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# The value of restoring urban drains to living streams

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ABSTRACT

Many urban streams have been cleared of native vegetation and converted to open drains resulting in a loss of ecological and aesthetic function. There is a growing recognition of the importance of these functions and work is being done to restore urban drains and create fully functioning wetland ecosystems ("living streams"). Such restoration work involves substantial cost, and it is important to know if the benefits generated from "living streams" are greater than restoration costs. This paper presents a detailed economic analysis of an urban drain restoration project in Perth, Western Australia. Controlling for other factors, we find homes within 200 m of the restoration site increased in value by 4.7% once the restored area became fully established. When we compare benefits to cost we find that, with real discount rates of 5%, 7%, and 9%, project benefit – cost ratios are 3.0, 2.8 and 2.6, respectively. We then show that current institutional arrangements in Western Australia make it difficult to implement urban drain restoration projects, even when project benefits are greater than project costs. The paper concludes by identifying changes to institutional and governance arrangements that would make it easier for restoration projects to proceed.



## 1. Introduction

Water Sensitive Urban Design (WSUD) is a land planning and engineering design approach that integrates the urban water cycle into urban design [1]. Water Sensitive Urban Design is a concept used in Australia and is similar to Low-Impact Development (a concept used in the United States and Canada) and Sustainable Urban Drainage Systems (a concept used in the United Kingdom). Important elements of WSUD include improving and securing water supply; protection of groundwater systems; and management of stormwater and wastewater. WSUD can provide benefits that are easily quantified, such as additional water supply [2]; and benefits that are not easily quantified, such as mitigating environmental degradation, improving aesthetic appeal, and recreational benefits [3]. WSUD concepts have been promoted for over two decades, but adoption has been relatively limited. There are various possible reasons for this [4], one of which is the lack of *ex post* assessments of WSUD projects that demonstrate project benefits have been greater than project costs.

Significant work has been undertaken on methods that can be used to rank different WSUD projects and identify, *ex ante*, the projects likely to deliver the greatest overall benefit to the community [e.g., 5]. The *ex post* evaluation literature is, however, limited. *Ex post* evaluations of WSUD projects are important for several reasons. First, *ex post* evaluations provide clear evidence of project effectiveness, and as such are an important tool in demonstrating WSUD is an economically viable concept that delivers improvements in overall community welfare. Second, *ex post* evaluations provide a check on the validity of the assumptions made when the project was originally proposed. Third, the information generated through *ex post* evaluations is an

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important input into new *ex ante* WSUD project ranking exercises.

Embedding the idea of systematic *ex post* evaluations of WSUD projects is also important in more nuanced ways. For example, if proponents understood that WSUD projects would be subject to rigorous *ex post* evaluations, it may result in proponents investing more heavily in the initial research phase to ensure that they put forward the very best projects.

Conceptually, *ex post* project evaluation is simple – sum total project costs and subtract these costs from total project benefits to determine the project net benefit – but it can be difficult to operationalise. Specific issues that are likely to appear as part of an *ex post* WSUD project evaluation include consideration of environmental benefits that do not have a clear market price; valuing the contribution of volunteer labour; apportionment of overhead and administration costs of organisations undertaking projects; the appropriate time lag to consider when calculating benefits; identification of an appropriate counterfactual scenario, and uncertainty in benefits.

The practical difficulty of undertaking comprehensive economic valuations means that few WSUD projects have been evaluated. Further, the evaluations that have been completed have been relatively simple; have mostly relied on rules of thumb to infer benefits; or have discussed benefits in a qualitative manner only [6–9].

However, even with WSUD-specific comprehensive economic evaluations that show a clear business case (i.e. benefits outweighing costs), there exist significant barriers to change and institutional inertia to implementing such projects [10,11]. Such impediments exist partly because of the complex existing institutional and regulatory structures that are used to manage urban water infrastructure. For example, in a comprehensive review of sustainable water management hurdles, Brown and Farrelly [2] identified the top three barriers as: uncoordinated institutional frameworks; limited community engagement, empowerment, and participation; and limits of the regulatory framework. Thus, to overcome the implementation hurdles, governance and institutional reforms will be required.

This paper provides an analysis of the benefits and costs of a particular WSUD intervention: the restoration of an urban drain to a more natural state. Through this process the paper illustrates how many of the challenges involved in an *ex post* evaluation of a WSUD project can be addressed. We then discuss the issue of drain restoration projects more generally, and outline barriers to their adoption in Western Australia. Practical suggestions for changes to institutional arrangements that would remove barriers to the implementation of value-enhancing WSUD projects are also provided. Specifically, it is shown that setting main-drainage service charges on some measure of residential property values is an appropriate second-best policy option for matching drain restoration project costs to beneficiaries; and that a minor change to the operating licence conditions of the water utility would create an institutional environment that would remove a substantial WSUD implementation barrier.

## 2. Case study background and context

Detailed information on the study area and the historical pollution issues in the catchment can be found in Swan River Trust [12] and SERCUL [13]. Here we provide just sufficient information to make the nature of the restoration project understandable. The Bannister Creek catchment is a highly modified system covering 23 square kilometres in the suburbs of Canning Vale, Lynwood, Ferndale, and Parkwood in metropolitan Perth, Western Australia. Across the catchment there is a mix of residential housing, commercial property, and light industry. Bannister Creek is a tributary of the Canning River, and prior to European settlement the creek was part of a linked wetland system. In 1979 the creek was straightened, deepened, and incorporated into the main drain network of the State water utility (Water Corporation)

During the 1980s and 1990s, urbanisation in the area led to an increase in impermeable area; which, combined with the loss of the wetland system and riparian vegetation; nutrient rich runoff from urban lawn and gardens; and runoff from industry, created erosion and pollution problems in the catchment. Additionally, during high-rainfall events, the

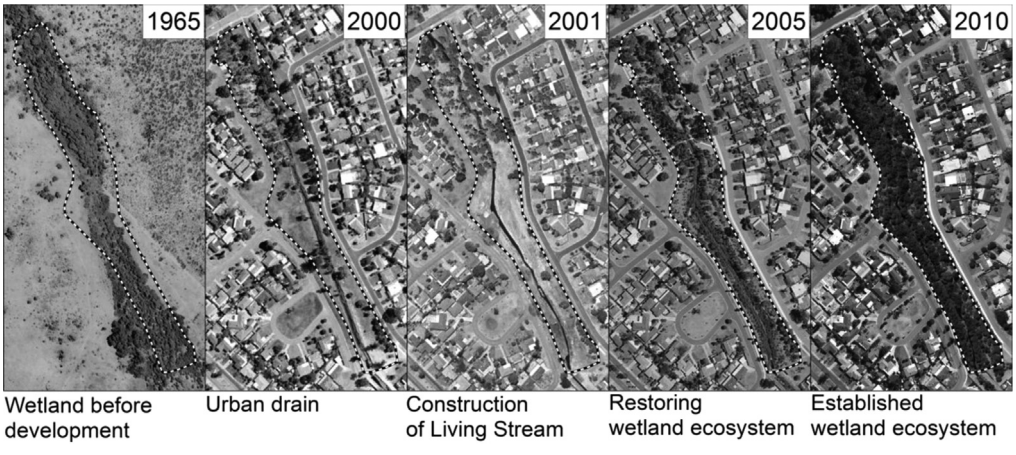


**Fig. 1.** Aerial photographs of Bannister Creek Living Stream project dynamics.

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