

# Discovering the value of water

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# From the introduction to *Future Water* (2008)

- *“We are all increasingly understanding that we need to value water more, use it more wisely and play our part in taking responsibility for protecting this essential and unique resource. This strategy aims to help all of us to do so.” Hilary Benn*
- References here to:
  - Valuation
  - Efficiency in use
  - Participation
- Compare with characteristics of competitive markets.
  - Price/value determination
  - efficient allocation of scarce resources
  - large numbers of buyers and sellers

# How things look today

- *The principal mechanism for achieving sustainable management and development of water resources is the Environment Agency's system of abstraction licensing. ... For historical reasons, many licences were issued to remain in force until revoked and cannot be readily modified. All licences issued since October 2001 have been issued with a time limit. There is a presumption of renewal such that a new licence would be granted, on the expiry of a time-limited licence, subject to a continuing need for, and efficient use of, the abstracted water and so long as the environmental impacts of the abstraction are acceptable.*
- Recent Water Resource Management Plans show a supply-demand deficit for the majority of water companies over 25 year horizon (only 4 companies showed no projected deficit)
- Is this credible? Planning -> problematic supply incentives?
- ... and limited information discovery.
- ... and tensions in environmental policy: forecast and provide?

# Markets :value and efficiency statics

- ‘Theories of value’ are central to microeconomics. Markets are arenas for ‘value discovery’ and coordination based on that discovery. *All valuations count, no single valuer has ‘undue influence’.*
- Efficiency: familiar results, from A. Smith’s invisible hand onward.
- Objections to markets in the case of water:
  - Natural monopoly: some parts of *networks* yes, the rest no, *including no in relation to the supply of raw water.*
  - Externalities: they exist (environmental, public health). But, contrary to virtually all economics teaching whilst being self evidently true, the existence of externalities does not imply market failure. Externalities reflect transactions costs. So no.
  - Abundance of the commodity: yes. But *Future Water* assumes that water is scarce.

# Abundance?: a tale from West Texas

- Occurrences of negative prices in the western part of Texas have rapidly increased in frequency as wind development has soared in the area while transmission links to other parts of the state have failed to keep up. Prices fell below US -\$30/MWh (megawatt-hour) on 63% of days during the first half of 2008.
- Pressure on water resources: declining water levels in the Ogallal Aquifer.
- The brackish Dockum Aquifer covers a large part of the Texas Panhandle.
- Cheap desalination = low value for water?

# Market statics: Galton's ox (*Nature*, 1907)

- Context: the wisdom of the (educated) few vs the wisdom of many. Majority rule democracy as an estimation procedure. Guess the weight of an ox competition (Plymouth).
- 787 tickets, 13 illegible, distribution no-normal, median 1207 lbs, actual weight 1198 lbs (< 1% error).
- Main point for today: location (among the many) and use (here via aggregation) of information.
- Other issues arise from use of example by, for example, Surowiecki, *The Wisdom of Crowds*, and Sunstein, *Infotopia*.
  - Galton clear, median not mean: limits the influence of any one guess, since the guesses of 'cranks' difficult to distinguish from the views of 'experts'. Mean would give equal weight to better and worse guesses.
  - Kurtosis.
  - Influence of experts: transmission of error (Levy and Peart).
  - "The importance of the rules".

# The wisdom of the few: current water abstraction charges

**Abstraction charges for year commencing 1 April 2007**

Region	2007/08 Standard Unit Charge (£/1000m <sup>3</sup> )
Anglian	24.37
Midlands	13.74
Northumbria	24.86
NorthWest	12.71
Southern	17.88
South West (incl. Wessex)	19.44
Thames	13.05
Yorkshire	10.71
Environment Agency Wales	12.85

# Current abstraction charges (continued)

## Source factors for year commencing 1 April 2007

Source	Factor applied to standard rate
Unsupported: all sources not included in other categories (incl. groundwater)	1.0
Supported: abstraction from sources or parts of sources within specific co-ordinates (for example, part of a river such as the Tyne or the Tees)	3.0
Tidal (inland waters downstream of normal tidal limit)	0.2

## Seasonal factors for year commencing 1 April 2007

Source	Factor applied to standard rate
Summer: abstraction only between 1 April and 31 October	1.6
Winter: abstraction only between 1 November and 31 March)	0.16
All year (abstraction which takes place all year)	1.0



# The dynamics of discovery: information and incentives

- Galton: majority voting as an estimation procedure; Hayek: competition as a discovery procedure.
- Value is not objective in the sense that the weight of an ox is.
- Two aspects here: the value of water, and the value of information.
- God's eye view of an economic process:
  - Information:  $I(1)$  to  $I(2)$  to  $I(3)$  to  $I(4)$  ...
  - 'Value':  $V(I(1))$  to  $V(I(2))$  to  $V(I(3))$  to  $V(I(4))$  ...
- The way in which the process evolves will be different under different institutional arrangements (the rules again).
- Competition is an effective mechanism for driving this forward: it will drive higher  $V(I(t+1)) - V(I(t))$ . But it is not feasible to estimate this *ex ante*, because (definitionally)  $I(t+1)$  is not known at time  $t$ .
- Why effective? Information and incentives.
- These are the two rocks on which central planning founders:
  - Informational poverty
  - Insufficient 'care'

# Like the ox, this is all old stuff, but it keeps getting forgotten or distorted

- J S Mill, *Principles of Political Economy* (1848):
- “... people understand their own business and their own interests better, and care for them more, than the government does, or can be expected to do.”
- “All the facilities which a government enjoys of access to information; all the means which it possesses of remunerating, and therefore of commanding, the best available talent in the market—are not an equivalent for the one great disadvantage of an inferior interest in the result.”
- “It must be remembered, besides, that even if a government were superior in intelligence and knowledge to any single individual in the nation, it must be inferior to all the individuals of the nation taken together.”
- NB These are not arguments against democratic government (see Galton). They are arguments against monopoly (consistent with Galton).

