

## The social control and rainwater management in Brazil

### O controle social e a gestão das águas pluviais no Brasil

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#### **ABSTRACT**

The aim of this article is to discuss the conflicts of jurisdiction between the different entities of the Brazilian Federation about water management, particularly since these were not determined by the resolutions of the 1988 Federal Constitution. Although the role of the different players involved was outlined in the Water Resources Law, it was only through the enactment of the Law on Basic Sanitation, updated in 2020, that the municipalities were given responsibility for the management of rainwater in Brazil. Rainwater management currently forms, or should form, a part of the municipal planning of basic sanitation and community involvement, together with transparency, is becoming a key principle underlying the new model of local governance. The adoption of sustainable techniques and non-conventional methods of water management, based on the concept of Low Impact Urban Design and Development (LIUDD), is serving as a model for the kind of rainwater management that can allow social control together with democratic participation and the decentralization of sanitation services.

**Keywords:** Rainwater Management, Social Control, Local Governance, Sustainability.

## RESUMO

O objetivo deste artigo é discutir os conflitos de competência entre os entes da federação brasileira, sobre a gestão das águas, sobretudo por não terem sido encerrados com as delimitações da Constituição Federal de 1988. Embora o papel dos atores esteja evidenciado na Lei das Águas, é na aprovação da Lei do Saneamento Básico, atualizada em 2020, que os municípios adquiriram a responsabilidade da gestão das águas pluviais no Brasil. As águas pluviais, atualmente, são ou deveriam ser parte do plano municipal de saneamento básico, e a participação cidadã e a transparência se tornam um dos princípios para um novo modelo de governança local. A inspiração em técnicas sustentáveis e métodos não-convencionais de gestão das águas sob o conceito do desenho e desenvolvimento urbano de baixo impacto ambiental, serve de modelo para uma gestão das águas pluviais, que privilegia o controle social com a participação democrática e a descentralização dos serviços de saneamento.

**Palavras-chave:** Gestão das Águas Pluviais, Controle Social, Governança Local, Sustentabilidade.

## 1 INTRODUCTION

Conflicts of jurisdiction about water management in Brazil have always seriously hampered policymaking at a local level. This is because the exact operational areas of each federal entity have never been laid down in a clear and well-defined manner and this has allowed their regulation to be confined to certain economic spheres, in particular the electric power sector.

Despite the changes introduced by the issuing of the Water Code<sup>1</sup>, the importance of local questions only became apparent in Brazil after the promulgation of the Federal Constitution of 1988, when the municipalities began to be regarded as federal entities and the notions of decentralization and community involvement made formal inroads into all levels of government (BRASIL, 1988).

The enactment of the Water Resources Law<sup>2</sup> also led to changes by establishing a new legal framework of governance, based on the Integrated Water Resources Management<sup>3</sup>, since the States of the Federation and the Federal Government itself, had begun to define the operational areas of rainwater management in the country (BRASIL, 1997).

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<sup>1</sup> Federal Decree n. 24.643 of July 10, 1934.

<sup>2</sup> Federal Law n. 9.433 of January 8, 1997.

<sup>3</sup> Translated from Portuguese: “*Gestão Integrada de Recursos Hídricos*”.

The National Guidelines for Basic Sanitation<sup>4</sup> in Brazil allowed the concept of basic sanitation to be more broadly defined. It now included drainage, and rainwater management in the area of basic sewerage services, as well as the cleaning and preventive surveillance of the drainage system. In addition, the Law made it mandatory for the towns and cities to include urban rainwater management within their local jurisdiction, when carrying out municipal planning (BRASIL, 2007).

At the same time, it was noted that when undertaking water management, the Brazilian municipalities have largely based their policies on the control of urban flooding and thus given priority to carrying out infrastructural engineering projects for the extension and maintenance of the drainage system and responding to emergencies. This has been to the detriment of the pressing need to find new models for the non-conventional management of urban water resources as an alternative.

