

MESSY MAPS:

Qualitative GIS for urban
flood resilience

FAITH TAYLOR, EZEKIEL JACOB, JAMES MILLINGTON, BRUCE MALAMUD,
MARK PELLING

KING'S COLLEGE LONDON

FAITH.TAYLOR@KCL.AC.UK

@FAITHATRON

BASIS OF THIS WORK

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Messy maps: Qualitative GIS representations of resilience

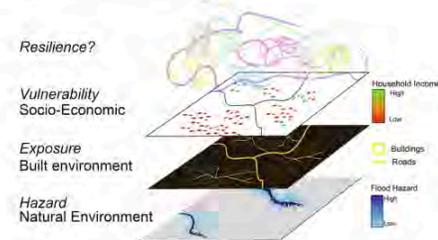
Faith E. Taylor^{a,*}, James D.A. Millington^b, Ezekiel Jacob^b, Bruce D. Malamud^a, Mark Pelling^a

^a Department of Geography, King's College London, Strand Campus, London WC2B 4BG, UK

^b FairTrade Foundation, London, UK



GRAPHICAL ABSTRACT



ABSTRACT

To include qualitative aspects of flood resilience, such as emotion, social connections and experience, into urban planning, we present a methodology incorporating innovative and experimental map visualisations of informal settlements. The concept of resilience in urban planning is often deployed in technocratic ways using quantitative tools such as geographic information systems (GIS). Yet in the urban Global South, where high proportions of the population live in informal settlements, the knowledge infrastructures used by public authorities leave little room for participation and consideration of local experience. We outline arts-based workshop activities and a qualitative GIS methodology to map resilience as defined by informal settlement residents in two case study cities, Nairobi (Kenya) and Cape Town (South Africa), with applicability across the urban Global South. For each city, four map layers were generated: (i) flood footprints showing resident's spatial knowledge of floods; (ii) georeferenced, narrated 360° photo spheres capturing different perspectives about a space; (iii) spatial social network maps showing residents connections to formal and informal actors before/during floods; (iv) multimedia pop-ups communicating contextual details missing from traditional GIS maps. We show how these prototype maps can be integrated within planning knowledge infrastructures. For spatially imprecise qualitative aspects of resilience in informal settlements, placing markers on a map makes them visible in ways that planners can begin to engage with. Although challenges remain, we found openness in Nairobi and Cape Town by city-level actors to use qualitative forms of evidence, and that the contextual detail aided their retention and understanding of resilience.

1. Introduction

This paper presents a methodology to better record and represent flood resilience of the urban poor and integrate these data within the existing knowledge infrastructures used for resilience planning. We demonstrate the potential for existing GIS tools used by planners to

record and visualise more contextual information about resilience, with the aim of GIS being a more inclusive tool for policy.

2. Background

To set the context for this paper, we explain the context of urban

* Corresponding author.

E-mail address: faith.taylor@kcl.ac.uk (F.E. Taylor).

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MOTIVATION

- 30% of urban population live in **slums** globally
- Slums uniquely and increasingly at **risk of flooding**
- Solution: **resilience planning (?)**



MOTIVATION

- Multiple **definitions of resilience**
- Top down planning systems (**GIS**) focus on quantitative, built environment
- Resilience not well represented in typical data

...how can we can we map a more inclusive version of resilience?

Resilience?

