Source: Hughey, K.F.D., Baker, M-A. (eds). (2010b). The River Values Assessment System: Volume 2: Application to cultural, production and environmental values. LEaP Report No.24B, Lincoln University, New Zealand.

Part B: Irrigation in Tasman District: Application of the River Values Assessment System (RiVAS)

Simon Harris

9.4 Introduction

9.4.1 Purpose

This section describes an application of the RiVAS Method to irrigation in Tasman District – it is the second application to irrigation.

9.4.2 Significance Assessment Method

The River Values Assessment System (RiVAS) aims to outline assessment criteria and significance thresholds for river values, for application within national and regional planning under the Resource Management Act (RMA). Its first application involved the development of attributes and indicators in conjunction with an Expert Panel, and then the population of those indicators with raw data for subsequent evaluation and ranking for Canterbury region. This second application briefly reassesses that work and then applies it to Tasman District using another Expert Panel (see Appendix 9B-1).

9.5 Application of the Method in the Tasman Region

9.5.1 Defining categories for the river value and river segments

The RiVAS enables assessments to be undertaken for categories[1] of river values or for individual river segments. No categories were identified for irrigation, and therefore the assessment for irrigation was developed with no sub-categories.

Consideration was given to segmenting rivers where there are major differences in upper and lower catchment attributes relating to irrigation. For example: one or more of: mean annual rainfall greater than 1200 mm; average slope greater than 15 degrees; altitude greater than 600 m. In the original case study because of the transportability of water, and because of the need to make the method nationally applicable, the panel decided that it was not necessary to use river segments.

In the Tasman case the group initially segmented the major rivers (Motueka, Waimea, Buller, Takaka and Aorere) into two or more reaches. However in the final ranking most of these were aggregated together to better reflect the value of the river overall, since individual segments may not have been regionally significant, but aggregated together they were. The final scores and rankings are therefore based on the river overall without segmentation (with the exception of the Wangapeka/Baton which was treated separately from the Motueka)

9.5.2 Attributes, scoring and weighting

The attributes are the facets of the river value that, taken collectively, describe that river value. For example, salmonid angling includes the attributes of level of use, anticipated catch rate, perceptions of scenic attractiveness, etc. The attributes, scoring and weightings developed for irrigation as per Harris and Mulcock (Part A, Herein) were used directly in the Tasman case study. These are described in Table 9-4 below.

1 **River value category**: A specific type or style of the river value. For example recreational values can be categorised into. whitewater kayaking, flatwater kayaking; wilderness fishery, lowland fishery.

Table 9-4
Summary of Attributes, Indicators, Thresholds and Threshold Scores for Irrigation

Attribute	Indicator (ranges are from the Canterbury case study)	Thresholds
Technical feasibility of abstraction	Expert ranking (range 1 - 3)	Used directly (3 = 3)
Technical feasibility of storage	Expert ranking (range 1 - 3)	Used directly (3 = 3)
Reliability (ROR)	MALF/Mean annual flow as % (range: 4% - 72%)	>40% = 3 >20% = 2 <20% = 1
Reliability (Storage)	Annual volume million m^3 (range: 32 - 11,000)	> 3000 = 3 >=100 and <= 3,000 = 2 <100 = 1
Size of resource	Mean annual flow cumecs (range 1 - 370)	>70 = 3 > 5 = 2 <= 5 = 1
Soil moisture deficit	Annual average rainfall over irrigable area (mm at nearest long term rainfall site; range: 500 – 1,200 mm)	<=1,200 = 3 > 1,200 = 2 >1,700 = 1
Irrigable area	Irrigable area ha (range 1,000 - 270,000)	> 100,000 ha = 3 > 5,000 ha = 2 <= 5,000 = 1
Receiving environment	Rank 1 - 5 with 1 being low risk and 5 being high risk (expert assessment)	Rank 1 and 2 = 3 Rank 3 and 4 = 2 Rank 5 = 1
Alternative supply	Bypass solution[1]: Ranking using % (based on groundwater availability maps from Lincoln Environmental 2000 for CSWS)	<=30% = 3 > 30% = 2 > 60% = 1
Socio economic benefit	Expert Ranking from 1 (low) to 3 (high)	Used directly (3 = 3)

[1] Alternative supply: where a proportion of the irrigable area can be supplied from groundwater this is considered to reduce the demand for supply from the river, i.e., little groundwater available gives the river a 'high' score (3).

