



Without Water - Economic impact of alternative water supply management options



Dr Ejaz Qureshi

Policy and Economic Research Unit, CSIRO Land and
Water, Canberra, Australia

Wednesday 6th of September 2006

Water scarcity and water allocation issues in Australia



Cost of water diversion and transmission increased

Reticulation system for water resources deteriorated

- high operation and maintenance costs
- high opportunity cost of capital

Easily accessible dam sites and water resources exploited

Demand for water resources increased

Recognition of natural resource degradation

Community demand for environmental objectives increased

Strategies for sustainable water resources



Development of a comprehensive water sector reform program.

Shift in focus from development and delivery of water services and supply to the management of water resources.

- water supply to water demand management

Development of water allocations and entitlements

Establishment of new institutions

Limit on water diversions (*the Cap*)

Commencement of NWI

Water management issues



Climate change

Environmental flow enhancement

Population increase

Urban rural water trading

Recycling

Desalination

Water use efficiency

What will happen to the shadow price of water?

- Shadow price = price that would equate supply with demand

Under climate change?

As rivers & aquifers are restored to health?

With more people?

2032 Water Price \$/KL



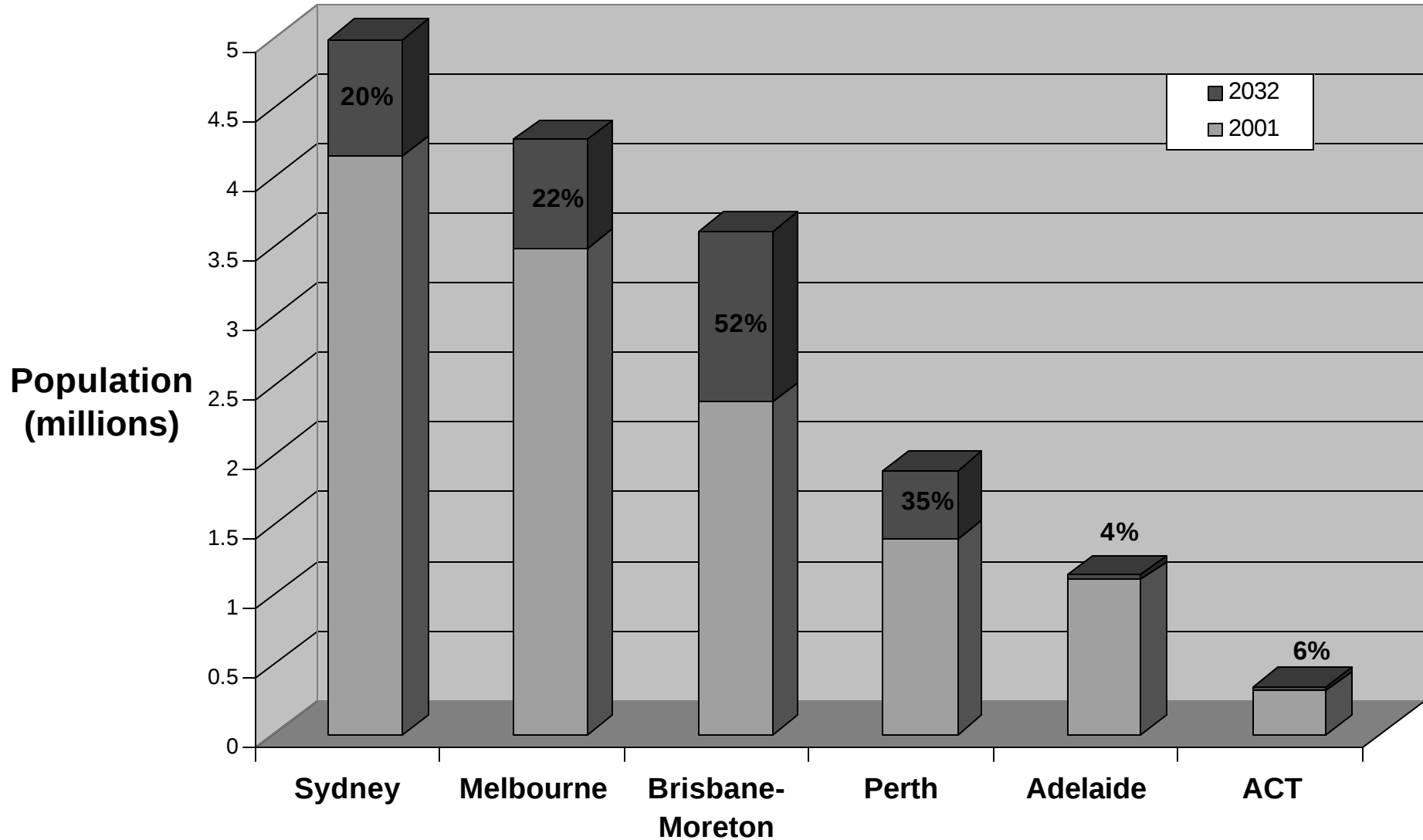
	Current Water price*	No Initiative	Trade	Trade + water. @ \$1.50/kL	Trade + water @ \$1.00/kL	Trade + Water @ \$1.50 plus wage driven migration
Sydney	1.36	8.09	2.97	2.71	2.62	2.71
Melbourne	1.17	5.96	1.57	1.53	1.51	1.54
Brisbane-Moreton	1.27	10.51	2.61	2.39	2.31	2.25
Adelaide	1.30	1.42	1.70	1.66	1.64	1.67
Perth	1.12	11.40	6.33	4.50	3.90	4.07
ACT	1.11	3.23	1.51	1.47	1.45	1.48