Vulnerability
Socio-Economic

Exposure
Built environment

Hazard
Natural Environment

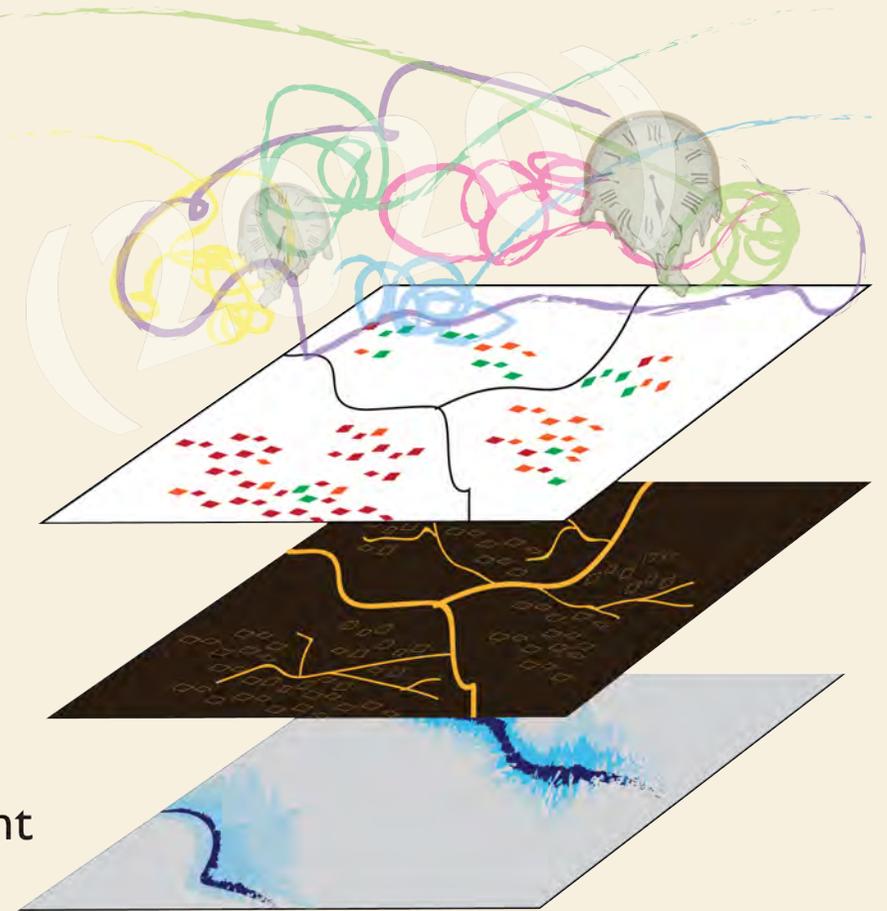
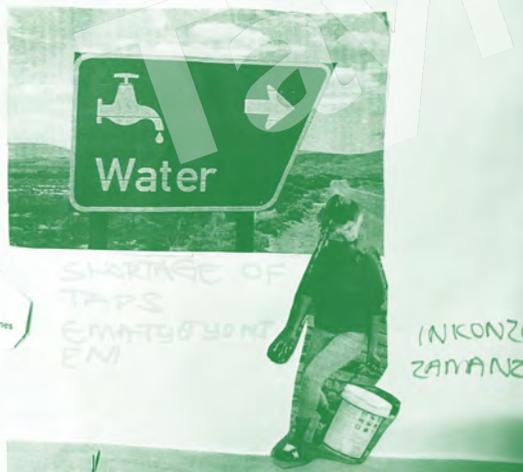
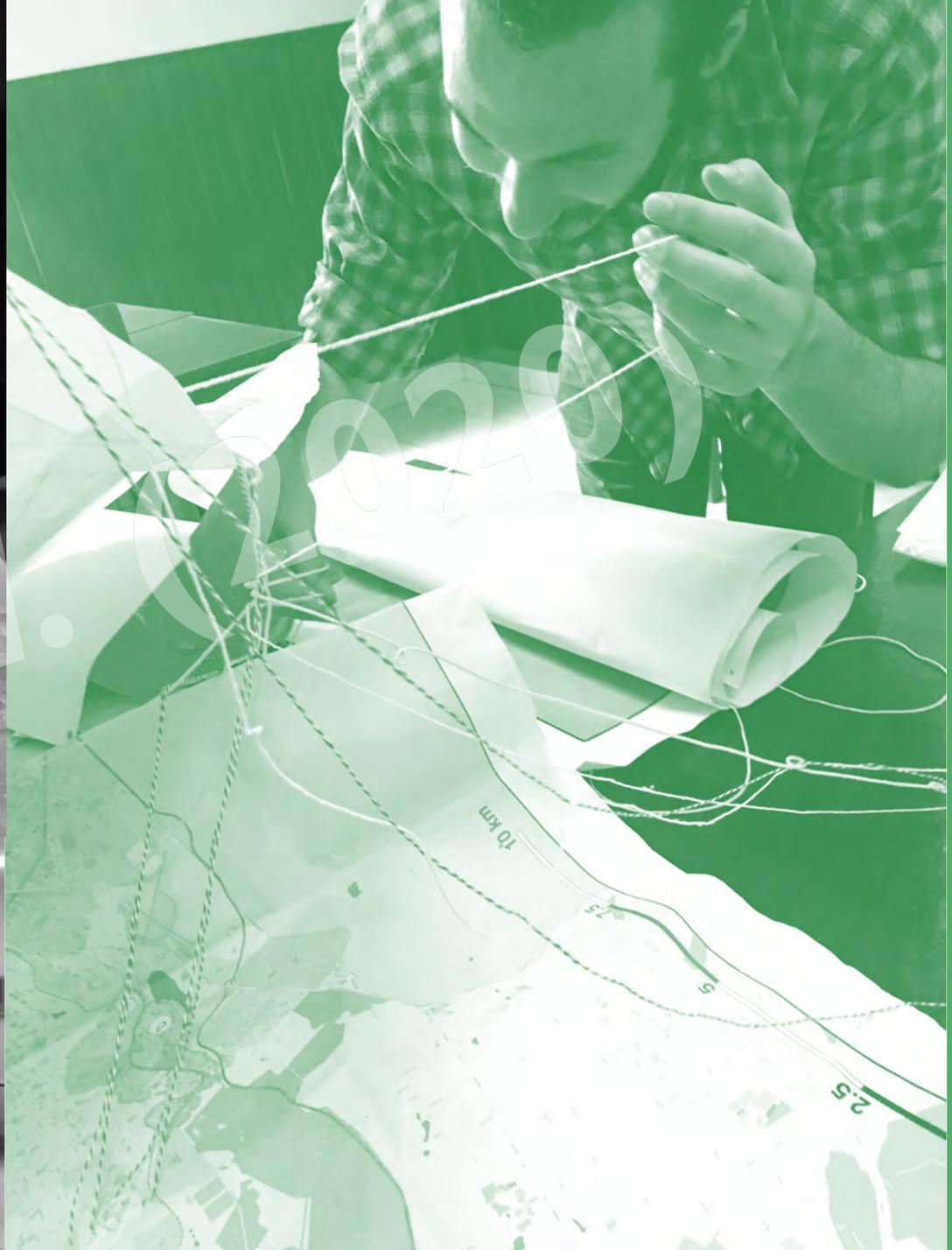


