Economic value of water allocation in Northland

Introduction

The purpose of this paper is to assess the economic importance of water allocated for permitted and consented use in Northland. It will provide a ranking of different water bodies in terms of the contribution that water allocated from it makes to Gross Domestic Product (GDP) and show the importance of different water sources for each industry. It is being done to provide input into the Waiora Northland Water work programme, which brings together both existing and new Northland Regional Council (NRC) work to improve the quality and management of our lakes, rivers, aquifers and wetlands.

A key part of the new work involves implementing the National Policy Statement for Freshwater Management (NPS-FW), including the setting of water quality and quantity objectives and limits for all water bodies in Northland.[1] The NPS-FW requires that the setting of these objectives must reflect local and national values. These values include uses that directly generate an economic return to the water user, such as irrigation, stock drinking water, electricity generation and commercial and industrial process, and others which are not directly linked to economic returns but which are nonetheless valuable for society such as recreational use, natural form and character, ecosystem support, cultural relationships and historic associations.

This report provides an assessment of the value of water in terms of generating an economic return to the region. Separate work is being done to assess other values. For example, the River Values Assessment System (RiVAS) methodology has been used to assess natural character, native fish and river swimming in Northland. Together these separate stands of work will provide information that will assist NRC and the collaborative stakeholder groups established for priority catchments to assess the values associated with different water bodies in Northland.

Approach

The approach adopted in this assessment follows the method set out in the System of Environmental-Economic Accounting for Water (SEEA-Water) prepared by the United National Statistics Division.[2] This method is used by the Australian Bureau of Statistics in preparing their annual Water Account for Australia.[3]

The starting point for studying the economy of water involves presenting the physical information on water abstraction together with the conventional national account information on Gross Domestic Product (GDP). These accounts are referred to as “hybrid accounts”, where “hybrid” refers to the combination of different types of units of measurements in the same accounts. In doing so, the physical and monetary data share the same structure, classification and concepts. The presentation of physical and monetary information in the same accounts enables the derivation of consistent indicators for comparing the environmental resource use of an industry with the economic contribution that it makes.

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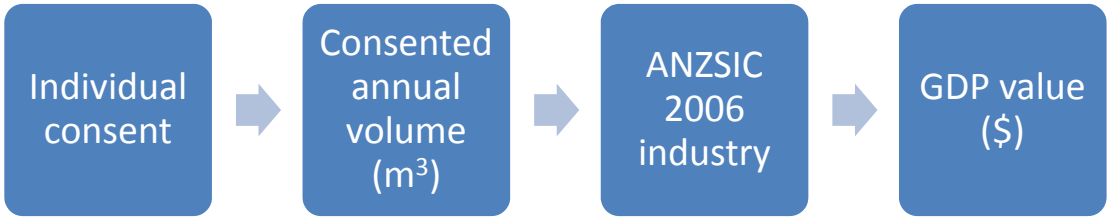
[1] http://www.mfe.govt.nz/rma/central/nps/freshwater-management.html.
[2] http://unstats.un.org/unsd/envaccounting/seeaw/seeawaterwebversion.pdf
[3] *Water Account, Australia, 2010-11*, http://www.abs.gov.au/ausstats/abs@.nsf/mf/4610.0 and *Information Paper; Towards the Australian Environmental-Economic Accounts, 2013*, http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/4655.0.55.002Main%20Features42013?opendocument&tabname=Summary&prodno=4655.0.55.002&issue=2013&num=&view=

The advantage of this method is that it uses information that is readily available and calculated on a consistent basis across industries. However, it is important to recognise that the monetary figures contained in this report do not represent the price that users are prepared to pay for water. This information is not available because water markets do not exist in Northland. Further, the economic values presented in this paper are an overestimate of the price that commercial users would be willing to pay for water because GDP represents the return to all factors of production (labour, land, capital, entrepreneurship) and not just water.[4]

While economists have developed mathematical techniques for estimating water prices for individual industries based on production functions, the time, effort and data required to do this for all industries in Northland in order to develop a picture of the market value of water at the regional level is impossible to achieve. Moreover, given that demand for water varies considerably from year to year depending on rainfall conditions, the price that users would be prepared to pay would also show large annual variation. Although GDP values also change from year to year in response to fluctuations in output and input volumes and prices, it offers a much more reliable and steady economic value for any one year.

