"Flood resilience in Slums: Community-Responsive Adaptation in Kibera, Nairobi"

• Rapid urbanisation and climate change are combining to dramatically increase exposure to flood-risk among the poorest.

- Top-down adaptation measures need to respond to and incorporate local knowledge and adaptations that can themselves integrate with municipal systems.
- A model of "Community-Responsive Adaptation" has the potential to integrate top-down policy with local adaptation measures and knowledge.
 In partnership with slum residents and

Examples of autonomous adaptation *in Kibera.*

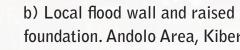
Potential of "community-responsive adaptation" in linking resilience meausres

across scales. Adapted from Mulligan et al, 2016

- Not relevant at this scale

	Relevant at this scale				
FLOOD RESILIENCE	Household	Compound	Community	Settlement	Watershed
MEASURES	Resident	Landlord	Comunity Orgs.	Local Gov.	State/Nat. Gov.
Raise floor level		-	-	 Lack of interface and legitimacy with communities Lack of capacity Lack of policy framework No integration of climate change 	
Raise Internal Assets			-		
Door step	•		-		
Floor drainage		-	-		
Building Waterproofing				-	-
Flood walls (local)				-	- / -
Rainwater Harvesting				- /	10/2/02
Local Flood walls (river/drainageway)	AUTONO				101010-01-00000
Drainage widening/formalisation	BY INDIV	IDUALS			
Green Infrastructure	-	-	COMMUNITY		-
Engineered Flood Protection	-	-	RESPONSIVE		
Drainage clearance			ADAPTATION		_
Flood Preparation Committees		-		PUBLIC POLICY MEASURES	
Flood Response Committees		-			
Waste collection (microenternrise)					







<u>local government we will co-design, build</u> <u>and evaluate three integrated "Community-Responsive Adaptation" projects in Kibera,</u> <u>Nairobi's largest informal settlement.</u>
We will provide the first systematic evidence on the delivery, costs and impact of "Community-Responsive Adaptation" that integrates community and city-level efforts to reduce local flood risk.

1. Rapid Urbanisation and Climate Change

In cities in the developing world, rapid urbanisation and climate change are combining to dramatically increase exposure to flood risk among the poorest and most vulnerable (Jha et al, 2012). This is because informal settlements consistently form in high flood-risk areas alongside rivers and other natural drainage paths (Parikh et al, 2012) and because inadequate drainage prevents rainwater from running off during storm events. In turn, climate change is increasing the frequency of extreme rainfall events (IPCC, 2014). Flooding occurs several times a year in many informal settlements, interrupting economic activity, contaminating water supply, leading to disease outbreaks, destroying the limited assets of poor households and often displacing residents (Douglas et al, 2008).

