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## Overcoming barriers in the Brazilian urban drainage management

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### Keywords

Challenges; community engagement; financing; governance; strategies; paradigm shift.

### Introduction

From the year 2020, urban drainage management in Brazil is under the direction of the National Water Agency which provides reference guidelines for defining a new regulatory model (ANA, 2021). These technical guidelines have the ambition to reach sustainability by prioritising new approaches in a context of paradigm shift from centralised grey infrastructures toward diversified blue-green solutions. However, it is known that there are several non technical barriers preventing sustainable stormwater management (e.g. Ewert *et al.*, 2022, Vasconcelos & Barbassa, 2021). Focussing on integrated and multidisciplinary stormwater management strategies, this research highlights how international experiences and case studies can facilitate and accelerate the urban drainage paradigm shift in Brazil.

Based on an international literature review, including articles, manuals, guidelines and case studies, this research identifies the main groups of barriers to be overcome, and suggests and discusses solutions applicable to the Brazilian context.

### Results

Considering the various strategic solutions found in the literature, several groups of issues were identified. In this short abstract, only three groups of particular significance are briefly introduced in Table 1: 1) governance (GOV); 2) community engagement (CE); and 3) financing (S).

Table 1 - Some recommended practices for the evolution of urban drainage management in Brazil

G O V	i) Implement interdisciplinary, collaborative and network approaches (Barbosa <i>et al.</i> , 2012; Leeuwen <i>et al.</i> , 2019), with a) exchange of experiences, through the creation of a forum for validating and optimising the design of policies and measures to be adopted (Tosun & Leopold, 2019); b) a regulatory enforcement and a strong leadership (Nascimento <i>et al.</i> , 1999); c) an open co-governance arrangement and research on social-economic sustainability (Qiao <i>et al.</i> , 2018). ii) Be distributed, ensure public involvement and foster collaboration among stakeholders (Dhakal & Chevalier, 2016). iii) Organise the participation of different stakeholders (Barbosa <i>et al.</i> , 2012).
C E	i) Develop a community “local voice” and establish a longer-term input to local decision making; ii) Make the community more likely to appropriate the outcome for future resiliency by considering their participation in the decision making process and their capacity-building; iii) Empower individuals by making them more proactive and likely to lead community actions (Ballard <i>et al.</i> , 2015). iv) Provide information campaigns (Almeida, 2014), and education and training actions.

\$	<p>i) Implement a robust financing mode, e.g. the Urban Property Tax (IPTU) linked to impermeabilization (Cançado <i>et al.</i>, 2005; 2006) or a specific drainage tax, not necessarily associated with the IPTU, including incentives to sustainable drainage infrastructures with the reduction of the amount charged in the drainage tax (Gomes <i>et al.</i>, 2008; Lengler &amp; Mendes, 2013).</p> <p>ii) Develop stormwater management fees to reward onsite management measures engaging the economic interest (Clune &amp; Braden, 2007).</p> <p>iii) Share costs between governmental, private and NGOs levels (Qiao <i>et al.</i>, 2018).</p>
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## Conclusion

Interdisciplinarity, inclusion, collaboration and participation are characteristics of a new governance model capable of reaching the objectives of the required paradigm shift. No model, structure, or proposal can be efficient if community engagement is not considered (Pompêo, 1999), so the development of sustainability should also be socially sustainable, integrating the participation of society as an essential ingredient and being a result of multi-sectoral efforts. Research shows that it is possible to share urban drainage management costs through collection systems already known to Brazilian citizens. Discussing urban drainage management strategic solutions in Scientific Committees can result in useful tools for governance.

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