

Monitoring and automation of the sewage system in the city of Maceió

V. C. V. Almeida, T. C. M. Batista, F. N. Lima, L.T. Melo, E. C. M. Silva

Centro Universitário Cesmac, Brazil

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Abstract— Flooding in urban basins is due, mainly, to excessive soil subdivision with the consequent sealing of surfaces, the occupation of riparian areas, inadequate drainage works and the obstruction of channels by debris and sediments. Considering the concepts of sustainability of urban drainage, the approach to solutions must consider a good characterization of the region, relating the occurrence of events with their causes and analyzing the effects in the regions of occurrence. One of the ways to obtain such answers is the characterization of problems related to flooding through interviews with the population that occupies affected areas. Aiming at the problem, this work deals with the assumption and practice of a flood risk supervision system, enabling its consistency with sensor networks to assist risk analysts in identifying and warning of the possibility of flooding, triggering the notification service through mobile devices of the interested community. It seeks to minimize, mainly, the social and financial losses caused by floods by predicting the flooding of coastal areas. The proposal of this work is to present a monitoring control of the garbage accumulated in manholes and its automatic removal in the city of Maceió.

I. INTRODUCTION

The extreme natural events that most affect human activities in our country are climatic in nature. Although they are natural phenomena, the actions of man interfering in urban or rural areas, over time, have contributed to their greater frequency, intensity and areal expansion (BRANDÃO, 1992, 2001).

Considering the concepts of sustainability of urban drainage, the approach to solutions should consider a good characterization of the region, relating the occurrence of events with their causes and analyzing the effects in the regions of occurrence. One of the ways to obtain such answers is the characterization of problems related to flooding through interviews with the population that occupies affected areas.

Aiming at the problem, this work deals with the assumption and practice of a flood risk supervision system, enabling its consistency with sensor networks to assist risk analysts in identifying and warning of the possibility of flooding, triggering the notification service through mobile devices of the interested community. It seeks to minimize, mainly, the social and financial losses caused by floods by predicting the flooding of coastal areas. The scope of the project includes the interests of local governments seeking to improve their emergency response through a network of enabled water level sensors, collaboration with flood forecasting and modeling capabilities in the city of Maceió.

II. MATERIAL AND METHODS

The project seeks to develop knowledge about the monitoring control and automation of the sewage system in

the city of Maceió. It consists of exploring the adaptation of various sensor models, exploring wireless communication.

To achieve the stipulated objectives, it was adopted as methodology to perform bibliographic review in books, magazines and electronic media about the theme, aspects and historical context, in addition to studies of the formal characteristics, materials and construction techniques employed for solutions and monitoring of flooding used in Smart Cities, smart cities, as for example, the state of São Paulo and Belo Horizonte, as stated by Folha de São Paulo, 2016.

In addition, a cataloging and survey of climatological data in the city of Maceió was done. To analyze the factors that potentiate and trigger flooding events, as well as the areas with the highest flooding index.

For the development of the work, the geomorphological conditioning factors of the study area were considered, as well as the anthropic conditioning factors related to the use and occupation of the land and to the changes imposed by urbanization, the climatic conditioning factors, the possible materials to be used, and their limitations.

Demonstrating that the monitoring and automation control of the sewage system in the city of Maceió can be of great use, because besides being of low cost and maintenance, it will preserve flooding.

III. RESULTS AND DISCUSSION

Imagine a dashboard (visual panel that presents, in a centralized way, a set of information: indicators and their metrics), through which it is possible to monitor the city's culverts and receive individual alerts of when cleaning and maintenance is necessary, avoiding flooding. How about an intelligent system capable of identifying and even remotely restoring power supply problems? This is already a reality in cities like São Paulo, Barueri, Rio de Janeiro, Belo Horizonte, and soon it will also be in Maceió, in the case of manholes. These cities are benefiting from the adoption of technologies aimed at Smart Cities (cities that use technology to improve the operation of urban infrastructure and to make urban centers more efficient, with better quality of life and less waste), or intelligent cities.

This will require the implementation of an Operational Control Center (OCC), which is a key piece in the operation of a Smart City. Taking as a good example of Operational Control Center, Net Sensors. As reported by Gratão (2020), Net Sensors is a company focused on developing sustainable solutions for Smart Cities. The equipment it supplies to some states, such as São Paulo and Belo Horizonte, monitors the stations for any sign of flooding

when there is heavy rain (SOUZA, 2020). When the basket reaches 70% of its capacity, the sensor sends an alert to the cleaning teams of the consortium linked to the City Hall (GRATÃO, 2020) for some of the previously mentioned states, such as São Paulo and Belo Horizonte, as mentioned. In the "macro" architecture of an Intelligent City, the CCO is located at the point of contact of the data (treated, processed, analyzed and combined) and, mainly, of the alerts (qualified, from the application of artificial intelligence in its analysis) with the decision maker. Public safety, urban mobility and health events (accidents, road interruptions), public lighting control, water and sewage network monitoring, garbage collection monitoring, meteorological situation and eventual points of potential flooding or landslides, among many other services and municipal functions, are, in the logic of the Smart City and the CCOs, centrally controlled, in a single physical place (enabling economies of scale and sharing of decisions among the different operators).

