Measuring Over Allocation of Water Resources

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Premise

- Much of current water reform and associated investment ($10B) is aimed at reducing over allocation of water resources.
- Over allocation is understood only in the broadest terms and there are no accepted ways of measuring it.
- How can we have confidence in resolving over allocation if we cannot measure it?

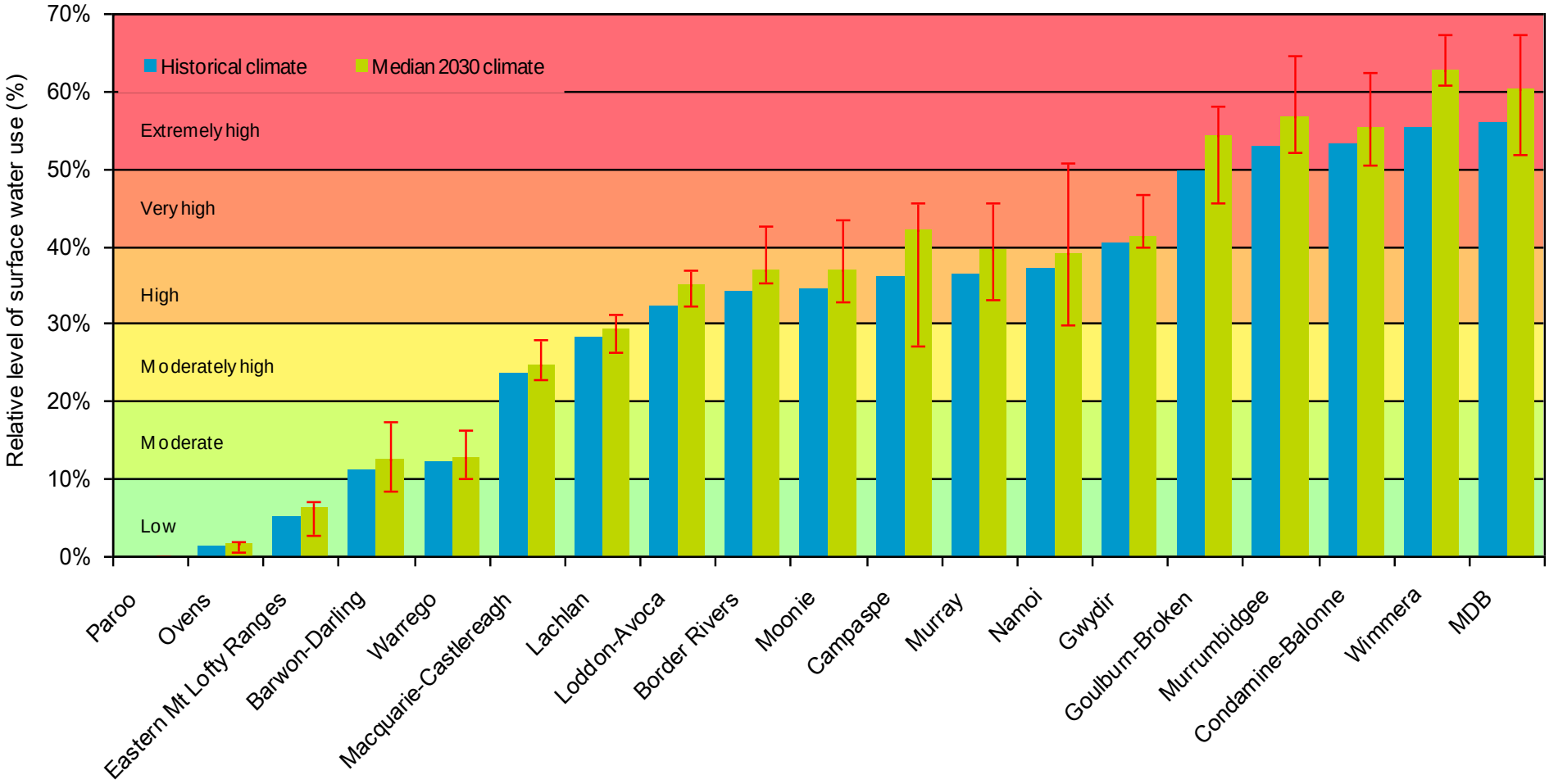
Semantics don’t matter

- Is it “over allocation”, “over entitlement”, “over use”, or “unsustainable use”?
- What it is called is of secondary concern
- All terms reflect a primary concern that too much water is used with an unacceptable impact on the environment
- It is more important to have acceptable measures of over allocation than argue about the appropriate term
- How much extractive use is too much?

