respect to water demand from residents (permanent and holiday homeowners) and businesses with low water demand. This group will be labelled as residential users in the following discussion. The upper limit of water delivery for the first block should be just above the average residential water demand, for example being exceeded by only the upper 20 to 30 percent of residential users.

More than one block of water charges tailored for the residential customers could be introduced based on the income distribution of the community. Studies suggest income elasticity for water demand ranges from 0.5 to 1.0 (OECD, 1999). Lower income groups are expected to consume less water or substitute towards a less water intense life-style more quickly. Thus, if the council wanted to support lower income groups it could introduce a low water usage block with lower fixed and volumetric charges. A general argument against such a low water demand block is that even with three blocks, low water users will still pay less than they do now with a uniform annual water charge. If the community has a relatively even income distribution this is a further reason in favour of a simpler water charging system.

Water conservation incentives are set for every customer with the introduction of volumetric charges for every cubic metre demanded. A switch to the second block will cause additional fixed charges, though not as high as the first tranche, and higher volumetric charges for the additional water used above the first limit. This will set even stronger conservation incentives for customers using more than the average residential customer, here the top 20 to 30 percent of all residential customers.

Every customer demanding water from the public water supply will have to pay the first tranche of fixed charges covering most fixed costs as detailed above, as well as the low volumetric charges. This will secure a great part of the revenue needed for the operation of the water utility. The first part of the revenue generation should not overpower the subsequent charges in order to maintain an overall incentive structure. Therefore, there should still be a significant increase in volumetric charges for blocks two and three.

The upper limit of the second block could be chosen with respect to the average water demand of the small or medium sized commercial customers, aside from those which have a very low water demand, for the same reasons as the choice of the upper limit of the first block. This group is likely to incorporate backpacker accommodation and food providers, and will be labelled small tourism service enterprises (STSE).

The group of the remaining commercial customers, is likely to consist of hotels, motels and camping grounds and can be labelled large tourism service enterprises (LTSE), and should be pooled in the third block. The higher level of volumetric charges in this block provides additional incentive for these users to conserve water. However, the wide range of absolute water demand over a relatively small number of businesses makes any further differentiation, and more blocks, infeasible.

Aside from the first block of fixed charges the fixed charges for the blocks should be set with regards to the effects of water demand on the capacity requirements. This will in turn go in line with increased stress on the environment. Considerations for the size of the first block were given above. The second block of fixed charges can be relatively low compared to the first tranche of fixed charges. The existence of additional fixed charges will emphasise the additional capacity costs inflicted on the water supply system. Given that a significant jump in water demand between the STSEs and the LTSEs was observed, the fixed and volumetric charges for the third block should be significantly higher than those of the second block.

9.1.3 Seasonality

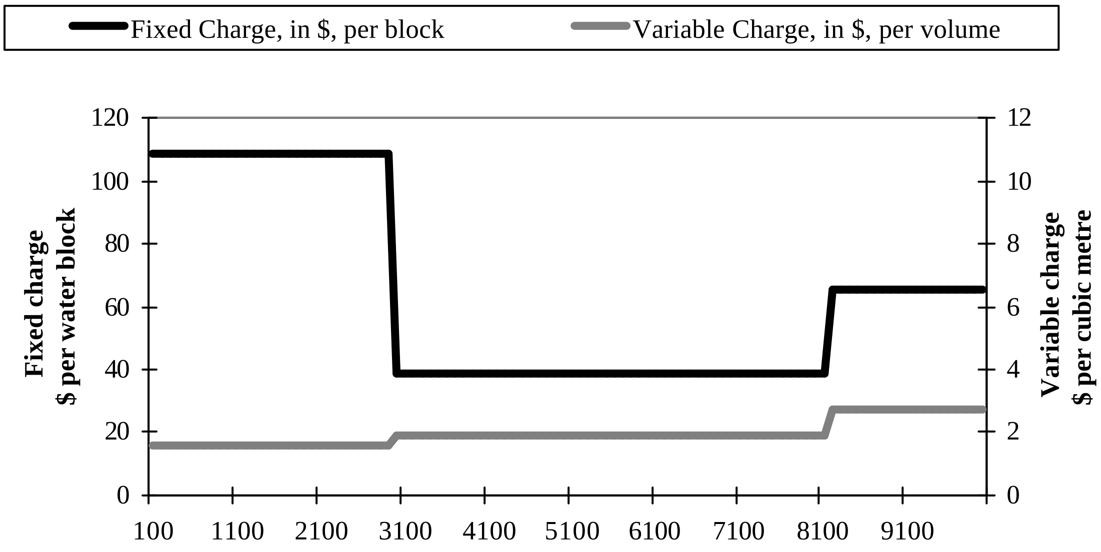
The proposed charging system should be further enhanced by the introduction of seasonal rates. The time series data available supports different rates during the course of a year due to varying water demand patterns. These patterns are driven by seasonal residential demand, mainly due to irrigation, as well as by varying tourist flows. Higher residential demand in summer usually coincides with higher water demand due to increasing tourist numbers (daytrips and guest nights). Seasonal water charges ensure in particular that permanent residents will not overly carry the burden of increased water usage by visitors during the peak-visiting season.

An increased summer rate for all charges will reflect the increased capacity constraints and environmental burden during summer time. Wastewater volumes yielded at the property boundary, mainly depend on guest nights. Thus, different ratios of water to wastewater usage could be applied for different seasons, but that adds complexity. While seasonal water to wastewater ratios are desirable to signal correct costs, they might not be recommended on the grounds of excessive complication of the charging system.

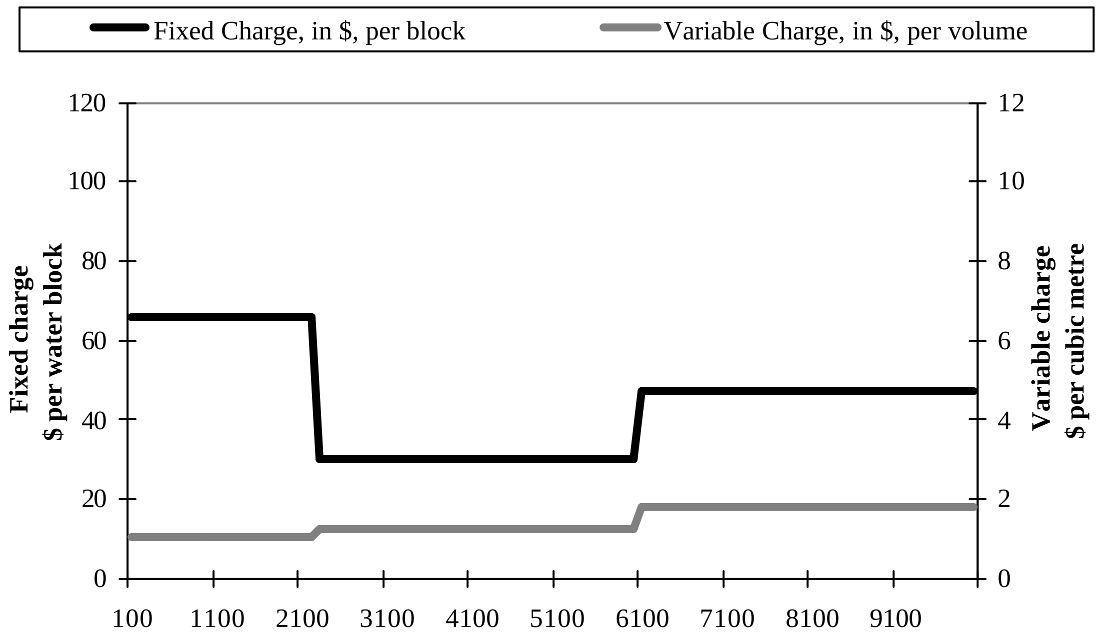
Given that seasonal pricing is chosen, the number and length of seasons has to be decided. Four seasons of varying duration and three different price levels would encourage greater efficiency of water use. Block limits will need to be set to the right level for each season, to be sure they work as planned. If it is perceived that a four seasons/three prices scheme is not feasible, for example because of its greater educational demands, an alternative two season/two prices scheme could be used. A more complex system requires more effort by managers as well as customers to understand the system and to see its merits.

In the case of a two season scheme water demanded from, for example, December through to April could be charged at a high volumetric price and the remainder of the year would have a lower charge. Customers would not have to learn as many seasonal cut-off points and the different prices, but the incentives for efficient water use during the course of the year are reduced. However, it could also be the case that customers would be more inclined to support a more efficient system, than a compromise solution, given that seasonal pricing is introduced. Figure 2 illustrates hypothetical water charges for two seasons. The high season volumetric charge has been arbitrarily set at 150 percent of the low season volumetric charge to illustrate peak season pricing. Note that the peak season volumetric charges per metre are not large.

Figure 2
Illustration of Possible Water Charges for Two Seasons.



High Season water charges



Low season water charges

9.1.4 Bridging a Lack of Data

In practice communities are most likely to be faced with little data to base a new charging scheme upon. Water meter reading will still be necessary. These may be read annually only (which is the most common practice), or preferably two times per year at the beginning and end of the peak and low seasons. This is discussed later in this section.

As discussed earlier, (Section 6.2.4) the seasonal profile of water demand may be simulated using indicator profiles such as Statistics New Zealand's commercial accommodation surveys (CAS) for districts or other indicators such as the town's Information Centre door count. The relative water demand between the different sectors will vary throughout the year, however it is reasonable to assume that this relativity is stable within the two main seasons (winter and summer) of the year. Daily Visitor Centre door counts are readily available in most tourist towns and these profiles can be used to depict the seasonality of water demand for a particular sector. It is expected that two seasons/two prices will be chosen by TLAs and hence described further, but the same principles apply to the more detailed pricing scheme.

CAS data or Visitor Centre door counts should be averaged over a number of years to increase stability in the resulting visitor pattern. As this pattern will ultimately determine water charges stability is necessary to reduce the risk of income fluctuations for the local authority and the risk of fluctuations in water charges for businesses and residents. The length of the peak season requires judgement based upon increases and decreases in visitor numbers, assuming that residential peak water demand coincides with the tourism peak season.

The duration and dates of the two main tourist seasons (high and low season) can be determined from the Visitor Centre door count profile. If there is one water meter reading only then this one reading can be seasonally profiled using the Visitor Centre door count profile. This profile can be made more accurate by reading the meter twice a year.

As an example of one reading per year, assume the peak season runs from December to April each year. Visitor counts should be used to calculate the percentage of total visitor number to the community who visit during the designated peak season. If we assume 80 percent of all visits occur during the peak season, then approximately 80 percent of annual water consumption will be used during the peak season. They might in fact use more than 80 percent of the total water as little irrigation is necessary during winter (off-peak) months.

It is argued that the peak period consumption should pay 80 percent of the total annual costs of water supply. Current charging systems implicitly charge 42 percent of annual costs for water used during the peak five months. If meters are read annually, then each connection will be assumed to use 80 percent of its annual water demand during the peak period.

This method could be improved if the meters were read twice a year, at the beginning and the end of the season. The information gathered would, over the course of a few years, provide a better data base for the calculation of peak water usage relative to off-peak water usage. However, the timing of seasons and therefore meter readings would still have to be determined by visitor counts.

It would have to be determined whether household demand shows the similar seasonality as commercial, particularly tourism related water demand. A certain degree of seasonality is expected for all water users as the high tourist season tends to fall in the drier summer months when landscape irrigation significantly increases water demand. Even if the seasonal pattern of non-tourism related sectors is weaker compared to tourism businesses higher seasonal charges for the summer months are still justified on the basis of higher stress on the infrastructure and higher opportunity costs in general during those months. In addition, low water users such as households and small commercial businesses will not be affected as much by seasonal changes in rates due to the structure of the proposed charging scheme.

Wastewater production is seasonally different in two ways. Firstly, more visitors in summer produce more wastewater. Secondly, higher irrigation needs during summer reduce the wastewater production/water demand ratio, meaning that during summer less wastewater is produced for every unit of water demand. Thus, overall the seasonal pattern exists, but is not as pronounced. Snapshot studies could help to determine the off-peak and peak ratio of wastewater/water. These ratios could then be used to assign the annual costs of sewerage in a similar fashion to the water cost allocation. For example, assume the wastewater/water ratio is 1:1 in winter and 3:5 in summer. Hence, with 80 percent of water used during the peak season close to 50 percent of all wastewater would be produced and have to be paid for during the peak period.

9.1.5 Implementation

Meters will need to be read at the end of each season and the seasonal bill sent to each customer. A continued practice of data collection and use of computer support will make it possible to reassess block limits. Solid computer support will make the choice of the more efficient four seasons/three prices seasonal model more feasible. In a seasonal context the block limits should be set with respect to the seasonal average of residential, STSE and LTSE water demand. Continued reassessment will ensure efficient water use at any point in time and across time.

Optimally, a system to calculate charges will only need the current meter reading per customer to deliver the necessary seasonal limits and prices for the following seasons. This requires having not only detailed metered readings, but also data on different cost components. Once such a computer programme to calculate charges is in place the administration costs will be reduced to meter reading, data entry and mailing out the bills. Christchurch City Council employs four to five full time meter readers for 100000 readings per year (pers comm van Toor, 2003). In a first approximation for a community with 1000 connections this would equate to just over four percent of these costs (1000x4=4000 readings per year). If a yearly wage of $31,000 is assumed meter reading would amount to around $5 per year per customer plus some office costs.

In a number of OECD countries some form of increasing block structure for water tariffs is used nationwide or in parts of the country. Mainly two or three blocks are used, for example in Australia, Belgium, Canada, Luxembourg, Netherlands, Spain, Switzerland and Turkey. Countries with many blocks are Greece (5), Japan (2-7), Korea (6-10) and Portugal (2-5). For Mexico the number of blocks are unspecified. Most increasing block schedules have a fixed charge; Canada, Greece, Korea, Mexico, Spain and Turkey also have a minimum allowance. The water tariffs are geared towards social and water conservation concerns, and achieve these goals (OECD, 1999).

Achieving understanding and support by the water utility's customers of a more complex system, such as the one proposed, should be a high priority goal. The Banks Peninsula District Council has set a positive example by fostering the acceptance of water metering in general (Foote et al., 2002). The success of that campaign provides grounds for believing it will be possible to achieve understanding and acceptance of the proposed charging scheme and its merits.

9.2 Calculated Examples

Available water data and management account data was used for calculating example charging schemes for water. Before describing each community in turn some general comments are made. Only financial costs for water demand are considered in the following. Environmental costs and sewerage costs are not taken into account. The proposed charging schemes follow the suggestions made in the previous paragraph. However, due to a lack of data no seasonal charges could be calculated. Also, the blocks could not be set with respect to the characteristics of the water users (residential, STSE, LTSE) but are calculated on the basis of the available water demand data only. The results suggest residential users face only the first block charges.

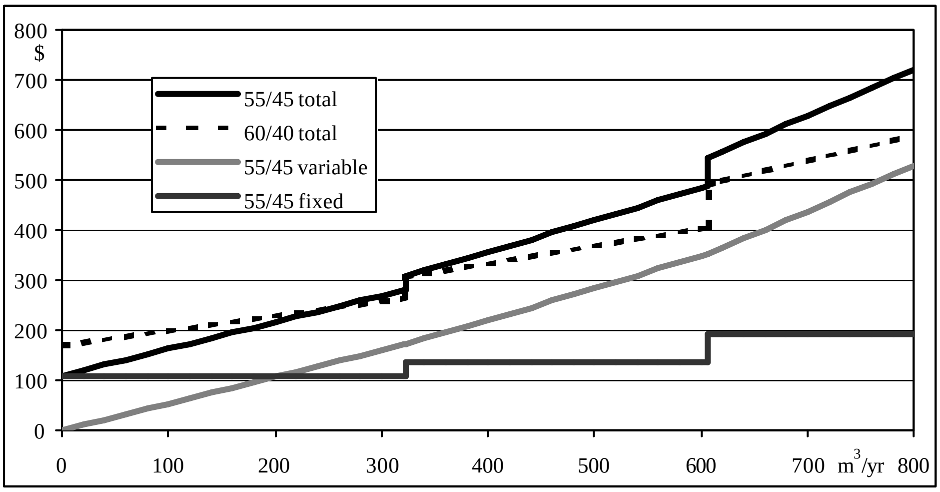
The general procedure was as follows; details for the two communities are described below. The management account data was divided up into fixed and variable costs. Where possible the cost data was averaged over a number of years. The water demand data and cost data was fitted to the same timeframe, for example broken down to a weekly figure.

The variable charges where calculated first and determined the upper limits for the blocks. The first block was supposed to cover 60 percent of all variable costs, and the two subsequent blocks covered 20 percent of all variable costs each. These block limits were used when calculating the fixed charges. The first block of fixed charges was supposed to cover the majority of the fixed costs (90% and 95% respectively). Differences in ratios were necessary to obtain results consistent with the proposed charging schemes. It is expected that this is due to only limited data available as well as different water demands in the two communities. The calculated charges and blocks are subsequently applied to water demand averages calculated for different user groups in the two communities.

Table 6
Underlying Charges for Examples

	Cost split	1st block	Charges in $		2nd block	Charges in $		3rd block	Charges in $	
		Upper limit	Variable	Fixed	Upper limit	Variable	Fixed	Upper limit	Variable	Fixed
		m^3/yr	per m^3	per yr	m^3/yr	per m^3	per yr	m^3/yr	per m^3	per yr
Kaikoura	55/45	332	0.5299	109.04	607	0.6358	26.85	none	0.9156	55.65
	40/60	332	0.2928	168.67	607	0.3514	41.53	none	0.5060	86.07
Hanmer Springs	55/45	373	0.3419	109.23	1212	0.4102	40.24	none	0.5907	68.75

Figure 3
Example charges for Kaikoura



For some cases the results show fixed charges being higher with the proposed scheme compared to the current charges. This is only superficially contradictory to the arguments made earlier as the fixed charges are a sum of different block charges. Hence though being higher than current fixed charges they set an incentive to reducing water consumption; a characteristic not shared by current fixed charges of both communities.

9.2.1 Kaikoura

For Kaikoura six years of management account data and budget data was available. The variable costs made up around 39 percent of the total costs over these years. All costs were averaged over the six years to obtain one figure for each of variable and fixed costs.

Water data was available from the snapshot studies as well as daily flow data from the main water source. The snapshot studies had varying numbers of observations which would have distorted the results. Hence some observations were counted multiple times to get a roughly equal number of observations, which turned out to be around 410 for each observation week. The data was further aggregated to one database. The number of observations was 1141. The resulting sum of water demand made up around four percent of the yearly water demand. Thus four percent of the total annual costs had to be spread across the observations.

For Kaikoura two models were calculated. One reflects the percentage of fixed costs in the fixed charges (60%). The other one covers 55 percent of all costs with flow charges. In both cases other parameters of the model were kept constant. Hence, 60 percent of all costs to be covered by flow charges were assigned to the first block and the remainder spread equally across the two other blocks. The first block also covered 90 percent of all costs assigned to the fixed charges with the remainder spread equally across the two other blocks. The resulting examples calculated are summarised in Table 7.