The indicators were weighted in order to reflect the importance of that indicator in determining the significance of a river for irrigation. Where a significant soil moisture deficit is indicated, a weighting is applied to emphasise both the size of the resource from a supply perspective, and size of the irrigated area from a demand perspective. The weighting selected is that when the soil moisture deficit threshold for a river is two (medium) or three (high), then the threshold scores for both size of resource and irrigated areas are weighted to power of three. For all rivers, the key secondary attributes of soil moisture deficit, reliability and presence of an alternative supply are all weighted +50%. The other attributes were not weighted. Table 9-5 summarises the weightings.

Table 9-5
Primary attributes and weightings

Primary Attribute	Weighting
Supply Attributes	
Technical feasibility of abstraction	Not weighted
Technical feasibility of storage	Not weighted
Reliability (Run of River)	Weighted + 50%
Reliability (Storage)	Not weighted
Size of resource	Weighted to the power of 3 where a soil moisture deficit is present, i.e., score = 2 or 3
Demand Attributes	
Soil moisture deficit	Weighted + 50%
Irrigable area	Weighted to the power of 3 where a soil moisture deficit is present, i.e., score = 2 or 3
Receiving environment	Not weighted
Alternative supply	Weighted + 50%
Socio economic benefit	Not weighted

The total weighted scores developed in step 7 are then used to order the rivers according to their value for irrigation. To determine national, regional or local significance for irrigation three 'trigger' attributes are applied: size of water resource, potentially irrigable area and soil moisture deficit.

- *National significance* is defined by the combined presence of a large water resource (>70 cumecs; i.e., Score = 3), a large potentially irrigated area (>100,000 ha; i.e., Score = 3), and a soil moisture deficit (Score >=2).
- *Local significance* is defined by the presence of either a small resource (< 5 cumecs; i.e., Score = 1), a small irrigated area (<5000 ha; i.e., Score = 1) or no significant soil moisture deficit (Score = 1).
- The remaining rivers not defined as nationally or locally significant are, by default, *regionally significant*.

This ranking approach reflects the fact that while there are other significant issues for suitability of a resource for irrigation, there is potential to manage these other issues - for example reliability can be modified by storage. However the absence of water and irrigable land cannot be changed. It is appropriate that these are the major drivers of determining the significance of the resource for irrigated agriculture.

9.6 Application to Tasman

The scores for each attribute are shown in Appendix 9B-2 and the rankings generated using the river. Because the rainfall profile in the Tasman district differs from that of the Canterbury region where the method was developed, it was considered necessary to manually adjust the scores in the soil moisture deficit category to better reflect the prevalence of summer drought in the Aorere catchment.

The method defines the Buller, Waimea, Motueka, Takaka, and Aorere as having regionally significant values from an irrigation perspective. Of these the Buller is perhaps something of a surprise, because irrigation is not generally considered for this area. However it is noted that in this area the amount of rainfall in the valleys, the size of the river resource and area of flat land suitable for irrigation all point to the potential for it to become a significant part of the region's irrigated land.

Other resources are considered local, largely because of the small size of the resource available and therefore limited area that can be supplied.

9.7 Other Factors relevant to the Assessment of Significance in Tasman

Consideration was also given to the need to better reflect the value of land irrigated in the Tasman district. Irrigation from the Motueka catchment in particular supports a number of very high value land uses such as horticulture, glasshouses, and vegetable production. The thresholds for the significance of the area irrigated did not adequately reflect the value of the land, even taking into account the socio-economic benefit category. This meant that the Motueka, which was on the threshold of national significance for size, did not qualify because of the smaller irrigated area. The panel suggested that this may need to be reviewed.