MDB Sustainable Yields - relative level of surface water use

Where is use too high ?

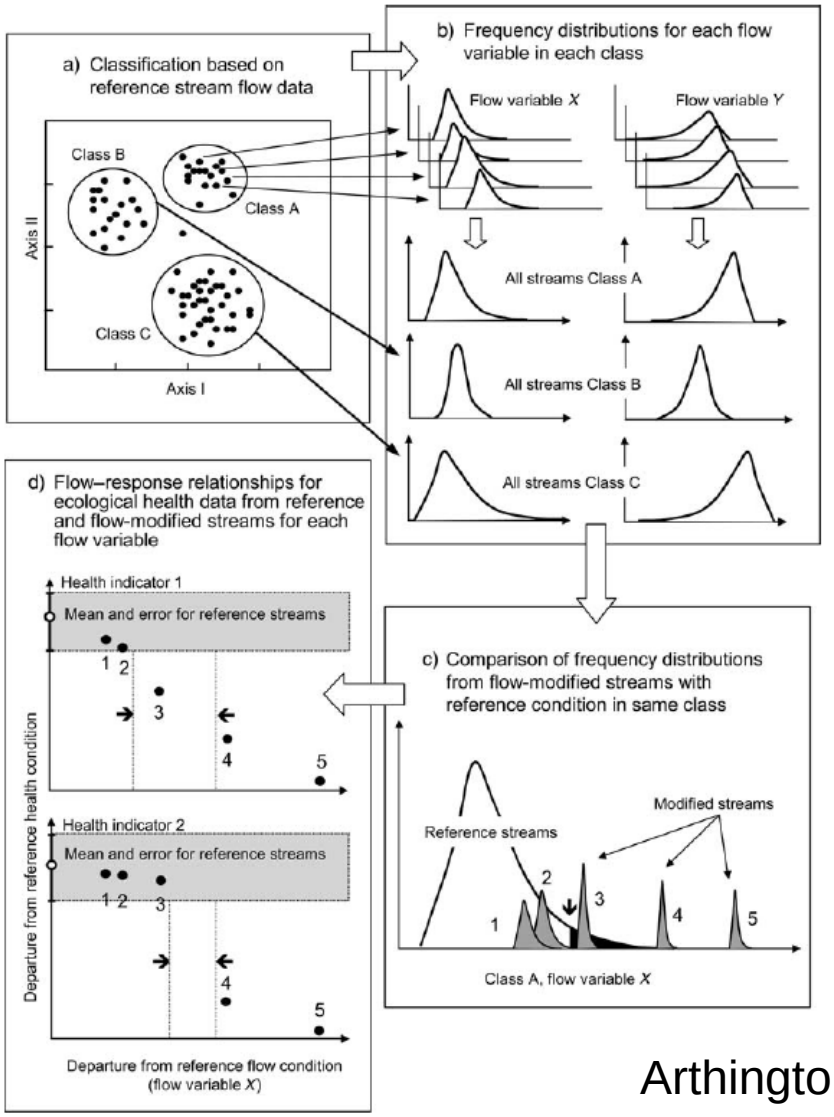
Why can't more water be used ?



No simple measure of acceptable use

Region	State	Relative level of use	Fraction of MDB SW Resource	Environmental Assets	Change in average period between env. beneficial floods
Wimmera	VIC	55%	1%	International	786%
Condamine-Balonne	QLD	53%	6%	International	384%
Murrumbidgee	NSW	53%	18%	National	188%
Goulburn-Broken	VIC	50%	14%	Regional	328%
Gwydir	NSW	41%	3%	International	77%
Namoi	NSW	37%	4%	Regional	26%
Murray	NSW/VIC/SA	36%	22%	Multiple International	155%
Campaspe	VIC	36%	1%	Regional	58%
Moonie	QLD	34%	0%	Regional	15%
Border Rivers	NSW/QLD	34%	5%	Regional	22%
Loddon-Avoca-Avoca	VIC	32%	1%	Regional	82%
Lachlan	NSW	28%	5%	National	71%
Macquarie	NSW	24%	7%	International	114%
Warrego	QLD	12%	2%	National	0%
Barwon-Darling	NSW	11%	0%	National	82%
Eastern Mount Lofty Ranges	SA	5%	1%	National	0%
Ovens	VIC	1%	8%	National	2%
Paroo	QLD	0%	2%	Multiple International	0%