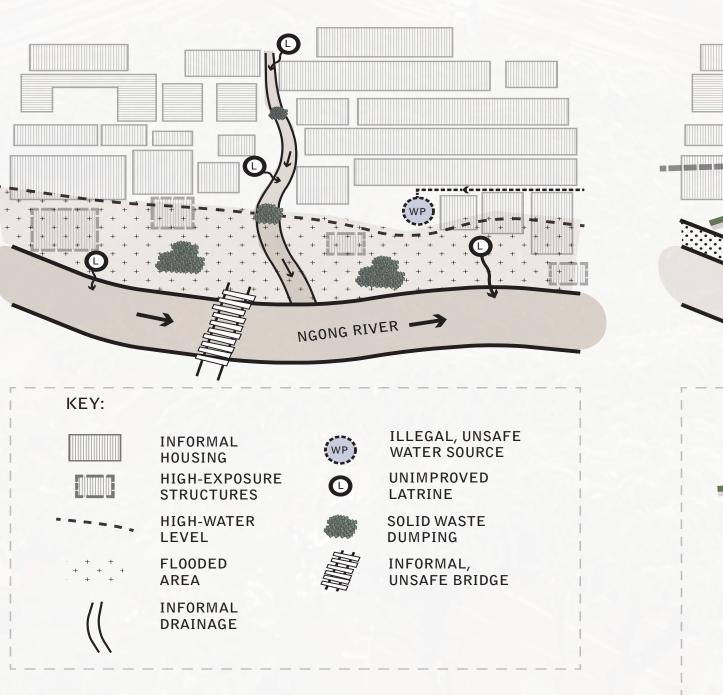


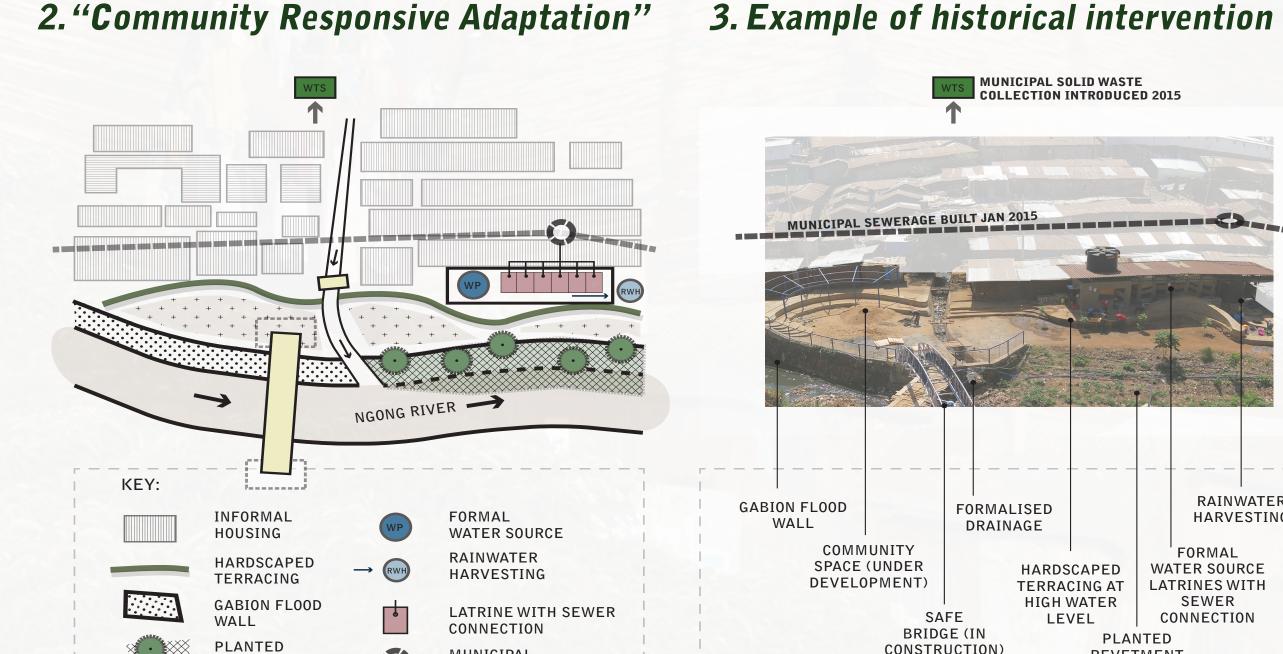
c) Double storey building to raise
d) Local gabion wall
assets and living area. Andolo
Area, Kibera.
d) Local gabion wall
embankment wall. Lindi Village.,
Kibera.

ALL PHOTOS PASCAL KIPKEMBOI/ANNA COLLINS, SEPT. 2015 (KDI)

	indete concernen (inter conterprise)			-	
STRUCTI	Micro-savings programs			-	-
	Government Flood awareness campaigns	- Lack of capital - Lack of technical knowledge - Lack of clarity on own- - ership -	 Builds on existing community efforts Connects with technical resources Connects with government programs 	•	-
	Waste collection (municipal)				-
	Early warning system				•
	National Disaster Response Mobilisation			-	
	Land Use Regulation/Assisted Relocation				

1. Typical Kibera Flooding Hotspot





IUNICIPAL SOLID

BRIDGE

*PHOTO OF KIBERA PUBLIC SPACE PROJECT 07 UNDER CONSTRUCTION, PASCAL KIPKEMBOI (KDI)

projects. The context for the study is Kibera, Nairobi's most control sites through a "Request for Proposals" issued

REVETMEN

FLOODED

AREA

PERIODICALL

FORMALISE

DRAINAGE

2. Bridging Bottom to Top - "Community-Responsive Adaptation."

Top-down efforts to reduce flood risk in informal settlements have had limited success. Efforts to relocate residents have caused conflict and insecurity, while largescale physical flood protection measures are expensive and inflexible. At the other extreme, low-income residents can independently or collectively take some measures to reduce their exposure to risk, but many of the vulnerabilities they face cannot be addressed by local action alone (Satterthwaite et al., 2007). Many observers have therefore posited the need for top-down adaptation measures to respond to and incorporate local adaptation measures; and for local adaptation measures in turn to be informed by and connected to wider municipal systems (e.g. Satterthwaite et al., 2007, Ranger and Garbett-Shiels, 2011). We call this approach, which integrates topdown policy with local adaptation measures, "Communitypopulous slum, which is exposed to high and increasing flood risk. Our study will provide the first systematic evidence on the delivery, costs and impact of a model of "Community-Responsive Adaptation" that integrates community and city-level climate adaptation efforts to reduce local flood risk.

