

## **First steps for improvements in urban rivers: the case of Niterói, Rio de Janeiro, Brazil**

Premières étapes d'amélioration de rivières urbaines : le cas de Niterói, Rio de Janeiro, Brésil

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### **RÉSUMÉ**

La ville de Niteroi, dans la région métropolitaine de l'État de Rio de Janeiro (Brésil), présente plusieurs rivières qui ont évolué avec des travaux d'ingénierie tout au long du 20ème siècle. Avec l'extension de la ville, de nombreuses rivières ont été rectifiées et couvertes, et leur végétation riveraine retirée pour faire place à de nouvelles constructions. Les effluents domestiques et déchets non traités sont déversés dans les rivières, rendant l'eau impropre à la consommation. En période de fortes pluies, ces rivières débordent et provoquent des inondations. Face à cette dégradation de l'environnement, cette étude présente deux projets préparés par le gouvernement local à la recherche d'une l'amélioration de deux rivières de Niteroi. Un projet de renaturalisation a été mis au point en 2002 pour la rivière João Mendes, inspiré par des exemples internationaux, avec l'aménagement d'un parc linéaire sur la rive. Pour le canal San Francisco, le Project Grael Eau Propre lancé en 2010 vise à améliorer la rivière au moyen d'une sensibilisation environnementale et de l'installation d'une eco-barrière à l'embouchure pour recueillir les débris flottants. Cette étude fait partie de la thèse de doctorat présentée par l'auteur en 2014 à l'Universidade Federal Fluminense (Niterói, RJ, Brésil).

### **ABSTRACT**

The city of Niteroi, in the metropolitan region of the state of Rio de Janeiro (Brazil) has several rivers that have changed with engineering works throughout the 20th century. As the city expanded, many rivers were rectified, covered and had their riparian vegetation removed and new buildings and roads came up. Domestic effluent and untreated waste are dumped, preventing water consumption. In times of heavy rains, these rivers overflow and cause flooding. Faced with this degradation of environment, this paper aims to highlight two projects prepared by the local government seeking the improvement of two rivers of Niteroi. For the João Mendes river was created a Renaturalisation project in 2002, inspired by international examples, for the construction of a linear park on the shore. For the San Francisco channel, Grael Clean Water Project, starting in 2010, focuses the improvement of the river from the environmental education and installation of an eco-barrier at the mouth to capture floating debris. This study is part of the doctoral thesis presented by the author in 2014 at Universidade Federal Fluminense (Niterói, RJ, Brazil).

### **KEYWORDS**

Changes in the drainage network; environmental education; renaturation projects; River channelization; urban growth

## 1 INTRODUCTION

Niterói is one of the main cities in the metropolitan region of the state of Rio de Janeiro, Brazil. It is located east of the Guanabara Bay and many of its rivers drain into the bay or to the beaches on the Atlantic Ocean. Large population growth rates are recorded from the 1970s, a period when it was built Rio-Niterói Bridge and there was a great expansion of the urban area, with the creation of new avenues and allotments. This urban expansion was not accompanied by treatment of sewage. This means that much of the wastewater went directly into rivers, lakes and beaches. Added to this, many rivers were channeled and their marginal vegetations were not preserved. Currently, as in most Brazilian cities, rivers, that were used for supplies, fishing and leisure, are degraded with high pollution levels and are floating garbage receptors also - as plastic bottles and aluminum cans (Tucci, 2006).

The government of Niterói has some interesting environmental legislation for the conservation of water courses, but little is put into practice. Two projects prepared by the local government seek to improve two rivers of the city. For the João Mendes river was created the Renaturalisation project in 2002, inspired by international examples, for the construction of a linear park on the shore. For the San Francisco channel, Grael Clean Water Project, starting in 2010, focuses the improvement of the river from the environmental education and installation of an eco-barrier at the mouth to capture floating debris. These two pioneering initiatives require consolidation and continuity of action for changes in the relations of men with urban rivers.