Flows required to sustain ecosystems



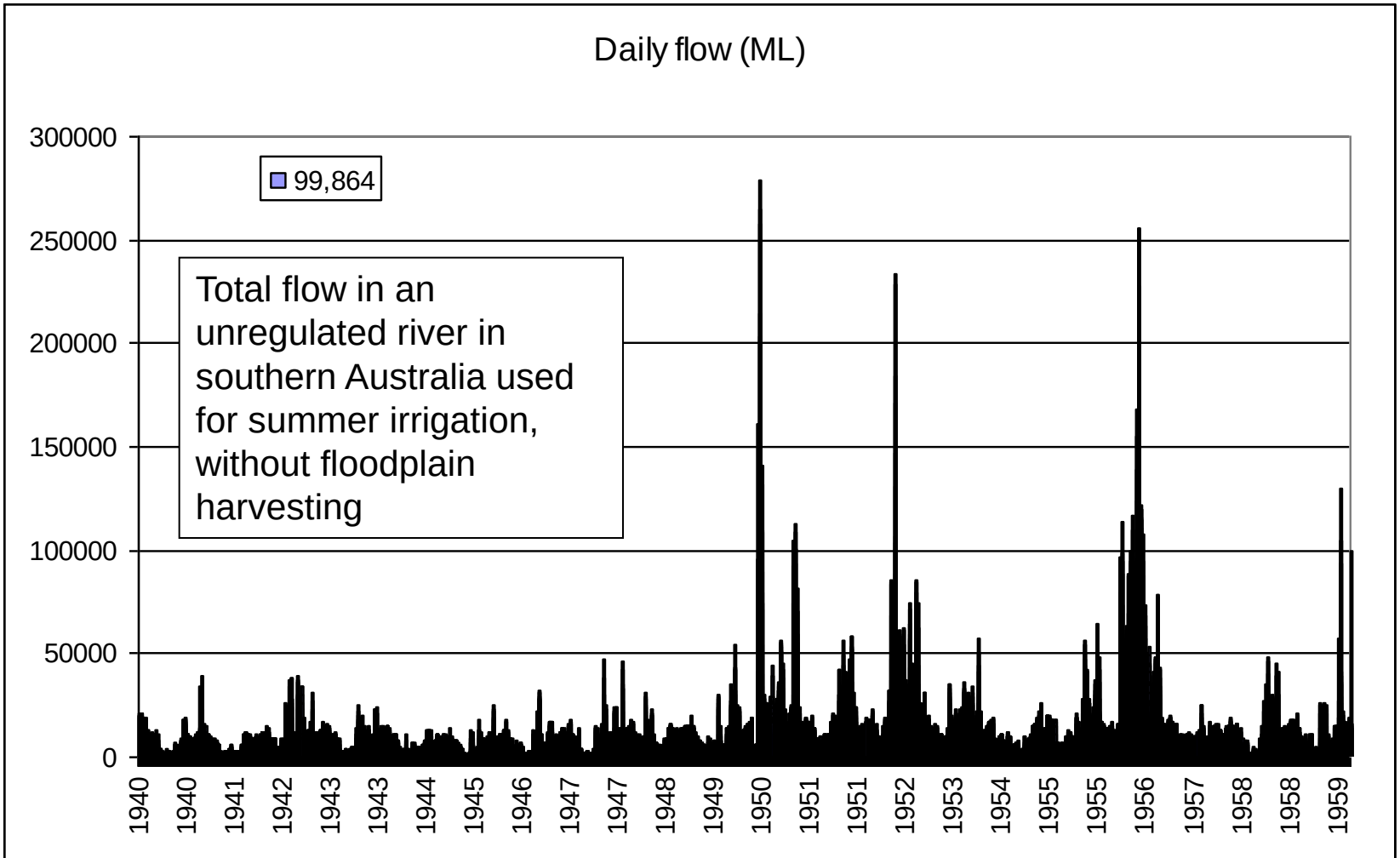
Arthington et al. 2006

What is over allocation?

