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Authors: Finlayson, Brian L., Peel, Murray C., and McMahon, Thomas A.

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DISCUSSION



Discussion of: Finkl, C.W. and Cathcart, R.B., 2011. The “Morning Glory” Project: A Papua New Guinea–Queensland Australia Undersea Freshwater Pipeline, *Journal of Coastal Research*, 27(4), 607–618.

Brian L. Finlayson[†], Murray C. Peel[‡], and Thomas A. McMahon[‡]

[†]Department of Resource Management and Geography
The University of Melbourne
Victoria 3010, Australia
brianlf@unimelb.edu.au

[‡]Department of Infrastructure Engineering
The University of Melbourne
Victoria 3010, Australia
mpeel@unimelb.edu.au
thomasam@unimelb.edu.au

ABSTRACT

Finlayson, B.L.; Peel, M.C., and McMahon, T.A., 2012. Discussion of: Finkl, C.W. and Cathcart, R.B., 2011. The “Morning Glory” Project: A Papua New Guinea–Queensland Australia undersea freshwater pipeline, *Journal of Coastal Research*, 27(4), 607–618. *Journal of Coastal Research*, 28(4), 979–981. West Palm Beach (Florida), ISSN 0749-0208.

Finkl and Cathcart have proposed a macroengineering project to deliver water from the Fly River in Papua New Guinea via an undersea pipeline into northeast Australia, routed down the Diamantina River and thence into Lake Eyre. The proposal has historical antecedents but its scientific basis is very weak. No case is made for the usefulness or demand for the water in Australia. Little consideration is given to the environmental, social, and political issues that such a scheme would involve. Scientific papers that are referenced in support of the arguments in the paper in many cases do not deal with the issues on which they are quoted. The authors appear to have little understanding of the geography of the areas they are discussing, which leads them to make many erroneous assertions about these places. The paper contains a considerable amount of irrelevant and trivial material, such as the life history of HMS *Fly*. The subject matter of the paper lies well outside the stated subject area of the *Journal of Coastal Research*.

ADDITIONAL INDEX WORDS: Papua New Guinea, Queensland, Fly River, macroengineering.

Early speculation about the source of the water in the Great Artesian Basin of Australia included the suggestion that it originated in the highlands of New Guinea (Powell, 2011). Geological investigations in the late 19th century demonstrated the real source of the water along Jurassic sandstone outcrops in central Queensland (Falconer, 1886; Jack, 1895). It is therefore interesting to see the New Guinea connection revived in this proposal to pipe water into western Queensland, with one of the aims being to provide recharge to the aquifers of the Great Artesian Basin. Despite this historical connection, the considered scientific basis for this paper is very weak and although its focus is on the spectacular nature of this “macroengineering proposal” (p. 609) and “profoundly transformative macroengineering concept” (p. 617) involving an 11-m-diam. undersea and overland “~2200-km-long pipeline(s)” (p. 614) delivering water into the upstream end of the Diamantina River, and then flowing along the natural channel into Lake Eyre, specific technical details are sparse.

The volume of water to be pumped is variously described as “...we do not assume that all 6000 m³ s⁻¹ is extracted from the Fly River in Case A and less than half (4.9 billion cubic m yearly pumped through an 11-m-diameter undersea pipe) is taken in Case B!” (p. 614). Here 6000 m³ s⁻¹ is the annual flow of the Fly River below the Strickland Junction, but 4.9 billion m³ per year is not half of this but a mere 155 m³ s⁻¹. Likewise, there is no discussion in this paper of the amount of water that could be transferred down the Diamantina channel, or about the demand for water in the receiving area. Costs are similarly vague: “We estimate the 2011 financial cost of this mostly underwater route at about four plus billion Australian dollars.” (p. 616). There is no suggestion anywhere as to what the cost of this water would be to its consumers.

The case made for the usefulness and demand for such a project is also lacking in substance. For example, it is argued that following a meteorological drought lasting more than a decade in southern Australia “it is likely that the nation’s farming population will move northward to wetter Queensland if extrasufficient (sic) and all-season freshwater supplies could be, somehow, made certainly available” (p. 617). The source

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quoted for this assertion is a paper by Leonardo Carroll (2008). Carroll makes no such assertion in his paper. Indeed, in a recent review of population and water in Australia, Rutherford and Finlayson (2011) pointed out that although water was a necessary requirement for population growth, it was, of itself, not sufficient to stimulate population growth. The Ord River Project in the north of Western Australia demonstrates this well (Davidson, 1982).

Carroll (2008) is not the only author cited for something not contained in their paper. Information on the bed of Lake Eyre attributed to Featherstone *et al.* (2011) was certainly not derived from that publication. Rather the two-paragraph description of Lake Eyre in the second column of p. 609 draws heavily upon the uncited website <http://www.ilec.or.jp/database/oce/oce-04.html>. Arblaster, Meehl, and Karoly (2011) do not discuss interactions between future climate change, population growth, and freshwater scarcity in the Southern Hemisphere. Similarly, Geobbert and Leslie (2010) do not discuss the potential for tropical cyclone formation in the Arafura and Coral seas to become stronger under climate change.

On p. 609 the following appears "... the introduction of extraneous freshwater supplies provided by long-distance interbasin freshwater importation macroproject that would cause the Diamantina River to become perennial, a significant hydrological improvement (Tisdell, 2010)." Nothing of the kind is contained in Tisdell's paper, which deals with environmental flows and specifically with the Murrumbidgee River in southeastern Australia. In fact, Tisdell's paper is about restoring environmental flows, and nowhere makes any suggestion that converting an intermittent stream into a perennial one would be a 'significant hydrological improvement'.