Shadow price increase 2032-2001

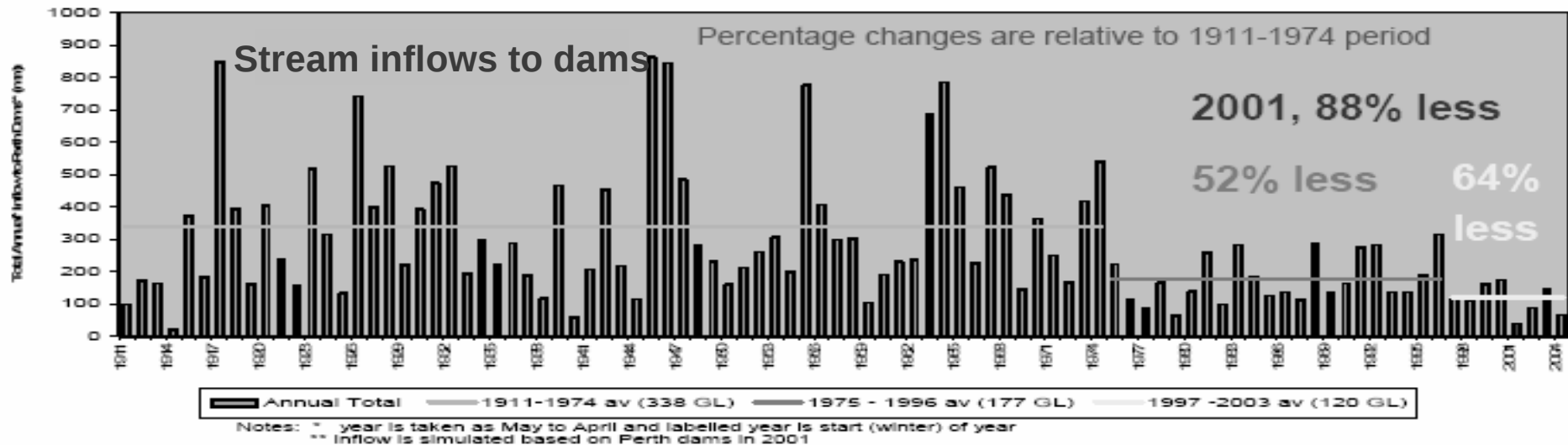
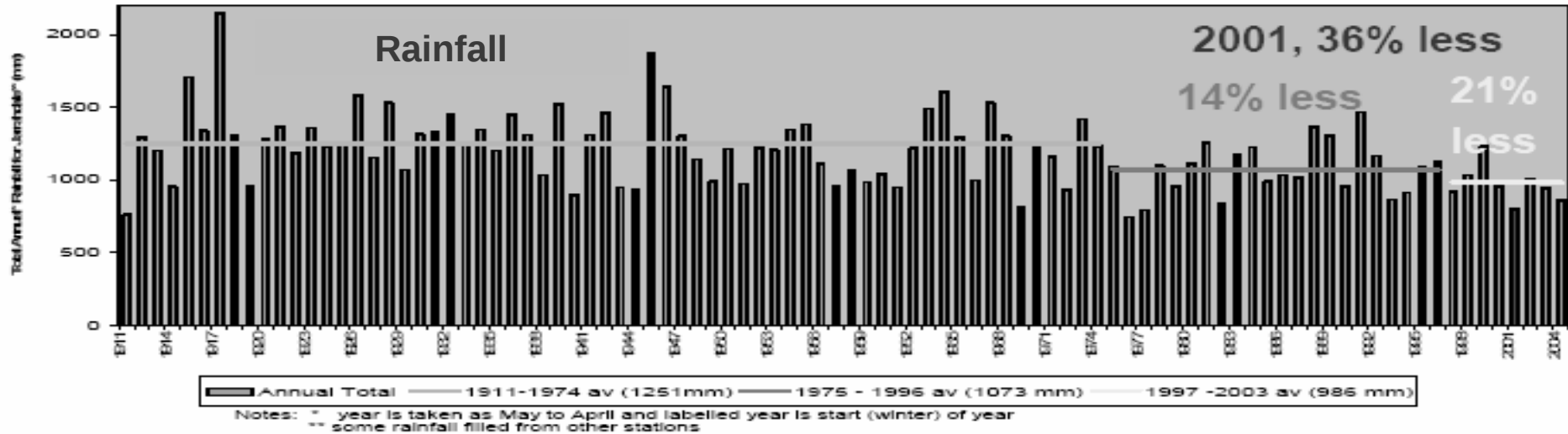