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METHODS



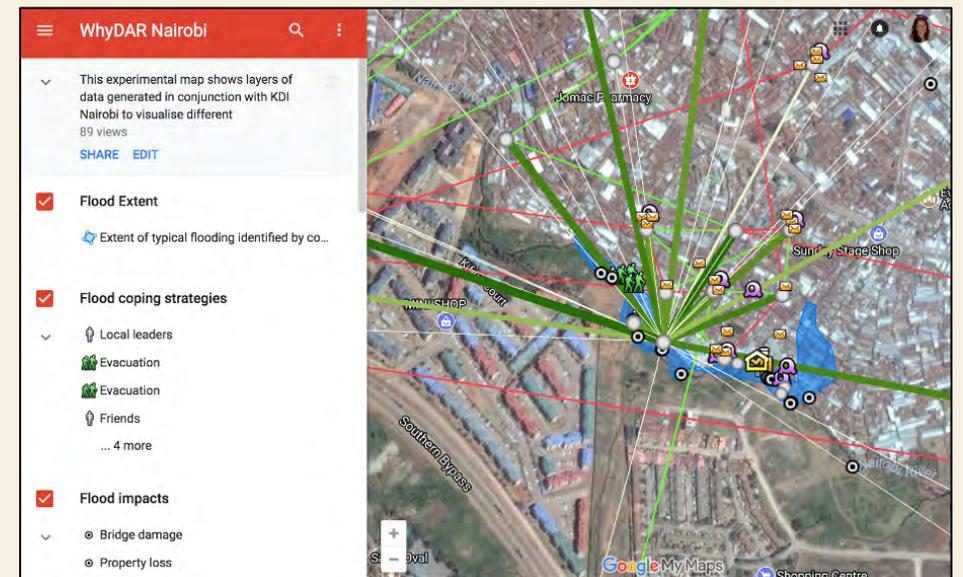
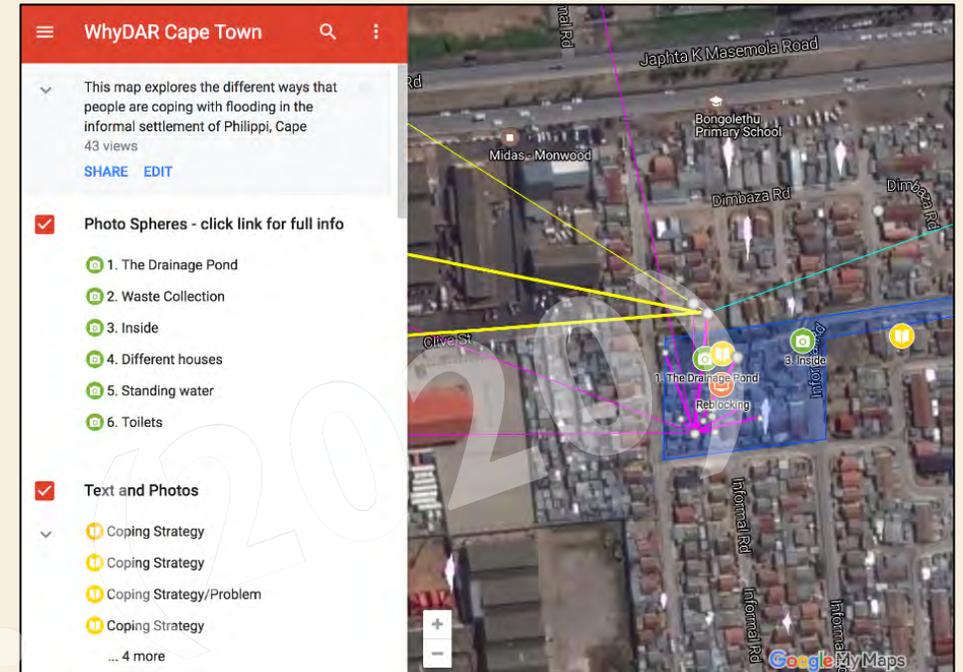
METHODS