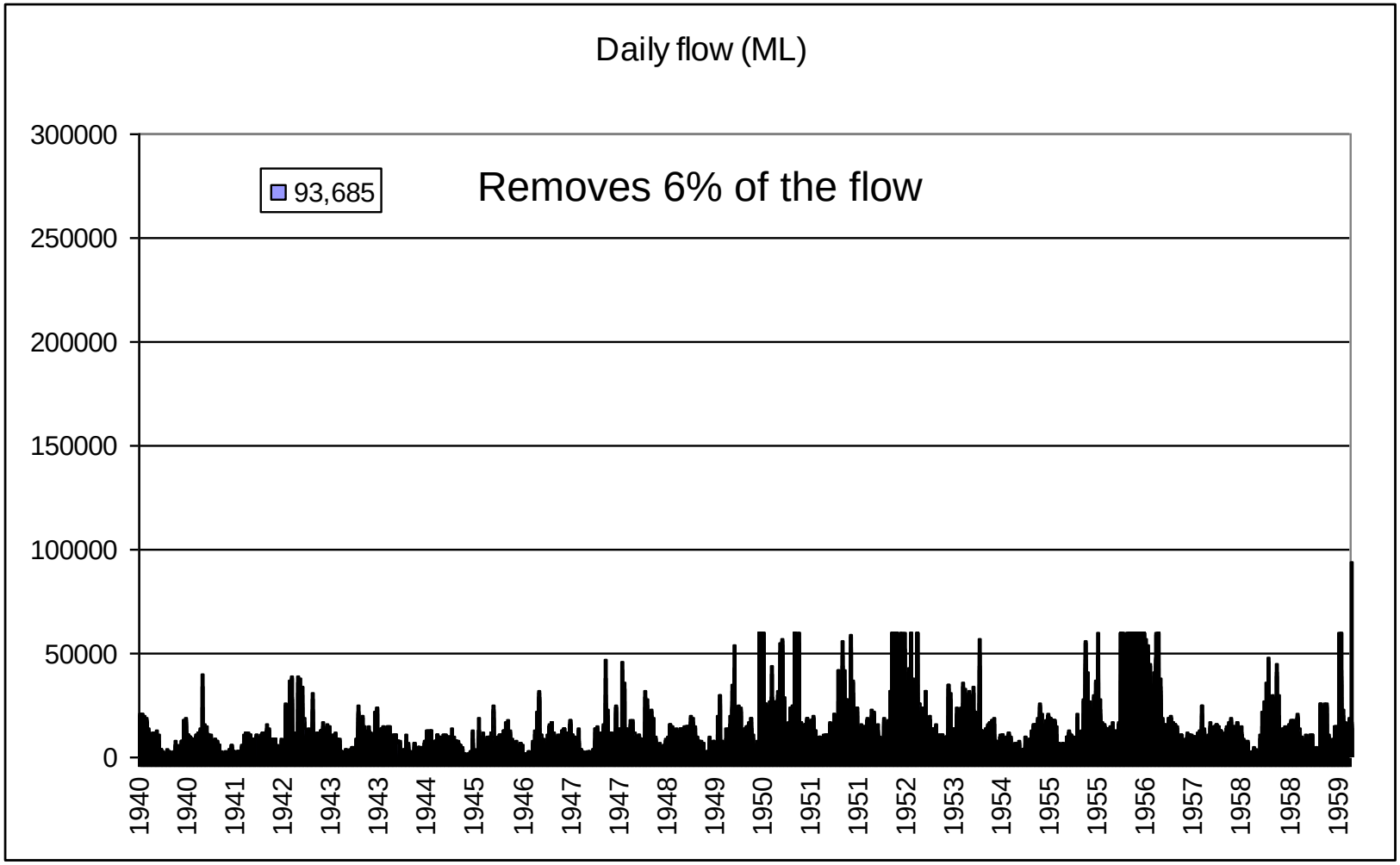
- Demands for water cannot all be met
- Conflict between environmental water demand and demand for extraction
- Need to introduce concept of environmental assets, and values to recognise fundamental trade-off with reference conditions
- Need to represent environmental water as a demand in the same terms as other use – volume, timing, reliability
- Over allocation is where environmental and extractive demands cannot both be met to the required reliability

Why can't more water be used (max 50%)?