Figure 1. Process diagram for consented takes



Water allocation data for individual water take consents is derived from the NRC consents database. These are measured on their consented take conditions because actual use data is not available for all consents. Annual metric volumes are used to provide a consistent unit of comparison across consents and with the GDP data. Where the consent does not specify an annual volume limit, this is calculated from the daily volume limit. The annual volumes for public drinking water, stock water and industrial purposes were calculated as the daily volume x 365 while the annual volume for irrigation was calculated based on the daily volume x 155 days.[5]

Each consented take is assigned to a particular industry in line within the Australian New Zealand Standard Industry Classification (ANZSIC) 2006. Northland regional GDP data based on ANZSIC 2006 is sourced from Infometrics and is used to assign a specific dollar figure to each water take consent. In some cases the consent holder is the only industry of its type in Northland or within a specific Area Unit and therefore the assignment is relatively straight forward.[6] Where the consent holder is one of a

[4] For further discussion of the limitations of GDP (value-added) refer to Young, Robert (2005), *Determining the Economic Value of Water: Concepts and Methods*, Resources for the Future.
[5] Following the assumptions in Aqualinc (2010), *Update of Water Allocation Data and Estimate of Actual Water Use of Consented Takes 2009-10*, Report No H10002/3, prepared for the Ministry for the Environment.
[6] Area units are aggregations of meshblocks with unique names. They are non-administrative areas intermediate between meshblocks and territorial authorities. Area units must either define or aggregate to define urban areas, rural centres, statistical areas, territorial authorities and regional councils. Each area unit must be a single geographic entity with a unique name. Area units of main or secondary urban areas generally coincide with communities of interest or parts thereof. Area units within urban areas normally contain 3,000-5,000 population.

number of businesses in that industry, a method of allocating GDP values among all the industries is required. For example, in the case of horticulture production, the contribution is spread among the consent holders based on their share of the total consented volume of horticultural water take.

In order to assign a GDP value for public water take, the various consented takes were aligned with the appropriate water supply areas. In some instances a single water take provides water to a particular area, e.g. Okaihau; in others four or more individual consented takes are used to supply an area, e.g. in Whāngārei or Kaitāia. Similarly, GDP area unit data was combined to provide total GDP values for the water supply area. These economic values were then divided amongst the consented public water takes servicing that area based on their share of total annual volume of consented take for that specific water supply area. This value therefore represents the GDP that is produced by industries that are serviced by the consented public water supply. It is not an estimate of the value of water supplied to individual households. As such, it will vary from water supply area to water supply area. Some only supply households and therefore water is not used by industry to produce output. In others, industries are a major user of consented public water supply, such as the Fonterra dairy factory at Maungatoroto.

In order to derive a figure for the total water take in each of the approximately 1,400 water allocation catchments in Northland, NRC have estimated the permitted water taken for stock use. Separate estimates are made for both dairy and other livestock in each of these 1,400 catchments. These permitted water use estimates are used to allocate the GDP for dairy farming and other livestock farming across the 1,400 catchments. This assumes, for example, that a dairy cow uses the same level of water and produces the same level of GDP across the region.

Results

By establishing both physical water take and economic values for each individual consent and for each of the 1,400 water allocation catchments, this allows the data to be combined into any combination of catchment groupings. For example, Table 1 shows the results when catchments are grouped into the 27 catchment/clusters as used for the RiVAS native fish assessment. Note that the Doubtless Bay, Waitangi and Whāngārei catchments in this particular grouping match the boundaries for these three priority 1 catchments identified for the Wairoa Northland Water project. The fourth priority 1 catchment, Mangere, is part of the larger Wairoa catchment.

Almost 145 million cubic metres of water is estimated to be allocated each year in Northland through permitted takes for stock use and consented volumes for both private use and the supply of public drinking water. Just over 52 million cubic metres of this or 35% is allocated from the Wairoa catchment. Other catchments in this particular arrangement representing over 10% of the total water allocation are Bay of Islands North, South Coast and Waitangi.

