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Land management and urban flood resilience

"Mopping with the tap open" in Houston (Texas) and Accra (Ghana)

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Today

Take-away: 'land management' is the key obstacle in building flood resilience

Based on two case-studies from:

1) the portfolio of the Deltas, Infrastructures and Mobility Initiative (DIMI) of Delft University of Technology (TUD): **Houston, Texas**

2) a commissioned study of World Bank Group's Independent Evaluation Group (IEG) on **Accra, Ghana**

An integrated perspective

Flood risk = chance * consequences

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1. Urbanisation pushes up consequences

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2. Climate change or ‘weird weather’ pushes up probability (chance)

An integrated perspective

Flood risk = chance * consequences

1. Urbanisation pushes up consequences

2. Climate change or ‘weird weather’ pushes up probability (chance)

And as a result, flood risk (and flood damages) skyrocket globally. So, there is REAL urgency.

An integrated perspective

Flood risk = chance * consequences

Flood risk reduction (or mitigation) is increasingly sought in the combination of probability and loss-reducing measures (Hoss et al., 2011). Currently, different traditions of flood risk management exist.

For example, in the Netherlands, flood risk management is traditionally focused on probability-reduction via infrastructures. In Texas, emphasis is put on consequence-reduction via disaster-management and recovery-based activities (Hogendoorn & Brand, 2015; Sebastian et al., 2017)

An integrated perspective

	Measures	Rationale
Layer 1	Preventive infrastructures like flood defenses (storm surge gates, levees), storm water reservoirs, drainage systems (sewage, culverts)	Preventing water from entering the built environment; all-inclusive flood loss mitigation
Layer 2	Secondary flood defenses (compartmentalization), designated land uses in the hazard zone, elevation (land or construction), dry- and wet-proofing (construction requirements)	Mitigating flood losses for a selection of sites
Layer 3	Evacuation (protocols), disaster management, awareness programs, early warning systems, contingency plans	Minimizing loss of life only

Multilayered Safety Approach (Brand et al., 2018)

An integrated perspective

Flood risk = chance * consequences

The combination of different measures that aim to reduce probability or mitigate the consequences is associated with urban 'flood resilience'.

This, however, requires a coordinated response of institutions that have different mandates, and manage different components of the built environment that are interdependent. It requires different sectors (f.e. emergency response, spatial planning and flood management) to collaborate.

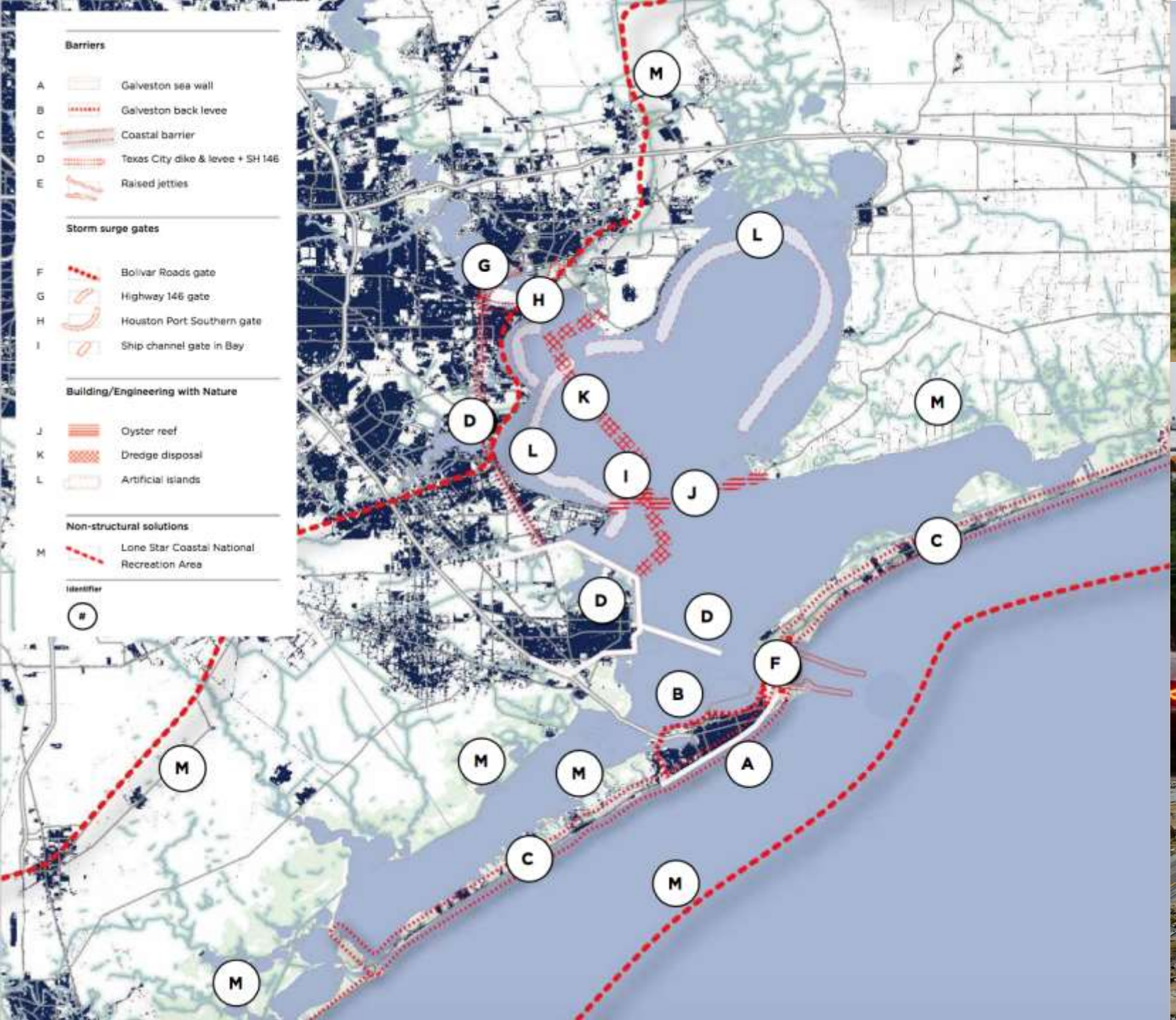
This can only be established based on an integrated understanding.

