



## Research Paper

# Understanding the value of urban riparian corridors: Considerations in planning for cultural services along an Indonesian river



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## HIGHLIGHTS

- Case study of riverside communities and plans to rehabilitate a riparian corridor.
- Mixed-methods approach to assess value of cultural services provided by urban river.
- Evidence of positive willingness-to-pay to include park space and forest conservation in plan.
- Qualitative methods like interviews help identify non-monetary expressions of value.
- Potential for integrating landscape design and social science research to enhance social value of green infrastructure.

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## ABSTRACT

Cultural ecosystem services are not easily integrated into planning decisions when rehabilitating urban rivers. Methods exist to characterize the value of these cultural services, but there are methodological challenges to obtaining this information and fitting it to a decision context, particularly when weighed against monetary costs and benefits. In a developing country, these challenges can be magnified and thus the value of cultural services is seldom considered. We illustrate this through a case study of a river in Jakarta, Indonesia, where plans call for widening the river channel, stabilizing the banks with concrete, and restricting access to the river. We employ a mixed-method approach of household surveys, a discrete choice experiment and ethnographic interviews, to ascertain historical and present uses of the river, and residents' preferences for future change to the river. We demonstrate that low-income residents value non- or indirect-use cultural services that the river corridor provides—services that would be lost under the current rehabilitation plan. By assessing residents' willingness to pay for cultural services, we can more easily compare these scenarios to the current plan. We also show how our mixed-methods approach to valuation can help frame and interpret quantitative results, so that decision makers have additional contextual information. We demonstrate that such approaches are feasible and sometimes necessary in complex, data-poor urban environments.

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## 1. Introduction

Water resource managers are slowly embracing nature-inclusive approaches to rehabilitating waterways (Pahl-Wostl,

Jeffrey, Isendahl, & Brugnach, 2010), but the full range of benefits to human well-being (Brown & Cummins, 2013; Cattell, Dines, Gesler, & Curtis, 2008; Chiesura, 2004; Groffman et al., 2003) is still not systematically incorporated into integrated water resource management (Burmil, Daniel, & Hetherington, 1999; Chan et al., 2012; Hubacek & Kronenberg, 2013). Climate change presents yet another rationale for incorporating green infrastructure into planning efforts, but institutional barriers have slowed uptake (Matthews, Lo, & Byrne, 2015). Moreover, the subjective and intangible nature of some cultural ecosystem services (ES) provided by green infrastructure makes it even more difficult to integrate into

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planning efforts (Daniel et al., 2012). By cultural services, we mean the nonmaterial benefits people obtain from nature (MA, 2005), especially aesthetic values, recreation, cultural heritage, social relations, and sense of place. Knowledge of the value of these services is important not only in the planning and implementation stage (Daniel et al., 2012; Everard & Moggridge, 2012), but also for the management (Rhoads, Wilson, Urban, & Herricks, 1999) and resilience of an ecosystem over time (Colding & Barthel, 2013). If these cultural services are not considered in the planning process, then their value is implicitly set to zero (NRC, 2004).

There are particular challenges to conducting ES valuations in developing countries, ranging from the validity of monetary techniques to concerns about local research capacity (see Christie, Fazey, Cooper, Hyde, & Kenter, 2012 for a comprehensive review). Recent valuations for the Philippines (Estoque & Murayama, 2013) and South Africa (Schäffler & Swilling, 2013) use land cover data to derive quantitative values of ES, but the authors call for more participatory research into the local validation and expression of these values. Kenter, Hyde, Christie, and Fazey (2011) present a group-based monetary valuation from the Solomon Islands and recommend mixed-methods approaches that can provide additional insight into social processes. Cultural services are often considered incommensurable with marketed (i.e., monetized) goods and services (Martinez-Alier, Munda, & O'Neill, 1998), prompting researchers in developed and developing countries alike to consider alternative, non-monetary or qualitative techniques (Byrne, Lo, & Yang, 2015; Dobbie, 2013; MacKerron & Mourato, 2013). However, there is a lack of guidance on how to incorporate such information into decision making (Chan et al., 2012).

By using ES as a “common language” (Granek et al., 2010) to explicitly link ecosystem functions to human benefits, we can link knowledge from several disciplines and worldviews (Lundy & Wade, 2011) and tailor the research to issues that end-users care about (Chan et al., 2012). This also facilitates a consideration of the less tangible social and cultural benefits alongside more tangible technical benefits related to flood mitigation and climate change adaptation, and thus a full accounting of the potential value of green infrastructure vis-à-vis its alternatives. Information on community attitudes towards the local environment can be employed more effectively if it is developed with knowledge of the socioeconomic variables (Jim & Shan, 2013) as well as cultural and political factors that influence perception and behavior (Harrison & Burgess, 2003). We adopt a perspective of value-pluralism (Gómez-Baggethun & Barton, 2012; Hubacek & Kronenberg, 2013; Lo & Jim, 2010; Lo & Spash, 2013), being mindful that ES values are socially produced, demanding direct social research (e.g., ethnography, interviews) into the articulation of these values (Ernstson, 2012).