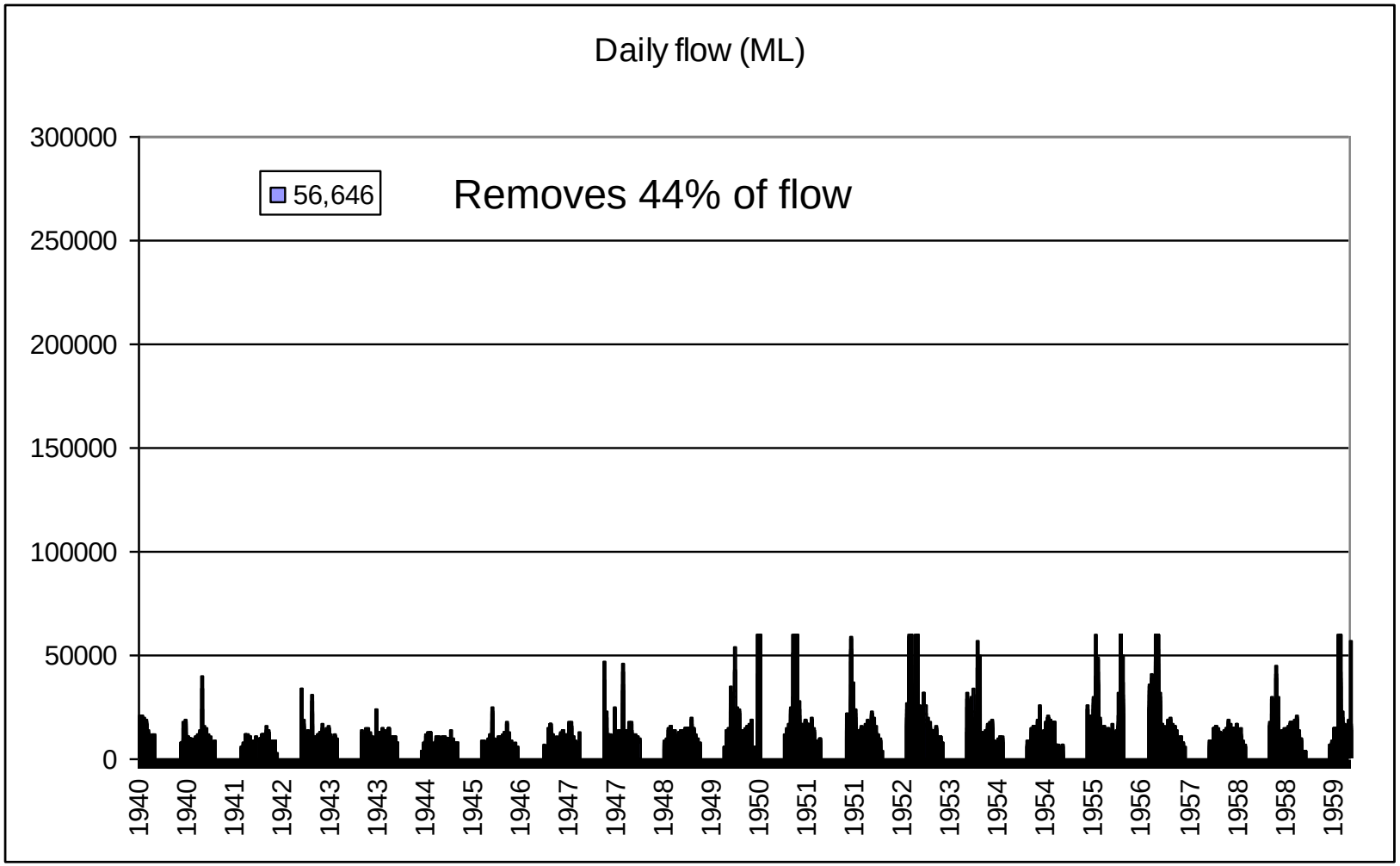
…for environmental use or consumptive use.
Where are the conflicts in resource use?