The FIG-paper

For Texas and Ghana, the paper for FIG 2019 explores:

1) The types of flood resilience measures that are currently pursued (what are the most common ones?), and which institutions pursue them?

2) How successful are the institutions in mitigating flood risk? What obstacles do they face, and in particular, how well do they coordinate their actions?


Barriers
A Galveston sea wall
B Galveston back levee
C Coastal barrier
D Texas City dike & levee + SH 146
E Raised jetties
Storm surge gates
F Bolivar Roads gate
G Highway 146 gate
H Houston Port Southern gate
I Ship channel gate in Bay
Building/Engineering with Nature
J Oyster reef
K Dredge disposal
L Artificial islands
Non-structural solutions
M Lone Star Coastal National Recreation Area
Identifier
#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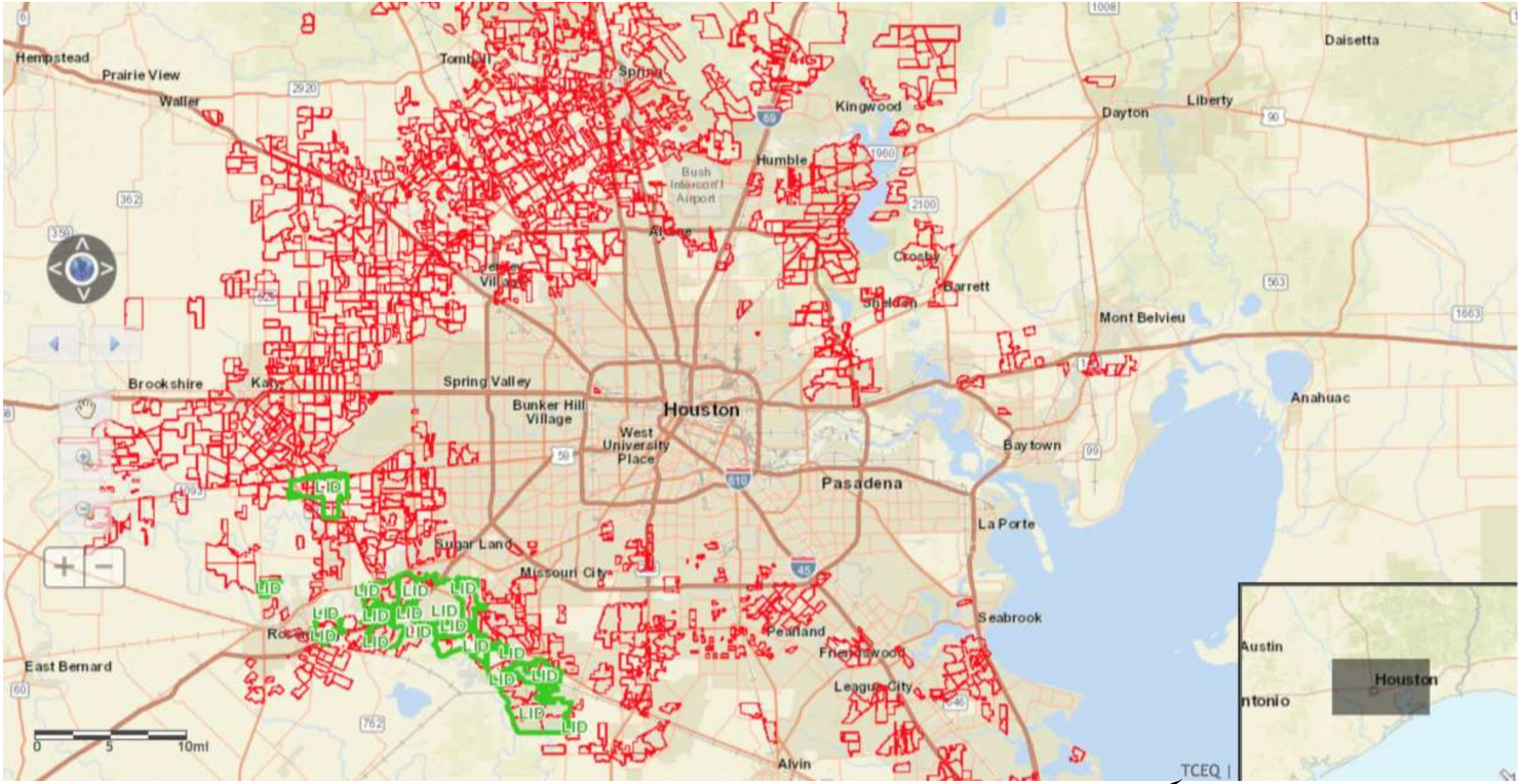
SALOON