The proposed pipeline routes would transit across part of the Gulf of Carpentaria Drainage Division. This drainage division produces 24.7% of the runoff in Australia but only 0.05% of this is currently diverted for beneficial use and the population of the division is only 0.05 million (Bureau of Rural Science, 2008). The question arises then as to why a complex and expensive transfer of water from Papua New Guinea should be built while local water supplies remain undeveloped. A detailed analysis of the rivers of northern Australia and a discussion of their potential for development has been provided by Petheram, McMahon, and Peel (2008). Potential development is limited by the high variability of flow in these rivers, by the limited availability of suitable storage sites, and the high evaporation losses. Petheram *et al.* (2010) further discuss the potential for the development of irrigation in Australia and show that the greatest potential for further development of irrigated agriculture will continue to be in the south of the continent, adding further to the inappropriateness of the contention of Finkl and Cathcart that farmers in southern Australia would like to flock to the north. In this context, Finkl and Cathcart are clearly aware of the work of Petheram *et al.*, having quoted their 2010 paper as a source of information on predicted climate change in north Australia.

Given the limits to irrigation development imposed by variability and storage sites in northern Australia, it could be argued that a permanent supply from Papua New Guinea offers, in theory at least, some potential benefits. The problem of high evaporation losses would still exist, with over 3.0 m of

expensive piped water being potentially lost to evaporation each year (Bureau of Meteorology, Australia, 2003). However, this also ignores the range of social, environmental, and economic constraints to such a project both in Papua New Guinea and in Australia.

Finkl and Cathcart dismiss any social and political issues in Papua New Guinea by claiming that this project would be of economic benefit to the whole Papua New Guinea population. The experience of mining operations in Papua New Guinea, such as Bougainville Copper and the Ok Tedi gold mines, should give cause for caution in this regard. Also, Papua New Guinea is politically in a parlous state, with high levels of endemic corruption such that it is highly unlikely that any benefits from this project would be equitably distributed in the population (Australian Government, 2004).

Environmental impacts at the Australian end of the pipeline are largely ignored. Finkl and Cathcart propose that the irrigated area at the lower end of the Diamantina River needs to be "isolated by desert and fencing to avoid being overrun by Cane Toads" (p. 617). A valid concern, but when in this project the Diamantina River is turned from a variable intermittent stream into a permanently flowing one, it is possible that this could support the migration of cane toads and other unwanted animals and plants into the interior. There is also the issue of organisms that would be transferred through the pipeline from Papua New Guinea into central Australia, probably necessitating the sterilization of the water before it could be released into the Australian environment.

The only other issue on which Finkl and Cathcart express any concern for environmental impacts is where they say (p. 616): "We have no intention to repeat coastal changes initiated by construction of the Snowy Mountains Hydroelectricity Scheme—namely, a morphological change at the mouth of the Snowy River dating from 1951 to the present day." Although large water extractions from the Fly River may cause coastal changes at its mouth, this is not the context in which this issue is raised. Rather, it comes in a rather strange discussion about the supply of water to cities on the east coast of Queensland. There is clearly no relevance to the Snowy in this case, as, were this water to be supplied to east coast cities, it would represent an addition, not a reduction of flow in the rivers associated with those cities.

The authors' lack of knowledge of this part of Australia is further exposed by their description of northeastern Australia as being a "wasteland" (p. 609), a description that would surprise its prosperous residents. This part of Queensland is a huge area with a large range of environmental conditions, none of which could realistically be described as wasteland. It ranges from highly productive dryland agriculture through irrigated farming districts and into pastoral rangelands. Similarly, Cairns and Brisbane are described as the major seaports on Australia's east coast. If we consider only the ports on the east coast of Queensland (ignoring all the large ports in New South Wales), by far the largest port in terms of throughput tonnage is Hay Point and the second largest is Gladstone. Brisbane ranks third, but Cairns is a minor port with only about 1% of the throughput tonnage of Hay Point (Queensland Government, 2010). Port Moresby is also described as a major seaport

but its throughput tonnage is less than that of Cairns (Independent Consumer & Competition Commission, 2006).

The paper contains a large amount of apparently irrelevant material, ranging from trivia such as the date of construction and scrapping of HMS *Fly* and a half-page, full-colour photograph of a morning-glory cloud (source not acknowledged, but actually sourced from Acidcow.com through Google Images), to extensive discussions about other water pipelines in Australia. The relevance of these other pipelines, Cape Pallerenda to Magnetic Island, Morgan to Whyalla, and Mundaring Weir to Kalgoorlie, is not made clear. They are all entirely within Australia, only two of them have (short) undersea sections, and they all supply water to high-value end uses where users can afford to pay the high cost of the piped water. In the case of irrigation, the end use of the “Morning Glory” pipe, the ability of farmers to pay the full economic cost of the water has long been a problematic political issue in Australia. For a thorough economic analysis, see Davidson (1969). If irrigators cannot pay the full economic cost of water delivered from dams within Australia, they will certainly not be able to afford the costs of construction, operation, and maintenance of this megaengineering scheme from Papua New Guinea.

We noted with interest that the paper was received and accepted on the same day, a response rate that would delight most authors. Finally, it is obvious that the topic of this paper lies outside the accepted realm of the *Journal of Coastal Research* as it has virtually nothing to do with the coastal zone.

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