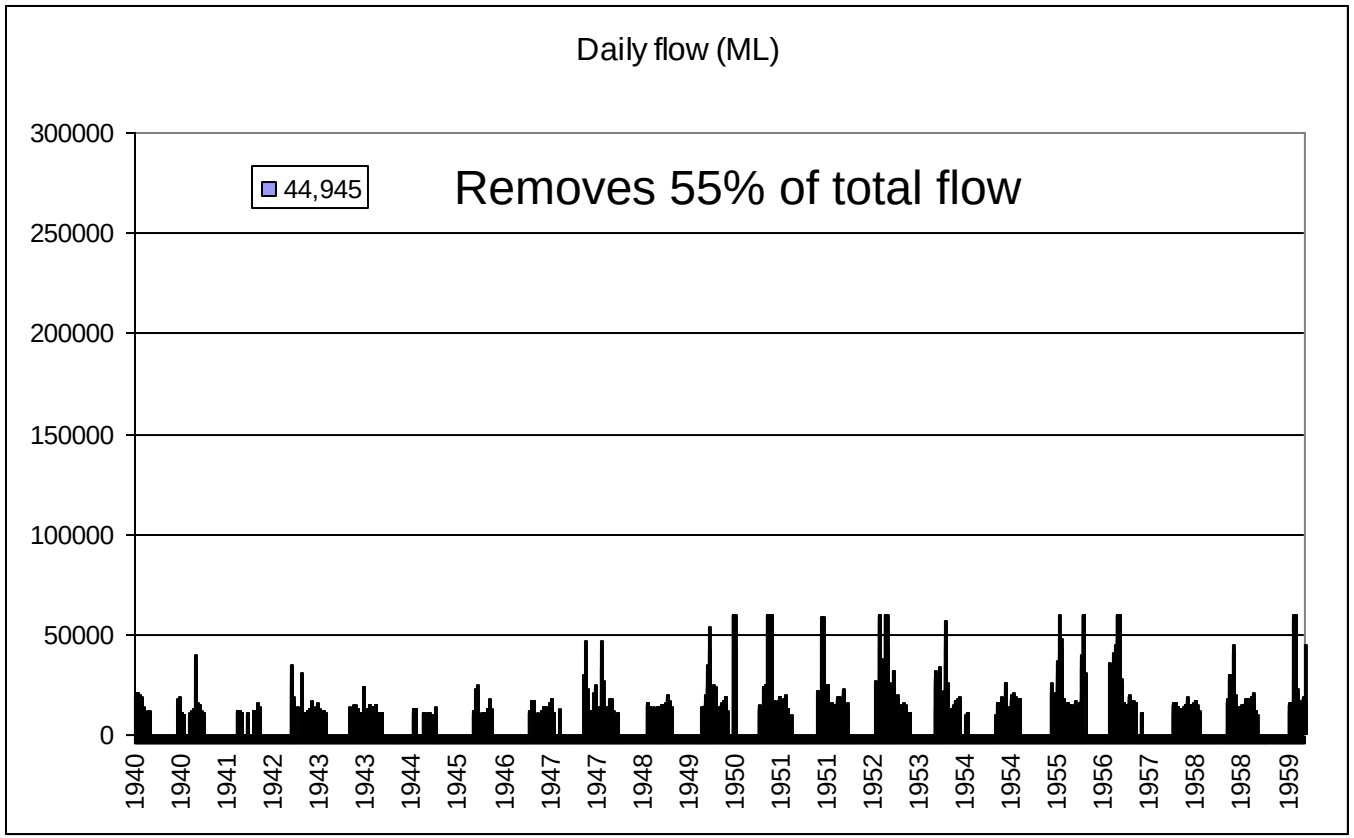
Manageable water resource 1 – remove floods



