St George in the northern Murray-Darling Basin has a 112km channel scheme which supplies water to about 10,000 ha of land

The Bradfield Scheme

In 1938 engineer Dr John Bradfield proposed an inter-catchment water diversion scheme to expand agriculture in central western Queensland by moving water inland from the north Queensland coast. Known as the Bradfield Scheme, the proposal, Dr Bradfield's 1942 variation, and modern variants have been analysed in a detailed desktop study. It found that while technically feasible, the historic Bradfield schemes and modern variants are not commercially viable.

Background

The study initially focused on the hydrology and technical feasibility of the historic Bradfield Scheme using contemporary information and methods to verify key assertions and to assess contrasting claims. Subsequently modern variants were studied, including:

- the potential to use pumped pipelines and renewable energy rather than gravity diversion tunnels;
- pumped pipeline and channel diversion infrastructure to the Flinders catchment; and
- diversion infrastructure to take water to the northern Murray-Darling Basin (MDB).

This study was made under highly optimistic agronomic and economic assumptions so that analyses could definitively answer whether such a scheme could ever be viable. The assumptions did not take into consideration the current regulatory environment or release water for environmental or cultural flows. Water released for these purposes would reduce the volume of water that could be diverted by the scheme.

What the assessment found

The historic and modern variants of the Bradfield Scheme were found to be technically feasible. However, the cost of diversion infrastructure added such a large premium to the cost of water that future crop revenues would never pay off the cost of the water storage diversion infrastructure alone. The maximum quantity of water that could physically be diverted was less than half what Bradfield identified.

Water resource development requires trade-offs. These trade-offs are more contentious with Bradfield-style schemes where water is transferred from one basin to another because the benefits accrued by one community occur at the expense of another.

The high financial losses, ecological impacts and community concerns associated with Bradfield-style schemes could potentially be mitigated by strategic development and staging of smaller resource developments situated closer to where the water is captured and to better match where future demands and opportunities are greatest.

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

Historic scheme key findings

Dr Bradfield estimated the annual flow of water (streamflow) coming from the upper Tully, Herbert, Burdekin and Flinders catchments was 7190 GL. This was double the 3305 GL of annual streamflow estimated in this study, which used climatic and hydrological information and tools that were not available to Bradfield in 1938.

The study found that the cost per megalitre of water released from Bradfield's 1938 scheme would be about three times more than other large dam options in the Flinders catchment.

The Bradfield's 1942 variation involved changing the height of the Hell's Gates dam to 152 metres, which would create a reservoir capacity of 142,350 GL. However, the study found it would never fill because the net evaporation from the large reservoir surface area would be more than the average annual flow of water into the reservoir.

A modified version of Bradfield's 1942 variant that involves a 98-m high dam at Hell's Gates and a 680-km long channel (instead of more expensive twin pipelines) could deliver about 1880 GL to farms along the Thomson River, after losses. This is only half the amount of water estimated by Dr Bradfield that could be diverted to inland Australia.

At best the cost of water storage and diversion infrastructure to the Thomson River would cost between $10 billion and $20 billion. This study found that diverting water inland adds cost without discernible benefit by moving water to areas where the irrigation requirements and operating and input costs are higher.

The modified version of Bradfield's 1942 variant could take 7 to 10 years for approvals, a 5-year minimum construction time, and additional time to establish productive crops.

Modern variants key findings

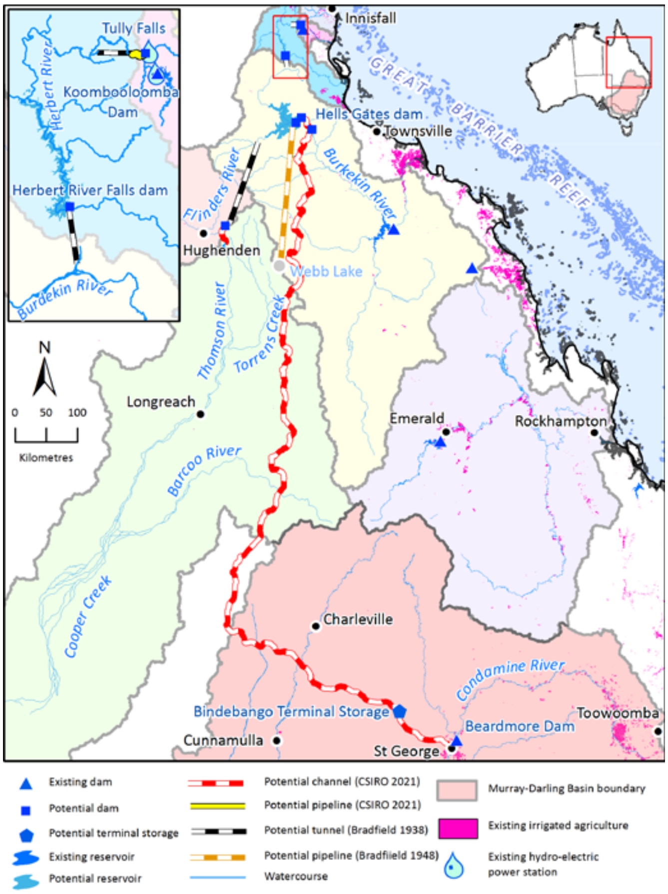
It is technically feasible that a 98-m high dam at Hell's Gates could deliver 1270 GL of water per year to farms in the northern MDB via a 1600-km gravity-fed channel with a deep cutting or a slightly longer gravity channel with a 43-m pumping station, noting 1270 GL is equivalent to 25 per cent of the average annual volume of water applied to farms in the Murray-Darling Basin between 2015 and 2019.

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

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.

At best the water storage and diversion infrastructure to St George, the first major irrigation area in the northern MDB, is estimated to cost between $16 billion and $32 billion. The annual cost to operate and maintain the scheme would be $140 million to $280 million and it could take 7 to 10 years for approvals and at least 12 years to construct.

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 would only be enough to cover about 25 per cent of the scheme's costs. Under a moderate set of risks this reduces to 8 per cent.



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.

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For further information

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