SMILEY N./GETTY IMAGES

(1) Texas

- *Breadth*: Preventive infrastructure is rare. Flood insurance (NFIP) and building codes are dominant resilience measures, followed by evacuation. Spatial policy at the city and regional level does not exist.
- *Institutional*: federal level is dominant…and recovery-based. Many NGOs.
- *Performance*: infrastructure development and maintenance is lagging; the key policy instrument for building codes and insurance (NFIP) – the 100-year floodplain map – fails to capture flood hazards properly.
- *Trends*: after Harvey (2017) institutions step up what they already did, but a 'regional gap' continues to exist.



TCEQ Water districts map viewer

(1) Land management in Texas

- In Texas, land management in the broadest sense is impeded by societal preference for a lean government, which results not only in a lack of spatial planning powers at the regional scale, but also in its decentralized and fragmented institutional system.

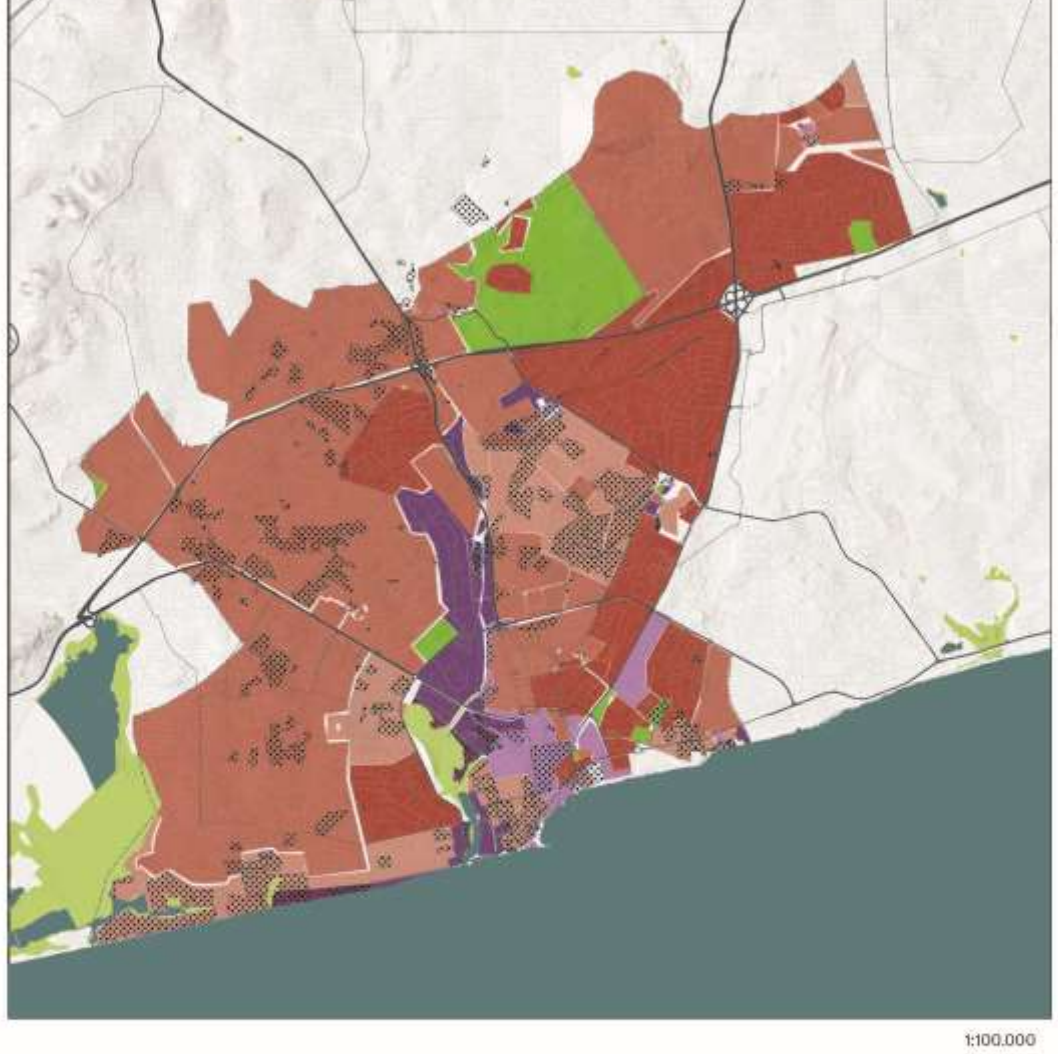
- An earlier cross-disciplinary study (Kok et al., 2015) indicated that all solutions from the MLS-approach are severely challenged by the governance system in Texas. Notions of political legitimacy put constraints on the raising of revenue, and imposing regulations. Land use regulations are seldom accepted.

Texas

- US ‘red’ state with high esteem for personal liberty property rights, antipathy for regulation and taxes (low taxes, low service)
- decentralized and fragmented governance system: no municipality in unincorporated areas. ‘MUD’-development and ‘special districts’
- car-dependent and low-density development
- one of the US’ strongest economies