Manageable water resource 2 – irrigation season



Manageable water resource 3 – remove low flows



Manageable water resource, which can be used, is 45% of total flow

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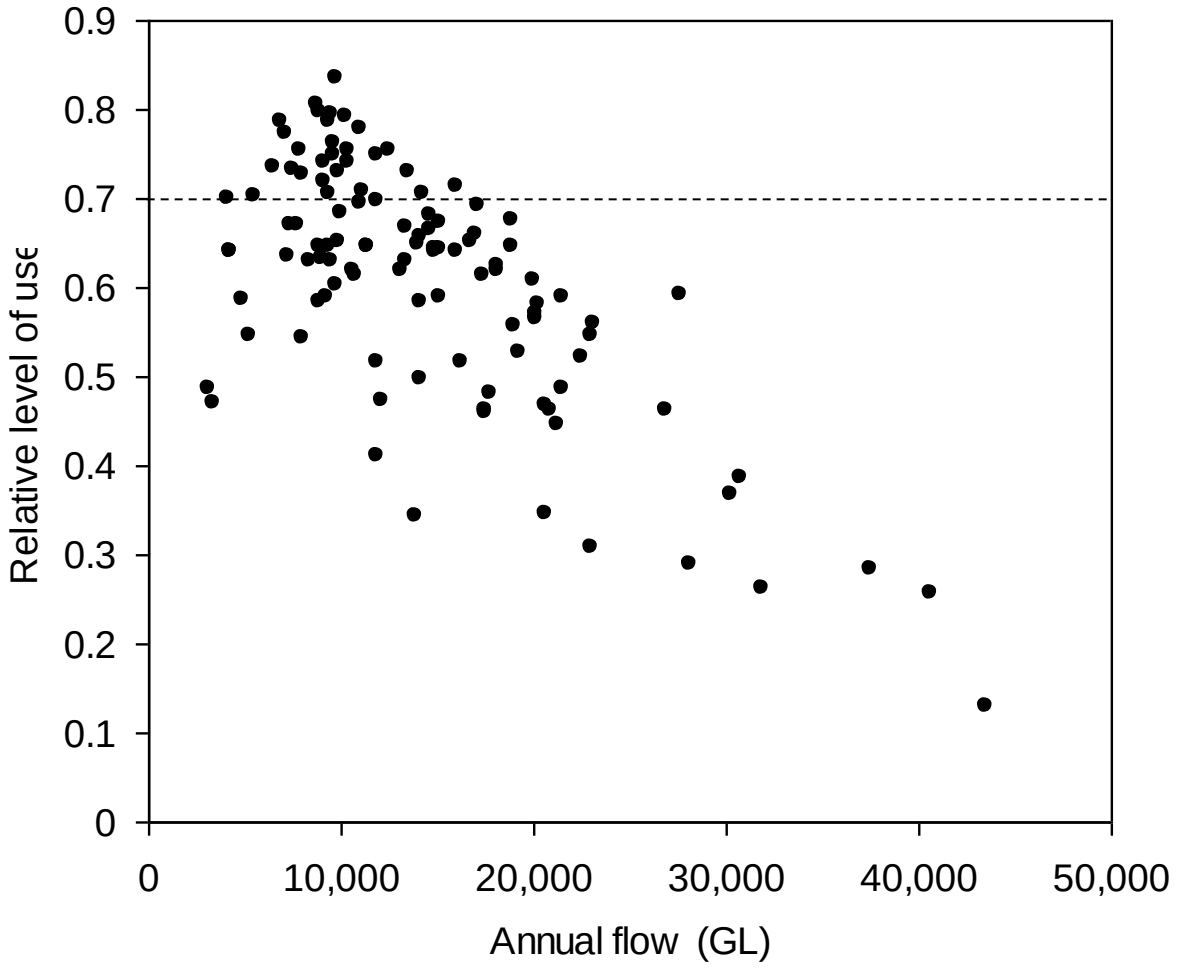
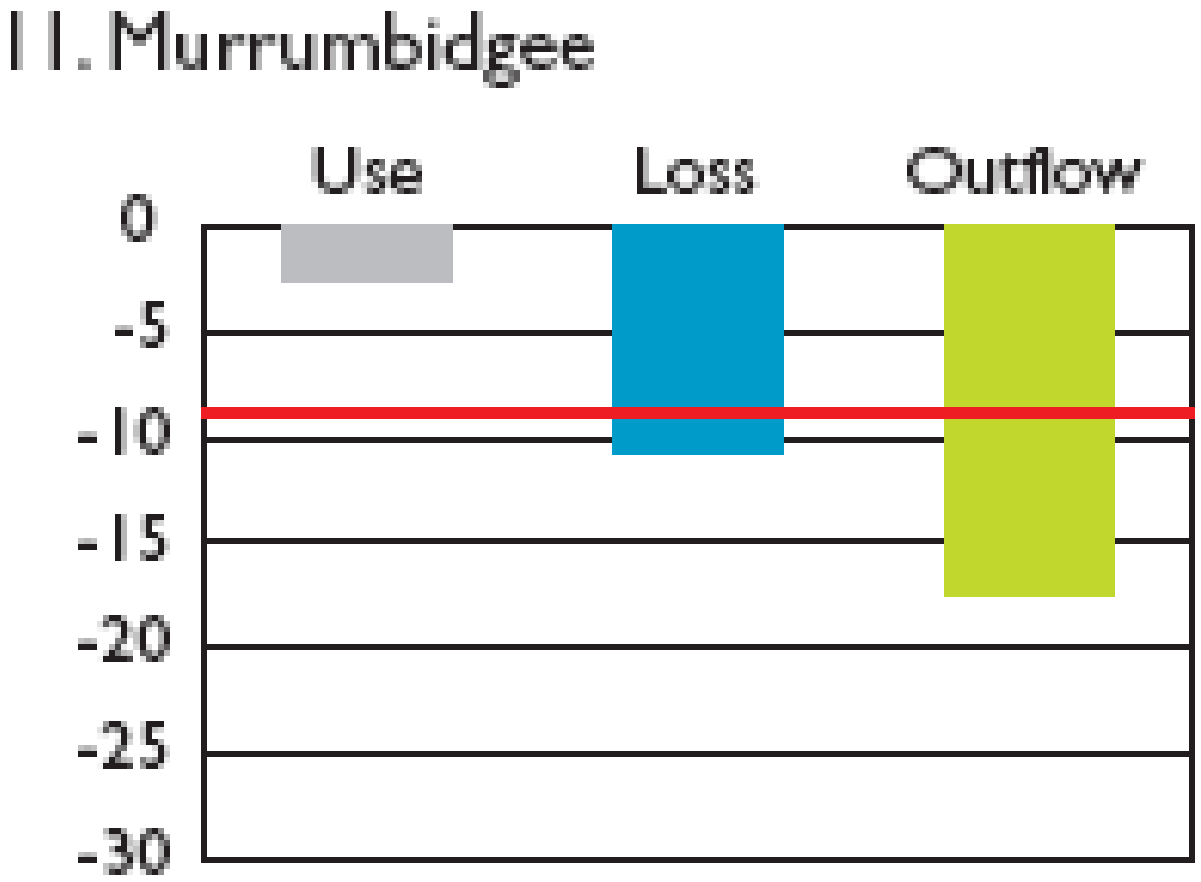
High level of use in many drier years

