

POLICY BRIEF

Live With Water: Building resilience to floods in suburban areas of Dakar, Senegal

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PROJECT IDENTITY:

Project's name: Live With Water

Funding scheme: DFID

Project's partners: CRES, BG, GROUPE
SENGHOR, NIYEL, REFDAF, EAWAG, TPH
Swiss, University of BERNE, MRUHCV and
EVE.

Intervention's areas in Senegal:
Yeumbeul nord, Yemubeul Sud, Grand
Yoff, Djidda Thiaroye Kao, Malika,
Thiaroye Gare, Rufisque Ouest, Medina
Gounass, Whakinane Nimzatt et Mbaou



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INTRODUCTION

Flooding in the urban areas of Sub-Sahara Africa continues to destroy urban infrastructure and affect livelihoods. Flooded houses, impassable roads, blocked drainage channels, increased incidence of malaria and diarrheal diseases, and disrupted livelihoods are challenges facing about 1.5 million inhabitants in the suburban areas of Dakar, Senegal. Addressing them by building the resilience of the vulnerable populations to flooding was the aim of the Live with Water project.

Decision makers at local, municipal and national levels often face the dilemma of prioritizing preparedness and response actions to address the multi-dimensional problem of flood exposure and vulnerability. Experiences with flood management suggest adopting an integrative approach by building flood mitigation infrastructure and by improving behaviour and flood governance in order to enable people live with flood. Such an integrative approach ensures that local people identify with, are involved in, adequately support flood infrastructure management, and flood governance, making for long-term and effective flood policies that build the resilience of vulnerable populations.

Consequently, flood policies in Senegal have evolved from a flood relief approach to a more adaptive, holistic and transformative approach of flood resilience. The limited success of top-down flood control and population relocation measures has over the years given rise to an integrative approach that combines flood infrastructure measures with adaptive and transformative processes of resilience-building that support people to 'live with water' instead of constantly fighting against it.



RESEARCH PARAMETERS

The Live with Water project started in 2013 and aimed at improving the resilience of vulnerable households to flooding in the suburbs of Dakar. Four types of interventions were implemented: a) drainage infrastructure to reduce flood exposure and improve the mobility, living conditions and health of the targeted population; b) waste management, including waste collection and recycling; c) creating income generating activities through urban gardening and waste recycling; d) supporting community organisation and contingency planning to organise flood relief and the management of drainage infrastructure. The four types of interventions were implemented from the end of 2016 to the end 2017. Data was collected in 10 Communes of the departments of *Pikine* and *Guediawaye*¹. Each of the 10 communes received different degrees of interventions with all interventions being accomplished in the commune Benn Barak (*Yeumbeul Nord*) before July 2017.

Building flood resilience requires strengthening the ability of individuals, households, communities, governments, and non-government stakeholders to anticipate, absorb, and adapt to flooding. The LWW thus adopts an integrative approach, whereby researchers collaborated with construction companies, civil society organisations, NGOs, local and national government authorities as well as local groups and individuals to build the resilience of the affected individuals and households to flooding.

A semi-experimental Before-After-Control-Intervention (BACI) approach was adopted to capture the baseline conditions before and after the impacts of the interventions, drawing on samples from the targeted population (treatment) and the non-targeted population (control). A difference-in-difference statistics comparing means was used to capture the relative change attributable to the LWW project. To capture exposure to flood, an index on how each household was physically affected by flood, the level of water entering a house, the level of flood in the street surrounding the house and the general perception of damages to households caused by flood was developed.

¹ Yeumbeul Nord, Djida Thiaroye Kao, Grand Yoff, Malika, Mbao, Medina Gounass, Rufisque Ouest, Thiaroye Gare, Wakhinane Nimzatt, Yeumbeul Sud

Resilience was characterised using the 3A&T (Anticipatory-, Adaptive-, Absorptive- and Transformative capacity) model whereby anticipatory, adaptive and absorptive capacity are considered as structural dimensions, and transformative capacity considered as a temporal reconfiguration of the first three dimensions (Bahadur et al. 2015).



