

--	--

# Determining an economic value for improved water quality in the Darling River.

Christine M Hill and Graham Carter

presented at the National Cyanobacterial Workshop  
12 August 2009 Parramatta NSW.

Principal Economist, Wagga Wagga and  
Natural Resource Officer, Newcastle  
NSW Office of Water,  
Department of Environment, Climate Change and Water.  
[Christine.Hill@dnr.nsw.gov.au](mailto:Christine.Hill@dnr.nsw.gov.au)

## Contents

Abstract.....	1
1. Introduction.....	1
2. Economic evaluations .....	1
3. Economic studies .....	1
4. Water quality improvement in the Darling River- a contingent valuation study.....	2
5. Cyanobacterial blooms – 2009.....	3
6. Summary .....	3
7. References .....	4

## Abstract

*Water quality in river systems has been of ongoing public concern. In December 1991 the world's largest recorded blue green algal bloom stretched for 1000 km along the Barwon - Darling River system in the Murray Darling Basin in New South Wales.*

*Following that bloom, a contingent valuation methodology was applied to establish a value that the public would place on improved water quality in the Darling River.*

*The results confirmed that the public considered both pollution in general and river pollution in particular to be major environmental issues.*

*This study supported the application of willingness to pay methodology as an input to allocating physical and financial resources for major environmental issues facing governments and policy makers.*

## 1. Introduction

The economics discipline can play a significant role in providing valuable information in the quest for efficient and optimal resource allocation. In this context, economics can assist in the decision making process in allocating scarce resources to address natural resource management issues. Economics should play an important role in policy development. Economic assessments can add context to scientific results for input to the policy process.

This paper outlines economic impacts, the application of an economic willingness to pay evaluation one technique to a cyanobacterial outbreak, and comment on future studies.

## 2. Economic evaluations

Post the 1991/1992 cyanobacterial outbreak in NSW several studies addressed the economic costs incurred by that event. Various evaluation methodologies were applied, which provided fair assessment of the economic impacts of the outbreak. (Walker and Greer 1992, Hassall and Assoc. 1993, Hill 1994a).

Details of economic evaluation tools applicable to natural resource management issues are outlined in Hill (1994b) and Adamowicz (2004). The economic literature has continued to apply the willingness to pay assessment methodologies (Adamowicz 2004). Further development of willingness to pay studies to include choice modelling has supported the public interest in valuing improvements in water quality (Bennett et al 2004, Morrison and Bennett 2004).

## 3. Economic studies

The economic studies of cyanobacterial outbreaks identified and quantified a range of impacts which included;

- Human health risks,
- Animal health risks,

- Tourism and recreation impacts for operators and visitors and
- Engineering costs/ abatement/mitigation such as;
  - Changed water flow operations,
  - Nutrient control works – the interception and land retention of diffuse source phosphorus and nitrogen,
  - Alternative water supplies.

Estimated monetary values showed that economic impacts could be substantial. The benefit cost study of Hassall (1993) indicated that no action in addressing the blooms resulted in significant economic losses to NSW. The proposed works of nutrient control works, algal watch kits, stock and domestic bores in the Barwon Darling Region, and changes in unregulated flow management provided a net benefit of \$171 million over 50 years. A significant cost of the blooms was perceived as human health costs. Thus a successful education campaign could efficiently reduce this risk.

The Walker and Greer (1992) study targeted the tourist and recreation impacts of the blooms, using three case studies; a section of the Hawkesbury Nepean River, towns along the Darling River and recreation impacts at Departmental water storages. Economic impacts were assessed at a total of \$9.4 million for the 1991/1992 period;

- \$6.7 million in Hawkesbury Nepean in tourism and recreation impacts,
- \$1.5 million in Darling River recreation impacts, and
- \$1.2 million in recreation impacts at the Dept water storages.

Neither of these studies addressed the non monetary impacts, such as the aesthetic impacts of the environmental condition.

## **4. Water quality improvement in the Darling River- a contingent valuation study.**

The extensive cyanobacterial bloom along 1000 kilometres in the Barwon-Darling River occurred in December 1991. Media interest and coverage was intense; this served to inform readers of the impacts, causes and consequences of the then current environmental management issues.

The Department of Water Resources undertook a contingent valuation study to determine values held by the public for the improvement in water quality along the Darling River. The contingent valuation study was funded by the Federal Water Resources Assistance Program (FWRAP).

Households were interviewed by phone in Sydney (150 households), the Darling River areas (150) and the rest of New South Wales (150). A discrete choice willingness to pay question was asked; respondents were asked if they would pay a once-off specific amount, (\$50, \$100 or \$200) to improve water quality in the Darling River. The results showed that households in the Darling Region were willing to pay a similar amount to households in Sydney and rest of New South Wales. Other studies have shown that use values were higher than non-use values (Hill 1994a, Morrison and Bennett 2004). Households in the Sydney region were willing to pay a median amount of \$118 as a once-off payment. This was similar to the \$105 willing to be paid by households in the rest of New South Wales and not significantly different (at the 95% confidence level) from the amount of \$153 that households in the Darling Region were willing to pay.

An open ended willingness to pay question was also asked of 100 households in Sydney. This resulted in a median willingness to pay of \$20 per household.

While the discrete choice and open ended questions resulted in different magnitudes of value, this may have highlighted the influence of more information, starting point bias, the difficulty in valuing environmental goods or the current (at the time) environmental levy of \$20 being incurred by Sydney households.

Applying the lower \$20 per household value, aggregated to all Sydney households resulted in a substantial value being placed on improving river water quality. Aggregated this meant that Sydney households alone were willing to pay a once off amount of \$26 million to improve water quality in the Darling River.

The study confirmed that the public was aware of and prepared to contribute to a perceived significant environmental issue.

## 5. Cyanobacterial blooms – 2009

The 2009 bloom of interest occurred in the Murray River at Easter time. Mention of Easter time is significant as the recreational demands on the river at that time are less that over the summer holiday break such as the time of the 1991/1992 bloom.

Preliminary enquiries along the Murray region have indicated that despite the negative press, the extensive efforts of tourist operators managed to mitigate downturns in visitor numbers. However the ongoing impacts may be apparent in future years. Much of the holiday accommodation along the river is booked ahead, so many visitors were already financially committed in 2009. Anecdotal information is that numbers of visitors camping along the river declined. Other operators identified that the post Easter lull was greater than expected but this may have been due to the economic downturn as much as the river condition. (Walker and Greer (1992) noted that many holidaymakers travelled further for their summer holidays in 1991/92 to access bloom free recreation pursuits).

One comment received from a tourist body was that the public was accepting of the water condition. Does this mean that the public is now resigned to lower water quality, or has the communication strategy employed this time been successful in educating the public?

## 6. Summary

Past evaluations of the economic impacts of cyanobacterial outbreaks indicated that significant costs were incurred by specific industries such as river and dam recreation enterprises. Potentially human health costs could be extensive. The literature indicates that the general population is willing to pay to reduce the incidence of outbreaks and improve water quality. These studies are important in identifying and allocating resources - people, knowledge, effort and money, to address natural resource management that will result in improved water quality.

It is now time to comprehensively reassess the economic impacts of cyanobacterial outbreaks in the light of current climate knowledge and expectations. Assessment of the economic costs of the current and future estimated incidence of outbreaks will identify and quantify the costs of no further action in terms of water quality as well as the benefits to society of proposed actions. An updated economic assessment of policy options will direct resources to efficient mitigation activity.

***Economics and science can work together to encourage efficient allocation of resources.***

## 7. References

- Adamowicz W (2004) What's it worth? An examination of historical trends and future directions in environmental valuation. *The Australian Journal of Agricultural and Resource Economics* vol 48, issue 3 Sept pp 419-444.
- Bennett J, van Bueren M and Whitten S (2004) Estimating society's willingness to pay to maintaining viable rural communities. *The Australian Journal of Agricultural and Resource Economics* vol 48, issue 3 Sept pp 487 -512
- Hassall & Assoc (1993) Economic Appraisal for NSW Algal Management Strategy for NSW Dept of Water Resources
- Hill C M (1995) *Economic Evaluation of Riparian Land Management Options* presented at the 39th Annual Conference of the Australian Agricultural Economics Society Western Australia February
- Hill C M (1994a) *Water quality improvement in the Darling River A Contingent Valuation Study* presented at the 38th Annual Conference of the Australian Agricultural Economics Society New Zealand February
- Hill C M (1994b) *Water quality improvement in the Darling River A Contingent Valuation Study* Water Policy Division Occasional Paper Series 94.1 NSW Department of Water Resources Parramatta
- Morrison M and Bennett J (2004) Valuing New South Wales rivers for use in benefit transfer *The Australian Journal of Agricultural and Resource Economics* vol 48, issue 4 Dec pp 591-612.
- Svedsater H (2007) Ambivalent statements in contingent valuation studies: inclusive response formats and giving respondents time to think. *The Australian Journal of Agricultural and Resource Economics* vol 51, issue 1, March 2007
- Walker C and Greer L (1992) The Economic Costs associated with lost recreation benefits due to blue-green algae in New South Wales: three case studies. Technical Services Division, NSW Dept of Water Resources Parramatta