



**HAL**  
open science

## Overcoming barriers in the Brazilian urban drainage management

L Angelini Sobrinha, J.-L Bertrand-Krajewski, N O Nascimento

► **To cite this version:**

L Angelini Sobrinha, J.-L Bertrand-Krajewski, N O Nascimento. Overcoming barriers in the Brazilian urban drainage management. 11th IWA Conference on Efficient Urban Water Management “Efficient 2023”, IFTS, Sep 2023, Bordeaux, France. hal-04209566

**HAL Id: hal-04209566**

**<https://hal.science/hal-04209566>**

Submitted on 18 Sep 2023

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

## Overcoming barriers in the Brazilian urban drainage management

L. Angelini Sobrinha <sup>\*^</sup>, J.-L. Bertrand-Krajewski<sup>\*</sup>, and N. O. Nascimento<sup>\*\*</sup>

<sup>\*</sup> INSA Lyon, 11 rue de la Physique, F-69621 Villeurbanne cedex, France  
 (E-mail: [jean-luc.bertrand-krajewski@insa-lyon.fr](mailto:jean-luc.bertrand-krajewski@insa-lyon.fr))

<sup>\*\*</sup> Department of Hydraulic and Water Resources Engineering, UFMG, Av. Antônio Carlos, 6627, Belo Horizonte, MG, Brazil  
 (E-mail: [niloon2012@gmail.com](mailto:niloon2012@gmail.com))

<sup>\*^</sup> School of Engineering, UFGD, Rod. Dourados-Itahum, Km12, Dourados, MS, Brazil  
 (E-mail: [loidesobrinha@ufgd.edu.br](mailto:loidesobrinha@ufgd.edu.br) ; [loide.angelini-sobrinha@insa-lyon.fr](mailto:loide.angelini-sobrinha@insa-lyon.fr) )

### 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

<b>G O V</b>	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).
<b>C E</b>	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>
----	---

## 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.

## REFERENCES

- Almeida, M.F. 2014 Aplicação de técnicas compensatórias na drenagem urbana, sob a ótica dos usuários do espaço: estudo de caso em São Carlos - SP. [Dissetação de mestrado, Universidade Federal de São Carlos, São Carlos – SP].
- ANA (2021) Resolução Ana nº 105, de 18 de outubro de 2021. Aprova revisão extraordinária do Eixo Temático 1 – Regulação de usos e operação de reservatórios e do Eixo Temático 5 - Normas de Referência para o Saneamento da Agenda Regulatória da ANA 2020/2021. Presidência da Agência Nacional de Águas e Saneamento Básico.
- Ballard B.W.; Wilson S.; Udale-Clarke H.; Illman S.; Scott T.; Ashley R. & Kellagher R. 2015 *The SuDS Manual*. London: CIRIA C753.
- Barbosa A.E.; Fernandes J.N. & David L.M. 2012 *Key issues for sustainable urban stormwater management*. Water Res., 46(20), 6787-6798. <https://dx.doi.org/10.1016/j.watres.2012.05.029>.
- Clune, W.H. & Braden, J.B. (2007). Financial, economic, and institutional barriers to “green” urban development: The case of stormwater. *Cities of the future: Towards integrated sustainable water and landscape management*. IWA. ISBN: 1843391368.
- Dhokal K.P. & Chevalier L.R. 2016 *Urban stormwater governance: the need for a paradigm shift*. Environ. Manag., 57(5), 1112-1124. <https://dx.doi.org/10.1007/s00267-016-0667-5>.
- Ewert J.; Hammer K.; Wong T.; Chesterfield C.; & Grant M. (2022). *Urban WaterGuide: a guide for building sustainable and resilient cities*. CRC for Water Sensitive Cities. ISBN 978-1-921543-86-9 (Online)
- Gomes C.A.B.M.; Baptista, M. & Nascimento, N.O. 2008 *Financiamento da drenagem urbana: uma reflexão*. RBRH — Revista Brasileira de Recursos Hídricos, 13(3), 93-104. doi: 10.21168/rbrh.v13n3.p93-104.
- Lengler C. & Mendes C.A.B. 2013 *O financiamento da manutenção e operação do sistema de drenagem urbana de águas pluviais no Brasil: taxa de drenagem*. R.B. Estudos Urbanos e Regionais, 15(1), 201-218. doi: <http://dx.doi.org/10.22296/2317-1529.2013v15n1p201>.
- Leeuwen K. van.; Hofman J.; Driessen P.P.J. & Frijns, J. 2019 *The challenges of water management and governance*. Water, 11, 1180. doi:10.3390/w11061180.
- Nascimento N.O.; Cançado V. & Cabral J.R. 2005 *Taxing for stormwater drainage systems*. Water Science & Technology. 52(9), 251–258. IWA Publishing 2005. doi: 10.2166/wst.2005.0331.
- Nascimento N.O.; Cançado V. & Cabral J. R. 2006 *Estudo da cobrança pela drenagem urbana de águas pluviais por meio da simulação de uma taxa de drenagem*. RBRH – Revista Brasileira de Recursos Hídricos, 11(2), 135-147. doi: 10.21168/rbrh.v11n2.p135-147.
- Nascimento N.O.; Baptista M.B. & Kauark Leite, L. A. 1999 *Stormwater management problems in a tropical city – the Belo Horizonte case study*. IUGG99, The XXII General Assembly of the International Union of Geodesy and Geophysics.
- Pompêo C.A. 1999 *Development of a state policy for sustainable urban drainage*. Urban Water, 1(2), 155-160. [https://doi.org/10.1016/S1462-0758\(00\)00003-0](https://doi.org/10.1016/S1462-0758(00)00003-0).
- Qiao X-J.; Kristoffersson, A. & Randrup, T.B. 2018 *Challenges to implementing urban sustainable stormwater management from a governance perspective: a literature review*. Journal of Cleaner Production, 196, 943-952. doi: <https://doi.org/10.1016/j.jclepro.2018.06.049>.
- Tosun J. & Leopold, L. 2019 *Aligning climate governance with urban water management: insights from transnational city networks*. Water, 11, 701.
- Vasconcelos A.F. & Barbassa, A.P. 2021 *Sustainable urban stormwater management in developing countries: integrating strategies to overcome Brazilian barriers*. Urban Water Journal, doi: 10.1080/1573062X.2021.1969415.