	Current Water price*	No Initiative	Trade	Trade + water. @ \$1.50/kL	Trade + water @ \$1.00/kL	Trade + Water @ \$1.50 plus wage driven migration
Sydney	100%	595%	218%	199%	193%	199%
Melbourne	100%	509%	134%	131%	129%	132%
Brisbane- Moreton	100%	827%	205%	188%	182%	177%
Adelaide	100%	109%	131%	128%	126%	128%
Perth	100%	1018%	565%	401%	348%	364%
ACT	100%	291%	136%	132%	130%	133%

Australian indicative population projections



Climate Change



Reduced water requirement per unit of output

- Rural water use = 34%
- Urban water use = 22%

TERM = The Enormous Regional Model



- **58 ABS statistical regions**
- **167 sectors from 107 ABS**
- **Split out energy use and water use**
- **Household consumption increases with income**
- **Industry consumption a function of output**

- **Consistent with ABS Water Accounts**
- **Not yet dynamic**

18 Regions created from 58



- 1 Sydney NSW
- 2 Murrumbidgee NSW
- 3 Murray NSW
- 4 West NSW
- 5 Rest NSW
- 6 Melbourne VIC
- 7 Mallee VIC
- 8 Rest Irrig VIC
- 9 Rest VIC
- 10 Brisbane-Moreton QLD
- 11 Burnett-Darling QLD
- 12 Rest QLD
- 13 Adelaide SA
- 14 Rest SA
- 15 Perth WA
- 16 Rest WA
- 17 Tas & NT
- 18 ACT

Water supply Assumptions



•Assumptions

- Eastern and Southern Mainland Australia decrease by 15%
- Western Australia no further drop in supply
- NT and Tasmania not supply restricted

A “Smooth Growth” extrapolation of Access Economics Projections

Australia keeps on chugging along

Holding its current place in the world

- 1. No trading, no new sources, ABS projections**
- 2. Urban-rural trading**
- 3. Trade + New sources**
 - a) Extra 80GL new water @ \$1.50/KL
 - b) Extra 120GL new water @ \$1.00/KL
- 4. Wage driven migration**

No trading, no new source

Region*	Aggregate consumption	Real GSP and GRP	Aggregate Employment	Population
	(%)	(%)	(%)	(%)
Sydney	36.2	36.3	12.9	20.2
Murrumbidgee	34.2	34.4	17.8	25.5
Murray NSW	33.8	33.9	19.8	27.6
Western NSW	42.9	43.0	26.3	35.6
Rest NSW	34.9	35.0	16.3	24.2
Melbourne	38.2	38.3	14.3	22.3
Mallee VIC	32.4	32.5	13.9	21.5
Rest Irrig VIC	34.6	34.7	16.2	23.9
Rest VIC	61.4	61.6	43.0	53.6
<u>Brisbane-Moreton</u>	<u>61.1</u>	<u>61.2</u>	<u>40.5</u>	<u>51.5</u>
Burnett-Darling QLD	65.9	66.0	46.9	54.2
Rest QLD	14.1	14.2	-4.9	5.2
<u>Adelaide</u>	<u>10.3</u>	<u>10.4</u>	<u>-6.9</u>	<u>3.8</u>
Rest SA	16.1	16.2	-4.2	6.6
Perth	42.2	42.3	24.1	34.9
Rest WA	61.3	61.5	32.1	43.3
Tas & NT	34.4	34.5	19.5	18.6
ACT	12.4	12.5	-3.3	7.7

S1 Water use change (GL)

	Demand growth	Non-agric. supply growth	Agricultural tech. change	Water availability	Agric effic & leakage	Reduced household requirements	Total
Crops & Livestock	99	-623	1586	-815	-774	151	-376
Dairy	43	-73	-363	-701	219	112	-763
Cotton	-433	14	-904	-596	785	77	-1057
Rice	-196	30	-380	-448	337	56	-601
Household	-8	69	-91	-142	244	-362	-290
Other	495	583	153	-479	-811	-34	-93
Australia	0	0	0	-3,182	0	0	-3,182

S1 Value of output (%)

	Demand growth	Taste changes and non-agric. supply growth	Agric. tech. change	Reduced water availability	Agric. water-efficiency gains and leakage reductions	Reduced household water needs	Total
Crops & Livestock	8.2	-16.5	47.9	-9.1	21.9	1.7	54.1
Dairy	9.8	-5.7	15.3	-16.8	40.9	2.6	46.1
Cotton	-11.9	0.5	-32.7	-17.6	63.2	2.2	3.7
Rice	-11.2	1.4	-23.5	-26.1	61.2	3.4	5.2

S1 Decomposition of shadow price increase (\$/KL)



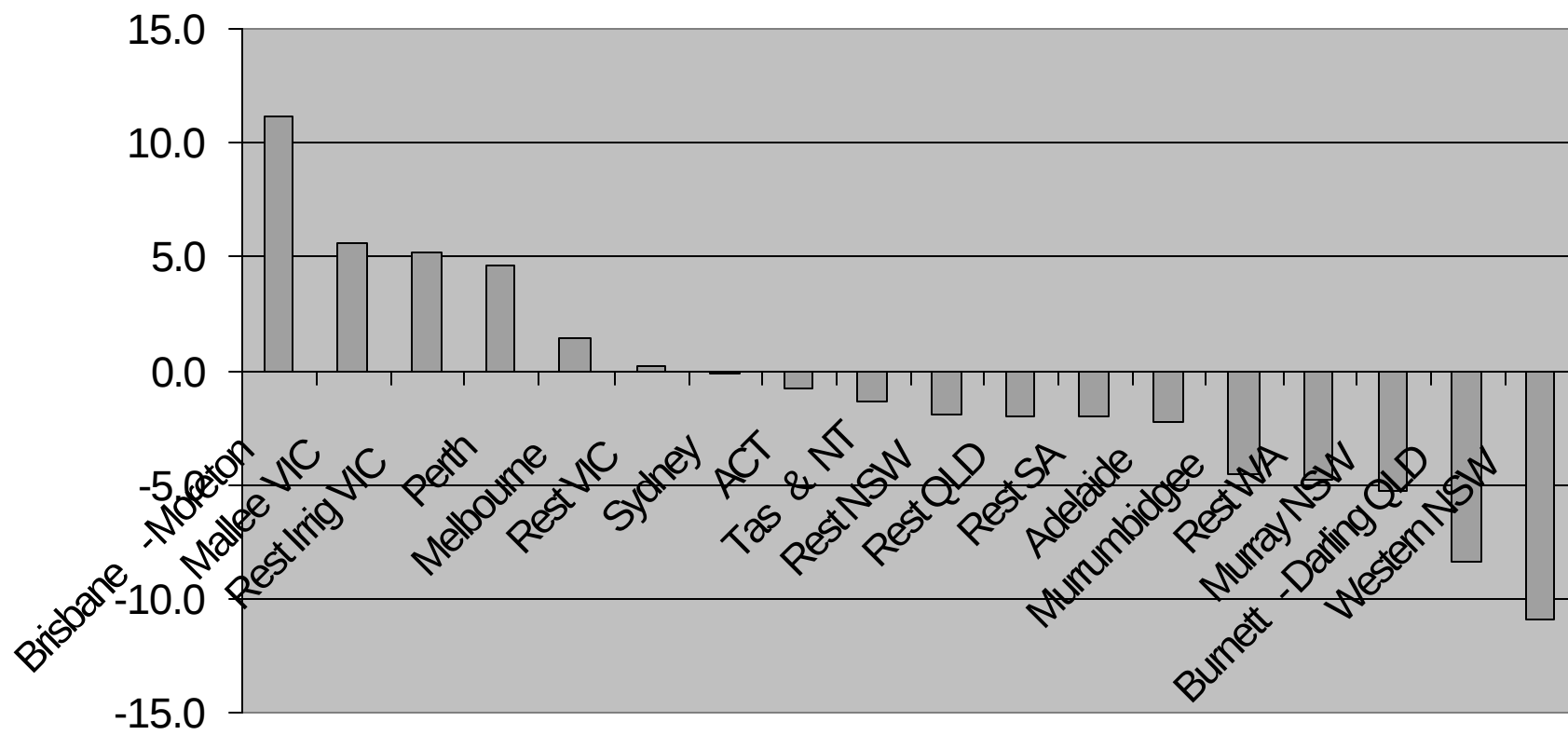
	Demand growth	Taste changes and non-agric. supply growth	Agric. tech. change	Reduced water availability	Agric. water-efficiency gains and leakage reductions	Reduced household water needs	Total
Western NSW	0.75	-0.55	0.71	0.22	-1.43	-0.05	-0.35
Adelaide	0.61	0.31	0.50	1.07	-1.56	-0.82	0.11
Murray NSW	0.61	-0.17	0.51	0.41	-1.13	-0.05	0.18
<u>Murrumbidgee</u>	<u>0.61</u>	<u>-0.17</u>	<u>0.52</u>	<u>0.41</u>	<u>-1.12</u>	<u>-0.05</u>	<u>0.20</u>
Rest QLD	0.56	-0.13	0.80	0.65	-1.49	-0.09	0.30
Rest SA	0.65	-0.07	0.54	0.52	-1.09	-0.09	0.46
Burnett-Darling QLD	0.74	-0.11	0.52	0.39	-0.67	-0.07	0.80
Mallee VIC	1.18	-0.08	0.84	0.78	-1.75	-0.14	0.83
Rest Irrig VIC	1.29	-0.02	0.62	0.74	-1.50	-0.15	0.98
Rest VIC	1.27	-0.01	0.58	0.72	-1.21	-0.15	1.20
Rest NSW	1.19	0.14	0.33	1.21	-1.27	-0.16	1.44
Tas & NT	2.09	0.16	1.11	0.59	-2.09	-0.37	1.49
ACT	2.95	2.55	-0.69	1.16	-0.22	-3.80	1.95
Rest WA	4.23	1.44	1.76	0.78	-3.45	-0.53	4.23
Melbourne	2.55	2.39	-0.22	2.23	-1.39	-1.15	4.41
Sydney	3.70	3.81	-0.59	2.52	-0.77	-2.47	6.20
<u>Brisbane-Moreton</u>	<u>5.59</u>	<u>3.53</u>	<u>-0.17</u>	<u>1.91</u>	<u>-1.07</u>	<u>-1.28</u>	<u>8.51</u>
Perth	6.57	5.82	-0.17	0.40	-1.18	-1.97	9.47