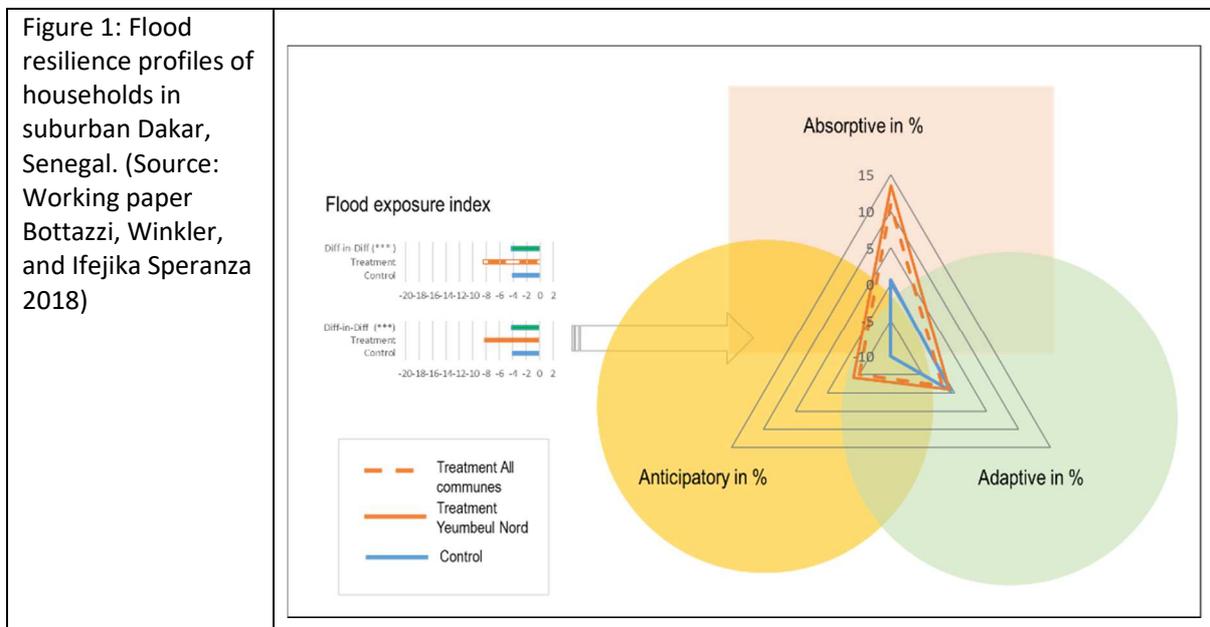
EVIDENCE AND ANALYSIS

Generally, the impacts of the intervention are broadly positive in the 10 communes with some differences according to the degree of progress in implementation at the time of assessment. For example, the commune of *Yeumbeul Nord*, where the implementation started and finished earlier, experienced more results that are positive. The beneficiaries found the Live with Water project considerably improved their resilience to flood, mobility, health conditions, income generating activities, environmental behaviour, and flood management capacities.

Reduced exposure to flood hazard: In all 10 communes, flood exposure declined by 4% (see Figure 1). Extrapolated to the number of households positively affected by the intervention, the Live with Water project reduced the exposure to flood of about 13% of additional households in the project area. This means that about 600 households were protected from flood due to the intervention and that mobility has been improved for approximately 13% of the

households allowing a better access to schools, health centres and workplaces. We can expect a significantly higher increase of the measurable impacts on flood resilience after the next flooding period in 2019 as some project activities were not completed at the time of follow-up data collection in July 2017.

Figure 1 compares the differences between the baseline and the follow-up and compares across the treatment and the control areas using a differences-in-differences approach. Examining these three dimensions of anticipatory, adaptation and absorption (3As) capacities as shown in Figure 1, helps visualise the respective contributions of the Live with Water project to flood resilience.



Improved capacity to anticipate flooding (Anticipatory capacity): Anticipatory capacity is the capacity of a social system to anticipate an extreme event or a shock through preparedness, planning, consultation, information sharing and collective action. The Live with Water project has significantly increased the anticipatory capacities of 6-7% of the 5000 households located in the most directly impacted areas through training and information dissemination activities.

Improved capacity to adapt to the impacts of flooding (Adaptive capacity): Adaptive capacity refers to the capacity to respond to an extreme event or a shock by changing the way the social system is functioning in normal times and finding alternative solutions to cope with the situation. Faced with flooding, households can adopt various measures to reduce flood impacts. As the project did not directly implement interventions that would enhance adaptive capacity to reduce immediate flood impacts, adaptive capacity remained unchanged. Since the contingency plans were not yet approved and implemented at the time

of the follow-up survey, the direct support to the vulnerable households that would have been expected was not realised.