This volume of water is used to support the production of GDP totalling nearly $3.5 billion. Again, the Wairoa catchment makes a significant contribution to this total, with industries using water sourced from the Wairoa accounting for just over $1 billion worth of GDP. Water allocated to all three purposes, in terms of permitted takes, private consent and for public water supply, make an important contribution in the Wairoa catchment. Water sourced from the Whāngārei catchment is the next most significant in terms of the contribution of industries to GDP, representing one-quarter of the GDP generated through allocated water in Northland. However, unlike Wairoa, this contribution is mainly due to use of this water in industries supplied through the

public water supply in the Whāngārei area. The South Coast is the only other catchment accounting for more 10% of the GDP generated by industries using allocated water, mainly due to the provision of water to industrial activity around the Ruakaka area.

Table 1. Water use and GDP by catchment grouping

	Water use 000 m^3				Gross Domestic Product $million			
Catchment	Permitted	Private consent	Public water supply consent	Total	Permitted	Private consent	Public water supply consent	Total
Aupouri East	368	1,632	149	2,150	8.0	2.1	0.0	10.1
Aupouri West	20	612	0	632	0.4	0.7	0.0	1.1
Awanui	861	1,573	3,709	6,144	22.1	8.2	202.1	232.3
BOI North	659	14,243	2,022	16,925	16.7	11.7	193.5	221.9
BOI South	122	47	0	170	3.0	0.4	0.0	3.4
Dargaville Coast	370	55	44	469	9.0	0.1	0.0	9.1
Doubtless Bay	618	1,073	80	1,771	14.3	0.7	0.0	15.0
East Coast	533	861	2	1,397	12.2	0.9	0.0	13.1
Herekino	190	13	0	203	3.7	0.0	0.0	3.7
Hokianga	411	49	436	895	10.1	0.0	14.0	24.1
Kaipara Harbour	2,391	0	0	2,391	66.5	0.0	0.0	66.5
Kawakawa	628	1,744	2,366	4,738	16.9	10.4	46.2	73.5
Mangamuka	80	0	0	80	2.3	0.0	0.0	2.3
North Coast	313	318	0	631	7.8	10.9	0.0	18.6
Pouto	0	0	0	0	0.0	0.0	0.0	0.0
Rangaunu	393	1,354	0	1,747	10.4	1.6	0.0	11.9
South Coast	1,029	2,585	13,537	17,151	31.2	9.0	433.4	473.6
Te Paki	11	0	0	11	0.2	0.0	0.0	0.2
Utakura	221	34	88	343	4.8	0.0	6.0	10.7
Waihou	247	320	0	567	6.0	0.2	0.0	6.2
Waima	914	1,643	1,553	4,110	22.9	1.4	140.6	164.8
Waipoua	138	0	400	539	3.3	0.0	5.1	8.3
Wairoa	10,290	32,643	8,366	51,299	292.0	57.6	668.1	1,017.8
Waitangi	858	14,168	1,460	16,487	22.6	9.3	160.0	192.0
Whangape	180	45	0	225	3.8	0.0	0.0	3.9
Whangarei	350	953	12,087	13,390	9.1	19.1	845.2	873.4
Whangaroa	219	93	66	378	5.4	0.8	0.0	6.2
Total	22,415	76,059	46,366	144,840	604.7	145.2	2,714.1	3,464.0

The results can also be shown by ANZSIC industry, highlighting the importance of various water sources for each industry (Table 2). It is estimated that some 13% of Northland's GDP of $4.9 billion is generated from industries that source their water from permitted takes, i.e. the livestock farming industries. Just over two-thirds of Northland's GDP is generated in areas that are serviced by consented public water supply, while a further 3% is attributed to individual consented water takes. The remaining 16% of GDP is produced using water sourced from alternatives such as rainfall or bores, due to the location of these businesses outside public water supply areas.

While individual water take consents represent just a small share of total GDP, these types of resource consents are relatively important for a handful of industries, namely horticulture and fruit growing, mining and certain primary processing industries such as dairy, meat, seafood and non-metallic mineral product manufacturing. For example, while the AFFCO meat processing plant in Moerewa has its own water take consent, the Silver Fern Farms meat processing plant relies on the Dargaville public water supply.

