

Regional

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THE GLOBAL FORUM FOR CITY
AND REGIONAL RESEARCH,
DEVELOPMENT AND POLICY

Regional Studies Association Winter Conference 15-16 Nov 2018

Planning Regional Futures Panel Session

Adapting a systems perspective for
planning futures: approaching flood
resilience in Texas and Accra

Outline

- 1) Introduction: Adapting a systems approach in planning, our research question and problem statement
- 2) Planning futures in a context of systems thinking
- 3) Flood resilience, why the topic of flooding!
- 4) Our case studies: Texas and Accra, why them!
- 5) Spatial interdependency in resilience thinking
- 6) Concluding remarks

1) Introduction (I): Adapting a systems approach in planning, our research question and problem statement

- There is a need to bring the developments in both theory and practice (many of them closely linked) to the attention of a wider body of people and to provide a framework whereby it can be related to the emerging problems of understanding and planning of cities and region (McLoughlin, 1969, p. 16)
- A system as “not the real world but a way of looking at it” (ibid, p. 79)
- The ‘spatial’ turn acts as “a mechanism for ‘joined-up’ policy-making, with planning seen as providing a credible forum in which other policy sectors can come to agree the spatial dimensions of future policy which will inform their own strategies” (Haughton et al., 2009, p. 5)

1) Introduction (II): Adapting a systems approach in planning, our research question and problem statement

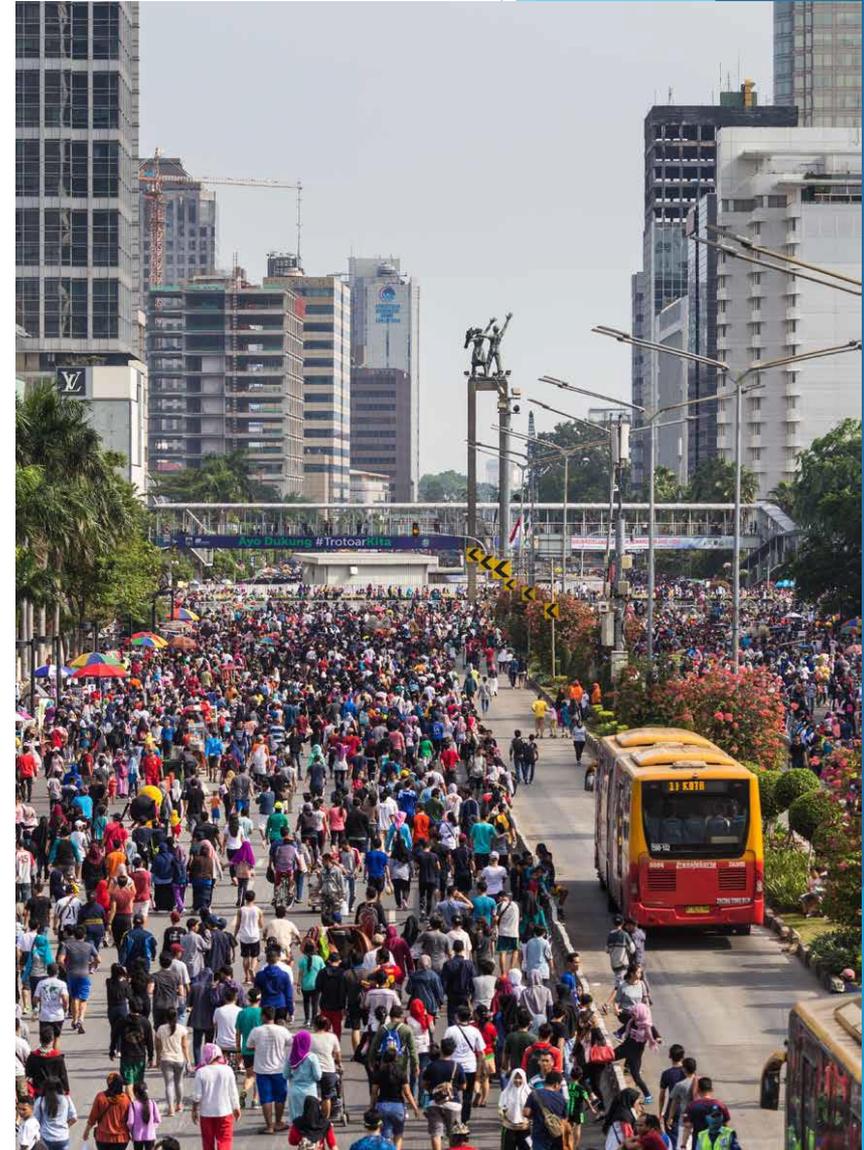
- Many policies, programmes and projects of governmental and non-governmental organizations are increasingly seeking to elaborate in detail the complex linkages between ecological systems, economic needs and activities, and sociocultural needs and processes
- Systems cannot be understood in isolation, especially the interaction between different subsystems, ecological, technological and social, should be considered in aiming to understand system behaviour (Cumming, 2011)
- The recognition that global challenges are interconnected and therefore require connected responses has resulted in the application of systems approaches to problem-solving recognizing the interdependencies between sub-systems (Van Bueren et al., 2012)