A further issue was raised regarding the overall significance of the value. While individual rivers in the Tasman district may only have ranked as regional significance, the value of irrigation overall in the district is probably of national significance given its role in horticultural production. The panel considered that the methodology did not adequately reflect the importance of the value overall, in addition to contribution of each river to the value.

References

Anon. (2008). *Canterbury Strategic Water Study – Stage II Draft Summary Report*. 10pp www.ecan.govt.nz.

Aqualinc Research Limited. (2006). Snapshot of Water Allocation in New Zealand: Ministry for the Environment, ME 782, www.mfe.govt.nz.

Booth, K., Deans, N., Unwin, M., Baker, M-A. (Herein). *Salmonid angling in Tasman District: Application of the River*.

Hughey, K., Booth, K., Deans, N., Baker, M-A. (Herein). *River Values Assessment System (RiVAS) – The method.*

Lincoln Environmental. (2000). *Information on Water Allocation in New Zealand*. Prepared for the Ministry for the Environment (Report no 4375/1 April 2000)

Grimes, A., and Aitken, A. (2008). *Water, water somewhere: The value of water in a drought-prone farming region.* Motu Working Paper 08-10. Motu Economic and Public Policy Research: Wellington, NZ.

Harris, S, Mulcock, C. (Herein*). Irrigation: Application of the Significance Assessment Method to the Canterbury Region*.

Ministry of Agriculture and Forestry (2004). *The economic value of irrigation in New Zealand.* MAF Technical Paper N.: 04/01. Wellington, NZ: MAF Information Bureau.

Appendix 9B-1
Expert Panel Members

Nigel Hayward is an Irrigator

Evan Baigent is an Irrigator

Richard Inglis is an Irrigator

Joseph Thomas is a Hydrologist with Tasman District Council

Simon Harris – see Part A, Appendix 9A-1

John Bealy is a Consultant

Appendix 9B-2
Significance Assessment Calculations for Irrigation from Tasman Rivers

River	Attributes and indicators											Conversion to threshold values										Ranking and scores		
	Feasibility of abstraction	Feasibility of storage	Reliability (ROR)	Reliability (Storage)	Size of resource	Soil moisture deficit	Irrigable area	Receiving environment	Alternative supply	Socio economic		Feasibility of abstraction	Feasibility of storage	Reliability (ROR)	Reliability (Storage)	Size of resource	Soil moisture deficit	Irrigable area	Receiving environment	Alternative supply	Socio economic	Aggregate	Ranking (weighted)	Significance
	Expert ranking (1 - 3)	Expert ranking (1 - 3)	MALF/Mean %	Annual vol (M m3)	Mean annual flow2 (m3/s)	Rainfall3 (mm)	Irrigable area (ha)4	Rank 1 - 55	Alternative supply6 %	Ranking7 from 1- 3		3 = 3	3 = 3	>40% = 3, >20%=2,<20%=	>3000=3, <100 = 1	>70 = 3,>5 = 2,	>1700 = 1,>1200 = 2	> 100000 = 3, > 5000 = 2 ha	Rank 5 = 1, 3 and 4 = 2, 1 and 2 = 3	> 60% = 1, > 30% = 2	Direct transfer (3 = 3)	Sum	See note below8	See note below9
Buller	3	2	29%	2334	74	1300	9666	5	10%	2		3	2	1	3	3	2	2	1	3	2	22	55	Regional
Waimea	3	3	12%	504	16	1000	13400	2	10%	3		3	3	1	3	2	3	2	3	3	3	26	41.5	Regional
Motueka	3	2	18%	1798	57	1200	29520	4	10%	3		3	2	1	3	2	3	2	2	3	3	23	39.5	Regional
Takaka	3	2	15%	978	31	1500	12500	2	10%	3		3	2	1	3	2	2	2	3	3	3	24	39	Regional
Aorere	3	2	18%	2,173	68.9	2200	9800	3	10%	2		3	2	1	3	2	2	2	2	3	2	22	37	Regional
Moutere	1	3	10%	44	1.4	1100	5660	2	50%	3		1	3	1	1	1	3	2	3	2	3	20	29	Local
Maruia	3	3	34%	1,829	58	2500	10140	1	10%	2		3	3	1	3	2	1	2	3	3	2	23	27.5	Local
Maitai	3	3	14%	44	1.4	900	150	3	10%	3		3	3	1	1	1	3	1	2	3	3	21	24.5	Local

