

Water-food-energy triangle

Basil Sharp

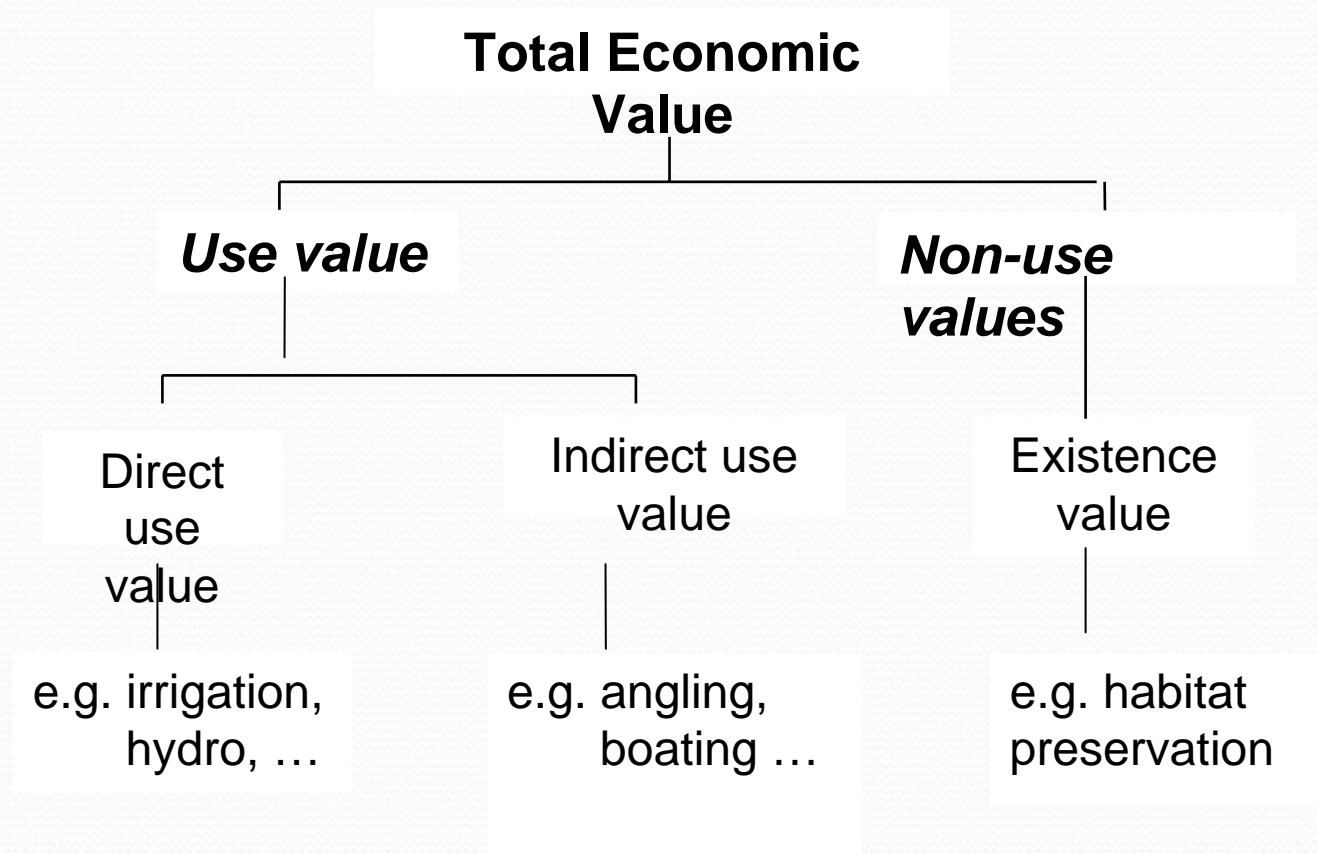
Energy Centre & Department of Economics



Overview

- Framework
- Water & food
- NZ export profile
- Policy Challenges

TEV Framework



Total Economic Value

Market & Non-market Value

- Basic Idea
 - (A) Use of water resource
 - Input into production process
 - → value (use value)
 - (B) Non-use
 - Maintain flows
 - → value (non-use value)
 - Economic efficiency seeks to balance (A) and (B)
 - Focus on use values