Economic Change (S2%-S1 %)

	Consumption	Real GDP	Employment
Sydney	-0.2	-0.2	-0.6
Murrumbidgee	-4.5	-4.6	-3.6
Murray NSW	-5.3	-5.3	-4.1
Western NSW	-11.0	-11.0	-10.3
Rest NSW	-1.9	-1.9	-1.3
Melbourne	1.4	1.4	0.4
Mallee VIC	5.6	5.6	3.3
Rest Irrig VIC	5.0	5.1	2.1
Rest VIC	0.2	0.2	0.0
<u>Brisbane-Moreton</u>	<u>11.1</u>	<u>11.2</u>	<u>6.3</u>
Burnett-Darling QLD	-8.4	-8.4	-4.3
Rest QLD	-2.0	-2.0	-1.6
<u>Adelaide</u>	<u>-2.3</u>	<u>-2.3</u>	<u>-1.8</u>
Rest SA	-2.0	-2.0	-1.6
Perth	4.6	4.6	2.4
Rest WA	-4.8	-4.8	-3.1
Tas & NT	-1.3	-1.3	-1.3
ACT	-0.8	-0.8	-0.7
Australia	1	0.6	0

S2 Urban – Rural Trading (S2%-S1 %)

Change in real GDP, GSP and GRP



S3 A new water source

Urban-rural trading + new source for

- **Perth**
- **Brisbane - Moreton**
- **Sydney**

S3 - 80GL supplied @ \$1.50/KL

S3A - 120 GL supplied @ \$1.00/KL

Ashelon 100 GL desalination plant in Israel

Under 25 year boot scheme supplying at US\$0.53/KL

Perth's new supply expected to cost A\$1.15/KL

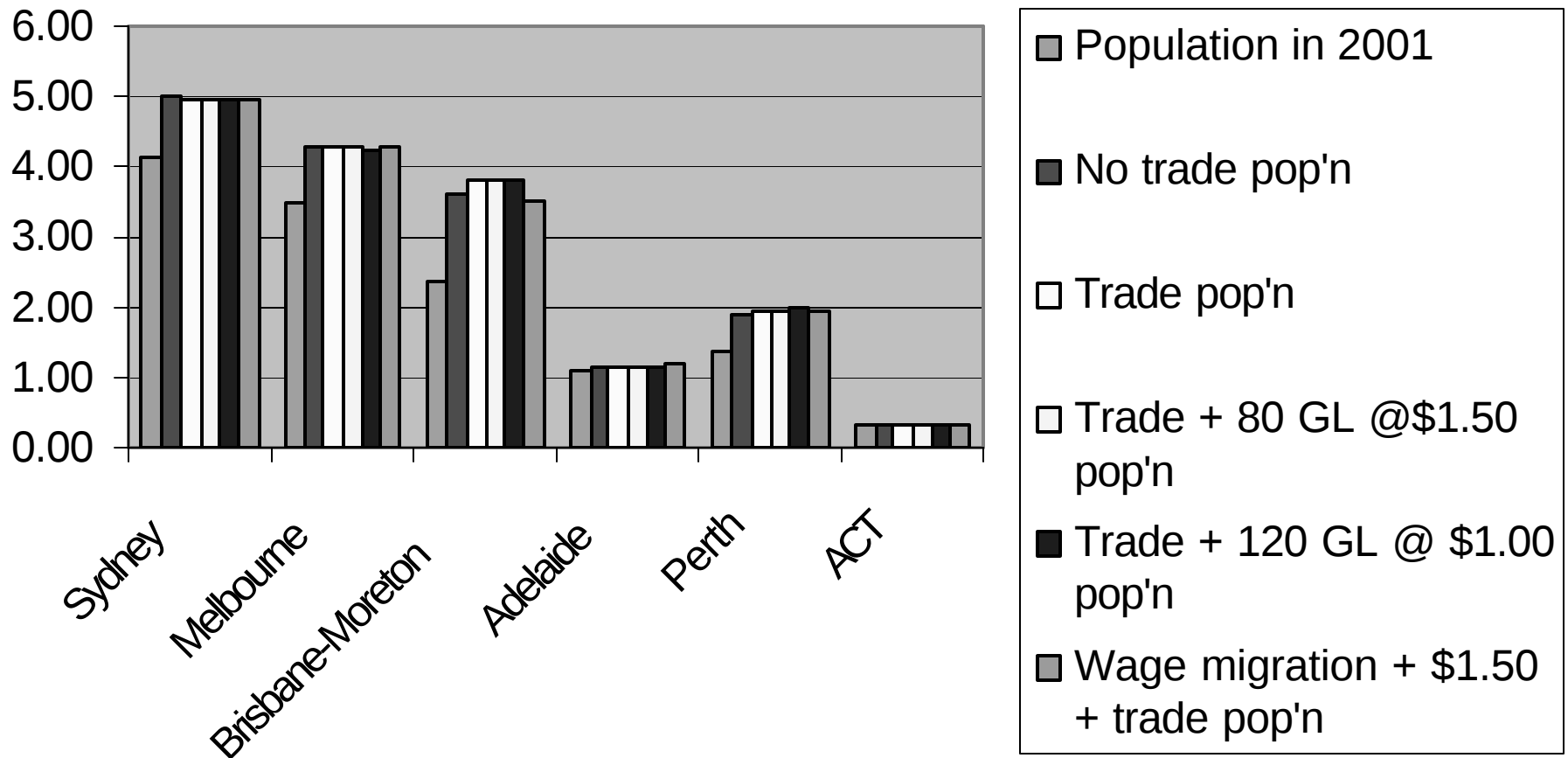
Wage driven migration



ABS projections are indicative projections that take no account of changing regional economies