- In **informal settlements** in **Nairobi** (Kenya) and **Cape Town** (South Africa) (~20 participants in each)
- **Arts facilitated workshops** to capture themes of resilience in each settlement (*games, singing, storytelling, participatory mapping, photography*)
- **Qualitative GIS** visualisations of resilience from workshop outputs Shared in **WebGIS** format (*Google MyMaps, ArcGIS online*)
- **Feedback** from urban planners, disaster managers, local government, community groups

RESULTS

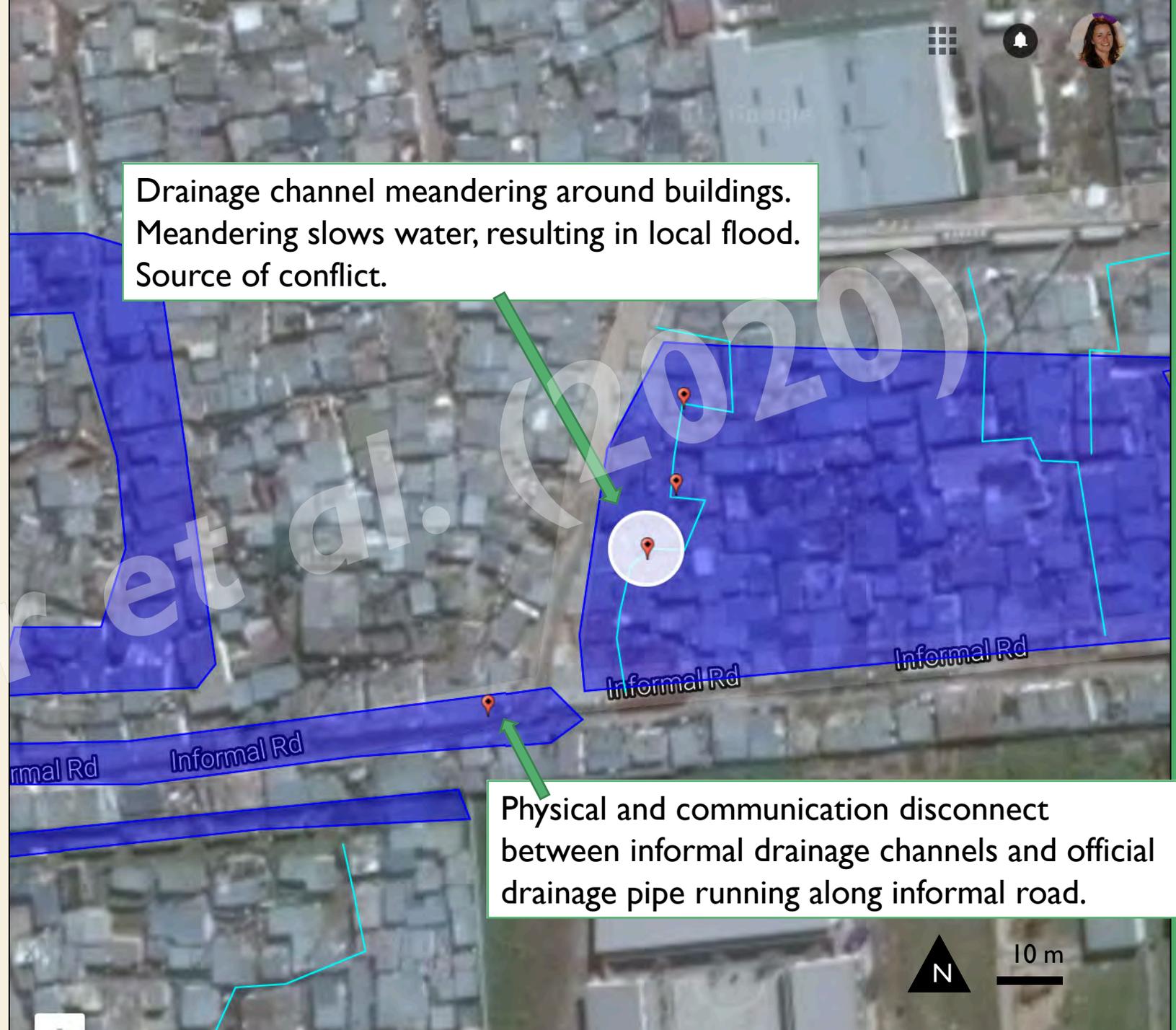
- i. Flood footprints
- ii. Text and video pop-ups
- iii. Social networks
- iv. 360° photo spheres

