Learning from the 2020 floods in Thiès: **Strengthening urban planning to reduce flood risks in Senegal**

A resident makes his way through a flooded street while a woman hangs clothes to dry on a terrace after last week's heavy rains in Keur Massar, Senegal September 8, 2020 © REUTERS/Zohra Bensemra TPX IMAGES OF THE DAY

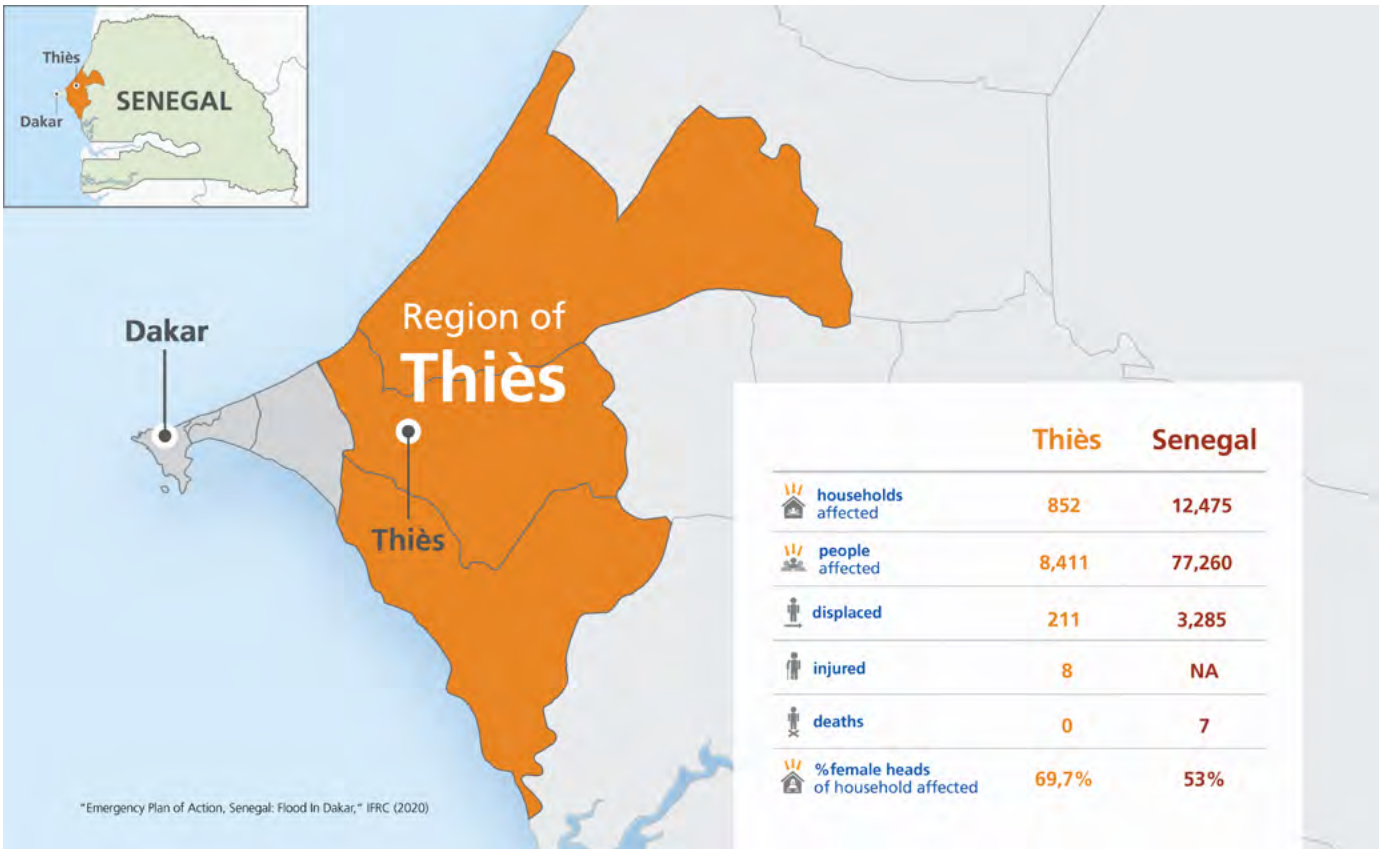
This brief is based on a Zurich Flood Resilience Alliance Post Event Review Capability (PERC) study analyzing the 2020 floods in Thiès, Senegal. It presents a series of resilience lessons on urban planning from the 2020 floods based on key informant interviews and background research, and highlights opportunities for strengthening urban planning to reduce flood risks in Senegal. An electronic copy of this brief and other materials from the study are available at: floodresilience.net/resources/collection/perc. Additional information about the PERC can be found at www.floodresilience.net/perc and additional information about flood resilience at www.floodresilience.net