Table 7
Example Charges for Kaikoura

	m^3/yr	Currently	Proposed		
			55/45 split	40/60 split	
Residential	188				
Water rate, UAC		$142.23			
Water loans UAC		$84.57	$109.04	$168.67	Fixed Charge
Water volume charges		$0.00	$99.61	$55.05	Variable Charge
Total annual		***$226.80***	***$208.66***	***$223.71***	***Total annual***
B&B	308				
Water UAC		$142.23			
Water loans UAC		$84.57	$109.04	$168.67	Fixed Charge
Water volume charges		$138.60	$163.20	$90.18	Variable Charge
Total annual		***$365.40***	***$272.24***	***$258.85***	***Total annual***
Backpackers	1430				
Water UAC		$142.23			
Water loans UAC		$84.57	$191.54	$296.27	Fixed Charge
Water volume charges		$643.50	$1,104.20	$610.18	Variable Charge
Total annual		***$870.30***	***$1,295.74***	***$906.45***	***Total annual***
Camping Ground	3200				
Water UAC		$142.23			
Water loans UAC		$84.57	$191.54	$296.27	Fixed Charge
Water volume charges		$1,440.00	$2,724.80	$1,505.71	Variable Charge
Total annual		***$1,666.80***	***$2,916.34***	***$1,801.98***	***Total annual***
Motel	1400				
Water UAC		$142.23			
Water loans UAC		$84.57	$191.54	$296.27	Fixed Charge
Water volume charges		$630.00	$1,076.74	$595.00	Variable Charge
Total annual		***$856.80***	***$1,268.27***	***$891.27***	***Total annual***

A few points are worth noting. When comparing the current charges with the 40/60 (variable costs/fixed costs) split, the changes in annual charges are not great, ranging from 1.4 percent to eight percent, and the low water users are financially better off. Though the charges are similar in total dollar amounts to the current dollar amounts the example charges are preferable because they provide water conservation incentives to users and confer less cross-subsidisation of high water users for example.

Considerable changes in dollar amounts exist when the flow charges cover 55 percent of all costs. In this case the low water users are even better off and the high water users would be facing increases in total water charges of up to 70 percent. Incentives for reducing water demand would be quite significant.

9.2.2 Hanmer Springs

For Hanmer Springs 11 years of management account data and budget data was available. Again, the variable costs made up around 39 percent of the total costs over these years. The rates collected suggest that the annual costs of providing the service are around $220,000.

Water data was available from the snapshot studies as well as from annual meter readings for four years. The annual readings were preferred for calculating the example charges. The annual values were averaged for each connection. The number of observations was 836. The annual costs were spread over the annual water demand averages.

With the suggested charging model for Hanmer Springs, 55 percent of all costs are assigned to flow charges. A model with 40 percent of costs covered by flow charges was also calculated. However, it is not summarised here, as it is not superior to Hanmer Springs' current charging scheme. The first block of charges covers 60 percent of these costs and the remainder are spread equally across the two other blocks. The first block also covers 95 percent of all costs assigned to the fixed charges, the second block covers 3.33 percent and the third block the remaining 1.67 percent. The results of the calculated examples are summarised in Table 8.

Table 8
Example charges for Hanmer Springs

	m^3/yr	Currently	Proposed	
			55/45 split	
Residential	188			
Water rate		$120.00	$109.23	Fixed Charge
Water volume charges		$90.07	$64.27	Variable Charge
Total annual		***$210.07***	***$173.50***	***Total annual***
B&B	200			
Water rate		$120.00	$109.23	Fixed Charge
Water volume charges		$95.82	$68.37	Variable Charge
Total annual		***$215.82***	***$177.61***	***Total annual***
Backpackers	1250			
Water rate		$120.00	$218.22	Fixed Charge
Water volume charges		$598.88	$494.10	Variable Charge
Total annual		***$718.88***	***$712.32***	***Total annual***
Camping Ground	6430			
Water rate		$120.00	$218.22	Fixed Charge
Water volume charges		$3,080.61	$3,554.18	Variable Charge
Total annual		***$3,200.61***	***$3,772.41***	***Total annual***
Motel	2316			
Water rate		$120.00	$218.22	Fixed Charge
Water volume charges		$1,109.60	$1,123.84	Variable Charge
Total annual		***$1,229.60***	***$1,342.06***	***Total annual***

Again the low water users are better off with the proposed scheme in comparison with the current charges. A water user demanding around 1,250 m^3 per annum would face little change in the total amount of charges paid. The other user groups would have to pay significantly more (high water users) or less (low water users) respectively.

9.3 Summary in Table Format

Table 9
Evaluation of Proposed Water and Sewerage Charging System Against Funding Criteria

Criteria	Sub Criteria	Compliance	Justification
Revenue generation			
	Sufficient	Yes	Computer support will ensure that the collected rates cover all costs.
	Stable over time	Yes	Preceding and continued water demand monitoring will ensure stability.
	Administration costs and complexity	Yes	Slightly higher complexity, but communication skills and computer support will assist.
Cost allocation			
	Non-arbitrary	Yes	User pays principle
	No cross subsidisation	Yes	User pays principle
Incentive provision			
	Static efficiency	Yes	The continued practice of reassessing the block limits will ensure efficient water use at any point in time.
	Dynamic efficiency	Yes	The continued practice of reassessing the block limits will ensure efficient water use across time.
	Encourage conservation	Yes	The design of the block limits will encourage water conservation.
	Correct interpretation	Partially	It is a transparent but more complicated system. In combination the continued communication practice and the incentive structures will become clear.

Chapter 10
Proposed New Charging Structures for Solid Waste

10.1 A Proposal for a Better Solid Waste Charging System

An improved system would take different volumes of waste per household into account. One way to achieve this is to take the refuse rates out of the rating system and to distribute different sized bags through the retail market. The prices of the bags could increase proportionally or over-proportionally with the size of the bags. The advantages of such a system are the application of the user-pays-principle and the introduction of waste reduction incentives.

The costs of recycling are currently included in the waste collection charges. This practice should continue under a new system. It is acknowledged that this does not reflect true costs and recycling might be perceived as free. Nevertheless, the desire to avoid further complication of the charging systems and environmental reasons both weigh in favour of continuation of that policy. Under the new system higher waste producers would also pay more for recycling, such that incentives for reduction in recycled waste are also effective.

Such a system could be introduced relatively easily. It would require the estimation of refuse costs per unit volume. Current data on waste volume and costs could be used to design a system with proportional costs per volume for the introduction of the new system. Monitoring of refuse costs and waste behaviour, as well as feedback from the community, will allow for future enhancement of the refuse-charging scheme. These further improvements could be due to better cost estimations, refined information on actual waste volumes, meaning the choice of the different sizes of bags, or the introduction of waste reduction incentives through pricing. Especially the size of the bags could best be evaluated through community questionnaires.

To implement such a system decisions are required on the cost and size of bags provided. Examples are two or three different sized bags with 15, 25 and 45 litre volumes. Bags may be made available through the retail market. This should not be a great obstacle since many councils already use the retail market for the delivery of the annual allowance and the extra rubbish bags. This pay-as-you-go system does not add extra billing costs and it reduces the annual rate payments.

Those who home-compost their green and putrescible wastes may prefer to store their rubbish bag until full before putting it out for collection. Their tendency would be to purchase the bag with the lowest cost per volume (the 45L bag in Table 10). For these people the incentive to reduce waste volume is simply the price of the bag. For those who wish to have their waste collected regularly, irrespective of whether their waste bag is full, the demand for the different sized bags has to be estimated. Successful implementation requires suitable cost allocation. For this the current costs can be used as an estimate, but over a period of time cost changes due to changes in demand and the demand structure for the different sized bags should be taken into account. The sizes of the bags suggested above, means two bags of one size provides greater volume than one bag of the next size up. The prices should be chosen such that two smaller bags are more expensive than using one larger bag. The absolute costs per bag are more important than the costs per litre, since the consumer cannot break the unit of a bag.

Table 10
Example of costs for alternative fixed period solid waste collection

		Waste Volume at Collection Date (Litres)			
		15	30	45	50
Bag size (Litres)	15	*$1.25*	$2.50	$3.75	$5.00
	25	<u>$1.75</u>	$3.50	$3.50	$3.50
	45	$2.75	$2.75	*<u>$2.75</u>*	$5.50

Table 10 gives an example for charges for solid waste. The italic price in a column refers to the absolute cheapest option for the chosen waste volume. The underlined price represents a volume option 5 litres less than the next highest volume and cheaper than the next highest volume. For example, it is cheaper for a consumer to produce say 25 litres of solid waste at $1.75 than to use two 15-litre bags at $2.50.

Prices with similar properties to the above should encourage waste minimisation as well as the use of only one bag.

Table 11
Evaluation of Proposed Refuse Charging System Against Funding Criteria

Criteria	Sub Criteria	Compliance	Justification
Revenue generation	Sufficient	Yes	Through estimation of volumetric costs and refuse disposal usage.
	Stable over time	Yes	Continued cost and waste monitoring will ensure stability.
	Administration costs and complexity	Yes	Utilisation of retail market and straight forward charges.
Cost allocation	Non-arbitrary	Yes	User pays principle
	No cross subsidisation	Yes	User pays principle
Incentive provision	Static efficiency	Yes	Different sized bags will ensure efficient waste production at any point in time.
	Dynamic efficiency	Yes	Different sized bags will ensure efficient waste production across time.
	Encourage conservation	Yes	Different sized bags will encourage waste reduction.
	Correct interpretation	Partially	It is transparent and sets environmentally sensible incentives.

Chapter 11
Summary

11.1 Summary of the Findings

11.1.1 Water and Wastewater

Kaikoura

- Charging system:
  - Payments are independent of service usage for residents.
  - Incorporation in annual rates makes payments less obvious.
  - Technical problems with water meters across the commercial sector.
- Long term effects:
  - Few incentives for efficient water demand are provided.

Hanmer Springs

- Charging system:
  - Payments are dependent on service usage for all water users.
  - Seasonal charges and a higher percentage of flow charges could improve the system further.
- Long term effects:
  - Few incentives for seasonally efficient water demand are provided.

11.1.2 Solid Waste

Kaikoura

- Charging system:
  - Payments are dependent on service usage excluding recycling.
  - Recycling is included in the annual rates.

Hanmer Springs

- Charging system:
  - Payments are independent of service usage for residents.
  - Low users subsidise high users.
- Long term effects:
  - Little incentive for waste reduction provided.