Interactive maps viewable online at:
WhyDARProject.wordpress.com



I. FLOOD FOOTPRINTS

- **Confirms** existing **flood hazard maps**
- Finer **scale** and more **complexity** than flood hazard maps
- Shows the **lived experience** of flooding



Drainage channel meandering around buildings. Meandering slows water, resulting in local flood. Source of conflict.

Physical and communication disconnect between informal drainage channels and official drainage pipe running along informal road.



II. TEXT AND VIDEO

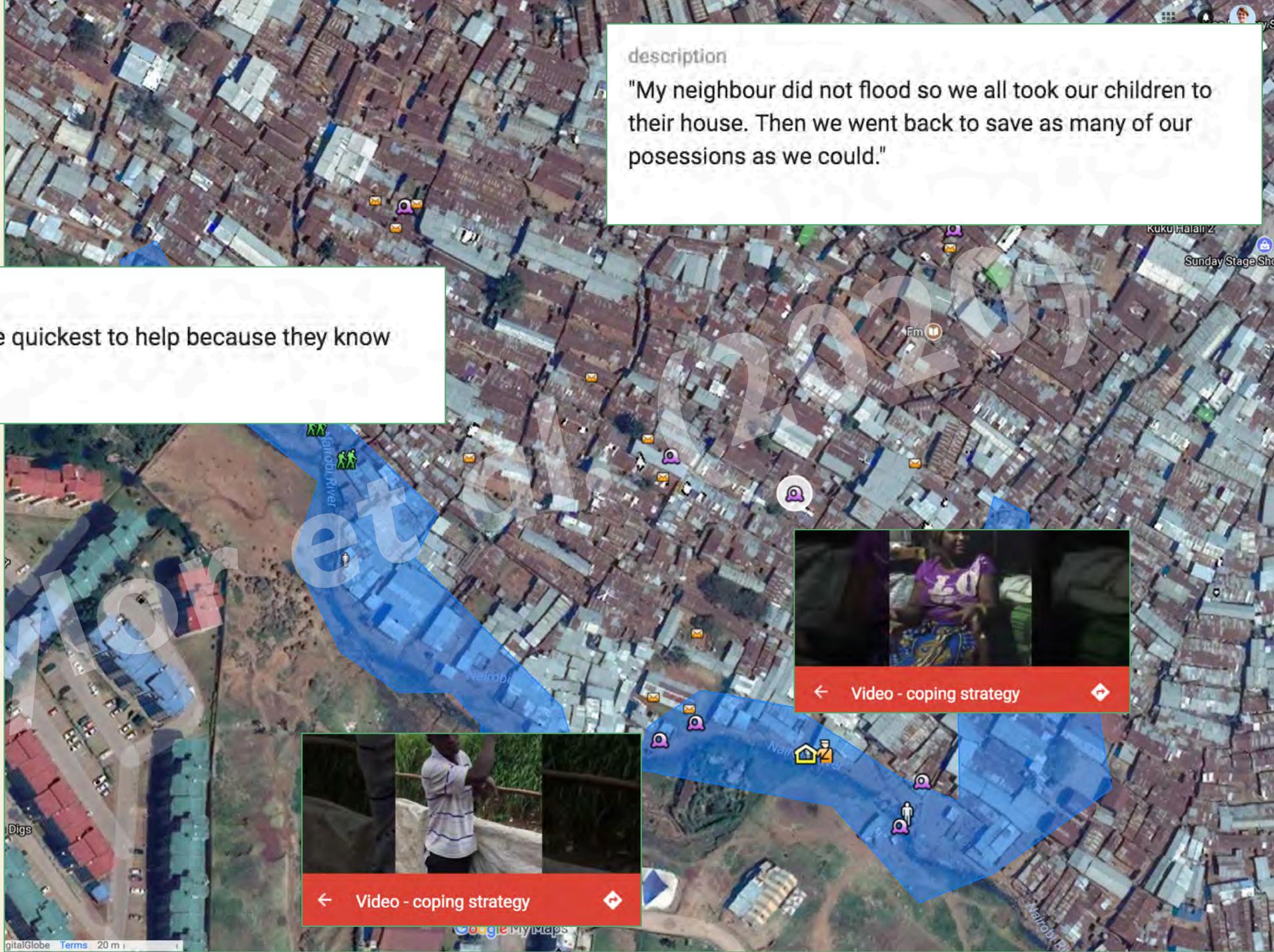
description

"My chaama is the quickest to help because they know me well."

