Thematic Week Seven: Economics and Financing, 28 – 31 July 2008

"Water Markets in Integrated Water Resources Management"

Tradeable emission rights for water quality management

Drew Collins

ABSTRACT

Tradeable emission rights seek to maximise the benefits of trade between those who place the greatest value on being able to make pollutant discharges to waters with those who can provide pollutant discharge reductions at lowest cost. The market framework to bring this demand and supply together has to date focussed primarily on tradeable emission permit schemes.

However with the increasing significance of diffuse source emissions, tradeable permit schemes are becoming less relevant. This is because the costs involved in establishing the market infrastructure to define, allocate, trade and enforce diffuse source liabilities is high. This has prompted the development of a broader suite of tradeable rights instruments with lower transaction costs that can still extract most of the benefits from trade.

In this paper, experiences with water quality trading in Australia are reviewed, focussing on the shift from point-point permit trading to alternative market structures that incorporate diffuse sources. In broad terms, issues associated with transaction costs, environmental equivalence and the dominance of diffuse sources are manageable. More problematic are political and regulatory cultures.

Keywords: water quality trading, tradeable emission rights, diffuse source trading

Drew Collins. Managing Director, BDA Group. PO Box 4022 Manuka ACT 2603 Australia. Phone: 61 2 6282 1443 Email: drewcollins@netspeed.com.au

Interest in water quality trading

Market based instruments (MBIs), such as tradeable emission rights, are receiving increased attention from environmental policy makers, as they offer a means to control cumulative impacts and to reduce compliance costs.

Proponents of MBIs argue that existing regulatory approaches, such as emission standards, promote inefficiency, inhibit innovation and impose unnecessary costs. This is because regulation usually imposes uniform requirements on all market participants, yet the cost of pollution abatement will vary, as may the damages of pollution discharged from various sources and in different locations.

In the case of MBIs, governments do not require detailed information on who is best placed to make changes and how, rather this information can be 'revealed' by the market. Although a strong regulatory framework is still required from government, particularly in setting overall emission targets, the market takes over the detailed task of allocating effort or opportunities between market participants. And by 'harnessing market forces', MBIs can reduce overall environmental compliance costs by encouraging those firms who face the lowest costs to make the greatest improvements.

MBIs offer a mechanism to manage the cumulative impacts of development on the environment. In many cases new developments may only a small environmental loading, however a large number of developments over time can significantly impact the environment. By capping total emissions and allowing the market to facilitate new development without increasing the overall impact, governments are able to avoid difficult negotiations with developers over small impacts.

MBIs also offer governments a means to engage diffuse sources of pollution. With improvements in emissions from point sources, diffuse sources are often having a more significant impact on the environment. Diffuse sources of pollution can be very costly to regulate given the large and often disparate number of sources, and difficulties in identifying them. Market based instruments can offer a lower cost means to engage diffuse sources in pollution abatement.

Australian experiences with water quality trading instruments

Similar to the US, Australia has enthusiastically investigated and trialled water quality trading instruments over recent years. And while the number of operational schemes and volume of trade are also limited, experience to date suggests that tradeable emission rights can fulfil their theoretical promise to reduce compliance costs.

An important learning has been the need to design schemes appropriate for the specific legislative, environmental and operational circumstances of each waterway.

Market structures are commonly thought of as either point-point or point-diffuse, but an array of factors are pertinent to market design – the mix of point and diffuse sources; whether they are regulated; the significance of emissions from existing versus new sources; whether there will be a few or many market participants; whether water quality targets are aspirational or statutory; the scope for offset trading and intermediaries (brokers / offset banks); whether case-by-case or rules based trading and approvals is required; and so on.

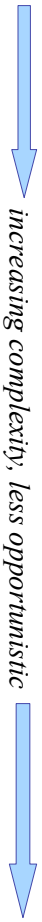
The simpler trading instruments can often be integrated easily into existing regulatory frameworks. The more complex instruments require more developmental work and administrative effort to run and these are only likely to be efficient if the anticipated gains from trade are large. Table 1 illustrates the range of water quality trading instruments that can be developed.

Fee offsets are allowed and have been used to reduce pollution discharge taxes paid by to EPA licensed activities in the state of New South Wales (NSW). Similarly, licensing offsets have also been used in NSW. Development offsets, including in relation to water pollution, have been opportunistically negotiated with new developments in most Australian states and are now a feature under national legislation (ie: to compensate for the impacts of developments on those matters of national environmental significance protected by the Environment Protection and Biodiversity Conservation Act 1999.

