

**Evaluation of Resilience from Water Management in the Urban Environment as a Factor of Environmental, Economic and Social Sustainability**

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**INTRODUCTION**

The need to plan cities considering water problems is still deficient.

Strategies and public policies can be developed to make cities of all sizes and profiles more resistant and habitable.

**Has climate change and urban resilience been considered in the management of rainwater?**

**URBAN RESILIENCE**

**Resists** natural disasters and / or caused by man.

**Absorbs** impacts by ensuring preparation for an effective response to adverse events.

**Adapt** the needs by making the necessary changes. Restore basic structures and functions.

**New configurations of the city? New practices?**

For the Workshop will be presented the case study of the municipio of São Carlos, located in the State of São Paulo – Brazil.

**Research purpose**

Thus, the present study had as objective to evaluate if the concept of resilience was approached in the Municipal Urban Drainage Plan (PMDU-SC), established by law nº 17.005 of 12/20/2013.

To do so, based on a bibliographical survey, the principles and guidelines that should be considered for the resilience approach associated with rainwater management were systematized. From this systematization, the PMDU-SC was analyzed, seeking to identify the direct or indirect presence of said principles and guidelines.

**METHODOLOGY**

- 1-Bibliographic research and characterization of the Municipality of São Carlos;
- 2-Systematization of aspects of resilience related to rainwater;

3-Definition of qualitative, quantitative variables and related to the management and participation in the management of rainwater defined by Correia e Teixeira (2018);

4-Application of the variables in the PMDU-SC, evaluating the direct or indirect presence of resilience and climate change.

### Characterization of the study area

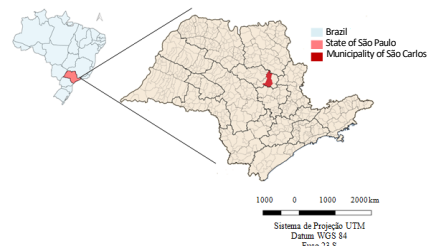


Figure 1. Location of the city of São C São Carlos  
Adapted from Abreu (2006)

### RESULTS

Table 1 summarizes the variables that can be associated with resilience and that were identified in the PMDU-SC.

Where:

- AD-Aborda directly
- AI-indirectly addressed
- N-No Address

	Variables	Focus
	Demands and uses of water	AD
	Water availability	AI
With regard to the amount of water	Surface flow of water	AI
	Underground flow	AI
	Water infiltration	AI
	Watercourse regime and Water Balance	AD

	Variables	Focus
With regard to water quality	Pollution of rainwater by mixing with sanitary drains (cross connections) and Pollution of rainwater as a result of washing the surfaces of the urban environment	AD
	Launching solid waste directly into the water bodies and dragging solid waste through rainwater	AD

	Variables	Focus
With respect to the management and participation in the management of rainwater	Municipal laws for the management of rainwater	AD
	Social participation and social projects	AD

### DISCUSSIONS

- The PMDU-SC has normative instruments referring to drainage that provide technical guidelines for the solution of problems and pointing planning solutions in urban drainage.
- The texts highlight the importance of training the population through environmental education.

- The variables are addressed directly in the PMDU, it is only the variavaives related to the amount of water such as water availability, water runoff, underground flow and indirectly infiltrated water.

### CONCLUSIONS

- The PMDU-SC does not explicitly mention resilience or even climate change.
- It is possible to verify the presence of the analyzed variables being addressed directly or indirectly.
- The PMDU presents concerns, both with structural and non-structural measures.

- In social participation there is a very clear focus on the need to raise awareness among the population.
- The management is foreseen in the legislation, some instruments of structural and non-structural measures important for drainage as pollution control.

It was observed that although there are many studies addressing urban water services with the declared goal of improving disaster risk reduction and resilience (UNISDR, 2012 and Turnbull et al., 2013), the concept of resilience is generally not operational (Howard et al. Bartram, 2010).

In this sense, there is a need to adapt the reformulation of the São Carlos PMDU so that the concept of resilience and climate change can be systematized, operationalized and applied to better guide the transitions to sustainable management of urban waters so as to incorporate clearer concerns with respect to resilience and climate change.

Therefore, there is an emerging challenge of projecting resilience to reduce the impacts of climate change, ensuring safe water supply, and protecting environments through agendas that rethink and redesign urban policy standards for cities to be able to withstand shocks and natural stresses or not.

Obrigada! Gracias! Thank you!

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