Rainwater management in urban areas began to be a challenge for any town or city because the effects of water drainage on the human and aquatic ecosystems leads to clear signs of environmental imbalance such as: inundations, flooding and landslides in urban areas, the collapse of hillsides, and the pollution of the water supply, as well as the soil sealing of the recipient water resources, among other factors.

The developed countries are currently exploring new models for water management, while at the same time reviewing the already existing administrative structures and adding an international design and carrying out urban development with a low environmental impact. This international trend is beginning to assign an environmental value to rainwater by reducing the problems of flooding in urban areas and making rainwater available as a water resource with multiple uses.

According to Fletcher *et al.* (2014), the use of sustainable technology for urban drainage is comparatively recent and it is based on the following: the American concept of Low Impact Development (LID), the Australian strategy of Water Sensitive Urban Design (WSUD), the Low Impact Urban Design and Development (LIUDD) of New Zealand, and even the British concept of Sustainable Drainage Systems (SuDS).

It has been noted that countries that choose non-conventional sustainable methods for rainwater systems are able to achieve a very satisfactory environmental

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<sup>4</sup> Federal Law n. 11.445 of January 5, 2007. Updated by Federal Law n. 14.026 of July 15, 2020.

performance, which involves: a reduction in the number of pollutants and amount of sediment, the maintenance of vegetation (green areas) and a reduction of soil sealing. In light of this, new opportunities can be found for controlling the outflows as well as to ensure an improvement of the habitat in the estuaries, the biodiversity and the local climate, as well as providing economic and social benefits.

The decision to install a sustainable model must be the outcome of a democratic decision where the stakeholders involved can have the right to take measures and play both a direct and indirect role in water management and be responsible for results, similar to the action taken by the municipalities for the management of rainwater.

The municipalities must carry out their responsibilities as local political agents by seeking existing pieces of legislation (and enacting others) that can underpin their urban and environmental programs by allowing them to give priority to a sustainable form of rainwater management and seek to incorporate social inclusion as a management tool – social control.

## **2 MATERIAL AND METHODS**

This paper is a result of a doctorate research, which presents a rainwater management model for the city of Rio de Janeiro, under the concept of Low Impact Urban Design and Development (LIUDD). The research is conceptualized under a qualitative, descriptive, and interpretive approach to the theme “sustainable rainwater management”.

As states Bardin (2011), qualitative content analysis is structured in three stages: organization, coding, and categorization of information, that results in an analytical generalization, capable of allowing the replication of the method, without necessarily requiring a quantitative complementation of the theme.

Descriptive research deals with the in-depth analysis of the researched reality, aiming to identify a correlation between the various sources, with a focus on the description, classification, and interpretation of the facts. Assuming that, models or frameworks are proposed from the observation and comprehension of a given phenomenon, which make them capable of supporting and validating the proposed hypotheses (RUDIO, 1985).

According to Schwandt (1994), an interpretive approach seeks to understand the world from the point of view of those who experience it, allowing to understand

the research object as a result of social interaction shaped by the actors involved, through a rereading of the meanings of the phenomena and the observed historical events.

In view of the credibility criterion described by Blattmann and Tristão (1999), data were obtained in the pre-analysis phase through electronic consultation of open access journals available on academic research portals such as: BDTD (Digital Library of Theses and Dissertations), ERIC (Education Resources Information Center), Google Books, Google Scholar, JURN, Portal Periodicals CAPES, SciELO (Scientific Electronic Library Online), SCIRUS, SPELL (Scientific Periodicals Electronic Library) and The British Library.

Taking advantage of the option of advanced criteria in the research portals, the authors performed a second search guided by Boolean logic, which deals with a type of information retrieval system, in which two or more terms are combined, relating them by logical operators, and that make the search more restricted or detailed (FERNEDA, 2003).

Brazilian researchers have incorporated network technologies in the development of their scientific routine. In addition, the use of electronic networks has generated a positive impact, favoring the expansion of scientific communities, facilitating and intensifying communication, and expanding access to the various information resources created on the network (PINHEIRO, 2003).