description

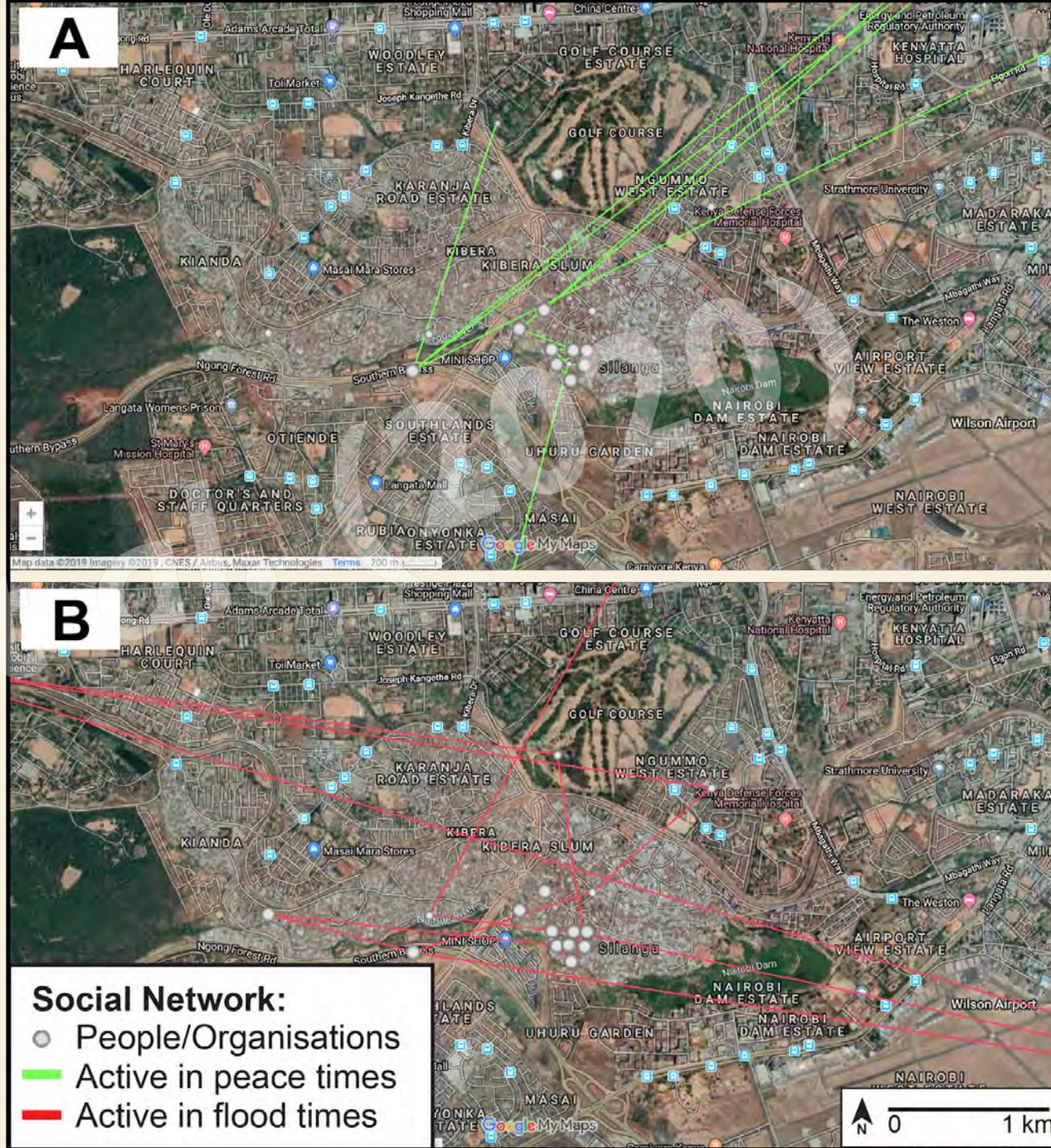
"My neighbour did not flood so we all took our children to their house. Then we went back to save as many of our possessions as we could."