A ‘bubble’ nutrient trading scheme has been operating on South Creek, a tributary of the Hawkesbury-Nepean River in NSW since 1996 between three urban wastewater treatment plants, and is estimated to have saved $A45m compared to a traditional uniform standards approach. Recently the scheme was expanded to trial a number of diffuse source offset credits, and the administering regulatory authority is currently investigating the potential expansion of the scheme to include a larger number of wastewater treatment plants – subject to resolving environmental equivalency issues (discussed further below).

Table 1: Range of water quality trading instruments

Option	Features
Fee offsets	Pollution fees paid by regulated (licensed) activities can be reduced through funding off-site emission reductions
Development offsets	Voluntary method for new development to meet development consent conditions through funding off-site emission reductions
Licensing offsets	Voluntary method for licensed sources to meet regulatory discharge limits
Bubble scheme	Small number of point sources meet aggregate emission target, statutory based and subject to agreed scheme parameters.
Mandatory offset scheme	New developments required to secure offsets or contribute funds to offset residual emissions
Point source permit trading scheme	Point sources allocated permits that limit discharges but are allowed to trade permits among themselves subject to a set of trading rules
Point source permit trading scheme with offsets	As with point source trading scheme, but point sources can use offset credits purchased from voluntary (and often diffuse) sources
Point & diffuse permit trading scheme	Point and diffuse sources allocated permits and all sources can trade to meet requirements
Broad based offset contributions scheme	Point and diffuse sources required to make payments, in lieu of on-site emission reductions, to a central fund which undertakes compensatory works



The Melbourne Stormwater Offsets Scheme in the state of Victoria requires new developments to make a financial contribution to a regional water quality fund which contracts catchment works such as constructed wetlands to intercept residual nutrient emissions. The Swan River Trust in the state of Western Australian is currently investigating an 'offset contributions' scheme which could include payments from new development as well as existing urban and potentially rural landuses, which would similarly fund offset works and programs.

The Hunter River Salinity Trading Scheme in NSW is a sophisticated permit trading scheme which controls the discharge of saline wastewater from 20 of the world's largest coalmines & 3 power stations. Allowable discharges are based on real time in-stream water quality. Every two years 20% of permits are retired and reissued via auction with a life of 10 years. The scheme has run since 1995 and successfully maintained in-stream water quality.

Barriers to more widespread water quality trading

Despite the successes to date, more widespread use of tradeable emission rights is constrained by a number of factors. Firstly, regulatory authorities typically have a 'compliance' mindset, with skills and operational practices geared towards end-of-pipe technical solutions imposed through increasingly stringent emission concentration discharge standards.

Secondly, potential markets for expanded water quality permit trading in Australia are limited. With increased water scarcity, wastewater is rapidly being redirected to recycling and reuse. Accordingly, diffuse sources – urban stormwater and agriculture – are now the major source of water quality impacts. However, the imposition of statutory emission limits on diffuse sources, such as urban households or rural landholdings faces significant political hurdles as well as administrative challenges in designing cost-effective mechanisms to identify, monitor and enforce liabilities.

In relation to agriculture, Gunningham and Sinclair (2004), highlight a number of barriers to managing diffuse water pollution in Australia:

- the agricultural sector has a history and culture of antipathy towards external intervention;
- conventional regulation relying on "on the ground" inspection is impractical on resource grounds as diffuse source pollution is difficult or impossible to measure;
- there is often limited knowledge of how to achieve environmental improvements, lack of financial resources, perceived risks of reduced yield, and geographical isolation (making regulatory oversight difficult and pollution out of the public eye).

Regulatory oversight of urban stormwater is more conducive to water quality discharge liabilities, but not without limitations. Concerns over housing affordability have led to reluctance to impose new requirements on new development which is already subject to a range of 'developer contributions'. Some progress is being made under national stormwater pricing reforms to introduce separate stormwater charges at the household and business level, differentiated to reflect volumetric stormwater loads (such as through variable fees based on block size and impervious fraction across different landuses), however no direct relationship with pollutant loads has been used to date.

Lastly, are technical difficulties in cost-effectively establishing the 'environmental equivalence' of discharges as a basis for establishing liabilities and trading rules that will ensure water quality goals are achieved.

