Beardmore Dam constructed in 1972 is the principal water storage on the Balonne River.

An assessment of contemporary variations of the Bradfield Scheme

CSIRO has completed a desktop assessment of contemporary proposals to divert water from north Queensland's east coast to the Murray-Darling Basin (MDB), based on the historic water diversion schemes proposed by engineer Dr John Bradfield.

This assessment found the costs to build the scheme's dam and diversion infrastructure would result in the price of water to irrigators being more than four times greater than irrigators could afford to pay.

Background

Dr Bradfield proposed diverting water inland from north east Queensland to enable greenfield irrigation and regional development of western Queensland.

His 1938 gravity diversion scheme involved diverting water from the upper Tully and Herbert catchments into a potential large storage at Hell's Gates on the upper Burdekin River, where a tunnel could divert water to the Flinders River, and be linked to the upper Thomson River via an open-cut channel.

In 1942, Dr Bradfield suggested a variation to his original scheme, piping water from the proposed Hell's Gates dam south to Webb Lake and then into Torrens Creek, a tributary of the Thomson River.

Since Bradfield's proposals, a variety of alternatives have been put forward, including diverting water to the MDB because of its established irrigation industry, supporting infrastructure and water demand.

What the assessment found

This assessment found that the cost of diversion infrastructure added a large premium to the cost of water, which would cost about six times what it would without the diversion infrastructure. Even before considering the additional costs of diversion infrastructure, financial losses on new bulk water infrastructure development are highly likely.

By prioritising improvements to local water security and water supply reliability, drought-related water shortfalls could be mitigated by gradually building additional water supply capacity and by linking relatively smaller pieces of new and existing infrastructure into inter-connected regional grids.

Alternative infrastructure, such as groundwater, farm dams and managed aquifer recharge, could assist in maximising the cost-effectiveness of water supply.

These options of configuring water infrastructure could support water supply and security objectives with less risk and lower cost. They would also better match water infrastructure development to where demands and opportunities are already greatest.

About this report

This is a scientific assessment of the technical feasibility and economic viability of contemporary proposals of the Bradfield Scheme to divert water from northern Queensland to the MDB.

It complements an analysis of the historic Bradfield Scheme to divert water inland, which CSIRO undertook in 2020. The two assessments were commissioned by the Australian Government through the National Water Grid Authority.

The suite of reports are accessible at csiro.au/bradfield.

Prepared by CSIRO for the National Water Grid Authority

Australian Government

National Water Grid Authority

Key elements of a contemporary Bradfield Scheme

This assessment examined key elements of a contemporary (modified) Bradfield Scheme to divert water from north Queensland to the MDB, after allowing for the water requirements of existing downstream entitlement holders in the Tully, Herbert, and Burdekin catchments.

Water diversion

Under these assumptions, it was technically feasible that a 98-m high dam at Hell's Gates could release 2280 GL in 75 per cent of years into a water supply channel which is 45 metres above the base of the dam.

Water released at this elevation would enable a 1600-km gravity-fed channel with a deep cutting or a slightly longer gravity channel with a 43-m pumping station to convey water to St George on the Condamine-Balonne River in the northern MDB, the first major irrigation area along the potential channel alignment.

The cost of a gravity or pumped pipeline from Hell's Gates to St George would greatly exceed the cost of a channel, even after allowing for channel losses.

Water for other industries

Opportunities to support other industries along the water supply channel are limited. The potential channel alignment traverses the most resource-poor parts of Queensland.

There is limited potential to generate hydro-electric power along the Bradfield Scheme water supply line.

Viability of agricultural production

The water storage and diversion infrastructure to St George is estimated to cost between $16 billion and $32 billion (assuming favourable geological conditions), allowing 7 to 10 years for approvals and at least 12 years to construct. The annual cost to operate and maintain the scheme would be $140 million to $280 million.

Next to, and downstream of, the existing 82 GL Beardmore Dam near St George, about 90,000 ha of land is already developed for broadacre irrigation and 600 ha for irrigated horticulture. However, collectively, irrigators along the Condamine-Balonne River can only extract their full entitlement in about 40 per cent of years due to the highly variable streamflow and limited regulation.

Under an 'optimal' Bradfield Scheme infrastructure configuration diverting water to the MDB with the existing cotton and broad acre cropping near St George fully irrigated, water reliability could rise to 75 per cent of years. It could also fully irrigate 80,000 ha of new cotton in 75 per cent of years, and about 30,000 ha of new high value horticulture in 100 per cent of years. However, this is highly optimistic. Market projections estimate horticultural growth in the St George region would be unlikely to exceed 13,000 ha by 2050.

Assuming the total cost of water storage and diversion infrastructure to be $21 billion and under an extremely optimistic set of assumptions, net farm revenue was only enough to cover about 25 per cent of the scheme's costs. Under a moderate set of risks this reduced to 8 per cent.

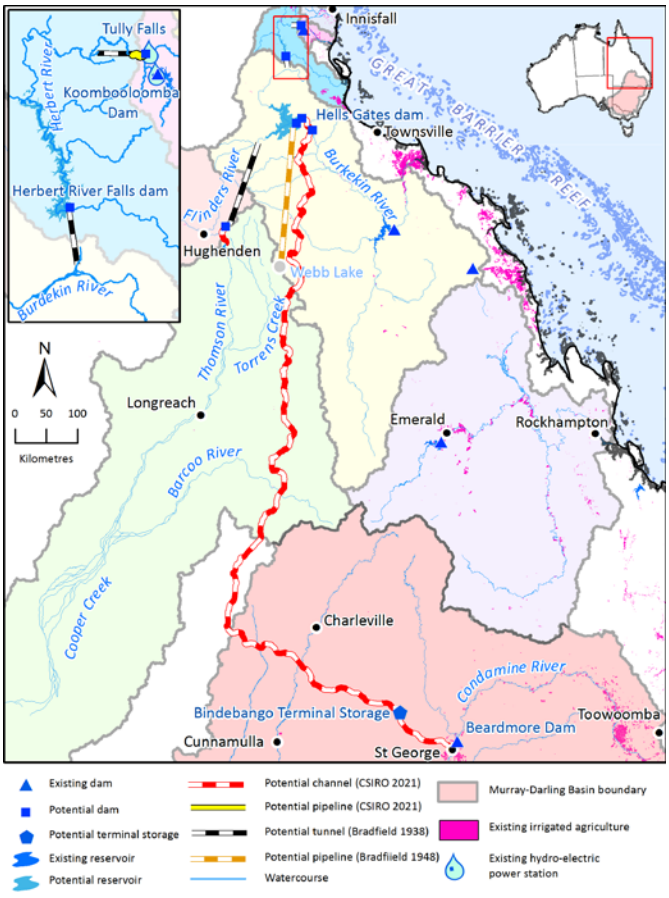
Water security for regional communities

No regional centres with water security issues are located near the potential channel alignment, and so the contemporary Bradfield Scheme offers little benefit for improving the security of regional centres in Queensland.

Environmental impacts

Bradfield Scheme infrastructure configuration diverting water inland or to the MDB could result in a reduction in human-caused sediment and nitrogen load delivered to the Great Barrier Reef of 10 and 8 per cent respectively.

The hydrological modelling did not include scenarios involving the release of water to meet environmental flow objectives stipulated in state government water plans or mitigate impacts to downstream water-dependent ecosystems. Water released for this purpose would reduce the volume of water that could be diverted by the scheme.



An overview of the potential water storage and diversion options proposed by Bradfield and adopted in this analysis to explore water diversion options to the Murray-Darling Basin.

For further information

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