11.2 Summary of the Proposals

11.2.1 Water and Wastewater

- Increasing fixed charges:
  - Large first block of charges.
  - Second additional charge lower than first block, with the third increasing again.
- Increasing volumetric block charges:
  - Limits dependent on grouped water demand.
  - At least three blocks.
- Data required before and after implementation:
  - Costs components.
  - Water usage with respect to:
    - Customer groups.
    - Seasons
- Likely outcomes:
  - Reduced water and wastewater flows, especially during peak season.
  - Lower operating costs.
  - Delayed need for new capacity.
  - Implementation of user pays principle.
  - Lower annual cost of water and wastewater for most customers.

11.2.2 Solid Waste

- Volumetric charges:
  - Include recycling in refuse charges.
  - Retail market based system.
  - Different sized bags.
  - (Over-) proportional price increase.
- Data required before and after implementation:
  - Costs components.
  - Refuse monitoring.
- Likely outcomes:
  - Reduced waste.
  - Implementation of user pays principle.

Chapter 12
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Part 2

A Toolkit for Estimating the Tourism Sector Demand and Impact on Water, Wastewater and Waste Services in Small Towns

Chapter 13
Purpose and Structure of the Toolkit

Few Territorial Local Authorities are able to accurately estimate how much water is used in their district by tourists, or just how large the tourist usage of wastewater and solid waste disposal systems are. There are two reasons for this: data are rarely available on numbers of tourists visiting a community; accurate data is not available on water use, or wastewater and solid waste production per tourist. Usage of the infrastructure may vary between classes of tourists (luxury hotel users, motels, backpackers), and between geographic locations. If these data were available TLA and other infrastructure providers would be better equipped to determine what shares of infrastructure use are attributable to tourists, plan for tourism growth, debate how to establish charging policies for these services.

There are three main parts to this toolkit.

> **The first part (Chapter 15) provides a method for a low cost desktop scoping study to evaluate the overall demand the tourism industry exerts on the town's water, wastewater and waste service**
>
> **The second part (Chapter 16) describes a method for a more detailed data collection and evaluation of the impact of tourism on the infrastructural services of water, wastewater and waste service.**
>
> **The third part (Chapter 17) offers a method by which this impact assessment can be used by territorial authorities to plan and design an appropriate charging structure for the services**.

NOTE: This toolkit does not describe, in detail, a methodology for the actual analysis of the data collected as described in Chapter 16 and Chapter 17. If the skills and knowledge for such analyses are not available in-house, such expertise may need to be contracted.

The methods and data provided in this toolkit are based on studies done in Akaroa (funded by the Foundation for Research, Science and Technology), Hanmer Springs and Kaikoura (both funded by the Ministry of Economic Development and Canterbury Development Corporation). All three studies were carried out by the Tourism Recreation Research and Education Centre (TRREC) at Lincoln University, Canterbury. These studies used snapshot studies in all three towns to collect daily micro-data such as water consumption for the whole town and selected properties, wastewater volumes and waste quantities. These were then correlated to guest-nights, and selected indicators. The Akaroa studies consisted of three 4-day snapshot studies conducted between October 2002 and January 2003. The Hanmer Springs and Kaikoura studies involved four 7-day studies in each town conducted between April 2003 and January 2004. The results of the Akaroa study has been published by TRREC (Cullen et al, 2003).

The underpinning framework for this toolkit is one of sustainable infrastructural services as discussed in detail in Part 1 Section 3.

After providing a summary of the key outcomes from the studies done on the three small Canterbury tourist towns, the toolkit offers guidelines on:

- Collection of data and information, including carrying out snapshot studies.

- Analysis of collected data.
- Synthesis and interpretation.
- Planning and design of cost allocation and charging.

Chapter 14
Introduction

In a press release, 18 Feb 2004, the Minister of Tourism noted that *2003 was a record year for New Zealand's tourism sector. For the second year in a row, New Zealand has seen over two million international visitor arrivals, with a three percent increase on 2002's record high.*

There are an increasing number of smaller towns in New Zealand that are popular seasonal tourist venues for both international and domestic tourists. The pressure on such towns with relatively weak rating resources for supporting the high standard of infrastructure demanded by this growing tourist industry is presenting difficulties for the local territorial authorities.

Box 1 highlights some specific examples pressure small tourist towns are experiencing.

Box 1

A recent headline in the ***Akaroa Mail***, (23 Feb 2003) read; *Akaroa's water stress is not over*. The article quoted the Akaroa Community Board Chairman who pointed out to a recent Board meeting, that *even though our water supply is coping, we still have to get over Easter.* Easter for Akaroa is a peak tourism period

Kaikoura Star 7 January 2004 featured a front page article on the *large amount of rubbish left lying on beaches and other public places during the holidays.* A local resident collected six bags of rubbish (*plastic, beer bottles and empty food containers*) from a local area and delivered these to the Office of the Kaikoura District Council to highlight the issue.

The same copy of the *Kaikoura Star* published a letter from a local resident complaining about the *disgraceful* state of the town - *Rubbish everywhere, filthy public toilets, overflowing rubbish bins and abused recycling containers….*

Communities require water, wastewater and waste services for households, community, commercial and business activities. These community needs are typically provided in New Zealand by territorial local authorities. Provision of these services involves substantial capital investment in collection, storage, treatment and delivery networks. As well, there are ongoing operating expenditures for these systems. In a growing and developing community, demands on the water, sewage and solid waste systems increase, perhaps leading to a need for further capital expenditure. Revenue must be collected to meet the capital and the operating costs of these systems. Users and beneficiaries of these systems pay a variety of rates and charges to meet these costs. The types of rates and charges used influence demand for these services, in the short run affecting operating costs, and in the long run influencing the amounts of investment needed.

The development and implementation of a fair and equitable revenue gathering structure for these services is dependent on having accurate and specific information about the nature of the town such as the distribution and temporal pattern of the demand different sectors within the community place on the services. This needs to be correlated to data on tourist flows and behaviour.

14.1 General Outcomes of the Canterbury Studies

Snapshot studies were the primary means used in this research to provide the required data and understanding of the town's tourist activities and profiles. As a consequence of this research experience there are a number of general outcomes that may assist with similar future studies. The key outcomes are as follows:

- Where necessary data is lacking, snapshot studies (Section 16.2) are an appropriate and necessary technique for a more detailed assessment of the impact of tourism on a town's infrastructures.
- To assess the impact of tourism on a town's water, wastewater and waste service, a profile of the numbers and categories of tourists using the town's facilities over a 12-month period is required. This may be measured or simulated.
- It is necessary to evaluate tourist flow, behaviour and seasonal patterns for each town.
- Availability and quality of available data varies between towns.
- Water, wastewater and waste monitoring varies between towns.
- Daily guest-night data is systematically collected by Statistics New Zealand, however because of confidentiality requirements these data are not accessible. Territorial and regional monthly data is readily available from Statistics New Zealand (Refer to Section 16.1.5).
- Individual property metering facilities for water consumption varies between towns. Some meters are often very difficult to locate and documentation on their location and their connection details can be inadequate. Those who read the meters have the most knowledge about them.
- Normalised water consumption (as litres/guest-night, L/GN) varies with season and accommodation type (Refer to Table 12).
- Normalised water consumption (L/GN) is significantly higher in the summer periods due to additional external water use such as landscape irrigation, swimming and spa pool/bath demand, car and boat washing. (Refer to Table 12).

Table 12
Normalised Water Demand (Litres/GN) Statistics From the Three Study Areas (Akaroa, Hanmer Springs and Kaikoura)

Accommodation category	Winter[1]		Summer		Number of readings[2]	
	Mean	Range	Mean	Range	Winter	Summer
Motel	180	75 - 270	260	120 - 1000	226	78
Bed and Breakfast	170	70 - 250	400	70 - 1300	50	66
Backpackers	150	70 - 200	180	135 - 300	81	26
Camping ground	150	50 - 240	150	100 - 190	47	10

1. Wastewater flow for each property could not be measured. It is acceptable to assume that the wastewater yield, throughout the year, (from the property boundary) is the same as the winter water consumption during the winter. Infiltration and inflow would be additional.
2. These are the number of daily water consumption reading from the three study areas (Akaroa, Hanmer Springs and Kaikoura) that were used for the statistical analysis

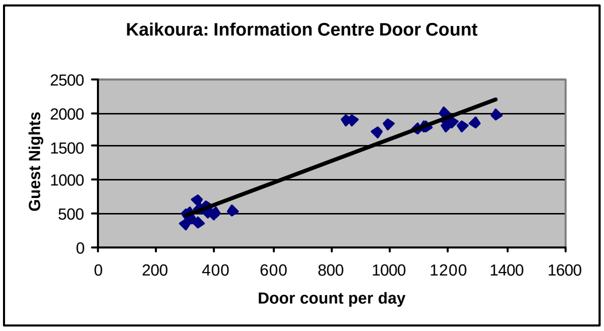
- Leakage due to pipeline failure does occur and can go undetected for some time causing significant excesses in water consumption.
- Normalised wastewater yields (to the treatment plant) can be significantly distorted by infiltration (leakage into the town's wastewater sewer pipe network from high groundwater) and inflow (leakage of surface stormwater into the town's wastewater sewer pipe network). The degree of distortion varied between towns. Some distortion can be very substantial. For example the flow rate to the Akaroa wastewater treatment plant increased 23-fold over average dry weather flow due to a large rainfall event of 217 mm (Cullen et al, 2003, p 22).
- Correlation between water consumption and wastewater production is distorted by seasonal external water demand and infiltration and inflow into the wastewater pipe network.
- The snapshot studies showed that internal water consumption and tourist industry wastewater production is related primarily to total guest-nights within the serviced area.
- For all three towns, good correlations were obtained between total daily guest-nights for the service area and daily traffic count into the town and door count at the town's information centre (Refer to Table 13 and Figure 4).

