

Nutrient Trading in Lake Taupo: Getting It Right

John F. Raffensperger, Department of Management, Private Bag 8004, University of Canterbury, Christchurch, NZ, john.raffensperger@canterbury.ac.nz

Mark Milke, Department of Civil Engineering, Private Bag 8004, University of Canterbury, Christchurch, NZ, mark.milke@canterbury.ac.nz.

5 March 2008

To protect Lake Taupo, the Waikato Regional Council proposes nutrient trading. Although we agree that trading is best way to protect the environment, we believe the proposal could be improved. A failure could tarnish the wide potential for environmental market solutions.

The Waikato Regional Plan proposes to “permit the transfer of nitrogen allowances around the catchment of Lake Taupo, by ensuring any increases in nitrogen leaching are offset by corresponding and equivalent reductions in nitrogen leaching within the Lake Taupo catchment”. The trading process will start with an initial allocation of discharge rights among users. Users can then decide to buy or sell rights based on their intended land use. As the regional plan states, an increase by one buyer should be offset by curbs elsewhere.

We have two main concerns with this plan.

First, transaction costs will be too high. A potential buyer who wants to convert land from forest to dairy use must find someone who is willing to sell, and in the right quantity. Determining the quantity requires looking up the “exchange rate” for, say, X cows versus Y hectares in forest. If the seller were unwilling to sell enough credits to offset the buyer’s needs, the buyer would have to look for additional sellers.

The users then have to negotiate a price, which will be challenging because no price records will be published. Without advance price information, a single failed deal may put off a user from trying to trade again. If the users manage to agree on price and quantity, they then submit their proposed trade to council for approval, which might deny the trade because of, say, impacts to a particular stream. When it succeeds, this search, calculate, negotiate, and approve process would take weeks. The problem is made worse by the relatively low number of users who are in the market in the first place. The combination of high transaction costs and few users is likely to result in very little market activity.

Second, in trying to reduce transaction costs, the proposal cuts corners on the hydrology. To relate discharges to lake concentration, hydrologists estimate a “transport coefficient,” which is the effect from a discharge now on nitrate in the lake in a future year. These coefficients are uncertain, but the council has tools to estimate them. This hydrological science has not been (and probably cannot be) translated correctly into the existing market proposal. Instead, the proposed market uses crude “lag zones” where every user is considered the same, and can trade one-to-one with each other. Discharges reaching the lake in different years are bunched together as though they arrived in the same year. The proposed number of zones for Lake Taupo is just one; all users are assumed to have equal effects, differing only by land use.

Pooling over time and space lets users trade who really shouldn’t. Some users will enjoy a “free ride” while others will pay more than their fair share. For example, if damage from farmer A’s X cows were more than his exchange rate implied, then farmer A would not pay the full amount. Other people may find this unfair. When the matter ends up in court, the standard will be, “Did you do the reasonable best you could with the data you had available at the time?” And the answer will be, “No, we had to cut corners to reduce the transaction costs.”

Fortunately, a solution is at hand. Over the past twenty years, new types of market mechanisms have been developed where trades are cleared with the help of computerised models based on operations research. These new mechanisms are called “smart markets.” Smart markets and the related economic discipline of mechanism design have been studied by recent Nobel Prize winners. While new for water discharges, smart markets are already in use here and around the world. The spot market for electricity is an example. For goods and services that require co-ordination, smart markets result in better economic gains and societal outcomes compared to traditional market mechanisms.

A smart market for nutrients would not be a “free market,” but would instead be a controlled auction in which all environmental effects are taken into account. By using the computer system to clear the market, the council would automate the approval process.

Users would not need to search for trading partners. Instead, they would make offers and bids to an online auction, similar to TradeMe but with more computation under the bonnet. The computer would calculate trades to maximise benefit to users, finding the lowest price which matched supply to demand, properly weighted by the transport coefficients.

The market mechanism simplifies into a periodic internet auction, and the transaction cost goes nearly to zero. The low transaction cost would allow government or anyone to buy credits through the auction at a fair price to improve the catchment. All traders could have their search, calculate, negotiate, and approval done in not weeks, but an hour.

By creating a central place for users to trade, a smart market further allows the benefits of a modern options exchange: parties are anonymous, the auction manager enforces regulations to ensure fairness and transparency, and markets are orderly. A few tentative auctions could be run to allow price discovery before the conclusive sale. Historical prices would be posted, so users would have a forecast of the likely price. Price data will make planning easier for all concerned.

At the same time, all available hydrological science is used without cutting corners. Every trade would be simulated to ensure that it had the expected effect. The computer would allow trading only within the desired environmental outcomes. Thus, the hydrological complexity is encapsulated in a device that manages complexity easily – a computer. The prudential standard is satisfied – “Did you do the reasonable best you could with the available data?” The answer is a resounding yes. New Zealand generally needs more hydrological study; the smart market would make better use of whatever data is available.

The regional councils are good candidates to operate the smart market, but this is not a requirement. The regional council could contract market operation to a private firm, while maintaining full oversight.

As well as nutrient trading, we are studying smart markets for water quantity, and believe they should be considered more fully.

The move to nutrient trading is to be applauded. A market approach is the best way to improve our treasured waters while maximising benefit for users. The Waikato plan correctly identifies these gains. However, a successful market design must have low transaction costs and the correct science to satisfy the environmental outcomes at least cost to society. A failure of this market could negatively impact the perception of any market solution to environmental problems. A mid-course correction is warranted for the proposed market.