In Scenario 4 we introduce wage driven regional migration

Population changes by scenario



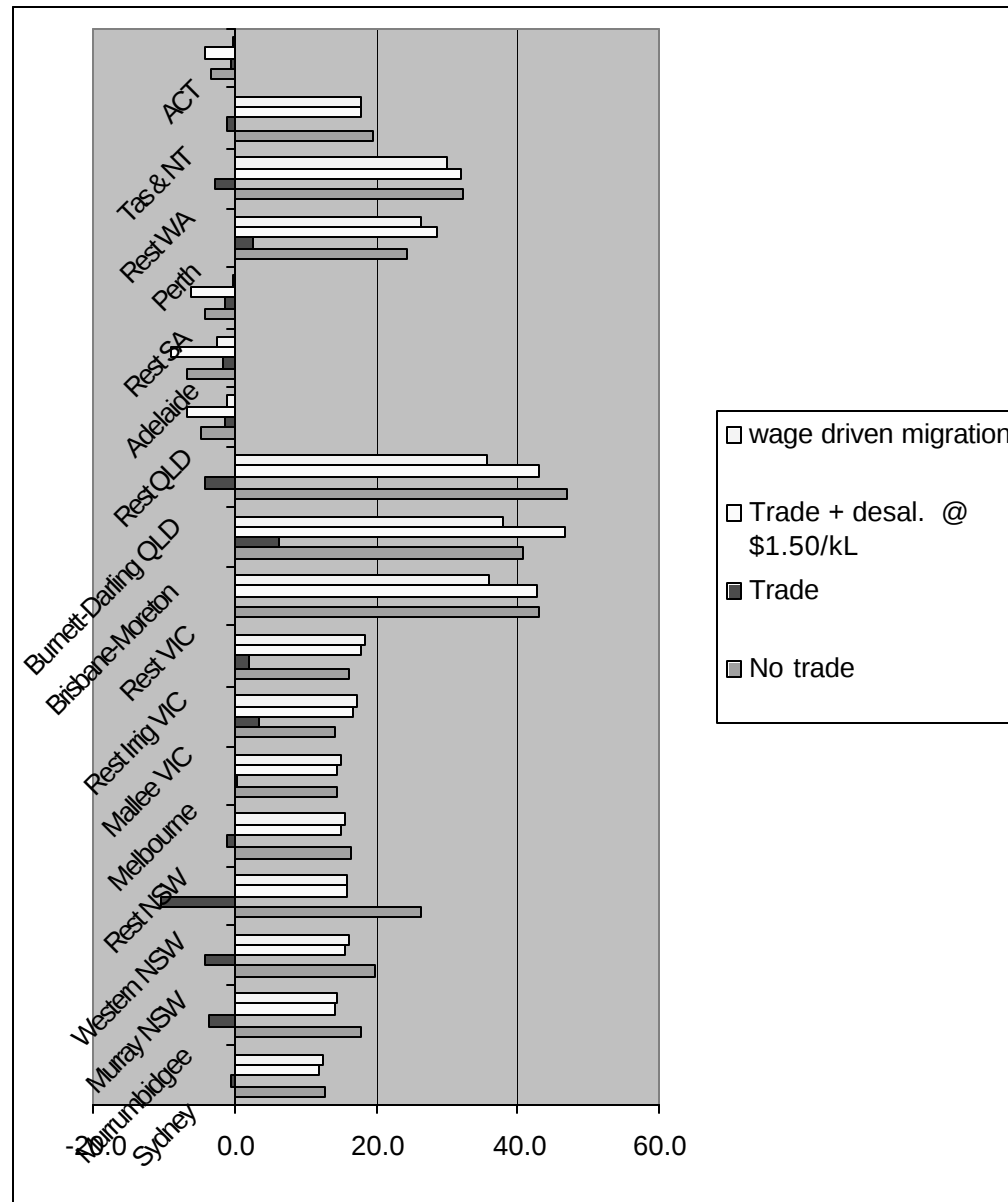
Brisbane- Moreton drops by 300,000 people from 3.83 – 3.43 people

Change water use by scenario (GL)