1) Introduction (III): Adapting a systems approach in planning, our research question and problem statement

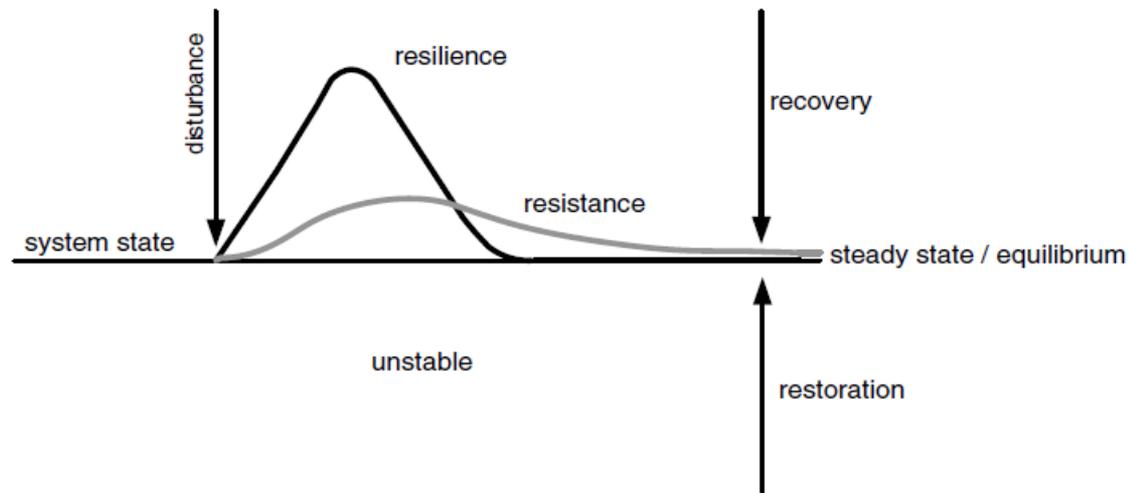
- We explore how adapting a systems approach within planning discipline can reconfigure socio-economic and institutional structures for the future of urban and regional planning
- The systems perspective on flood resilience not only contributes to our understanding of regional economic adaptability but also connects the changing dynamics of planning and regions to broader processes of political, economic, societal and behavioural change
- While the international comparative perspective of our paper provide insights on planning cities and regional futures, it also sheds light on different perspectives on the changing institutional context in which planning urban and regional futures is increasingly conducted

2) Planning futures in a context of systems thinking (I)

- Cities are set up by physical and social systems that are inseparably interlinked and they have co-evolved over time, influencing each other: the socio-ecological systems, the political-ecological systems, the socio-technical systems > systems cannot be understood in isolation, especially the interaction between different subsystems, ecological, technological and social, should be considered in aiming to understand system behaviour (Cumming, 2011)
- The concept of resilience: “the ability of an urban system-and all its constituent socio-ecological and socio-technical networks across temporal and spatial scales-to maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity” (Meerow et al., 2016, p. 39)



2) Planning futures in a context of systems thinking (II)