Table 2. Importance of water source by industry

	GDP $million	Source of water used % of GDP			
ANZSIC 2006 Industry	Year ended March 2012	Permitted take	Private consent	Public water supply consent	Other
Sheep, Beef Cattle and Grain Farming	183	100%	0%	0%	0%
Poultry, Deer and Other Livestock Farming	12	100%	0%	0%	0%
Dairy Cattle Farming	441	95%	5%	0%	0%
Horticulture and Fruit Growing	26	0%	100%	0%	0%
Dairy Product Manufacturing	49	0%	73%	25%	1%
Mining	48	0%	63%	0%	37%
Non-Metallic Mineral Product Manufacturing	27	0%	46%	53%	1%
Meat and Meat Product Manufacturing	23	0%	44%	54%	2%
Seafood Processing	5	0%	25%	65%	10%
Arts and Recreation Services	30	0%	8%	73%	19%
Wood Product Manufacturing	38	0%	6%	84%	10%
Accommodation and Food Services	96	0%	3%	75%	22%
Pulp, Paper and Converted Paper Product Manufacturing	0	0%	0%	100%	0%
Basic Chemical and Chemical Product Manufacturing	6	0%	0%	100%	0%
Petroleum and Coal Product Manufacturing	328	0%	0%	100%	0%
Insurance and Superannuation Funds	9	0%	0%	100%	0%
Electricity and Gas Supply	135	0%	1%	99%	0%
Fabricated Metal Product Manufacturing	21	0%	0%	99%	1%
Local Government Administration	39	0%	0%	97%	3%
Auxiliary Finance and Insurance Services	14	0%	0%	97%	3%
Finance	104	0%	0%	97%	3%
Transport Equipment Manufacturing	11	0%	0%	96%	4%
Health Care and Social Assistance	325	0%	0%	96%	4%
Information Media Services	16	0%	0%	95%	5%
Professional, Scientific and Technical Services	188	0%	0%	92%	8%
Rail, Water, Air and Other Transport	48	0%	0%	91%	9%
Machinery and Other Equipment Manufacturing	35	0%	0%	91%	9%
Telecommunications, Internet and Library Services	31	0%	0%	90%	10%
Printing	3	0%	0%	90%	10%
Other Store-Based Retailing and Non Store Retailing	137	0%	0%	88%	12%
Other Services	77	0%	0%	87%	13%
Polymer Product and Rubber Product Manufacturing	3	0%	0%	86%	14%
Postal, Courier Transport Support, and Warehousing Services.	65	0%	0%	86%	14%
Rental and Hiring Services (except Real Estate)	37	0%	0%	85%	15%
Wholesale Trade	97	0%	0%	85%	15%
Central Government Administration, Defence and Public Safety	185	0%	0%	85%	15%
Water, Sewerage, Drainage and Waste Services	39	0%	0%	84%	16%
Motor Vehicle and Motor Vehicle Parts and Fuel Retailing	45	0%	0%	81%	19%
Road Transport	88	0%	0%	80%	20%
Heavy and Civil Engineering Construction	72	0%	0%	79%	21%
Fruit, Oil, Cereal and Other Food Product Manufacturing	17	0%	0%	79%	21%
Supermarket, Grocery Stores and Specialised Food Retailing	75	0%	0%	77%	23%
Textile, Leather, Clothing and Footwear Manufacturing	5	0%	0%	77%	23%
Building Construction	33	0%	0%	76%	24%
Education and Training	245	0%	0%	74%	26%
Administrative and Support Services	99	0%	0%	74%	26%
Furniture and Other Manufacturing	6	0%	0%	70%	30%
Construction Services	121	0%	0%	68%	32%
Property Operators and Real Estate Services	209	0%	0%	63%	37%
Agriculture, Forestry and Fishing Support Services and Hunting	27	0%	0%	55%	45%
Beverage and Tobacco Product Manufacturing	2	0%	0%	11%	89%
Fishing and Aquaculture	5	0%	0%	10%	90%
Forestry and Logging	102	0%	0%	0%	100%
Total of productive industries	4,083	15%	4%	67%	14%
Owner-Occupied Property Operation	379	0%	0%	77%	23%
Unallocated	444	0%	0%	74%	26%
Total Northland	**4,905**	**13%**	**3%**	**56%**	**12%**

Conclusions

Comparing water allocation data alongside GDP data is a relatively simple method for helping to understand the economic value of water use in a region. By assigning GDP values to each of the 1,400 water allocation catchments and to each water take consent, the data can be arranged into any particular catchment/cluster groupings. Using the same groupings as for the RiVAS native fish assessment shows the economic importance of the Wairoa, Whāngārei and Coastal South catchments. Water used by industries in these three catchments account for nearly $2.4 billion or nearly half of Northland's GDP.