2 Expert opinion and various prefeasibility studies

3 Average Annual Rainfall (mm) over irrigable area (nearest rainfall site)

4 From GIS

5 with 1 being low risk and 5 being high risk (expert assessment)

6 Alternative supply ranking from expert opinion

7 Socio-economic benefit -ranking 1 (low) - 3 (high) Expert assessment

8 Irrigated area and size of resource cubed, reliability soil moisture and alternative supply +50%, remainder aggregated. Weighting for irrigable area and size of resource only applies if Soil Moisture deficit is >1, otherwise they receive a 50% weighting.

9 National - irrigated area 3, size of resource 3, soil moisture deficit 2 or greater. Local - resource size = 1, irrigated area = 1 or no soil moisture deficit. Remainder regional

River	Attributes and indicators											Conversion to threshold values										Ranking and scores		
	Feasibility of abstraction	Feasibility of storage	Reliability (ROR)	Reliability (Storage)	Size of resource	Soil moisture deficit	Irrigable area	Receiving environment	Alternative supply	Socio economic		Feasibility of abstraction	Feasibility of storage	Reliability (ROR)	Reliability (Storage)	Size of resource	Soil moisture deficit	Irrigable area	Receiving environment	Alternative supply	Socio economic	Aggregate	Ranking (weighted)	Significance
	Expert ranking (1 - 3)	Expert ranking (1 - 3)	MALF/Mean %	Annual vol (M m3)	Mean annual flow2 (m3/s)	Rainfall3 (mm)	Irrigable area (ha)4	Rank 1 - 55	Alternative supply6 %	Ranking7 from 1- 3		3 = 3	3 = 3	>40% = 3, >20%=2,<20%=	>3000=3, <100 = 1	>70 = 3,>5 = 2,	>1700 = 1,>1200 = 2	> 100000 = 3, > 5000 = 2 ha	Rank 5 = 1, 3 and 4 = 2, 1 and 2 = 3	> 60% = 1, > 30% = 2	Direct transfer (3 = 3)	Sum	See note below8	See note below9
Motueka	3	1	19%	693	22	2000	4200	4	10%	2		3	1	1	3	2	1	1	2	3	2	19	23	Local
Eastern Golden Bay/Clifton/Marahau	2	1		9	0.3	2200	500	1	10%	3		2	1	1	3	1	1	1	3	3	3	19	22.5	Local
Motupipi	3	1		31	1	1500	300	3	10%	2		3	1	1	3	1	2	1	2	3	2	19	22	Local
West Coast rivers	1	3	19%	145	4.6	1750	1262	1	10%	1		1	3	1	3	1	1	1	3	3	1	18	21.5	Local
Minor north west rivers	3	1	18%	31	1	2500	640	1	10%	1		3	1	1	3	1	1	1	3	3	1	18	21.5	Local
Minor Aorere-Takaka	2	1	18%	12	0.4	2500	1000	2	10%	2		2	1	1	3	1	1	1	3	3	2	18	21.5	Local

Red coloured cells show where threshold score has been adjusted by Expert Panel

Shaded columns show the attributes that have been weighted to obtain the total score