Environmental equivalency and water quality trading

With available scientific understanding, monitoring and enforcement technologies, it is not feasible to establish tradeable rights directly for environmental quality. As a surrogate, rights to a closely related activity can be used to achieve the desired environmental outcome. A successful tradeable rights instrument therefore requires a direct relationship between the activity expressed in the rights and the environmental outcome being sought.

The term environmental equivalence refers to the difference between the impacts of pollution from different sources on the environment goal. The reason for differences in impacts between two sources may be due to:

- their location – say in a lower estuary compared to upper reaches of a river;
- the types of discharges – for example, agricultural nutrients are often particulate bound and may not be as readily available for assimilation by algae as dissolved forms of nutrients;
- the timing of the discharges – say whether seasonal or episodic which may lessen impacts;
- hotspot or spillover impacts – for example, to prevent deterioration in water quality in localised instances or to prevent unintended impacts on other environmental amenities.

In water quality trading schemes, environmental equivalence can be handled in a number of ways. Commonly, trading is made subject to equivalence ratios. So for example, a trading ratio of 1:3 for two sources means that 1 tonne of pollutant from the first source is expected to have a similar environmental impact as 3 tonnes from the second source. In addition, trading zones may be specified to limit the spatial extent of trades; limits may be imposed on the duration of trades; and so on. Further, where uncertainty over the equivalence of trades exists and / or there are risks associated with offset works, a risk margin is commonly incorporated in trading ratios.

To minimise transaction costs, trading ratios and other trading rules may be established from the outset. However environmental regulators have often held too little confidence in the available science to codify environmental equivalence relationships in trading ratios, despite the choice and design of other regulatory instruments implicitly doing this! A reliance on case-by-case determination significantly increases transaction costs, reduces trading activity and erodes overall trade benefits.

Emerging directions in water quality trading

Recent interest in the use of tradeable rights instruments to manage regional (rather than local) water quality has seen a shift away from physical emission trading schemes which marry highly targeted like-for-like trades to contribution style schemes. In these schemes, contributions are not highly differentiated as regional water quality impacts from various sources are broadly similar and the key focus is on managing the regional, cumulative pollutant load.

This significantly reduces the administrative burden on the demand side, without significant efficiency losses. In addition, supply side efficiencies can be realised as the ‘offset fund’ manager can adopt an investment portfolio approach to managing compliance risks, maximising returns and adapting to new information. This can be done by, for example, using performance based competitive tenders and large scale works with size economies to drive down offset costs, and being responsive to new information (such as the impact of climate change) on the effectiveness of offset works.

Therefore while, contribution style schemes may be perceived as a blurring of price and tradeable right approaches, they offer a pragmatic way forward in embracing diffuse source emissions and capturing the benefits of trade without imposing high administrative and transaction costs.

Concluding comments

In countries such as Australia with relatively infertile soils and low rainfall, wastewater is increasingly being viewed as a resource, rather than a problem. Accordingly, the development of instruments to manage wastewater needs to be integrated into broader water market reforms. This would ensure comprehensive rights are developed to promote efficient water management across the whole water cycle and which do not create perverse incentives. Australia is currently overhauling its water markets

to better accommodate environmental water demands in a volumetric sense. However the extension of rights to incorporate quality components has at best been piecemeal.

Water quality trading instruments offer a means to establish more robust rights. The development of efficient instruments will benefit from prior reforms to firstly establish water quality goals, targets and catchment based nutrient load (or mass) budgets. Secondly, point sources will be more easily included if they are subject to performance-based regulation – that is, the use of load based emission discharge limits, rather than continuing with concentration-based standards in an attempt to control both local acute issues as well as cumulative regional loads.

Finally, resistance to the adoption of water quality trading has often focussed on scientific discomfort in establishing environmental equivalence ratios and administrative means to cost-effectively monitor and enforce liabilities. While these are significant challenges to be overcome, all policy interventions face these problems, it is just that the assumptions used and ultimate performance of other approaches is generally less explicit. Policy choice is inevitably one of relative imperfection, and MBIs and alternative policy approaches need to be judged on equal terms.

References

Gunningham N. and Sinclair D., 2004. "Non-Point Source Pollution, Voluntarism and Policy Failure: Lessons from the Swan-Canning", Environmental and Planning Law Journal, 21,93-106