Improved capacity to absorb the impacts of flood (Absorptive capacity): Absorptive capacity is the capacity to absorb and buffer the adverse impacts of a hazard event through mobilizing sufficient resources to create a safety buffer. It can be measured in terms of different capitals (human, social, financial, physical natural). Absorptive capacity is the most positively impacted dimension with an increase of 9-13% among the 5000 families located in the most directly impacted areas. This is the direct positive consequence of the secondary drainage infrastructure that supported the households living far from the primary drainage. The Live with Water project improved features that enable the households to absorb flood impacts, in particular, mobility due to road and drainage infrastructure as well as improved hygiene and sanitation thereby enhancing living conditions and wellbeing.

Improved transformative capacity: Transformative capacity is a time-framed dimension of “unintended” or “deliberate” change encompassing the improvement of resilience in the first three dimensions. This latter temporal and dynamic dimension was measured by using a panel survey designed to meet the criteria of robust semi-experimental BACI methodologies. It is presented in Figure 1 as the overall transformation of the 3As system.

Improved flood governance: The Live with Water project enhanced flood governance (for detail see Bottazzi et al. 2017). It motivated community leaders, women groups and individuals to engage in activities

directed at community deliberations on actions against flooding and on collective action to manage flood consequences such as clearing canals and water bodies of waste, and motivating inhabitants to use waste collection schemes.

Realised Partnerships: Finally, the Live with Water project shows the advantages of a broad coalition of researchers, NGOs, civil society organisations and government partners, which can act as a check and balance for the limitations of implementation by a single entity, whether government, research, non-governmental, or private. This integrative approach ensures complementary perspectives.

POLICY IMPLICATIONS

Mainstream flood resilience into government activities at multi-levels: This action oriented research project shows that it is possible through an integrative approach to reduce exposure to flood significantly. While the beneficiaries improved their capacity to anticipate and absorb flooding, the sustainability of the impacts of the Live with Water project would require that the communal and municipal councils, the city of Dakar as well as the national government take stock of these experiences and include such activities into their procedures without which these benefits will only be short-lived. The project also supported the implementation of municipal contingency plans that will help local stakeholders’ long-term planning of flood response in collaboration with local neighbourhoods’ delegates and other civil society organisations. This municipal contingency planning requires further support and funding from the central government to become effective. Enforcement of environmental norms at the municipal level is also urgently required to help local stakeholders manage drainage and sanitation infrastructures adequately.

Mainstreaming thus implies continuous monitoring, environmental education and the adoption of appropriate incentives (rewarding responsible environmental behaviour, progressive sanctions), which the municipal government in collaboration with government agencies² is best fit to do.

Take advantage of opportunities created by the project to initiate new livelihoods: Project activities such as improved sanitation and waste disposal increased the awareness of the targeted population about the health risks of indiscriminate waste disposal



² DARZI is the Direction of Management and Restructuration of Flooded Areas

and identified income-generating options that turn wastes into resources such as through waste collection activities. This livelihood requires little financial investment, benefits the social environment and reduces environmental pollution by wastes, hence it can be extended to all 10 communes and create jobs. More support is needed such as safety material for waste recycling, seeds, tools and logistical support for urban gardening.

Need for continuous motivation of local actors to engage in flood governance: While the LWW project involved local leaders and groups in flood governance, they worked as volunteers for the project and received no income. This adversely affected their willingness to engage actively in project activities as the project evolved. Hence, there is a need to **make provisions for funding local leaders' active involvement in flood governance** to cover some of the costs they incur in mobilising community members and compensate for some of the incomes they lose when they neglect their other activities to engage in local flood governance.

This relates to a general idea of decentralizing flood governance.

Plan for and deal with unexpected positive and negative impacts: As flooding reduced, inhabitants did not have to vacate their houses hence uninhabited houses used as hideouts by criminals decreased. This improved women's perceived security. Other unexpected effects include the emergence of new land whose ownership first had to be clarified and new areas of stagnant water due to road and drainage infrastructure. Tenure rights in the newly drained areas need clarification to allow local inhabitants use those spaces for common benefits (such as leisure and income generating activities).

Maintain Research-Public-Private-Partnerships: Project achievements have been possible through collaboration between research, government, non-governmental and civil society organisations. Such collaboration needs to be maintained to capture the multi-dimensions of flood resilience. In all these, **the active engagement of relevant government organisations is critical.**