Introduction

From Friday, September 4th to Saturday, September 5th, 2020, intense rainfall caused widespread flooding in 11 regions and 25 departments in Senegal. These floods resulted in significant economic and material losses, and impacted the living conditions and livelihoods of many. In the Thiès region, 16 neighborhoods were flooded, affecting nearly 8,500 people, damaging 85 houses and injuring eight individuals. Fortunately, no loss of life was reported. Although the rainfall in Thiès (about 126.9 mm in 24 hours) was well above the critical threshold of 75 mm — which corresponds to "intense rainfall" — flooding is not a new risk for the region. Given climate change and its consequences, extreme weather events such as this will likely become the norm.

The city of Thiès high vulnerability to flooding is the result of the interplay of several risk factors including climate change, low-lying terrain at the base of the 120 meter high Thiès plateau, which leads to the flow of rainwater into the town center, high water

FIGURE 1. Impacts of flooding in the Thiès region



This map, "Region of Thiès", is a derivative of Map of the departments and regions of Senegal - wikipedia map by Amitchell125 shared under a Creative Commons (CC BY-SA 4.0) license

tables, rapid urbanization and a flood-risk governance environment that is characterized by limited coordination between actors as well as a recovery-oriented approach. Of these risk factors, many PERC interviews highlighted the role of urban planning in influencing flood risk in Thiès .

An analysis of land occupation dynamics reveals that the settlement of populations on flood prone areas is the result of a complex historical process. A succession of droughts during the 1970s and 1980s led to the displacement of rural populations dependent on agriculture to urban areas in search of alternative livelihoods. Under the pressure of rural-urban migration and increasing population growth (reaching 3% per year in the 1980s), informal settlements expanded considerably. The resulting urbanization has encroached on land that previously served as catchments for heavy rains, and has led to largely unregulated and uncontrolled urban development, with the more socially vulnerable concentrated in higher flood-prone areas. In Senegal, despite a number of achievements in terms of laws, tools and infrastructure for better urban management, challenges remain. These PERC findings suggest several entry points and opportunities for strengthening urban planning to reduce flood risk.

Urban planning to reduce flood risk in Senegal

Despite the existence of tools and laws for better urban management to reduce the impacts of flooding, PERC interviews revealed an ongoing need to strengthen

urban flood risk planning and management. In particular, the PERC study identified the following strengths and opportunities for improvement:

Institutional and regulatory frameworks and tools exist that could improved urban flood risk management, but they need to be updated, strengthened, and enforced.

Interviews conducted as a part of the PERC revealed that Senegal has institutional and regulatory frameworks as well as urban planning tools that could improve flood risk management. The actors involved in urbanization are well established as are planning documents at national, regional and local levels such as the *Plans Généraux d'Occupation des Sols (PGOS), Plans de Développement Communaux (PDC), Plans Directeur d'Assainissement; Plans Directeur d'Urbanisme*, etc. Moreover, with decentralization, local authorities have been granted the authority to organize their territories through the production of planning documents, but due to a lack of technical and financial capacities and a low level of coordination, these documents are not always updated or or fully aligned with national, regional and departmental urbanisation strategies[1]. In Thiès, the most recent planning framework is from 1981 and does not take into account rapid population growth, increased flood risks and uncontrolled urban growth. Moreover, in these documents, green spaces are not always taken into account and their management is not clearly defined. The application and enforcement of these plans is another challenge. The PERC interviews pointed to a low level of control and sanction. In addition, the fact that Senegal's urbanization pattern is characterized by a multitude of dispersed micro operations[2], combined with a low level of information sharing and coordination, makes it difficult to enforce its plans, resulting in many people living in flood-prone areas.