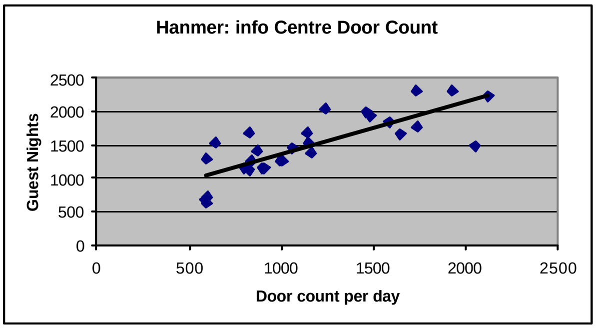
Table 13
Correlation Coefficients – GN to Indicators

Total Daily GN Correlation With	**Correlation Coefficient[1]**		
	Akaroa	**Hanmer Springs**	**Kaikoura**
Road Count	0.83	0.87	0.94
Information Centre daily door count	0.90	0.79[2]	0.96[2]

1. A correlation coefficient greater than 0.80 indicates good correlation
2. See Figure 1

Figure 4
GN/Info Centre Door Count Correlation Plots for Kaikoura and Hanmer Springs





- Other indicators may also show suitable correlations. Table 14 gives the correlation relationship between guest nights (GN) and three indicators for Kaikoura.

Table 14
Guest-Night (Y) Correlation With Indictors

Indicator	Equation	Correlation coefficient	Number of data sets
Kaikoura Visitors Centre door Count (X)	Y = 1.64x - 38.7	0.96	28
Road count[1] (X)	Y = 0.45x – 479	0.94	28
Public toilet door count (X)	Y = 0.83x + 142	0.92	25
1. The road count is the sum of the daily north bound and south bound at the southern and northern counters respectively.			

- Monthly and daily Information Centre door counts are readily available from most tourist towns. The monthly data can be used to provide a seasonal profile of the town's guest-nights which in turn can be used to simulate sector seasonal water demand and wastewater yield. Other demands (of water) that will need to be added to this will be external tourist related water demands such as (landscape irrigation and swimming pool water demands.
- Obtaining detailed daily data on solid waste practices is more difficult than it is for water data. Solid waste management procedures are diverse, varying from individuals transporting their waste directly to the transfer or landfill site to council or commercial collection services. As well there are highly varying efforts to separate and recycle solid wastes (domestic, commercial and industrial) and variable public facilities and services for collection, transfer and recycling. In addition to this diversity of practice and services, it is also very difficult to distinguish between the contribution by day visitors and overnight visitors.
- The study concluded that solid waste production per GN for commercial accommodation providers varied from 7 to 15 L/GN and about 60 percent was recyclable. Refer to Table 15.

Table 15
Solid Waste Production From Accommodation Providers

	Litres of Solid Waste/GN				
	University Accommodation	**Motel**	**Backpackers**	**Camping Ground**	**Mean**
Recyclables	3.4	7	6.5	11	7.0
Rubbish	3.84	7.75	2.7	3.3	4.4
Total	7.24	14.75	9.2	14.3	**11.4**

- The demand placed on water and wastewater services by tourist using commercial accommodation facilities can be accurately assessed. However the tourist component for tourist related non-accommodation activities (business, commercial and community) is more difficult to assess because they are shared by the permanent residents and impacted on by day visitors. Coefficients can be applied to model these shared demands.

Chapter 15
Desktop Scoping Study

This is a low cost desktop study that will enable the Council or the local tourism industry to create an approximate quantitative picture of the relative demand tourism places on the town's water and wastewater services.

15.1 Data Required

- Monthly guest-night data for the town from the Commercial Accommodation Survey (CAS) data, from the Regional Tourism Organisation or Statistics NZ – refer to Chapter 16.
- Permanent resident population.
- Twelve months of monthly water consumption and wastewater production data for the town.

15.2 Step 1

From the CAS data a crude estimate of relative person-nights can be calculated.

For example:

Using CAS data for Kaikoura, the total person-nights from guest-nights for 2003 is 255128 (Nov 02 to Nov 03). Assuming the town's population is 1900, the total person-nights for permanent residents will be about 365x 1900 = 693500. Therefore guest-nights contribute 36 percent of the person nights for Kaikoura. It can therefore be concluded that tourism will exert a significant demand on the town's services. This same analysis can also be done on a monthly basis to gain a picture of the seasonal pattern. This is important to evaluate peak season demands. This analysis does not provide a clear picture of the actual demand that tourism places of the services. To achieve an approximate estimate, proceed to Step 2.

15.3 Step 2

To relate GN to demand on water and wastewater services, the crude average water and wastewater quantities per total guest-night are given in Table 16. These values may be used with the total estimated guest-nights provided by CAS data. These values can then be compared with total town water consumption and wastewater production volumes, if such data is available. This may be done on a monthly and/or annual basis.

Table 16
Average Crude Water Consumption and Wastewater Production Per Guest-Night (GN) – Property Boundary Values.

	Off peak Season (Winter)	Peak Season (Summer)
	For Accommodation Businesses	
Water Consumption, L/GN[1]	175	275
Wastewater Production, L/GN[2]	175	185
To estimate total L/GN to include service demand due to non-accommodation tourist related businesses add 20 percent to the above values.		
These values are the averaged Crude L/GN obtained from the snapshot studies conducted for Hanmer Springs and Kaikoura. Crude L/GN for each town was the average L/GN of **all** accommodation provider categories that were measured each day of the of the snapshot period. This is an estimate of the average volume of wastewater yielded per guest-night from the property boundary. It will not include additional volumes due to stormwater inflow or groundwater infiltration.		

Based on the Kaikoura measurements the quantity of solid waste per GN resulting from commercial accommodation providers is about 10 L with about 60 percent of this being recyclable (paper, class, cans and plastics). There was insufficient data available to determine solid waste volumes per GN from street bins or tourist related non-accommodation businesses.

15.4 Initial Assessment of Infrastructure Funding Structure

If the desktop study illustrates a significant tourism demand on the town's water, wastewater and waste services, there may be issues that the Council, community and tourism industries may wish clarify with respect agreed criteria. For example these criteria may include some or all of:

- Equity of cost allocation between sectors.
- Sufficient and stable revenue generation.
- Infrastructure durability, resilience and adaptability.
- Risk minimisation.
- Efficiency in resource use and conveying appropriate signals to consumers – maybe factoring in seasonal variability.
- Acceptable ecological, social and cultural impact – short and long-term.
- Economic vitality.
- Affordable, reliable, understandable and manageable.
- Transparency.
- Provision for ongoing monitoring.

Hanemann's criteria, (See Section 5.1 Part 1), are listed in Table 17 and provide a useful checklist for the evaluation of the charging and cost allocation of the services.

Table 17
Hanemann's Criteria

Criteria	Subcriteria	Assessment Questions
Revenue generation	Sufficient	Are all annual costs covered by annual charges? Are seasonal costs covered by seasonal charges?
	Stable over time	How much unpredictable variation does the charging scheme include? Will the unpredictability reduce over time, for example by improving the database?
	Administration costs and complexity	How high are rate calculation and billing costs; for example value assessment, meter reading, pan monitoring? How high are production and distribution costs for rubbish bags? How many different rates exist for the same service; for example residential, undeveloped sections, commercial? How complex are the rates; for example combination of UAC, loan charges, infrastructure charges, non-linear pan charges, number of seasons, number of blocks?
Cost allocation	Non-arbitrary	Does charging scheme work towards achieving objectives? Does charging scheme reflect cost structure?
	No cross subsidisation	Do rate payments reflect costs inflicted; for example does a unit utilising x percent of a service pay ~x percent of the costs?
Incentive provision	Static efficiency	Are resources efficiently allocated at any point in time; for example does the unit with the highest true water need have access to the resource and is a unit with high discretionary water use encouraged to reduce water demand?
	Dynamic efficiency	Are resources channelled towards efficient allocation over time?
	Encourage conservation	Are units encouraged to change behaviour in order to reduce pressure on the resource?
	Correct interpretation	Are the charging scheme and its underlying objectives understood, and carried out by managers and customers?

15.5 Limitations

The limitations of this type of desktop analysis are:

- CAS territorial data does not include hosted accommodation (i.e., holiday homes, Bed and Breakfast, or other non-registered accommodation providers).
- Peak demands periods are poorly quantified.
- The analysis does not provide sufficient data to enable modelling and optimising improved cost allocation and charging structures.

Chapter 16
Detailed Study

As a consequence of the scoping study, the decision may be that a more detailed study is appropriate to assist the Council in designing an improved cost allocation and charging structure. This section provides the details of how such a study may be carried out.

16.1 Information and Data Gathering

16.1.1 Details of TLA Services

It is important to obtain a clear understanding of the detailed nature of the serviced areas. A visit to the Local Territorial Authority should be the starting point for gathering these details.

Request the following details from the TLA:

- A description of the town's water supply and wastewater management systems.
- A description of the town's solid waste collection and disposal service including details of street bin collection and management.
- At least 12 months of daily/weekly/monthly (what ever is available) data on:
  - total town water consumption.
  - total town wastewater production.
  - total town solid waste production – street waste, commercial and domestic.
- A plan of the town showing layout and boundaries of the water and wastewater serviced area.
- Total number and list of commercial properties with water and wastewater connections.
- Total number of non-commercial water and wastewater connections.
- Water meter installation details and meter reading programme.
- Where available obtain individual property water consumption data. This data may be available only for commercial properties.
- Name and contact detail(s) of person(s) who maintain the town's water supply and wastewater treatment plant and reads or records the water meters.
- Name and contact detail(s) of person(s) who read(s) the individual water meters.
- Name and contact detail(s) of person(s) responsible for the management of the town's solid waste service – included street waste collection.
- Details of fixed and variable costs for water and wastewater services for the township.

16.1.2 Tourist and Visitor Accommodation Data

It is necessary to prepare a complete list of accommodation providers within the serviced area**.** Overnight tourists and visitors will be accommodated by a number of providers. These will include:

- Commercial accommodation providers, and will include some or all of the following:
  - Lodges.
  - Hotels.

- Motels.
- Bed and Breakfast.
- Backpackers.
- Self contained units.
- Camping grounds.
- Commercially operated holiday homes.

- Informal accommodation:
  - Holiday homes.
  - Friends and family homes.
  - Casual parking – campervans, vans, cars, tents.

Information on commercial accommodation may be obtained from a number of sources. These include:

- Local Visitor Centre and/or Information Centre
- There are a variety of publications and websites that provide information on accommodation, for example;
  - Automobile Association publications or website: http://www.aatravel.co.nz/main/index.shtml
  - Jasons New Zealand Travel Channel publications or website: http://www.jasons.co.nz/
  - Budget Backpacker Hostels Ltd (BBH) publications or website - http://www.backpack.co.nz/
- Local knowledge – once an initial list of accommodation providers has been compiled it is of value to have this checked by one or two local people who have a detailed knowledge of the town, (maybe someone from the Information Centre).

Obtaining details of informal accommodation is more difficult. Holiday homes are often advertised in local newspapers. Some councils have classified properties as holiday homes and may be willing to make this information available. In Section 16.2 snapshot studies are recommended. Such studies can be constructed (using a street survey) to provide additional information on the informal accommodation sector.

16.1.3 Non-Accommodation Tourist Related Businesses and Commercial Activities

Small tourist towns will inevitably have a number of tourist related business and commercial activities, other than provision of accommodation, that impact on the town's water, wastewater and waste services. The degree of impact varies considerably, depending on the nature of the activity. For example a popular public bar and restaurant with public toilets and restaurant kitchen will have a much greater impact than a tourist art and craft shop with two to three staff. It is recommended that a list of all commercial and business properties be compiled, tourist related and non-tourist related. This information may be obtained from the "Yellow Pages" or a Council listing of businesses. However more reliable information can be obtained by driving all streets within the serviced area of the town listing all non–residential occupied properties. By actually seeing the business, the surveyor can assess to what extent it may be related to the tourism industry. Each property will then need to be broadly classified as tourist related or non-tourist. Tourist related properties should be further described. For example description categories could be; cafés, café/restaurant, restaurants, public bar, fast food, bakery, commercial laundry, non-food shops, small tourist business, theatre, service station and so on. The primary purpose of categorising these properties in this manner is to identify tourist related commercial and business activities that impact significantly on the town's water, wastewater and waste services. Those with significant impact normally involve kitchens and food preparation, customer toilets and bathroom facilities, washing and hosing facilities (e.g., car washing, laundry), landscape irrigation, water related entertainment, leisure and sport, and packaging (e.g., supermarket). Business and commercial activities that are not of interest are those that have no or an insignificant impact on these services, even if tourist related. To further complicate the analysis, there will be significant businesses and commercial activities that serve both the local permanent residents and tourists and visitors; for example a supermarket and public bar. These should be listed.

16.1.4 Other Tourist Activities that Impact on Water, Wastewater and Waste Infrastructure

Within the town there are likely to be significant tourist related activities other than those identified in Sections 16.1.2 and 16.1.3 that impact on water, wastewater and waste services. These need to be identified. Examples of such facilities are:

- Public toilets.
- Rubbish and waste recycling facilities.
- Public swimming pools.
- Public parks and reserves.

16.1.5 Tourist/Visitors Flows and Profiles

An accurate and quantitative description of the number, type and temporal profile of tourists visiting the town is required.

16.1.6 Types of Tourists/Visitors

Tourists and visitors to a town fall into the following categories:

- Overnight visitors –those who are not permanent resident and stay one or more nights at a residence within the serviced area.
- Day-visitors – visitors to the town or region who stop in the town and use some of its facilities but do not stay overnight within the serviced area. Those who live permanently within the local region (but outside the serviced area) and regard the town as their service town (for example farmers) are not considered day-visitors.

16.1.7 Data on Overnight Visitors

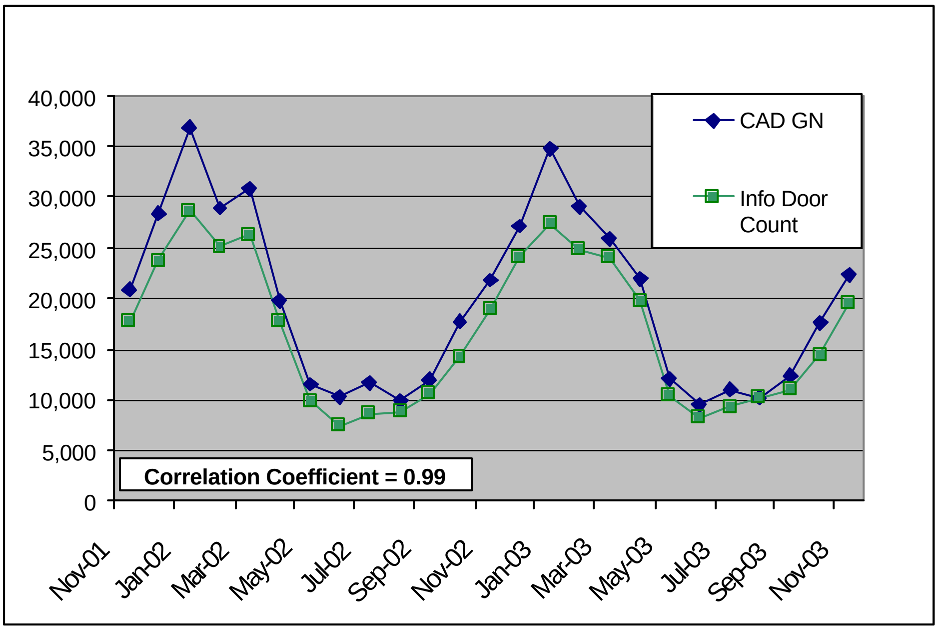
Statistics New Zealand (SNZ) collect short term commercial accommodation survey data (CAS) and present this as monthly totals for defined regions and territories in New Zealand. The data can be easily downloaded as pivot tables from the website of Statistics New Zealand. (http://www.stats.govt.nz). It contains the number of establishments, capacity, occupancy rates, guest-nights, guest arrivals, length of stay and some ratios of these variables.

This data is collated by SNZ for the local Regional Tourism Organisation (RTO) and gives the aggregated monthly data (including guest-nights) for GST registered commercial accommodation providers. Smaller providers (with annual turnover less than $30 000) that are not GST registered, are not included. This would exclude many hosted accommodation providers such as bed and breakfast and self-contained units. Also excluded from this list would be accommodation providers (such as the local pub) that do not identify accommodation as their primary business. It is also possible that the CAS territorial boundaries may differ from the boundaries of the serviced area of the town being studied. CAS data are not broken down to the different accommodation categories. To obtain this data the local RTO should be first approached. A listing of RTOs can be found at http://www.trcnz.govt.nz/NZ+Regions/. Depending on NZ Statistic's current release policy and confidentiality criteria, customized data may be obtained from SNZ (Christchurch Office) at a cost. These data could include such information as number and categories of commercial accommodation establishments, their capacity and guest-nights for each category. However for smaller towns, it is likely that confidentiality criteria may prevent the release of data required.

The monthly data is useful in providing monthly tourism profiles which are likely to reflect the local town's temporal GN profile. See examples as in Figure 5 and Figure 7.

Using such profiles with the guest-night data obtained from snapshot studies, a reasonable estimate of guest-nights profile within the serviced area can be simulated. Alternatively, if the CAS data are not available, or are considered a poor representation of the town's tourist profile, the Information Centre's door count profile can be used to give the required GN temporal profile. As seen in the Kaikoura example in Figure 5 the correlation between Visitor Centre monthly door count and SNZ Commercial Accommodation Survey data is very strong (Correlation Coefficient = 0.99).

Figure 5
Monthly Guest-Nights for Kaikoura District Provided by Statistics NZ Commercial Accommodation Data (CAD GN) and Kaikoura Information Centre Door Count



16.1.8 Solid Waste Data

As discussed in section 14.1, retrieving data on the various solid waste streams will be much more problematic than gathering data on water and wastewater due to its diverse nature and measurement difficulties. Waste management and monitoring varies significantly from town to town. As discussed in Section 16.1.1 details of the service should obtained from the TLA. With this information, identify the waste management streams and devise the best method of obtaining waste data.

The waste management streams may consist some or all of the following:

- Street collection of domestic rubbish.
- Street collection of recyclables.
- Street bin rubbish.
- Community recycling stations.
- Commercial and industrial (tourism and non-tourism) rubbish.
- Commercial and industrial (tourism and non-tourism) recyclables.
- Private collection and transport of rubbish, greenwaste and recyclables to landfill, transfer station or recycling centre.

It is possible that those who collect the various waste categories may document the quantities.

16.2 Snapshot Studies

It is recommended that four 1-week snapshot studies be carried out to obtain the necessary data to be able to create a reliable picture of the demand tourism places on the town's water, wastewater and waste services.

Two 7-day studies should be done during the low tourist season and another two 7-day studies completed during the peak tourist season for the town.

The purpose of these studies is to obtain an intimate understanding of the nature of the tourist activities in the town and to collect specific daily data.

16.2.1 Daily Data

The specific daily data that is to be collected during each snapshot study includes:

- Guest-nights for all commercial accommodation. This information can be obtained by delivering a survey from to each commercial accommodation provider (See example of survey form, Appendix A). Some providers may query why the same data that they provide regularly to SNZ, cannot be used. In such circumstances it may be necessary to explain that due to confidentiality requirements, SNZ cannot release such data. When collecting this data it is helpful to record the number of stay-units occupied by guest as well as the total number of guest present. It is also important to record the number of permanent residents living on the property.
- Water and wastewater flows for the whole town.
- Weather conditions, including rainfall.
- Individual water meter readings for representative properties such as:
    - different categories of accommodation providers,
    - different categories of tourist related non-accommodation business, commercial and community activities.