## 2 METHODS

The methodology consisted of a literature review, office work and field work. In the watershed of the João Mendes river and San Francisco channel topographic maps were used in 1976 and 1996 to rebuild the drainage network; aerial photographs from 1976 and 2002 satellite images to compare urban growth; documents were analyzed as municipal laws on water resources, Renaturalisation Project Rio João Mendes and Grael Clean Water Project to understand the management of rivers by the government. Maps were produced in ArcGIS 9.3 Software for the delimitation of the watersheds studied, for classification of the use and land cover in 1976 and 2002, identification of drainage basins and identification of interventions in rivers.

## 3 RESULTS AND DISCUSSION

The Renaturalisation Project of João Mendes river (2002), is based on public-private partnership where private capital to buy lots of interest the implementation of the Urban Park in River João Mendes, whether empty or occupied, with subsequent donation to the municipality. These lots, occupying the Waterfront (10 meters on each side) will be spaces for the deployment of the river Renaturalisation Project. However, beyond this limit of 10 meters, the buildings could have 6 floors for projects of donor lots were within the marginal range of protection.

The exchange of land has been seen by entrepreneurs as a possibility of increasing the feedback of the property and, by the residents, as an appreciation of their homes. On the one hand the project aims to rescue the marginal range of protection, on the other, press the intensification of the occupation of the watershed by higher floors of buildings (Galvão, 2008). The project hasn't yet to be continued. The land that is donated to the project are bad, small, triangular.

The João Mendes river was chosen by the city for the renaturalization project as one of the most important contributors to the lagoon system Piratininga / Itaipu (which is degraded). One obstacle to the project would be the removal of the buildings from the river banks. Families would have to be resettled and the costs would be more costly to the government.

The San Francisco channel is constantly frequented by cleanup crews to remove trash and sediment from his bed. The channel cleaning is important for preventing flooding, since these materials reduce the channel capacity and block the passage of water.

The current vice-mayor of Niterói, Axel Grael (2013-current) has a cleaning project for the San Francisco channel, as this takes tons of garbage to the Guanabara Bay. The trash origin is often of poor communities near the canal of San Francisco. The Grael Clean Water Project was initiated in 2010 and aims to collect floating garbage San Francisco channel, which is the most polluting source of

the San Francisco bay. In addition to collecting the solid material, the Grael Project focuses on prevention, educational campaigns in communities and schools, in order to reduce the launcher sources of waste.

Aiming to prevent the garbage brought by San Francisco channel spread by sand and reach the sea, was implemented in 2014 an Eco-barrier Project in San Francisco channel. The barrier is shaped like a network wall that prevents the trash from the river reaches the bay.

The state government of Rio de Janeiro and the city of Niterói has plans to install A River Treatment Unit at the San Francisco canal, as a part of the Guanabara Bay remediation goal for the Olympic Games in 2016. In the beach of San Francisco, where's the mouth of the channel, there is the presence of several clubs, with practitioners of water sports. The San Francisco channel, as stated earlier, carries sewage effluent fresh and lot of garbage floating on the bay of Guanabara, which compromises water quality and becomes a hindrance to practice these water sports, which has a tradition in the city.

#### 4 CONCLUSION

It can be concluded that the environmental laws of Niterói were prepared from the 1990s, when the city's occupation was already consolidated and rivers have suffered strong human pressure, with the creation of new buildings and the presence of polluting sources. The Renaturalisation Project of João Mendes river, of 2002, despite being a pioneering initiative in preserving the river and Protection Marginal Strip, was not followed. The Eco-barrier Project in San Francisco channel installed in 2014, refers to the installation of a network in the channel mouth to catch the floating garbage carried by the river. The Grael Clean Water Project has focus in the communities and neighborhood schools to raise awareness about the consequences of waste released into the canal. A River Treatment Unit must be installed by 2016 in San Francisco channel to improve the quality of water that reaches the bay of Guanabara.

Currently, we seek to new public policies that return to rivers their natural space for the development of morphology and vegetation, so as to be able to recover its shape, its function and the quality of water (Gorski, 2010). In large urban areas, however, the degree of degradation is so high that the return to the above conditions, pre-condition is quite difficult. It is necessary, at least, the removal of garbage and sewage to improve water quality.

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