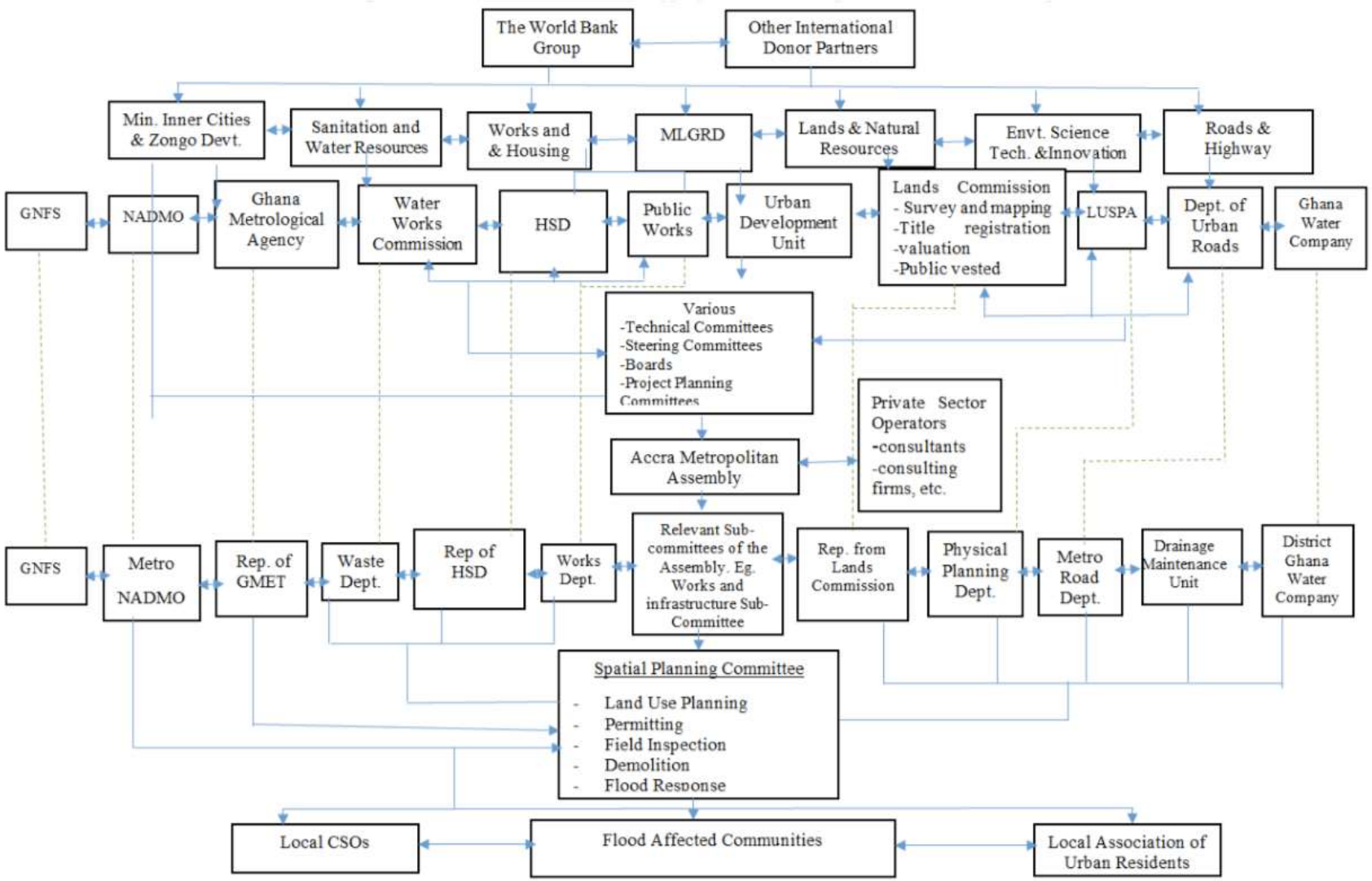
Ghana

- current governance system is a blend of relatively centralized formal institutions and strong informal ‘customary’ ones
- institutional system originally based on clans and tribes with chiefs as customary leaders
- combination of formal and informal settlements
- modest growth, but still a relatively poor nation with many WBG-loans



‘Land use’ in Accra Metropolitan Assembly in 2018. (Map by Daniele Cannatella)

Flood hazard areas in Accra Metropolitan Assembly in 2018. (Map by Daniele Cannatella)



Institutional network relevant for flood resilience in Accra Metropolitan Assembly

(2) Accra, Ghana

- *Breadth*: drains and sewers of infrastructure departments at the municipal (assembly) and national level dominate. Formally, a building ban applies parallel to open waterbodies to prevent encroachment.
- *Institutional*: MMDAs oversee compliance, emergency response organized by NADMO, the national disaster management agency. NGOs assists in emergency response, including religious organizations (Catholic relief, Red Cross) and international ones (UN).
- *Performance*: persistence of informal settlements encroaching waterbodies; land conflict and administration (delays in deed/title-registration); clogging of drains; misalignment of drains; lack of resources to enforce compliance.
- *Trends*: incremental steps towards diversification of flood resilience efforts (early warning system; Adenta Assembly flood shelters). WBG's 'GARID-project'.

(2) Land management in Accra, Ghana

- In Ghana, spatial planning powers do exist, but appear to be ineffective because of non-compliance, informal land transactions and interference with mandates.