As proposed by Alves da Silva *et al.* (2015), data were compiled using electronic spreadsheets and cross-reference tables, which served as input to the NVivo software (version 11), which was chosen to support the research, performing the tasks of finding, analyzing, and organizing the information in the documents such as: scientific papers and articles, magazines, newspapers, and web content, according to the relevance and adherence to the theme, whose results can be seen in Table 1 below.

Table 1. Result of the content analysis of the theme “sustainable rainwater management”, according to the relevance and adherence to the links obtained from the advanced search criteria (2010-2020).

Links	Number of documents	Relevance and adherence to the theme (%) <sup>1</sup>
“Rainwater” and “urban rainwater”	12.210	25,78
“Urban planning” and “urban drainage”	17.488	36,93
“Social control” and “rainwater social control”	9.400	19,85
“Water governance” and “rainwater governance”	4.783	10,10
“Local governance” and “rainwater governance”	3.448	7,28
“Urban water social control” and “rainwater social control”	24	0,05

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Total of documentary sources	47.353	—
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Note:

<sup>1</sup>Percentage determined by the ratio between the total of documents analyzed in a link and the total of documents sources analyzed.

Source: Prepared by the authors (2020).

Using the advanced criteria of searching, the content analysis created links between the theme of “sustainable rainwater management” with the ideas of: “rainwater” and “urban rainwater”, “urban planning” and “urban drainage”, “social control” and “rainwater social control”, “water governance” and “rainwater governance”, “local governance” and “rainwater governance”, and “urban water social control” and “rainwater social control”; using the operators “and”, “or”, “and/or” and “not”.

Finally, the content analysis of these documents allowed us to include a historical exploration in the literature review of the thesis, to narrow the role of the communities and the sustainable methodologies for rainwater management which can be effectively strengthened by social control and democratic participation.

### **3 DISCUSSION**

#### **3.1 WATER RESOURCES MANAGEMENT IN BRAZIL**

Water resources management in Brazil has begun to be regarded in terms of the first ideas described in the Water Code (1934), which was also interpreted as a shift in water governance strategies at that time. Before 1934, water was believed to be an unlimited natural resource which could serve all private activities. On the basis of this understanding, the “coffee” and “cattle” barons in power during the First Republic (1889-1930), basically administered the water resources for the purposes of meeting the needs of agricultural production and subsistence farming (DRUMMOND and BARROS-PLATIAU, 2006).

The domination of the water resources by the oligarchs came to an end at the beginning of the Vargas Era (1930-1945), when during the Interim Government (1930-1934), and with the support of the Armed Forces, control of natural resources passed to the hands of the State, with the aim of ensuring the necessary resources were supplied to the industrial as well as the agricultural sector. In this way, water ceased to be treated as an unlimited natural resource and became a public asset where the responsibility for its regulation competed with the other responsibilities of the central government.

The main purpose of water management during the different political regimes that followed the Vargas Era, was to generate electricity and serve the needs of agriculture: these were the years of populist governments (1946-1964) and military dictatorship (1964-1985). There were few changes to the Code of 1934 throughout this period, and environmental concerns were regarded as of practically secondary importance.

The Federal Constitution of 1988, which symbolizes the transition from a military system of government to contemporary representative democracy, led to a new judicial order in Brazil that was grounded on the recognition of the importance of protecting natural resources and restoring parts of the environment that had been damaged by human activities (Art. 20 to 24, Art. 170 and Art. 225). It also laid down the responsibilities for water management – by defining the different spheres of action of the States and the Central Government (BRASIL, 1988).

As Conca (2006) pointed out, the Water Resources Law of 1997 resulted from the political and economic reforms that were set in motion after the military dictatorship. However, the process of democratic transition was interpreted in different ways with regard to the National Water Resources Policy and the National System of Water Resources Management, namely:

- (i) the delegitimizing of the model for water management which gave priority to energy, agriculture, transport and other requirements for “development”, while disregarding their socio-environmental impacts;
- (ii) the constitutional post-authoritarian order which sought to extend the rights of citizens by creating “opportunities for new actors to take part in national political debates”; and
- (iii) The economic decentralization brought about by the Real Plan [a set of measures taken to stabilize the economy in 1994 after a period of hyperinflation], which introduced a new currency and a new monetary system characterized by “neo-liberal” principles that allowed a greater degree of intervention by the private sector.