- Human **stories** aid **memory** and understanding
- Adds **contextual detail** missing from standard GIS (e.g., why, how, when)



III. SOCIAL NETWORKS

- **How** are local actors and local groups **connected to organisations and individuals** that can help them be resilient to floods?
- When are these connections **active**?
- Peace times: 27 connections. Flood times: 18 connections.
- Shows formal and **informal** actors

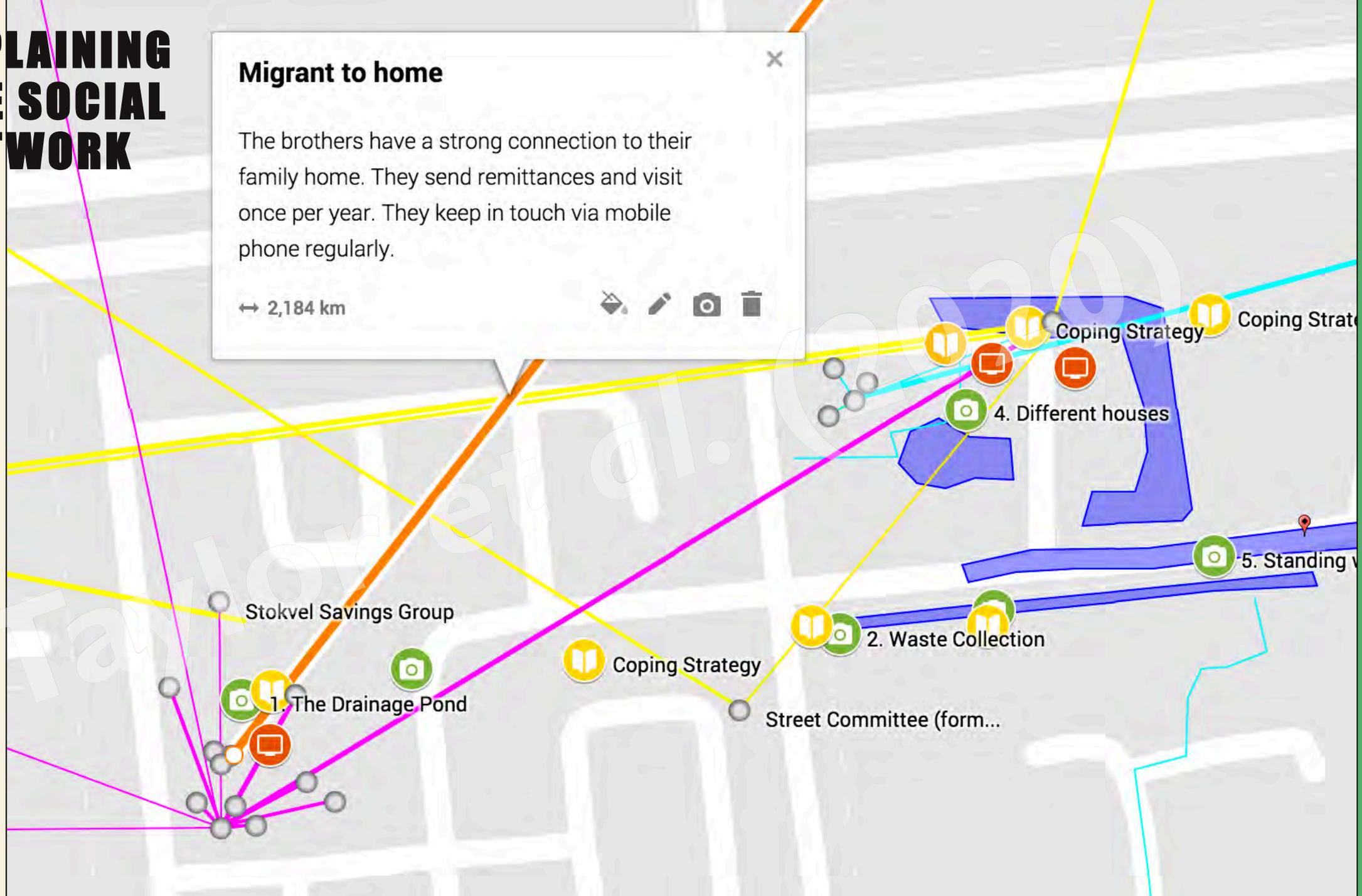


EXPLAINING THE SOCIAL NETWORK

Migrant to home

The brothers have a strong connection to their family home. They send remittances and visit once per year. They keep in touch via mobile phone regularly.

↔ 2,184 km



IV. STORYSPHERES

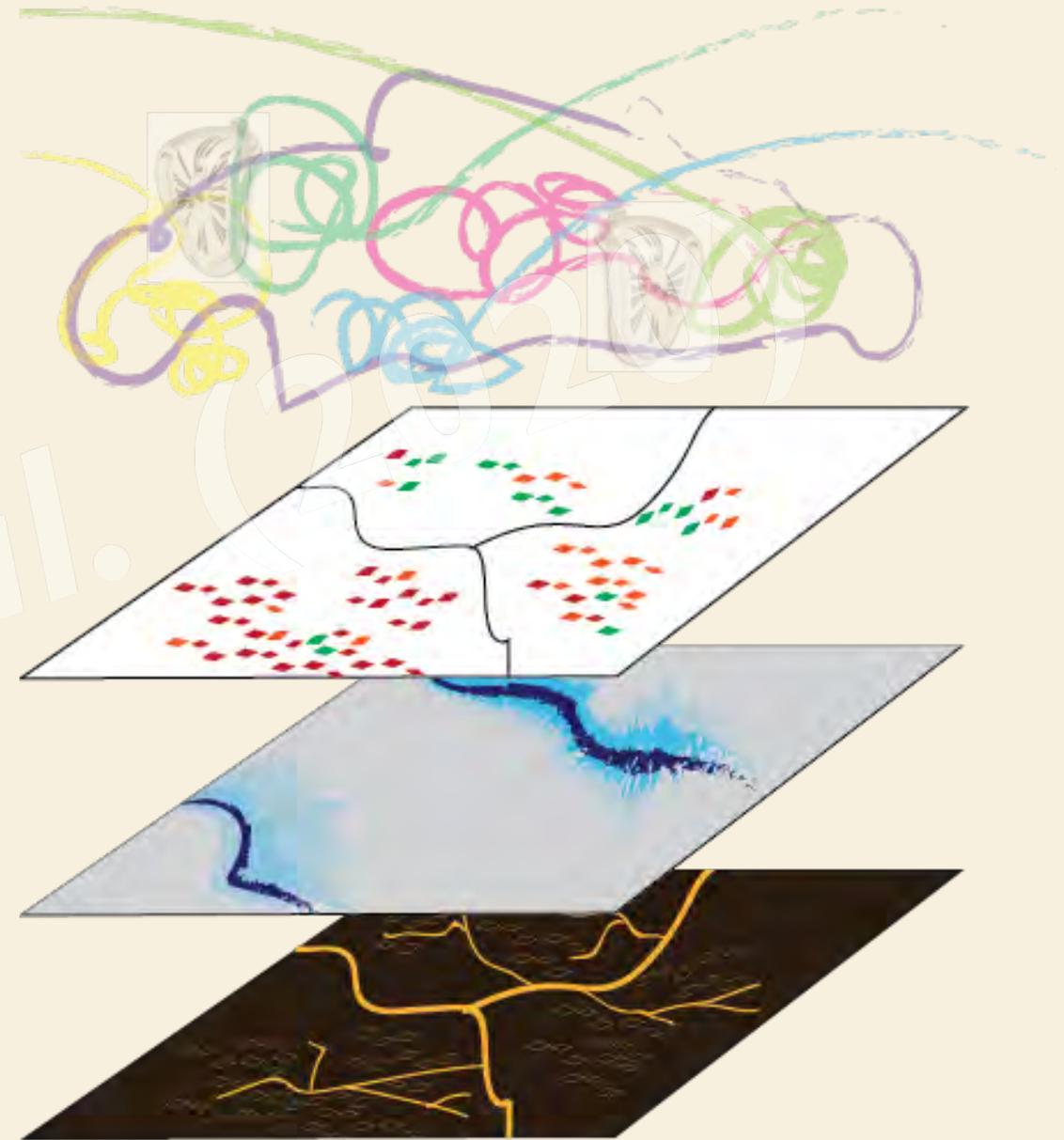


- Immersive **360 photo** with directional **audio**.
- Viewed in web browser or smartphone.
- Virtual field visit
- Representing **different narratives** about a **single point** in space.



CONCLUSIONS

- Putting broader defined **resilience** on the **map**
- Maps that take **time to interpret**
- **Richer picture** of locations where maps are missing
- Planners' willing to **accept qualitative GIS as evidence**
- Being **taken forward in Nairobi** working with local government and NGOs
- Being modified for understanding **Covid-19 interventions**



FURTHER RESOURCES

EMORF

Expressive Mapping of Resilient Futures

<https://emorfmaps.wordpress.com/>



Adapting methods for looking at Covid-19 interventions in Kibera, Nairobi

<https://www.kcl.ac.uk/how-do-you-manage-covid-19-with-a-population-density-of-130000-people-per-square-kilometre>

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