- That, unfortunately, complicates a multitude of sectoral projects aiming to build flood resilience, like acquiring lands for upstream reservoirs, and keeping lands downstream free from settlement.

- Conflict over landownership, but also the informal but apparently powerful role of customary leaders, may complicate flood resilient land use planning schemes. There appears to be a correspondence between customary ownership and informal settlements, at least on the map.

Land ownership of informal settlements and/or slums, according to the data gathered for the Land Services and Citizenship Project II by Cities Alliance (2016). (Map by Daniele Cannatella).

Texas and Ghana

Texas (base-case greater Houston)

Spatial planning regulations, most notably at the regional level, are rarely accepted (if at all)

- Complicates properly offsetting of development with water storage
- Buy-outs and other measures only on a piecemeal basis

Ghana (Accra Metropolitan Assembly)

Land administration and (non) compliance with spatial planning regulations.

- Complicates securing upstream land for water storage
- Complicates relocating vulnerable communities (compliance with building bans)
- Complicates building-level adaptation of vulnerable communities

Today

Take-away: land management is the key obstacle in building flood resilience

- Proper land (use) management is a decisive precondition for success. This applies to virtually all types of efforts, ranging from the creation and operation of (preventive) infrastructures to the reallocation or flood-proofing of vulnerable land uses and communities.
- Unless the performance of this key sector is improved – ranging from proper land registration to systematically imposed regulations and building codes at the regional scale – it is likely that these cities will continue to flood.