# A few points about locational water values

- Abstraction may have different environmental costs in different locations, but those locational cost difference do not necessarily translate into locational differences in water values.
- Locational value differentials also depend on transport costs (i.e. on the water transportation network and how it is priced).
- Network and locational raw water value discovery are two sides of the same coin.
- It is therefore possible to have wholesale market with wide coverage, even though 'costs of production' vary substantially with geography.
- Example: electric power. Wide variations in the cost of generating extra power, but there is a single GB price at a virtual national balancing point.

# Markets in water abstractions

- The current approach to water abstractions is chiefly administrative in nature, based around the licensing arrangements and charging structure noted above.
- The valuations reflected in these charges are inconsistent with broad views about scarcity set out in *Future Water*.
- Reform is clearly in the air.
- There has already been some progress toward trading of abstraction rights.
- Will this be accelerated as a result of work being done by Defra, the Environment Agency and Ofwat?
- Will progress be hindered by concern that higher water values will hit domestic consumers, and that existing cross subsidies need to be defended by means of devices such as a 'single buyer model' (i.e. monopsony cum monopoly) at the wholesale level?
- See above on the information and incentive properties of monopoly.

# Limitations of the status quo

- The Water Act (2003) introduced significant changes to abstractions system, including measures intended to simplify the water rights trading process. However, unnecessary restrictions on trading still exist.
- It is not a conventional exchange mechanism: trading proposals are dealt with by EA in manner similar to new applications for water abstractions.
- The EA retains the discretion to vary the character and nature of rights from those surrendered when it re-issues an abstraction licence.
- In the EA's view, many areas are 'over licensed' and 'over abstracted' and new or varied licences in these areas are very likely be restricted.
- The time to complete transactions is relatively long: between 3 to 4 months or longer.
- So:
  - Using 'trades' to address over-abstraction is poor policy targeting.
  - It is effectively a tax on value discovery – not a good idea.
  - There is considerable regulatory/policy uncertainty (EA's wide discretion and lack of predictability as to how it will behave).
- But issues around durations of rights are largely red herrings for the problems of interest tonight. They are distributional in nature.

# The system operations function

- Question: how are the environmental effects of water abstractions to be valued?
- Institutions/rules to address this type of issue have evolved, via the usual trial and error processes of innovation. They have developed to a point where, in some sectors, there is, in effect, market trading in the avoidance of third party harm (i.e. in what would otherwise be an externality).
- The concept of a system operator is most familiar in energy, particularly electricity, but there are analogues in other sectors (e.g. air traffic control, timetable co-ordination in rail).
- There are variants on the basic model, and each case tends to involve adaptations tailored to context (strong/weak, deep/shallow). In water the externalities arise from water abstraction in a context where rights are already allocated. The pattern of external effects (harm) is geographically heterogeneous.
- A water resource manager (WRM) with SO functions.

# Strawman (Decker & Yarrow): part 1

- Start with an administrative charging structure – the ‘initial structure’ – for abstractions (as now).
- Allow trading with no reductions in rights.
- WRM trades in abstraction rights, buying back rights in over-abstracted areas as well as selling new rights; initially via structured tenders (to buy and sell rights).
- Add abstraction surcharge to establish initial WRM budget over admin costs (i.e. replace current tax-on-trading approach with an extra charge on abstraction).
- Simultaneously introduce incentives schemes for regulated companies to sell existing abstraction rights where appropriate (see part 2 below).
- WRM might initially be proactive in facilitating/promoting direct trades between rights holders (e.g. by price reporting), but is otherwise passive in relation to such trades.

# Price consequences and a new rights settlement?

- What would happen to the locational prices/values of abstraction rights, and hence to the locational costs of raw water?
- We don't know. The whole point is to get better information and incentives. These things are to be discovered.
- But won't (a) the price of water shoot up in the South East and (b) harm domestic customers?
- (a): maybe, maybe not. Place your bets.
- (b): not necessarily, even if the cost of raw water rises sharply.
- The question is: who has beneficial ownership of the rents? At the moment, companies have legal rights, but are unable to realise any value because of regulation. Customers therefore get the benefits.
- There is therefore scope for a rights settlement that protects the existing benefits of customers, whilst freeing up the restrictions on companies at the margin.



# Abstraction rights ownership: Strawman 2

- The policy aim: eliminate or substantially mitigate the 'income effects' on domestic consumers from increases in the price of raw water, thereby avoiding a repeat of the carbon permits pratfall in energy.
- Negotiate a rent settlement in which the beneficial ownership of abstraction rights to a defined annual volume of water abstraction, corresponding to something like an existing average annual level of a domestic customer, is allocated to each customer ( $Q_m$ ).
- Thus, similar households in, say, Northumberland and Essex, would receive the same quantity entitlement, but if the raw water values between the two areas changed substantially, movements in the rights' values would compensate.
- The rent per unit of water ( $R$ ) is calculated as the difference between traded water values and the administrative charge in the relevant area
- Domestic customers are entitled to a lump sum rebate =  $R Q_m$ .
- This makes the payment structure equivalent to a two-part, rising, block tariff, so the average charge (what matters for income distribution) is less than the marginal charge (which matters for incentives).
- Water companies have beneficial ownership of all abstraction rights above the allocation to domestic customers, giving incentives to trade rights.