Senegal has made significant investments to improve flood risk management infrastructure, but there is still room for improvement.

With population growth and urbanization comes a demand for services and infrastructure, including flood risk reduction infrastructure, which are essential for development. In this sense, the Government of Senegal has made progress in providing infrastructure through the Ten-Year Flood Control Plan (2012-2022) and the second phase of the Rainwater Management and Climate Change Adaptation Project (PROGEP II) which runs from 2021 to 2026. However, despite the progress made, some flood risk reduction infrastructure is still limited or may be poorly adapted, shifting flood risks to new areas. Some point to "concrete-ization", which has considerably reduced the infiltration capacity of soils, and to large public projects (roads, highways, etc.) which, in their design and construction, do not always include structures dedicated to stormwater drainage, and which modify the direction of water flow, thus creating new flood zones and more intense runoff.

In many neighborhoods, drainage and sewage infrastructure is non-existent or undersized and does not take into account extreme rainfall events stemming from climate change. In addition, housing is tightly packed with no space for water to drain or evacuate, making these areas particularly vulnerable to the impacts of heavy rains. The issue of infrastructure sustainability is particularly acute in the city of Thiès. The lack of financial resources of local authorities is considered to be one of the main reasons for the poor management and maintenance of grey infrastructure. In addition, the low level of inclusion and participation of communities in the design and management of these facilities, coupled with the inadequate performance of the local waste management system, particularly in non-developed areas, results in poor practices. Communities often dispose of their household waste in the canals which blocks the flow of water, and makes the drainage networks ineffective. This situation shows the inadequacy of the waste management system at the household level, especially for those in un-zoned areas where the Solid Waste Management Coordination Unit (UCG) has limited

1 An analysis of rainwater management in Senegal (GRET, AgroParisTech, FIND)

2 Study for the elaboration of a national strategy of integrated planning and urban management, taking into account flood risk prevention and adaptation to climate change (PROGEP)

Senegalese Red Cross - 2020 flood season in Thiès

access. Preparing for the rainy season – which brings stormier weather – is another challenge that persists, because activities are often delayed or not carried out at the right time. For one, the National Sanitation Office of Senegal (ONAS) has a limited budget to operate the sanitation network. At the institutional level, the roles and responsibilities of local authorities are unclear and at times contradictory. Though local authorities lack the capacity and equipment for sanitation activities they are charged with clearing open canals. In addition, in Senegal, urban policies in place for several decades to reduce the risk of flooding favor grey infrastructure, which has limitations such as when consistent maintenance is lacking or hard thresholds are surpassed. Indeed, though green infrastructure can address some of the limitations of grey infrastructure and help reduce flood risk, there is very little green infrastructure planned and few examples exist or are properly managed.

There are plans to resettle some communities living in high-risk areas, but there are financial and technical constraints.

The Government of Senegal has undertaken actions to relocate certain populations living in at-risk areas. In 2005, the Government of Senegal launched the Jaaxay plan, an emergency plan that aimed to relocate populations affected by flooding in a new city 30 km from Dakar with 4,000 housing units and to build retention basins on the cleared land. The results are mixed, however, due to delays, the limited number of housing units and the additional cost borne by

affected populations[3]. In some areas of Thiès that were severely flooded and where the water table is high, relocation is one of the main solutions. A government initiative supported by the Islamic Development Bank is underway to build 200 homes for the inhabitants of the Nguinth neighborhood in the northern part of the city. However, whether it is a matter of relocating households or infrastructure, these projects are faced with major financial and technical constraints, as well as reluctance and pushback from communities.

Recommendations

These successes and challenges highlight several opportunities for improving urban planning in the face of flood risk in Senegal, and more specifically in Thiès, especially at the local and community level:

Strengthen the use of urban management tools to support Disaster Risk Reduction (DRR) and flood risk management.