- Level of use >70 percent of total flow in 25 percent of years



Uneven risk sharing



Steps to measuring over allocation

- Identify environmental assets, values, condition required
- Define environmental water demands and reliability (timing etc)
- Define extractive water demands and reliability
- Analyse through a range of scenarios if both extractive and environmental demands can be met at required level of reliability
- Ensure exposure to risk of reduced supply is shared evenly

- Over allocation is the extent (volume) to which combined demands cannot be met

Simple example

Year	1	2	3	4	5	6	7	8	9	10
Resource (Gl/y)	500	100	1000	300	400	700	600	800	200	500
Extractive demand (Gl/y)	200	200	100	200	200	200	200	150	200	200
Environmental demand (Gl/y)	250	50	900	200	100	600	300	600	50	250
Over allocation (Gl/y)	0	150	0	100	0	100	0	0	50	0

Sustainable extraction limit at 90% reliability is 100 Gl/y
Over allocated by 100 Gl/y

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Conclusions

- Over allocation is subjective
- Must define environmental assets and their condition
- Over allocation is degree of conflict between demands
- The conflicts are often restricted in time – summer, droughts, low flows, regulation of floods
- Can only be evaluated with detailed analysis of demands through times and rules for entitlements
- Some simplified proportions of use may be possible for rivers of the same class

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