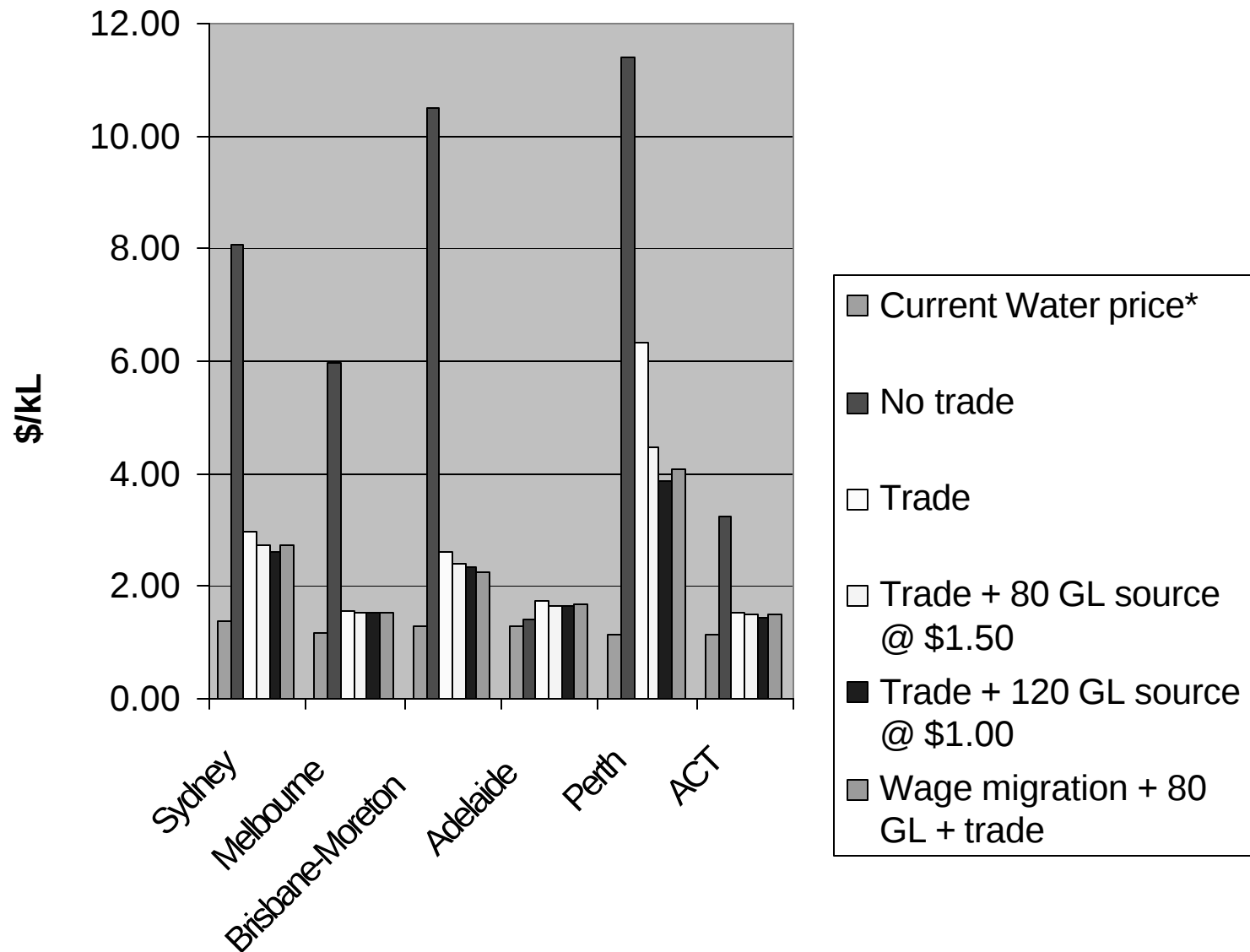
	No trade	Trade	Trade + 80 GL source @ \$1.50	Trade + 120 GL source @ \$1.00	Wage migration + 80 GL @ \$1.50 + trade
Crops & Livestock	-376	-356	-268	-227	-268
Dairy	-763	-477	-462	-455	-470
Cotton	-1057	-1493	-1445	-1421	-1429
Rice	-601	-708	-690	-681	-689
Household	-290	-246	-235	-226	-232
Other	-93	98	158	188	145
National	-3182	-3182	-2942	-2822	-2942

Other => $98 - (-93) = 185$ GL & Household = $-246 - (-290) = 54$ GL

Employment effects by Scenario



Actual price by scenario



Some concluding observations

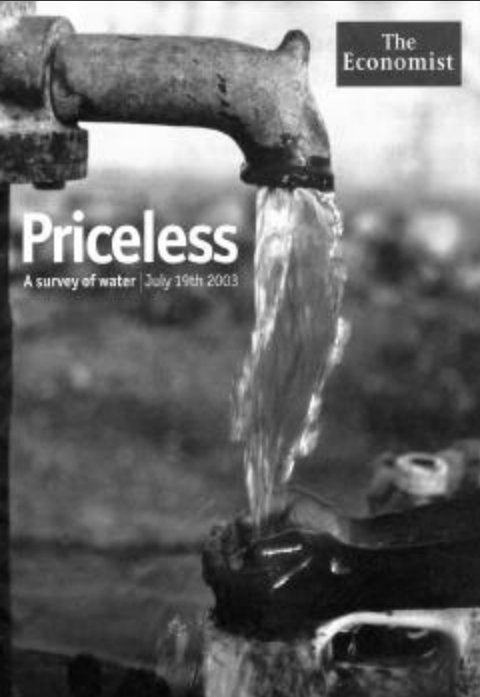


Water policy choice has the capacity to influence where people live and work in Australia

Relatively small volumes make a big differences to urban water price

Significant increases in water price must be expected if Australia says no to

- to Urban - rural trade**
- to Recycling**
- to Desalination**



Drops of water make rivers and aquifers



Contact:

Dr M Ejaz Qureshi
Policy and Economic Research Unit
CSIRO Land and Water, Canberra Australia
Email: Mike.Young@adelaide.edu.au
Phone: +61-2-6246.5622
Mobile: +61-409-666.612