The improvement of urban planning requires the provision of operational tools for more accurate flood risk management. This requires an understanding of the risk and its interaction with land use dynamics. The use of Geographic Information Systems (GIS) as a decision-making tool should be encouraged among researchers and decision-makers by facilitating access to high-definition satellite data. But above all, the effective application of urban planning tools must be accompanied by funding for their implementation on the one hand, but also by a mutual control mechanism between the actors in charge of the operationalisation of urban strategies on the other to limit unpermitted construction. It is also important to ensure the continuous sharing of information between actors as well as the integration of operations related to urban planning (from the identification of flood-prone areas to the issuance of building permits, including the definition of building standards specific to each type of area). In addition, local solutions can include promoting the participation of communities in the co-construction of municipal infrastructure in partnership with local government and technical experts, such as the Pikine Irrégulier Nord Guediawaye – Integrated Flood Risk Management project (PING-GIRI) with the NGO GRET[4]. This type of initiative involves the establishment of urban renewal funds to co-finance projects and provide training in construction techniques that are more resilient to flooding.

Improve waste management to reduce the impacts of flooding.

Improving waste management requires efforts from local authorities and awareness campaigns for communities, and workers. As a first step, local

BOX 1. FLOODPLAIN MAPPING

The research conducted as part of the PERC highlighted approaches and innovations to strengthen flood risk reduction. For example, at the local level, the Ecole Polytechnique de Thiès (EPT), through the Laboratoire des Sciences et Techniques de l'Eau et de l'Environnement (LaSTEE), is conducting studies focusing on the mapping of flood-prone areas and the evaluation of impacts based on indicators that take into account physical and socio-economic dimensions. In addition, structures such as Géomatica have developed an application that also deals with the mapping of flood zones. Additionally, at the national level, within the framework of the *Projet de Gestion Intégrée des Inondations au Sénégal* (PGIIS), digital terrain models to identify flood zones are being produced. These different products can be used to contribute to the elaboration of prevention measures (I.e evacuation routes) or to identify flood zones.

3 https://reliefweb.int/report/senegal/senegal-utopian-plan-belies-dismal-reality-flood-victims

4 https://gret.org/projet/gestion-integree-du-risque-inondation-a-dakar-pikine-irregulier-nord-guediawaye-ping-giri/

authorities need to ensure that waste collection services continue even during floods. Secondly, awareness campaigns should be conducted to make communities aware of their own role in waste management. And finally, the key role played by informal workers in the sector should be recognized and integrated into efforts to improve waste management. The carts responsible for collecting household waste in flood-prone areas, for example, are a relevant alternative to the garbage truck. They should therefore be fully integrated into the system and supported to ensure their effectiveness.

Explore the use of green and grey infrastructure for flood risk management.

The adoption of nature-based solutions (NBS) targeting the Plateau could help restore degraded environments and improve water absorption and retention in the soil. Regreening the plateau and protected forests, which are considered a priority area for the Great Green Wall initiative[5], would also contribute to shared efforts towards sustainable development and climate change adaptation across the region. NBS that increase drainage and improve infiltration can be designed to provide co-benefits in the form of community building and income-generating activities. It is therefore an opportunity for urban development policy to combine grey infrastructure with NBS. In addition, tools and approaches to increase the adoption of contextually appropriate NBS in urban planning and land use need to be identified with community participation.

Examine the 'if, when and how' of relocation for communities living in areas at risk.

Authorities and communities must decide on the trade-offs between adaptation, mitigation, and relocation. If relocation is the chosen option, the households in question must be active and willing participants. To avoid community rejection, relocation plans must consider people's social capital and cultural ties and livelihoods. If communities are relocated, supportive measures must be put in place to prevent additional pressures on already disadvantaged populations, including the provision of basic infrastructure and services such as schools and markets, as well as an environment conducive to business opportunities and sustainable building patterns.

5 https://www.grandemurailleverte.org/

The Zurich Flood Resilience Alliance PERC provides research and independent reviews of large flood events. It seeks to answer questions related to aspects of flood resilience, flood risk management and catastrophe intervention. It looks at what has worked well (identifying best practice) and opportunities for further improvements. Prepared by Practical Action and ISET-International, as part of the Zurich Flood Resilience Alliance, this publication is intended solely for informational purposes. All information has been compiled from reliable and credible sources; however, the opinions expressed are those of the Practical Action and ISET-International.