Besides the monitoring of natural disasters that aims to keep citizens informed, in real time, about risks of environmental disasters, in order to mitigate their consequences and solve in the instrumentalization and use of computational intelligence to monitor in real time rainfall data and data from other sensors to predict slope movement, displacement, flooding and inundation, and issue warnings. The lack of infrastructure, pollution, and the use of environmentally inappropriate materials are some of the causes of the problems in the cities of Brazil, including the city of Maceió.

The application of non-permeable materials in the composition of the city and the scarcity of vegetation in the areas of large population harm the passage of water to the soil, thus occurring, the flooding that can cause the homelessness of the population and the opening of holes in the streets. One way to prevent this from happening is to use non-permeable materials that will help both the environment and the city.

Looking for a way to help the population and the city hall itself, an application would be developed that would enable citizens to warn about the problems in the streets, being able to register the occurrence with photos and send them to the monitoring center of the Maceio City Hall. In addition to this device, the manholes would receive sensors, alerting them to the situation, in order to facilitate cleaning and maintenance, because they would control the progress of the manholes in relation to cleaning, to avoid flooding, caused by the accumulation of dirt.

There would also be lectures and mini-courses on the consequences of dumping garbage in the streets,

emphasizing Environmental Education and the importance of preserving the city.

IV. CONCLUSION

With this, this work brings as a proposal the introduction of technology so that, with these devices, there is the possibility of identifying the problem and finding a solution even before it happens, as is the case of flooding, avoiding inconvenience to the population as a whole. As well as this, it brings one more solution regarding the waterproofing of the city, presenting a series of materials that also avoid this same inconvenience.

Moreover, the introduction of this device will not only help in cases of flooding, but will also serve as a means of communication between the population and the responsible agency, so that with this communication, problems can be solved, thus providing a greater identification of urban problems and enabling everything to be solved more quickly.

REFERENCES

- [1] ASCOM, SMTT. Pontos de alagamento a serem evitados na cidade. Disponível em: <http://www.maceio.al.gov.br/2017/07/__trashed-9/>. Acesso em: 12 maio 2019.
- [2] BRANCO, Renata. Pavimento Permeável. Disponível em: <<http://www.forumdaconstrucao.com.br/conteudo.php?a=31&Cod=1530>>. Acesso em: 11 maio 2019.
- [3] BRANDÃO, A. M. P. M. Clima urbano e enchentes na cidade do Rio de Janeiro. In: GUERRA, A. J. T.; CUNHA, S. B. (Orgs). Impactos ambientais urbanos no Brasil. Rio de Janeiro: Bertrand Brasil, 2001, p.47-95: 240.
- [4] CANALE, Ronaldo Henrique. Bueiro autônomo. Disponível em: <<http://conic-semesp.org.br/anais/files/2018/trabalho-1000000751.pdf>> Acesso em: 25 maio 2019
- [5] COMO evitar entupimento de bueiros?. Higitec. Disponível em: <<http://www.higitec.com.br/blog/como-evitar-entupimento-de-bueiros/>>, Acesso em: 12 maio 2019.
- [6] KLIEMANN, Júlia. Materiais para uso em área permeável. Disponível em: <<http://empresaempec.com.br/2018/12/27/materiais-para-uso-em-area-permeavel/>>. Acesso em: 10 maio 2019.
- [7] LOPES, Michele. Pisos permeáveis: economia, design e eficiência. Disponível em: <<https://www.temsustentavel.com.br/pisos-permeaveis-economia-design/>>. Acesso em: 11 maio 2019.
- [8] PAIVA, Fernando. Bueiros conectados e “ouvidos” em postes são instalados no Rio. Disponível em: <<https://www.mobiletime.com.br/noticias/06/07/2016/bueiros-conectados-e-ouvidos-em-postes-sao-instalados-no-rio/>>. Acesso em 20 maio 2019
- [9] PENA, Rodolfo. O problema das enchentes. Disponível em: <<https://brasilescola.uol.com.br/geografia/enchentes.htm>>. Acesso em 10 maio 2019
- [10] SILVA, J. F. F. Alternativas para controle de alagamentos urbanos utilizando telhados verdes e pavimentos permeáveis em um bairro da cidade do Recife. Disponível em: <https://www.ufpe.br/documents/39810/1355139/Jhonata_Final_banca_11dez19.pdf/fb173945-86f4-4470-bb65-ca0ac991d5c1>. Acesso em 15 maio 2019