The updated Law of Basic Sanitation (2020) maintains concepts that broaden the scope of water resources by including sewerage and the management of urban rainwater with a view to ensuring public health and protecting the environment within the sphere of municipal management. It began to be a mandatory policy for



the towns and cities to draw up a Municipal Plan for Basic Sanitation, conduct analyses, define strategies that could be applied universally and set out goals and objectives through a participatory and transparent process (of social control) (BRASIL, 2020).

### 3.2 SOCIAL CONTROL IN RAINWATER MANAGEMENT

The new understanding of urban ecology entails the study of forms of social planning and socio-economic activities with regard to the space and surroundings of towns and cities and involving the features of the urban organism in every sense. In light of these factors, specialists and policymakers must seek to improve their integrated knowledge of the urban eco-system (AB'SABER, 1995).

However, although significant progress has been made by democratically involving civil society in the decision-making carried out by public authorities, there are still serious gaps in urban rainwater management, notably with regard to social inclusion and transparency.

The lack of democratic practices in public management becomes more apparent when urban and rural settings are compared with regard to the current distribution framework that provides access to the supply and sanitation of water. This is because the interests of civil society in the interior of the country or less “developed” areas remain suppressed by the interests of the government which seeks to cater for the needs of the urban areas (CLEAVER, 1999).

This lack of transparency is repeated in the domains of the municipalities where urban and peripheral areas have different social traits, since this allows particular groups to dominate the decision-making process on the basis of a demonstration of techno-scientific knowledge or local political power.

Some people adopt participatory strategies in so-called “developing” countries to support the idea that the simple “inclusion” of those sitting round the decision-making table, would automatically result in their empowerment and the creation of a democratic form of management. However, these social actors are unable to resort to the skills required to influence the decisions; as well as this, they lack a sufficient degree of techno-scientific knowledge to understand what is being discussed and do not share the same interests (CLEAVER, 1999).

The processes of local governance must be concerned with the capacity of the State to govern without ignoring the need to democratize public mechanisms.



They must decide in favor of social control and decentralization, as well as providing incentives for public/private partnerships together with the creation of sector-based advisory boards and a participatory budget (DINIZ, 2001).

However, with regard to the participation of citizens, democratic governance in Brazil still relies on its vestiges of the State dominance, as a traditional inheritance.

In effect, a crisis of governance can result not only in the State being incapable of managing or implementing public policies but also in an inability to be responsive to the wishes of the people and the collective goals that are formulated in the game of politics (TORRES, 2016).

When addressing the question of the urban governance of rainwater, one should mention the obligations imposed on the municipalities by the Basic Sanitation Law. These stipulate that they must comply with the terms of the legislation in the following ways by: i) formulating Municipal Policies for Basic Sanitation; ii) drawing up plans either at a local level or together with other municipalities (through joint ventures); iii) setting up regulatory bodies that are independent with regard to their financial, budgetary, administrative and decision-making activities; iv) forming Municipal Advisory Boards of Basic Sanitation within the City or Town Councils; v) having due regard for the provisions of the Law in matters concerning planning, regulation, social control and the direct rights of consumers to services; vi) establishing contractual relations and making an economic feasibility analysis of the services in an indirect way (e.g. awarding grants); vii) undertaking activities through a democratic governance and in a transparent way (BRASIL, 2020).

Tucci (2004) argues that the main factor that makes it difficult to undertake an integrated form of planning is the limited technical and institutional capacity of the municipalities to confront interdisciplinary and complex problems and the way the municipal management is divided into different sectors.