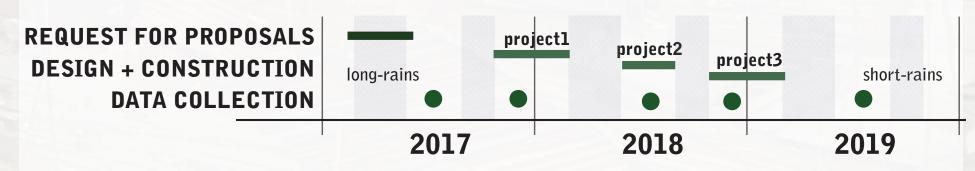
4. Study Components

Our study has three components. First, we will co-design and implement a package of "Community-Responsive Adaptation" measures, which combine hard solutions (e.g. small-scale flood protection, drainage, rainwater harvesting) with soft interventions (e.g. flood preparedness, early-warning, solid waste management), at three highexposure sites in Kibera, Nairobi, in partnership with community organisations and local government.

Second, we will quantify the impact of the package of "Community-Responsive Adaptation" measures on localised flood risk and vulnerability. To do this, we will carry out waves of a household survey in 1,500 households, before and after three rain seasons, across three treatment and three control sites. We will recruit both treatment and to community groups in three areas with high-exposure to flooding in Kibera. We will evaluate the program's impact on reported flood damages, impacts on health and other measures of welfare affected by flooding, as well as changes in housing investment, rents, health and effects on the movement of people.

Third, to evaluate the drivers for the effectiveness (or indeed, lack of effectiveness) of the different components of the package of interventions, we will carry out semistructured interviews and focus group discussions with residents and other project stakeholders.

Simplified Project Timeline



5. Expected Results

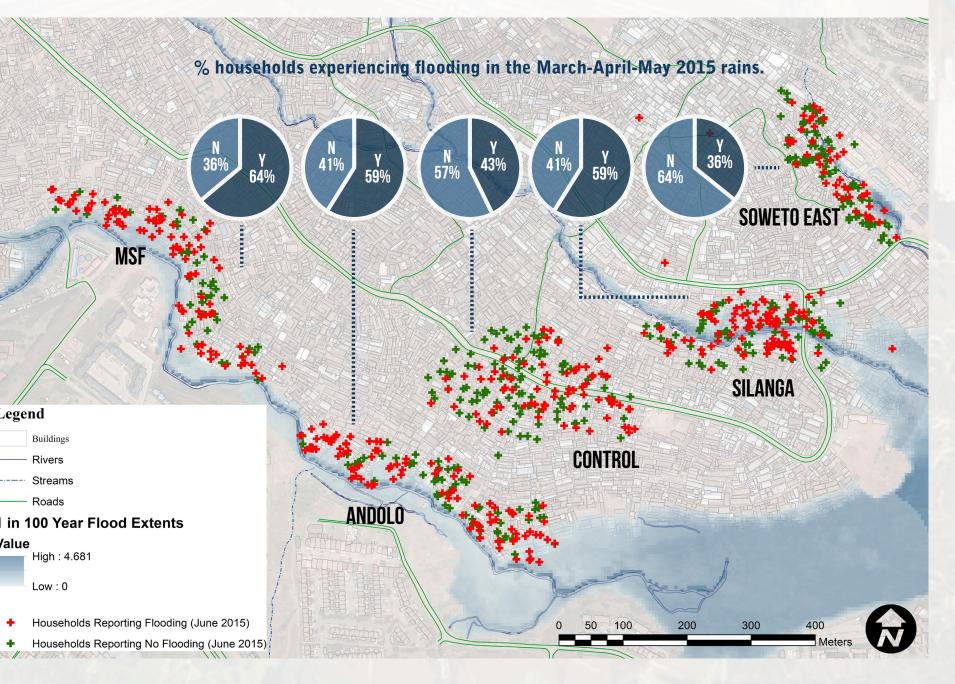
Our results will inform policy locally in Kibera, and other informal settlements across Kenya. However, other rapidly urbanising cities also face the fundamental challenges of informal housing encroaching in flood zones and a lack of an implementable spatial-planning policy to address the issue. As a result, we expect our results to have broad relevance across rapidly urbanizing cities in sub-Saharan Africa, and worldwide.

Responsive Adaptation."

3. New evidence on the delivery, cost, impact of a model of "Community-Responsive Adaptation"

To date there are relatively few real-world examples of projects that successfully implement "Community-Responsive Adaptation". To our knowledge, none of these precedents have been systematically evaluated, either in terms of costs, or impact. This study addresses this knowledge gap. In partnership with the non-governmental organization (NGO), Kounkuey Design Initiative (KDI), and with slum residents and local government, we will co-design, build and evaluate three integrated adaptation

Kibera household flooding in 2015 long-rains. Source: KDI



Project Partners:







