Promoting water efficiency measures through pricing

Ross Cullen
Gerit Meyer-Hubbert
Andrew Dakers

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This presentation

- Water and wastewater services and their pricing
- Report research on Akaroa
- Outline new charges
- Comment on Dunedin’s systems
Water and Wastewater Services

- Large, costly network services
  - Capital invested big part of TLA assets
  - Annual costs big part of TLA budgets
  - Water ~34% of annual DCC expenditure ($14.4m)
  - Wastewater ~30% of annual DCC exp’t ($12m)

- Diverse range of pricing systems used
  - Hurunui all users: Charge per m$^3$
  - Christchurch residents: Charge cents per $CV$

- Can have major environmental effects
- Choice of pricing system matters
The Dunedin Networks

Dunedin water supply
- 900 km of pipelines, 57 reservoirs
- 43,000m³/day delivered

Dunedin wastewater system
- 810 km of pipeline
- 73 pumping stations, 7 treatment stations
Funding Water & Wastewater Services

- TLA have Funding Principles, e.g. DCC
- Rates set prices for water and wastewater services
- If $p = 0$, likely that usage $\uparrow$ until $MB = 0$, and $\uparrow$ demand for capacity, $\uparrow$ operating costs, $\uparrow$ environmental impacts.
Akaroa Water and Wastewater

Research on tourist use of these services, using micro data where possible. (FRST funded)

- Characterise Akaroa’s water and sewerage system
- Evaluate BPDC service charges
- Propose a new pricing scheme
The Situation in Akaroa

- Dry area
- Few permanent residents
- Holiday/daytrip destination
- Steep peak usage during summer

- Unsuccessful search for new springs
- Investment in a new dam costly - $3m?
The Data Collection Process

- 3 four-day studies (Oct, Dec, Jan) including:
  - Water metering
  - Visitor counts at various points
  - Visitor and resident surveys
  - Accommodation surveys
- Management account data (yearly)
- Monthly water flows for 6 years
- Monthly visitor counts for 3 years
Tourism and Water/Wastewater Flow

- **Guest Nights**
- **Water**
- **Wastewater**

The graph shows the flow of tourism and water/wastewater from July 1996 to July 2002. The x-axis represents the time period, and the y-axis represents the volume. The data peaks and valleys indicate changes in guest nights, water usage, and wastewater flow over the years.
Water Modelling Results (peak)

- External - Tourist: 30%
- External - PR: 30%
- Internal: Businesses: 4%
- Internal: PR: 6%
- Internal: Non-commercial GN: 20%
- Internal: Commercial GN: 10%
BPDC Rates and Charges

- Combination of UAC, infrastructure contributions and pan charges
- Excess water charges only apply above 300 cubic metres per year
- Essentially flat rate for residents, most businesses pay excess water charges
## Current Share of Costs

<table>
<thead>
<tr>
<th></th>
<th>HH</th>
<th>RP</th>
<th>Com</th>
<th>Mo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual water, sewage, refuse rates paid</td>
<td>1.00 : 1.00 : 1.01 : 4.30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual water usage</td>
<td>1.00 : 5.7 : 3.7 : 32.5</td>
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</table>

Without the holiday homeowners

<table>
<thead>
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<td></td>
<td></td>
</tr>
<tr>
<td>Annual water usage</td>
<td>1.00 : 0.65 : 5.70</td>
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</tbody>
</table>
Hanemann Evaluation Criteria

- Revenue generation
  - Sufficient
  - Stable over time
  - Complexity and administrative costs

- Cost allocation
  - Non-arbitrary
  - No cross subsidiation
  - Include all private and social costs

- Provision of incentives
  - Statically efficient water use
  - Dynamically efficient water use
  - Encourage water conservation
  - Transparent water charges
# Akaroa Charges Evaluated

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Compliance</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue generation</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sufficient</strong></td>
<td>Yes</td>
<td>The collected rates cover all costs.</td>
</tr>
<tr>
<td><strong>Stable over time</strong></td>
<td>Yes</td>
<td>Predictable and no significant changes with water use.</td>
</tr>
<tr>
<td>Administration costs &amp; complexity</td>
<td>Costs only</td>
<td>Essentially flat rate and little differentiation between users.</td>
</tr>
<tr>
<td>Cost allocation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-arbitrary</td>
<td>No</td>
<td>Due to big first block of water.</td>
</tr>
<tr>
<td><strong>No cross subsidisation</strong></td>
<td>No</td>
<td>High water users are subsidised as well as certain groups of users.</td>
</tr>
<tr>
<td>Incentive provision</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Static efficiency</td>
<td>No</td>
<td>Big first block of water, no seasonal peak charges.</td>
</tr>
<tr>
<td>Dynamic efficiency</td>
<td>No</td>
<td>High water allowance sets no incentives to change long-run behaviour.</td>
</tr>
<tr>
<td><strong>Encourage conservation</strong></td>
<td>No</td>
<td>The lack of differentiated water charges sets no incentives to engage in water conservation.</td>
</tr>
<tr>
<td>Correct interpretation</td>
<td>Partially</td>
<td>Transparent system, but no recognition of right incentives.</td>
</tr>
</tbody>
</table>
Proposed New Charges

- Same scheme for all ratepayers
- Combined water and wastewater charging
  - Wastewater as percentage of water demand
- Combination of fixed and volumetric charges
- Seasonal variation in water blocks and charges
  - E.g.: block limits may decrease and/or charges increase over summer/peak period
Marginal Cost Pricing

- Economic efficiency arguments in favour of MCP

- Possibility of underfunding
  - Risks sufficiency criteria

- Difficulty of calculation
  - Adds high complexity and makes revenues unstable

- Complicated for customers to understand
  - Deters from water conservation incentives

- Use combination of tools to get close to MCP
One Charging Scheme

- Collapsing many charges into one scheme
- Important difference to service is the amount of water used
- All sectors are treated equally
Combining Water and Sewage

- Sewage is impractical to meter
- Evidence for correlation between the two m³ in other communities
- Akaroa: high stormwater infiltration hinders correlation estimation

- Combination reduces administration and complexity
Fixed and Volumetric Charges

- Accounting for fixed and variable costs
- Block increases in price per cubic metre
  - E.g.: $1.80/m³ for first 200m³, $2/m³ for next 500m³, $3/m³ for all subsequent m³
- High first fixed charge and lower but increasing subsequent fixed charges
  - E.g.: $110 for first 200m³, +$40 for next 500m³, +$65 for all subsequent m³
Seasonal variation

- Better reflection of monetary and environmental cost at the time of the year
- Peak use has high percentage of discretionary use
- Effectiveness of peak pricing to reduce water demand
Number of Seasons

- Four seasons/three prices preferred
  - Reflects pressure on system better
  - Greater efficiency
  - Closer to marginal cost pricing

- Two seasons/two prices possible
  - Lower administration cost
  - Higher acceptance by community (?)
Determination of seasons

- **Four seasons/three prices:**

- **Two seasons/two prices:**
  - Dec – Apr – high price, May – Nov – low price
Illustrative Charges
Results for Akaroa

- Winners and losers
  - Off peak
    - Tourism businesses pay less
    - Permanent residents and ‘dry’ commercial businesses pay slightly more
  - Peak
    - Tourism businesses pay considerably more
  - Holiday homeowners generally pay less
Implementation Issues

- More accurate data on water and wastewater use is needed for setting the actual water charges
  - For the individual connection
  - Over time/seasons
- Communicate changes within community
- Estimate demand changes

- Needs time for accurate implementation
  - Will customers adapt behaviour before final implementation?
Pricing, Before and After

- 5 fixed charges, differing pan charges, 1 CV-based charge, excess water charge
- Cross-subsidiation

Set of fixed charges and set of volumetric charges for chosen number of seasons
- User-pays principle, no discrimination
What about Dunedin?

Do its **rating systems** for water and wastewater services **contribute to sustainability goals**?

Could they be improved?
## Dunedin water & drainage rates

<table>
<thead>
<tr>
<th></th>
<th>Water</th>
<th>Drainage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Residential (connected)</strong></td>
<td>$299 / property + fire protection water rate 0.1427c/$ CV</td>
<td>$181.50 / property</td>
</tr>
<tr>
<td><strong>Non-Residential (connected)</strong></td>
<td>$299 / property + fire protection water rate 0.1427c / $ CV, 70.6c/ 68.2c/54.4c m³</td>
<td>$181.50 / property + 0.37c/$ LV + 0.092c/$ CV</td>
</tr>
</tbody>
</table>
Dunedin pricing, comment...

- No incentive for residential users to reduce water use, or use of the wastewater system.
- Non-residents declining $/ m$^3$ of water hence decreasing incentive to reduce water usage.
- Non-residential properties have no price incentive to reduce volumetric use of wastewater system.
Changes in Dunedin pricing?

- DCC is **aware of lack of incentives** to conserve water, and use of the wastewater system, see LTCCP, s.5.
- **Meters are necessary** to introduce water charges/m$^3$.
  - Meters cost ≈ $300/property, last about 20 years.
  - Annual costs of 4x/year meter reading, $5.00 -$6.00.
- **Wastewater usage** can be charged by a **proxy** - m$^3$ of water used.
- Use **seasonal prices** to encourage conservation in summer.
Do prices reduce water use?

- Price elasticity of demand for water is < 1.0
- Water usage falls by 15+% with water charges/m³
- Price elasticity is greatest during peak use periods, as more water use is discretionary
- Water meters & charges assist identification of leakages
- Water meters installed in Akaroa, December 2002
  - Water use over summer peak period 40% less than in 2001/02
Sustainability and Three Goals of Rating Systems

- TLA are concerned about revenue stability
  - Two part pricing to ensure that revenue does not fluctuate unacceptably with changes in water usage

- Fixed charge plus volumetric charges as solution
  - Sufficient revenue is collected
  - Costs are more accurately allocated
  - Incentives are provided to conserve water and reduce use of wastewater system
Rating systems and Sustainability

- Reduced water use means
  - less demand for infrastructure
  - lower operating costs
  - less pressure on the water sources

- Achievements are useful contributions towards
  - economic,
  - social and
  - environmental sustainability objectives.
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