We present a case study of a densely settled urban river in Jakarta, Indonesia (Section 2) to illustrate the value of cultural services that could be provided by a riparian landscape. The current central government-backed plan to “normalize” (*normalisasi*) Jakarta's rivers is focused on restoring flood mitigation capacity by dredging and widening channels, stabilizing them with concrete, and fencing off the area. While flood mitigation is an important ES for Jakarta, particularly if future climate change leads to more frequent or intense storms, we suggest that the proposed approach overlooks cultural services important to residents' quality of life, and thus we work with local communities along the Ciliwung River to identify and value these services. We employ a mixed-methods approach (household surveys, a monetary choice experiment (CE), interviews, and focus group consultations) to identify residents' values for ecosystem services (ES) within an urban riparian corridor (Section 3), following Chan et al.'s (2012) framework for investigating cultural services. This approach allows us to estimate residents' willingness to pay (WTP) to maintain a rehabilitated river corridor, but also facilitates an understanding of underlying factors that

influence their perceptions (Section 4). In this way, we are able to demonstrate how low-income residents value non- or indirect-use cultural services.

We also show how a mixed-methods approach to valuation can be deployed to help frame and interpret quantitative results. Aside from a positive WTP for a rehabilitated corridor, we find evidence of communal investments of time and resources to maintain the local environment, and other expressions of value. We conclude with a discussion (Section 5) of the implications of residents' demand for cultural services, and how this information could be used to influence planning and landscape design decisions.

## 2. Case study context

The Ciliwung River has long been a key piece of infrastructure for human settlements in what is now the city of Jakarta (Prescott & Girot, 2013). Jakarta's urban beginnings trace back to the 4th century CE (Abeyasekera, 1990), when the Ciliwung formed an axis of the Tarumanagara and later the Sunda kingdom. The Sunda kingdom's main harbor, Kelapa, was located at the mouth of the Ciliwung, which connected the kingdom's center (Pakuan Pajajaran, which is roughly 60 km upstream) to its agricultural hinterlands and the outside world. The Dutch eventually conquered Kelapa in 1617 due to its significance for the region. Colonial rule saw the development of a dense town modeled on Dutch urban design principles, in which water management systems were instrumental. Kooy and Bakker (2008) plot the colonial government's development of hydraulic networks in the late nineteenth and early twentieth centuries, and ensuing attempts of postcolonial governments to ‘modernize’ particular areas within the city through the delivery of large-scale water supply projects. However, a repetitive lapse in provision and maintenance of infrastructure has provoked the Ciliwung River and Jakarta's other twelve rivers to continue deteriorating in terms of water quality and flood mitigation capacity.

Today the lower stream of the Ciliwung (the portion passing through Jakarta) does not even meet Indonesia's minimum Class IV standards, making it unsuitable for any type of use. It also contributes substantially to seasonal flooding—more than 400,000 city residents were displaced by flooding in 2007 (Texier, 2008) and floods in January 2013 were the first to inundate the central business district and caused estimated damages of at least US \$2 billion (beritajakarta.com, 2013). As a partial response, Indonesia's Ministry of Public Works (MPW) has budgeted over US \$100 million (Rp 1.2 billion) to normalize the Ciliwung, widening the channel to approximately 50 m (it has narrowed to 10 m in some areas) and building a service road alongside a 19 km stretch of the river. Similar investments are proposed for other rivers in metropolitan Jakarta. In short, the Ciliwung is being treated as an engineering challenge, as typical infrastructure projects are, instead of being viewed as an ecological system capable of providing a range of benefits (Oberndorfer et al., 2007).

Our study area (Fig. 1) represents less than 10 percent of the portion of the river corridor designated for normalization, but it is the pilot site for implementation and so will be the first to be transformed. The Bukit Duri and Kampung Melayu sub-districts are located along the Ciliwung, near the geographic center of Jakarta. These sub-districts are densely and mostly informally settled, housing over 48,000 people within a square kilometer. Residents are typically but not exclusively low-income; about three quarters of surveyed households have incomes around or below Jakarta's minimum monthly wage rate of Rp 2.2 million (~US \$190) (see Table 1). Residents are also among the city's most at risk of fluvial flooding—some portions of our study area were under 4 m of water during the January 2013 flood and have experienced dozens

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