- Waste production from the different sector sources (as in Section 16.1.8).
- Information Centre door count and any other additional obvious indicator of visitor numbers within the town.
- Quantities of solid waste collected – street bins, recycling bins, rubbish and/or recycling collection, and central transfer/landfill site quantities.
- Where possible, waste quantities from representative individual properties (See Appendix A). This may be too difficult to do in some situations.

The people implementing the snapshot studies and collecting the data will gain a very good understanding of how the town operates. This knowledge and information should be documented and used for planning and managing the town's services and tourist industry aspirations.

16.2.2 Street Survey

The daily data collection procedure outlined in Section 16.2.1 will not provide data on:

- The number of day-visitors.
- The guest-nights in the informal sector such as informal holiday homes and visitors staying with friends and family.

An indication of this missing data can be obtained from survey of people in the street. A street survey involves a trained person randomly intercepting and executing a brief interview of adult people walking in the main street of the town; preferably completed where a cross-section of visitors can be interviewed. This survey should seek the following information:

- Whether the interviewee is staying overnight in the town or is a day visitor (as defined in Section 16.1.6)
- If staying overnight ask,
    - what category of accommodation are they staying at?
    - is the accommodation within the serviced area?
    - number of nights and dates.

For an example of a street survey form refer to Appendix B.

It is recommended that a minimum of three days of street survey be carried out during the low tourism season and another three days during the peak tourism season. These street surveys are to be carried out during the snapshot study period. At least one of the three days is to be during the weekend.

16.2.3 Enlisting Support for the Snapshot Studies

It is very important that these studies have substantial support and endorsement from:

- Local business associations, particularly those representing accommodation providers and tourist activities.
- Key local community groups.
- The local TLA.
- Local Information Centre staff.

- Individuals and contractors who operate and maintain the town's water, wastewater and waste services and facilities.

16.3 Data and Information Analysis and Interpretation

The data and information collected as described in Section 16.1 and Section 16.2 must be analysed and interpreted.

16.3.1 Analysis of Guest-Night Data

The daily guest-night data is to be summed for the different accommodation categories described in Section 16.1.2. Where data is missing or not provided by a particular commercial accommodation provider, a best estimate should be made by interpolation from other data (within the same category) provided.

16.3.2 Analysis of Water and Wastewater Data

Two categories of daily water and wastewater data will be collected. These are:

- Total town water consumption and wastewater production.
- Water consumption by individual representative properties.

Total Town data

Total town water consumption and wastewater production can be plotted to show the trend and relationship of the two data sets. "External" water demand (such as landscape irrigation) will not be reflected in the wastewater flow.

It is also useful to plot wastewater production with rainfall events noted. This information can provide a picture of the effect of inflow from stormwater leakage, which inflates wastewater flows. The external water demands will not enter the wastewater stream.

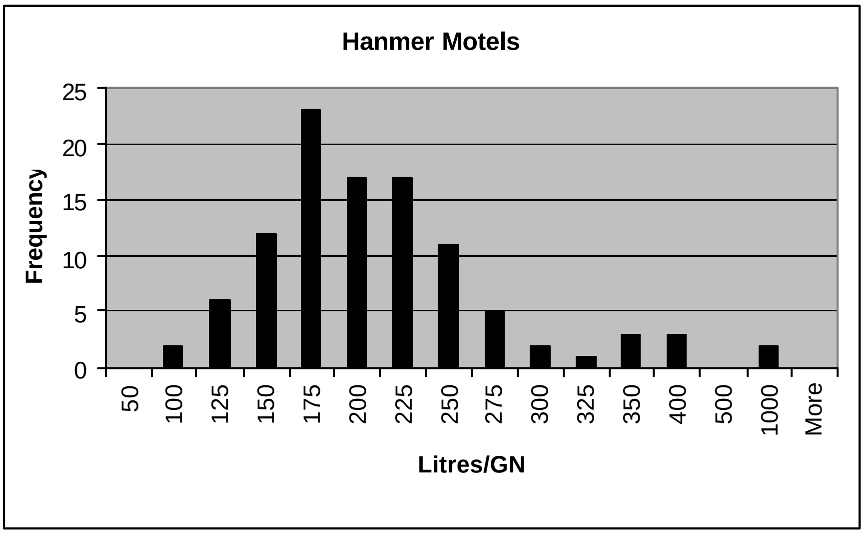
Individual Property Water Meter Data

The daily water meter data collected for individual accommodation providers and the corresponding guest-night data are to be used to calculate Litres/guest-night (L/GN). This data should be analysed for both of the following:

- Different accommodation categories.
- Low tourist season and peak tourist season.

A frequency analysis of this data should produce a distribution pattern that enables identification of internal water use (which can be used to estimate wastewater production per GN) and external water use. An example of this analysis is shown in Figure 6.

Figure 6
Histogram Showing Frequency Distribution of L/GN for Hanmer Springs Motels



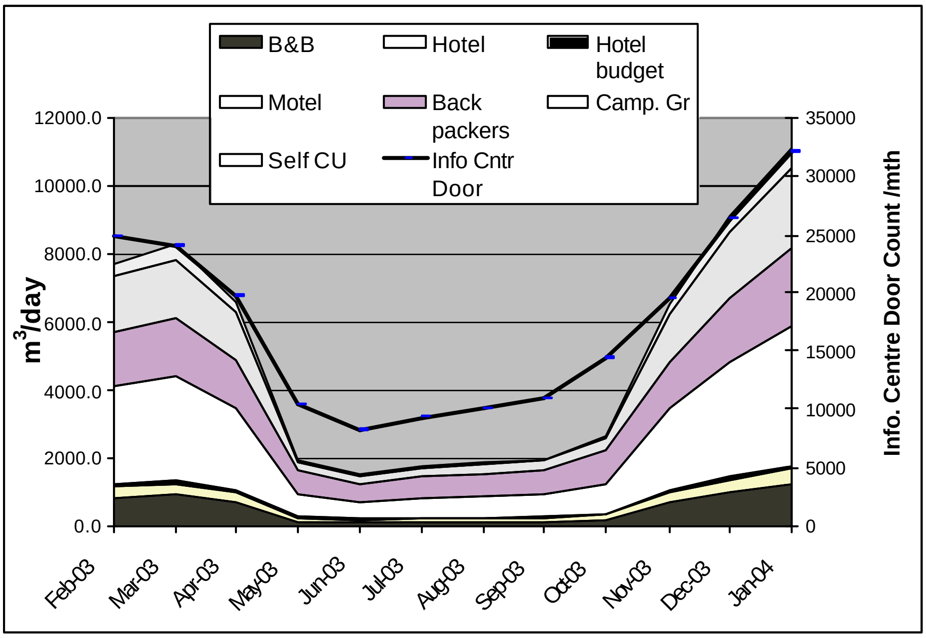
Refer to Table 12 for typical values of normalised water and wastewater volumes for the different accommodation sectors.

16.3.3 Sector Demand

The demand that different tourist industry sectors place on the services can be analysed and modelled using normalised water, wastewater and waste data in conjunction with the simulated guest-night profiles.

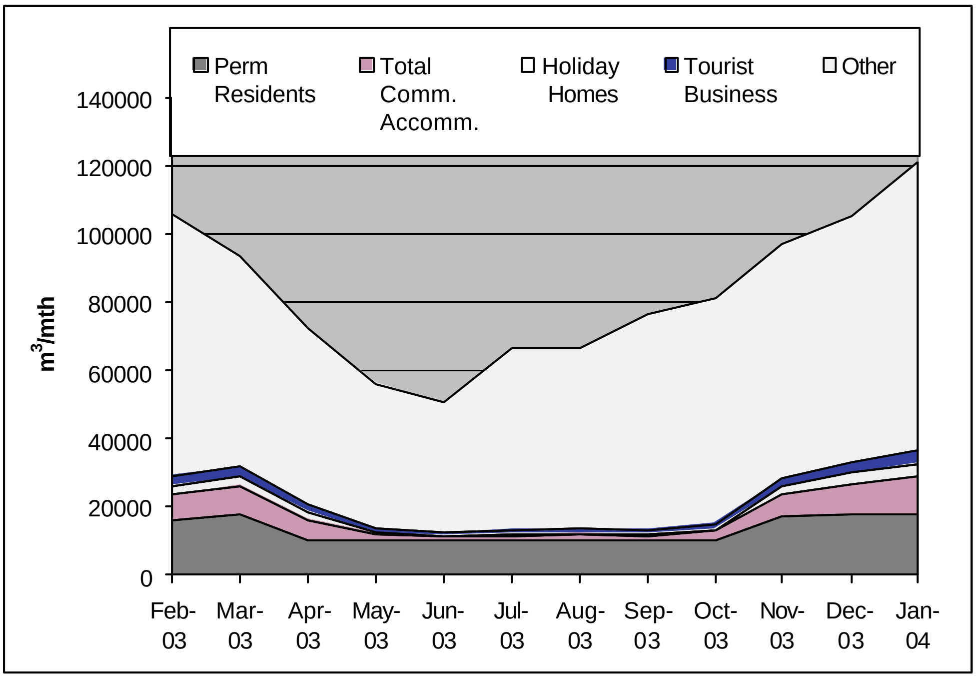
An example of this analysis is illustrated in Figure 7 where the Kaikoura Information Centre door count profile for 2003 was used with data on water consumption obtained from the October and January snapshot studies. It profiles, for a 12-month period, the monthly water demand for each of the accommodation categories.

Figure 7
Plot of Sector Water Demand for Kaikoura and Information Centre Door Count



The same method can be used to simulate the water demand profiles for the major sectors for the whole town as illustrated in Figure 8. Some care needs to be taken when considering commercial and business activities that are shared between the tourist sector and permanent residents. In this particular example, the sector labelled "other" accounts for water users in Kaikoura such as businesses not classified as tourist related, for example the diary factory, fish processing factory, farms, as well as any leakages.