Non-consumptive use

Hydro storage:

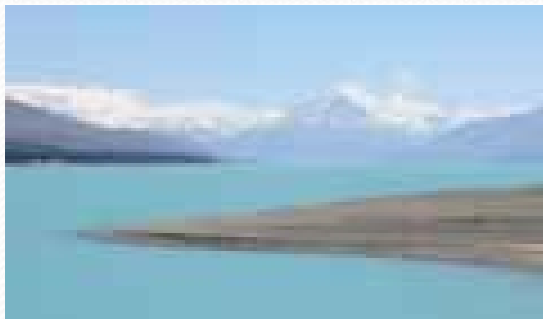
Public access
Irrigation
Recreation
Habitat



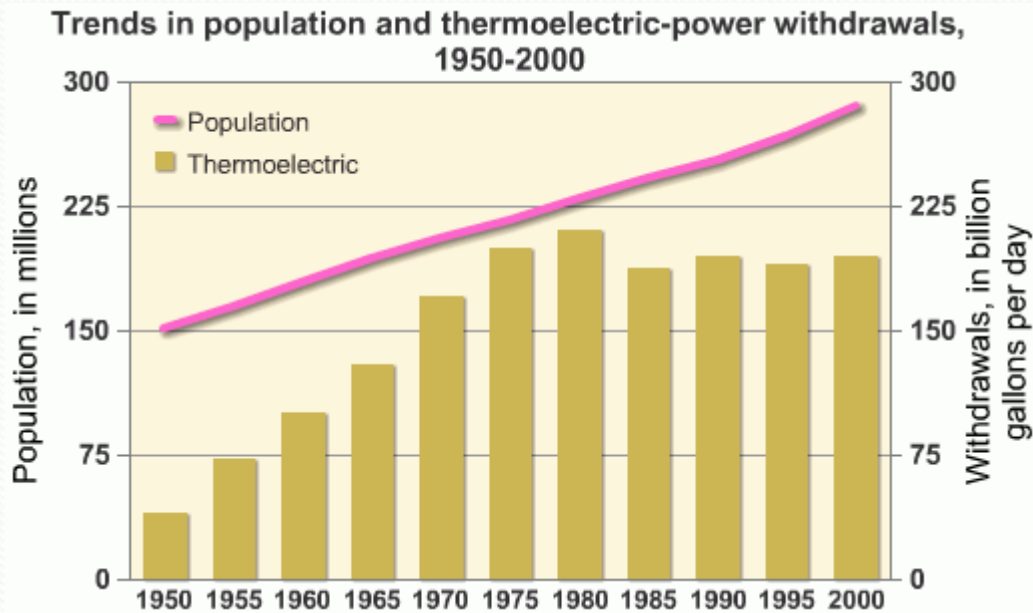
Generation

Electricity
Market
valued

River:
Minimum flow
regime
Ecology



Cooling thermal power plants



Huntly power station –
Waikato River

Consumptive use



Milk, crops, etc
Market valued

Irrigation

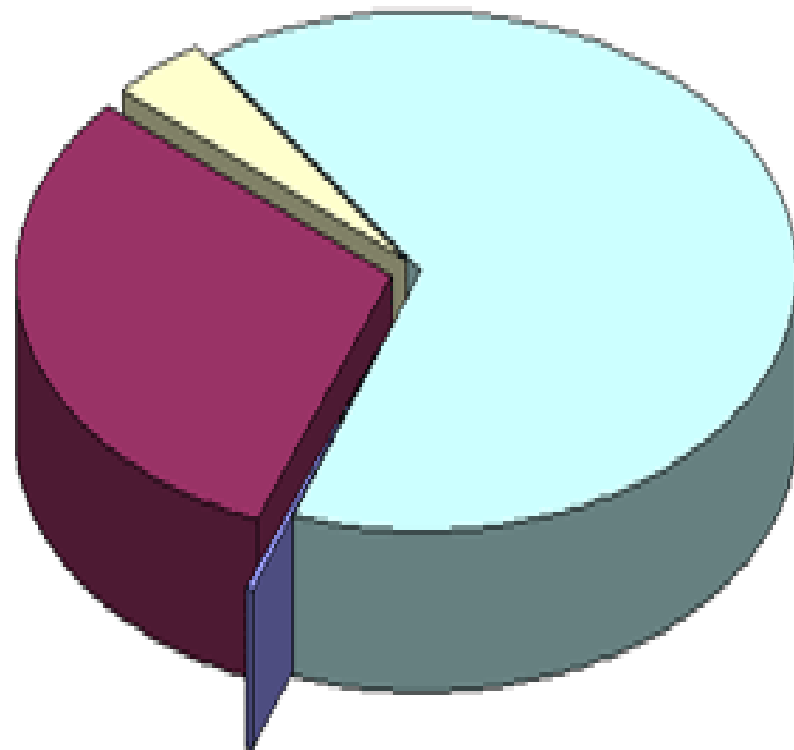
Abstraction site:
Allocation amount,
rate

Nutrients
Not market valued

River



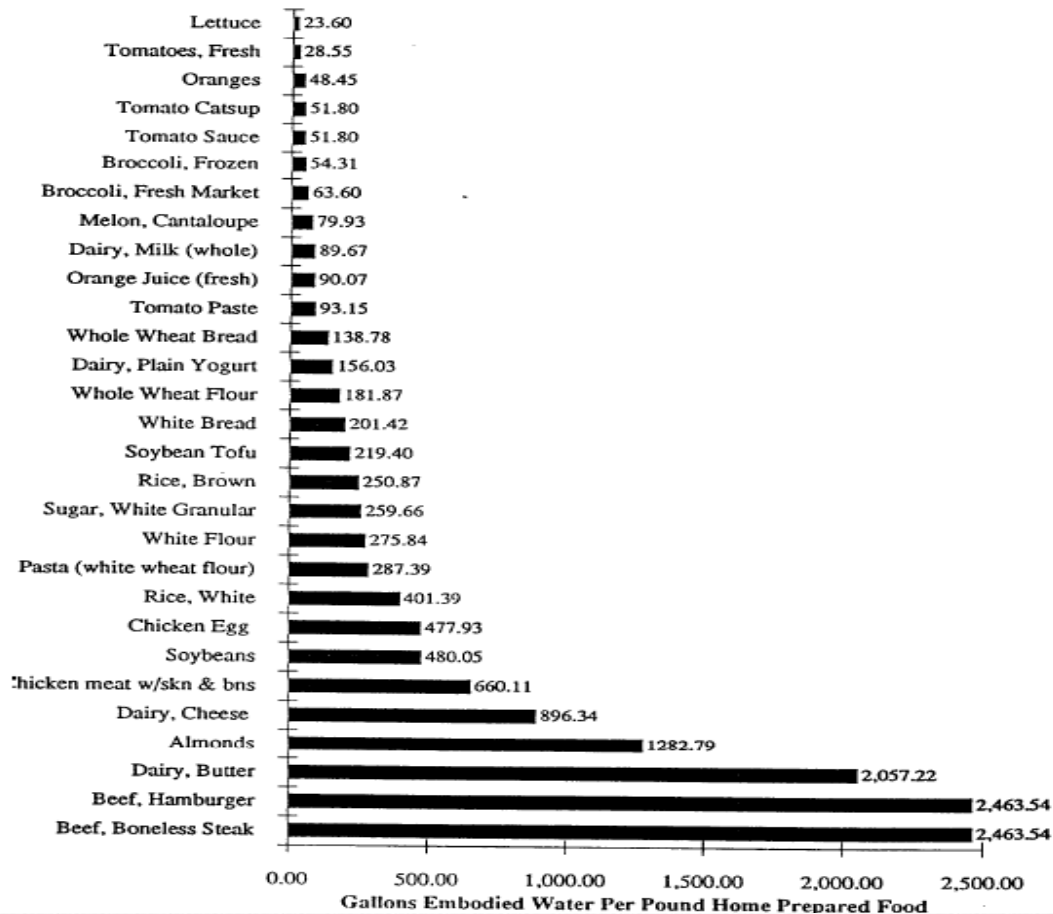
Water and Food



- Embedded in Food - 65%
- Drinking Water - 0.2%
- Domestic Uses (cooking, cleaning, etc) - 4.2%
- Embedded in Industrial Goods (car, bicycle, TV, etc) - 30.6%

Water embedded in food

Chart E.2 Gallons Water Use Per Pound Home Prepared Food



Policy challenges in NZ

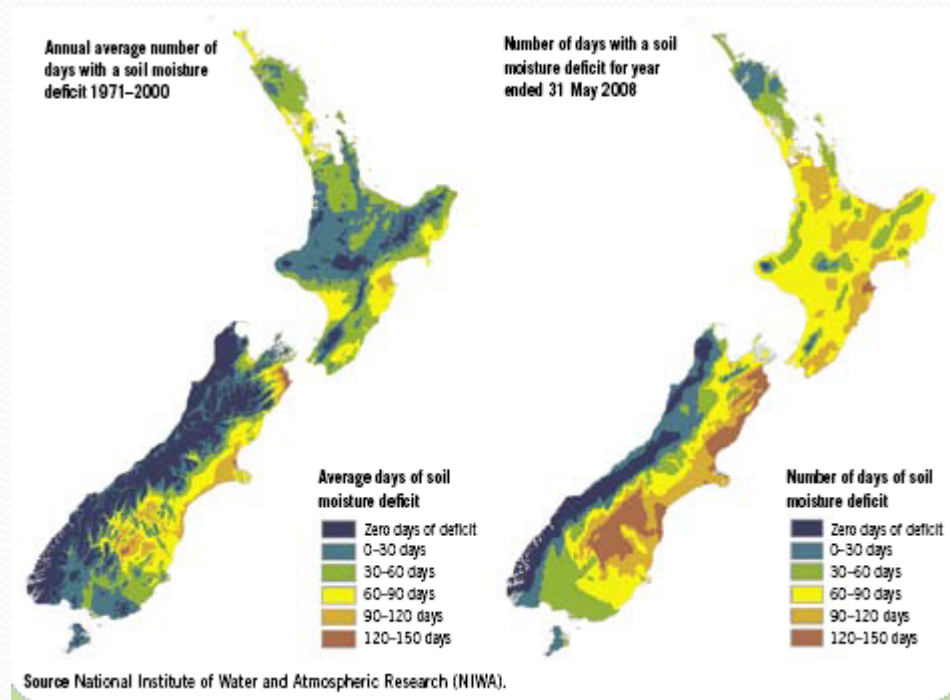
- Energy: Target of 90% electricity from renewables
 - Hydro is key source ~ 60%
 - Likely decrease in use for cooling
- Food production: export led economic growth
 - Dairy largest single export
 - Beef, horticulture,
 - Wood processing
- Food processing:
 - Drive to add value to primary products
 - Expect increase in use
- Tourism: Large earner of foreign exchange
- Environmental values

Contribution to GDP

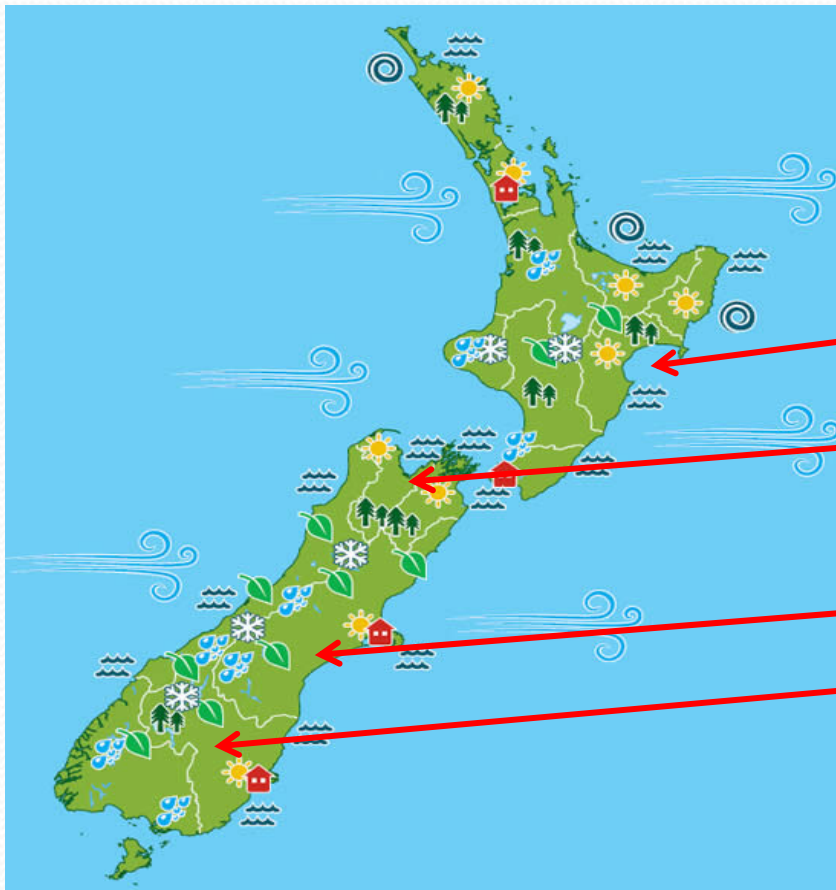
»» TABLE 2.3: GROSS AGRICULTURAL REVENUE AND EXPENDITURE, YEAR TO 31 MARCH 2006–2012

YEAR TO 31 MARCH	ESTIMATE			FORECAST			
	2006 (\$ MIL)	2007 (\$ MIL)	2008 (\$ MIL)	2009 (\$ MIL)	2010 (\$ MIL)	2011 (\$ MIL)	2012 (\$ MIL)
Dairy	4 642	5 182	6 461	7 426	6 457	6 713	7 336
Cattle	2 078	2 184	1 879	2 037	2 303	2 565	2 722
Sheep meat	1 742	1 748	1 666	1 770	1 880	2 034	2 059
Wool	545	526	471	465	520	569	609
Deer	210	255	251	286	307	338	373
Poultry/eggs	135	143	148	150	152	154	156
Pigs	164	166	165	166	168	170	171
Other farming	171	208	189	202	222	244	253
Sales of live animals	1 006	1 162	1 054	1 131	1 240	1 361	1 411
Value of livestock change	85	91	-12	15	13	12	7
Fruit	1 449	1 452	1 592	1 841	2 016	2 206	2 364
Vegetables	715	715	740	697	763	823	868
Other horticulture	278	280	290	273	299	322	340
Crops and seeds	334	398	506	654	619	650	678
Agricultural services	2 879	3 055	3 304	3 554	3 803	4 052	4 302
Non-farm income	205	218	222	219	229	236	241
Total gross revenue	16 638	17 783	18 926	20 888	20 991	22 450	23 891
Intermediate consumption	9 690	10 348	10 696	11 886	12 032	12 817	13 574
Contribution to GDP¹	6 948	7 435	8 230	9 002	8 959	9 633	10 317

Frequency of soil moisture deficit

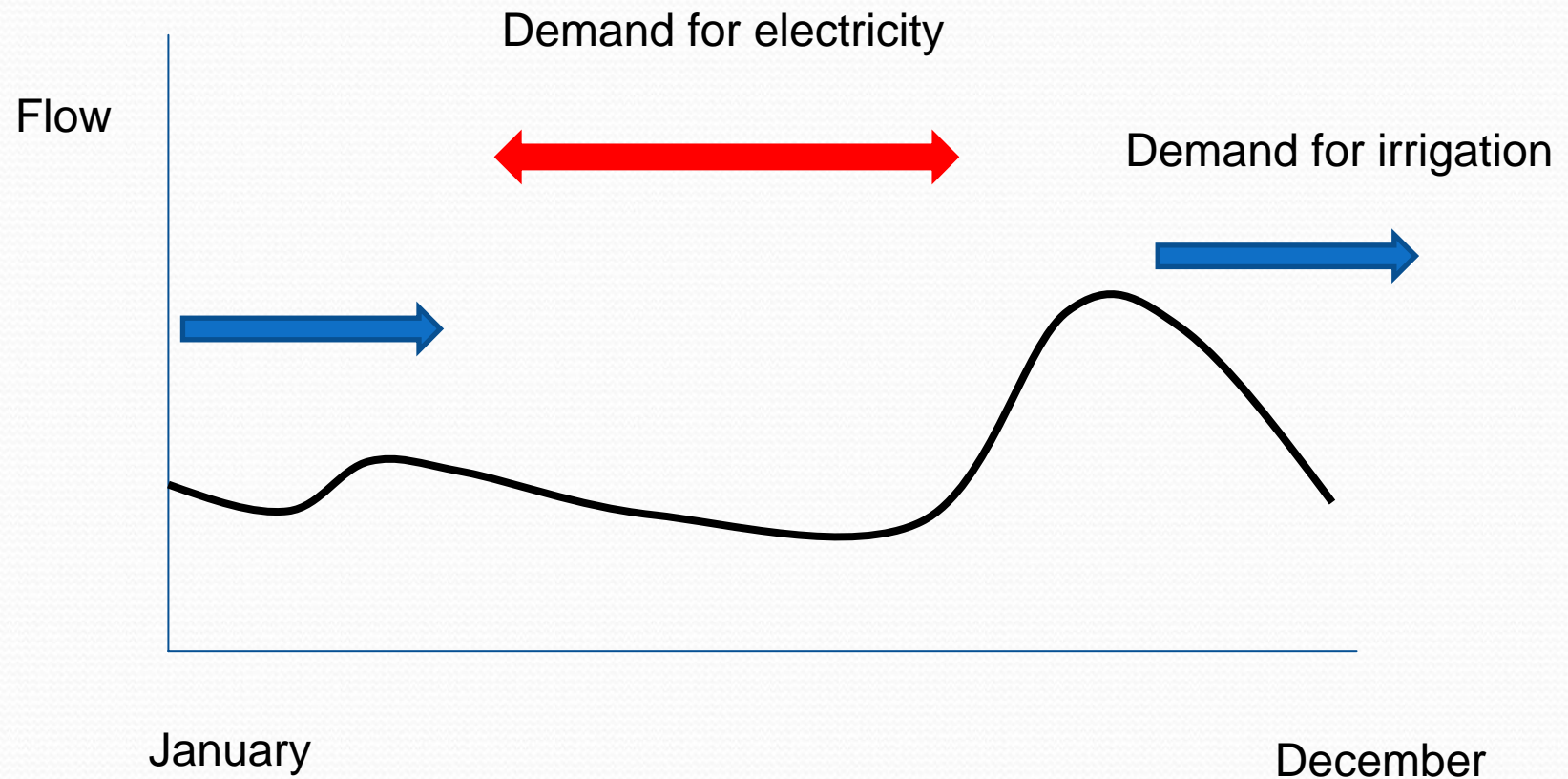


Competition for scarce resource



Water short areas
-Over allocated
-Groundwater issues

Competition for water



Trends in governance

- Water resource development → water allocation and water quality
- Old development model: centralised decision-making, administrative regulation
- New model: decentralised decision-making, economic instruments, stakeholder participation

NZ's water management

- Resource Management Act: provides basis for administrative systems at regional level
- First-come-first-served
- Rights not transferable
- Little monitoring of use
- Total abstraction limited by minimum flow

Property rights

- Water permit:
 - Water vested in Crown
 - Use: may have freedom when and how to use but
 - May not be able to exercise right
 - Transfer: may transfer to subsequent owner of land
 - May not transfer outside catchment
 - Duration: maximum 35 years but usually much less
 - Some hydro 10-15 years
 - Excludable: typically yes but irrigators contesting access to stored water

Should we be concerned?

- Most definitely yes!
- Pricing water services
 - Key principle in sustainable development policy (e.g. OECD, 2002)
- Why?
 - Race to the pump house
 - Managing without information on value
 - Water “demand” > supply
 - Existing uses unlikely to be efficient
 - Substitution of natural capital for manufactured capital

Policy challenge ahead

- Objectives and instruments
 - Energy: carbon pricing e.g. ETS or tax
 - Sustainable use
 - Minimum flow regimes - regulation
 - Water: instrument that reveals value of water
 - Within minimum flows use tradable rights
 - External impacts
 - Regulate or use tradable rights