Although advances have been made in assisting society to find solutions to the conflicts in the river basins (such as setting up river basin committees for example), there has still been a failure to determine what role the municipalities should play in taking effective measures to manage the waters within their domain. The legislative autonomy of the towns and cities should be encouraged to include basic criteria for the conservation of available water resources within their programs

of urban expansion. This could assist them to operate in a sustainable way, either by the inclusion of a Master Plan or adopting some other effective legislative means.

### 3.3 SUSTAINABLE SEWAGE SYSTEMS – A SHIFT IN FOCUS

The United States, Australia, New Zealand and the United Kingdom are countries that have been shifting their focus with regard to sewage systems and instead of regarding this question as a “problem” now see it as an “opportunity”. There are models for the management of rainwater that are being employed with the aim of reducing its impact on urban areas by finding alternative ways of carrying out rainwater harvesting. These include the following: additional supplies of water, an increase of biodiversity, and an improvement of the local microclimate, among other factors (ASHLEY *et al.*, 2015).

This new focal point allows towns and cities seriously affect by rainwater to achieve a hydric balance and satisfactory environmental performance (Figure 1) and enable them to: a) reduce the number of pollutants and amount of sediment; b) encourage the maintenance of areas of vegetation (green zones and wetlands), seepage beds and trenches; c) reduce the degree of soil sealing by using permeable surfacing; d) encourage the installation of green roofs, raingardens and wall treatment, e) improve the habitat in the estuaries as well as the local biodiversity; f) provide social and economic benefits (EASON *et al.*, 2003).

Figure 1. Hydric balance for a town or a city seriously affected by rainwater.



Source: Prepared by the authors, adapted from the National League of Cities (2020).

Installing these new models for the management of water successfully, necessarily involve the commitment of the public authorities and the participation of the community. The results of this crossover can be seen in studies on how to implement eco-friendly techniques which have models that are employed in desirable initiatives that must be included in any political planning at a pedagogical level (PIMENTEL DA SILVA and NEFFA, 2015).

Thus, it was noted that the investment and maintenance costs of conventional sewage systems are very high and have a continuous environmental impact on coastal areas and the urban hydrographic basins. These include the following: soil sealing, carriage of contaminants, silting, contamination of the soil, instability of embankments, and degradation of the quality of the water from hydric bodies etc. (EASON *et al.*, 2003).

Generally speaking, the low-impact urban sewage systems have become increasingly popular methods, in view of the need to reduce adverse hydrological factors and mitigate their negative effects on the quality of water. The LIUDD and WSUD concepts have been designed with the aim of stemming, holding back, infiltrating or treating the urban surface run-off and thus reduce the impact of urban development (urbanization) on the hydrographic basin (WONG *et al.*, 2002).

#### 4 CONCLUSION

The process of “redemocratization” in Brazil has allowed the management of Brazilian towns and cities to undergo a significant alteration in the domain of social participation. This has opened up new horizons for the public and shifted the position of the community from that of being bystanders subservient to the rules and regulations of the State, to actors consciously participating in an organized society.

The inclusion of the community in decision-making has reached various areas of regional management, particularly the management of water resources under the auspices of the Water Resources Law (1997). However, it has been found that the question of urban waters is a local issue and should be included in the same model of participatory inclusion, as for example in the case of the consequences of heavy rainfall that directly affects the towns and cities.

In light of these circumstances, the municipal public authorities are responsible for the decisions made at a local level for the management of rainwater. Municipal planning with regard to basic sanitation which follows the guidelines of the Sanitation Law, confirms the fact that transparency and social control are key principles required for the success of municipal policies.

The participatory role of the communities can be ensured by the system adopted and put into effect by the governance which allows the setting up of advisory boards, public-private partnerships and the installation of a participatory budget – i.e. the “democratization” of public mechanisms.

The use of sustainable techniques and non-conventional methods for the management of rainwater (based on the concept of low-impact environmental urban design and development), and the search for local models of governance that are suited to Brazilian towns and cities, are effective methodologies for rainwater management which can strengthen social control and democratic participation.

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