Figure 8
Major Sector Water Demand Profiles for Kaikoura



16.3.4 Analysis of Solid Waste Data

The nature and quality of data on the various solid waste streams will be more variable than for water and wastewater, due simply to the diverse characteristics and measurement difficulties of the material. Where there is sufficient data it may be possible to obtain normalised (L/GN or kg/GN) quantities of solid waste yield from accommodation providers. As in the case of water and wastewater these data may be used to determine sector demand on the town's waste service.

16.3.5 Analysis of Street Survey Data

The street survey data can be analysed to provide the following additional information:

- Proportion of tourists/visitors who are day visitors as compared to overnight visitors. (As an example of this analysis see Table 18).
- The proportion of overnight visitors staying in different accommodation categories. This is particularly useful for estimating the number of overnight visitors using non-commercial accommodation such as holiday homes, homes of family and friends who are permanent residents. (For an example of this analysis see Table 19).

Table 18
Overnight Visitor to Day Visitor Ratios for 20003/04 Kaikoura Studies

Snapshot study month	July 03	October 03	January 04
Total number of people in the street survey	438	987	1981
	Overnighters to day-trippers ratios		
Day 1	1.00	0.43	0.28
Day 2	0.55	2.54	0.40
Day 3	1.62	1.30	0.99
Mean ratio	1.06	1.42	0.56
Winter mean	**1.24**	Summer mean	**0.56**

Table 19
Comparing Guest-night Shares for the 2003 Kaikoura Study

Accommodation Type	**GN Share Based on Data From Accommodation Providers**		**GN Share From Street Survey**	
	Winter	**Summer**	**Winter**	**Summer**
Bed and Breakfast	5%	5.8%	3.2%	9.7%
Hotel and Budget Hotel	2.3%	0.9%	0.9%	1.5%
Motel	25.9%	23.7%	37.9%	20.5%
Backpackers and hotels	30.4%	16.2 %	42.4%	14.9%
Camping Ground	23.6%	35.7%	-	36.4%
Self Contained Units	1.9%	2.6%	-	-
Holiday Homes	Not measured	Not measured	14.3%	17.0%

16.3.6 Synthesis and Interpretation

This toolkit offers a methodology for gathering relevant data from a small tourist town to make it possible to design a sustainable cost allocation and charging system related particularly to the town services of water supply, wastewater and waste management. The necessary analysis depends on:

- An accurate assessment of the typical tourist demand profile for the town. This can be obtained from existing indicator data such as Statistics NZ Commercial Accommodation Survey data and/or Information Centre door count. This profile is useful for two key purposes:
  - Defining the seasonal periods and the cut-off points for each charging block.
  - Using water meter readings, calculating seasonal water demand within each block.
- Sector demand profiles obtained from peak and off-peak snapshot surveys.
- Peak and off-peak water to wastewater ratios to provide assessment of full year demand on the wastewater service. This data is obtained from the snapshot study.
- Sector demand on waste services. This data is obtained from the snapshot study.
- Relative impact of non-commercial guest-nights and day visitors. This data is obtained from the snapshot study.
- The amount of fixed and variable costs for water and wastewater services for the township. This can be obtained from current year budget data. As well, a few years management accounts data for the township are needed to calculate the average ratio of fixed to variable costs for the town's water and wastewater services. This can be obtained from management accounts for the township.

Chapter 17
Planning and Design of Cost Allocation and Charging Structure

This section should be read in conjunction with Part 1 where concepts are explained and terms defined.

17.1 Objectives and Decisions

The TLA needs to decide what the desired outcomes are for their service charges. These may fall into the following categories:

- Cost recovery:
  - Allocate costs accurately.
  - Collect adequate revenue to at least cover capital and operational costs.
  - Provide incentives to avoid wasteful use of water and wastewater services.
- Avoid cross subsidisation:
  - User pays principle requires meters for every connection.
  - The less water meters are read and the more approximations are made the greater the chances of cross subsidisation and hence less efficiency.
  - More frequent water meter readings enhance the assignment of costs to users across sectors and seasons.
- Charging method:
  - A combination of fixed and volume based charges for water.
  - Blocks for both the fixed and volume based charges.
  - Seasonal variations in charges.
  - Wastewater charges linked to use volumes.
- Risk attitude:
  - Higher risk aversion increases the upper limit of the first block.
  - Higher risk aversion decreases the percentage of costs assigned to flow charges.
  - Higher risk aversion hence decreases the water conservation incentives set by charging schemes.
- Efficient water use/water conservation efforts:
  - Higher efficiency requires more blocks.
  - Higher efficiency requires more seasons and different prices.
  - Higher efficiency increases the complexity of the charging scheme.
- Seasons:
  - Decide on the number of seasons and blocks.
  - Use two seasons and three blocks as a first solution.

17.2 Data Collection and Analysis

A minimum amount of data is required to enable the design and planning of the services charging structures. The method of acquiring these data has been discussed in detail previously in this toolkit.

In summary the data required include:

- Daily or monthly Visitor Centre door counts or Commercial Accommodation guest-night data, that adequately represents the temporal profile of guest-nights within the serviced area. It is recommended that five years of this data be averaged to provide a stabilised profile.
- Peak and off-peak data from the snapshot studies:
  - Determine the daily water demand and wastewater production for each sector and their relationship.
  - Determine correlations between the indicator (Visitor Centre door counts, CAS data, other) and service usage.
- Water meter readings (preferably at least biannually) from every connection:
  - Determine the seasonal water demand.
  - Determine the relative demand for different sector groups.

With these data certain calculations/decisions are required. These include:

- Size of blocks:
  - Equity considerations and/or
  - Percentage of costs assigned to each block.
- Flow charges:
  - Allocate the total variable costs of a block to users based upon their water demand within the block.
  - The first block includes all users, the second and subsequent blocks include only those whose water use exceeds the preceding block limit.
  - Water used within a block times the charge per m3 gives the flow charge for each block for each ratepayer.
- Fixed charges:
  - Spread the fixed costs assigned to each block equally across connections within the block.
  - The first block includes all users, the subsequent blocks include only those demanding more water than the limits set for each block.

17.3 Monitoring

Improve the accuracy of the charging system as more years of data become available.

- Regular water meter reading:
  - Determine the actual use during different seasons.
  - Increase database of individual water demands.
  - Determine water demand changes over time.

- Guest-nights:
  - Identify a suitable indicator of guest-nights and monitor the indicator to obtain guest-night trends and seasonal patterns.
- Reassessing charging scheme:
  - Use bigger database to recalculate block limits and charges.
  - Improve achievement of objectives by readdressing charging scheme.
- Solid waste:
  - Determine demand for solid waste and changes in demand over time.
  - Use information to recalculate bag sizes and prices.
  - Improve achievement of objectives by readdressing charging scheme.

Chapter 18
References for Part 2

Bossel,H. (1999). *Indicators for sustainable development: Theory, method, applications*. International Institute for Sustainable Development, IISD. Canada.

Cullen, R., Dakers, A., NcNicol, J., Meyer-Hubbert, G., Simmons, D.G. and Fairweather, J.R. (2003). *Tourism: Waste and Water in Akaroa: Implications of Tourist Demand on Infrastructure.* Tourism Recreation Research and Education Centre (TRREC), Lincoln University, Report No. 38.

Appendix A
Accommodation Survey Form

Commercial Accommodation Survey. **Date……………………**

Business name	
No of permanent Residents.	
Total number of guest units.	

Contact for survey;

Name
Contact details…………………..

……………………………………

	Number of overnight guests and occupied units for the night of:						
	Mon 29th Dec	Tues 30th Dec	Wed 31 Dec	Thurs 1 Jan	Frid 2nd Jan	Sat 3rd Jan	Sun 4th Jan
Enter number of guests							
No. of units occupied							
	Mon 5th Jan	Tues 6th Jan	Wed 7th Jan	Thurs 8th Jan	Frid 9th Jan	Sat 10th Jan	Sun 11th Jan
Enter number of guests							
No. of units occupied							

PTO

Please indicate if you provide or use the following water consuming facilities:

	Some	All	comments
Is laundry done on site?	Yes/no	Yes/no	

	Yes/No	Number
Spa baths		
Spa pool (s)		
Swimming pool		
Guest car washing facilities		Not applicable
Garden/lawn irrigation used between 30 Dec and 12 Jan		Not applicable
Other significant water consuming activities between30 Dec and 12 Jan		

Estimate of solid waste production

Do you

Recycle paper/cardboard	- Y / N	Recycle glass	- Y / N
Recycle plastic	- Y / N	Recycle cans, metals	- Y / N
Compost kitchen and green wastes	- Y / N	Collect rainwater	- Y / N

If possible can you make an estimate of the quantity of solid wastes produced for each day OR for the whole week period
Specify quantity as either number of rubbish bags, bins or skip

	Mon 29th Dec	Tues 30th Dec	Wed 31 Dec	Thurs 1 Jan	Frid 2nd Jan	Sat 3rd Jan	Sun 4th Jan
Daily amount							
OR whole period							
	Mon 5th Jan	Tues 6th Jan	Wed 7th Jan	Thurs 8th Jan	Frid 9th Jan	Sat 10th Jan	Sun 11th Jan
Daily amount							
OR whole period							

Appendix B
Street Survey Forms

Over-nighters

Accommodation Codes. Hotel – **H**. Motel/Inn – **M**. Backpackers - **BP**. **YHA**. Camping Ground - **CG**. Campervan – **CV**. Holiday home – **HH**. Friends – **F**. Other – **O**.

Survey date:

# in group	# nights in Kaikoura	Tick nights accommodated							Type of Accommodation Code as above	Activity in Kaikoura	Other Comments
		Tues 30	Wed 31	Thur 1	Fri 2	Sat 3	Sun 4	Mon 5			

Day trippers

Survey date:

# in group	Activity	Local out-of-towners		Comments
		Shopping	Business	