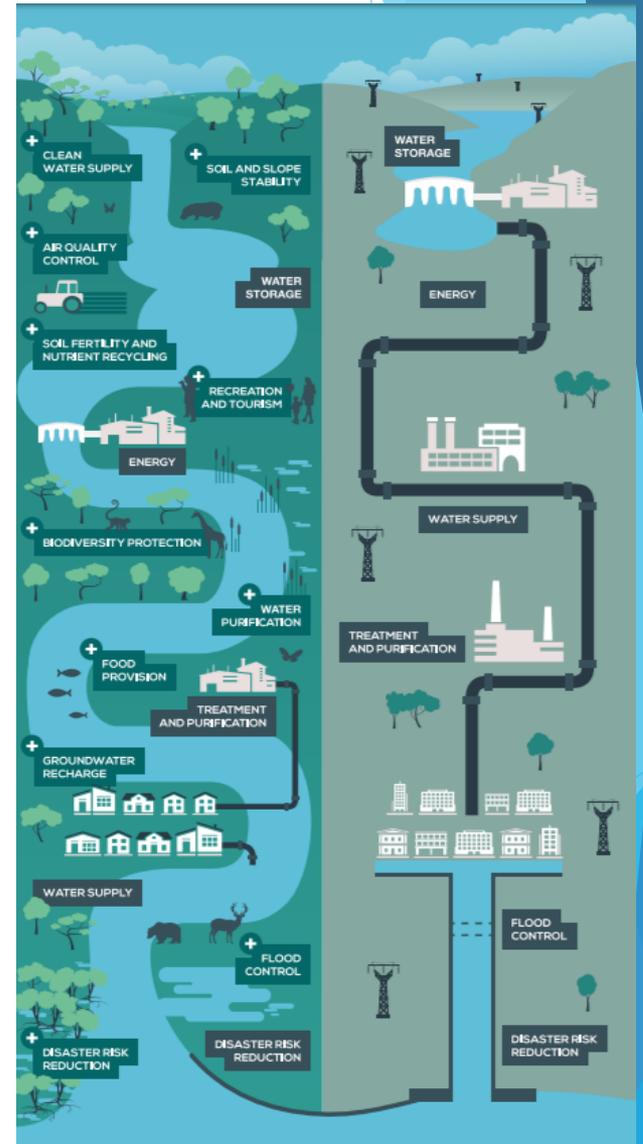


Ecosystem responses to disturbance: resistance, resilience and instability (Van Bohemen, 2012, p. 31)

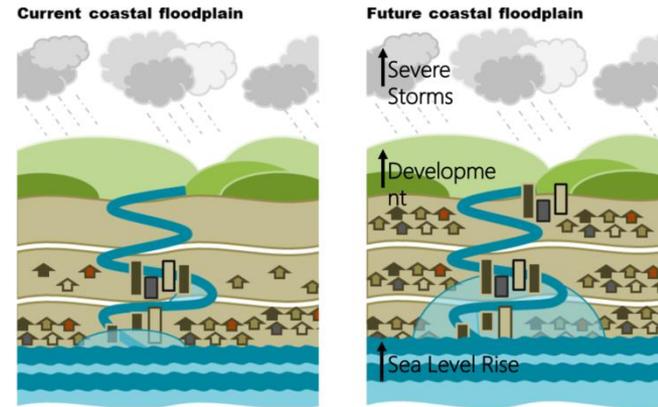
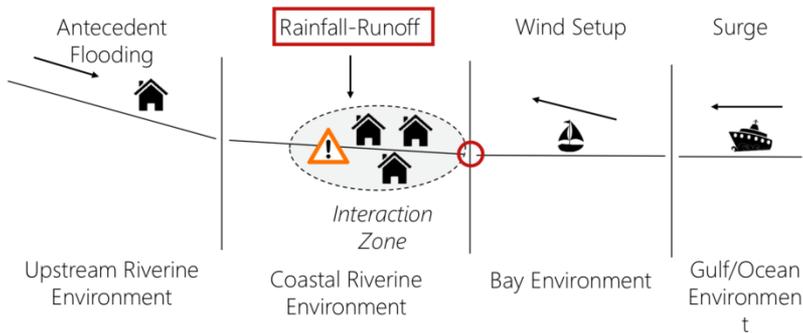
- There is a long list of regional resilience literature which deals with how regions respond to shocks and their experience with their recovery aftermath (Davoudi, 2012; Bristow, 2010; Christopherson, 2010; Hudson, 2010)
- “The attention to resilience may be, however, a response to a generalized contemporary sense of uncertainty and insecurity and a search for formulas for adaptation and survival. In this respect, the fashionable use of the concept may originate both from an increased sense of risk (economic and political as well as environmental) and from the perception that processes associated with globalization have made places and regions more permeable to the effects of what were once thought to be external processes” (Christopherson et al., 2010, p. 3)

2) Planning futures in a context of systems thinking (III)

- Although discussion on urban and regional resilience are essential to understand the structural determinants of eco-systems within given boundaries, it is crucial to acknowledge the multi-scale interdependencies that those systems are embedded within their institutional environments (Lang 2011)
- System components are related to a particular place, and qualifications as resilience are therefore also space depended: “Although places are specific and unrepeatable in their institutional environment, it is not ‘the city’ or ‘the town’ that acts but individual or collective actors. And it is their actions that constitute change” (ibid., p. 9)
- Water systems > the changing dynamics of water systems have been discussed by a series of scholars recently as the management of traditional water systems opposes challenges for the future of cities (Gonzales and Ajami, 2017; Graymore et al., 2010; Hering et al., 2013; Hughes and Pinctl, 2014; Padowski and Gorelick, 2014)



3) Flood resilience, why the topic of flooding! (I)



Courtesy of dr. A. Sebastian, Rice University

Flood resilience can be attained in multiple ways as associated within the Multi-Layer Safety Approach (Kingdom of the Netherlands, 2009; Hoss et al., 2011) > infrastructures can be built to capture or drain flood waters on a permanent basis; vulnerable land uses and/or communities can be expelled from the floodable areas, or structures equipped to temporarily deal with flood waters can be implemented; communities can be relocated from the floodable areas during an emergency

3) Flood resilience, why the topic of flooding! (II)

Siloed understanding of flood resilience!

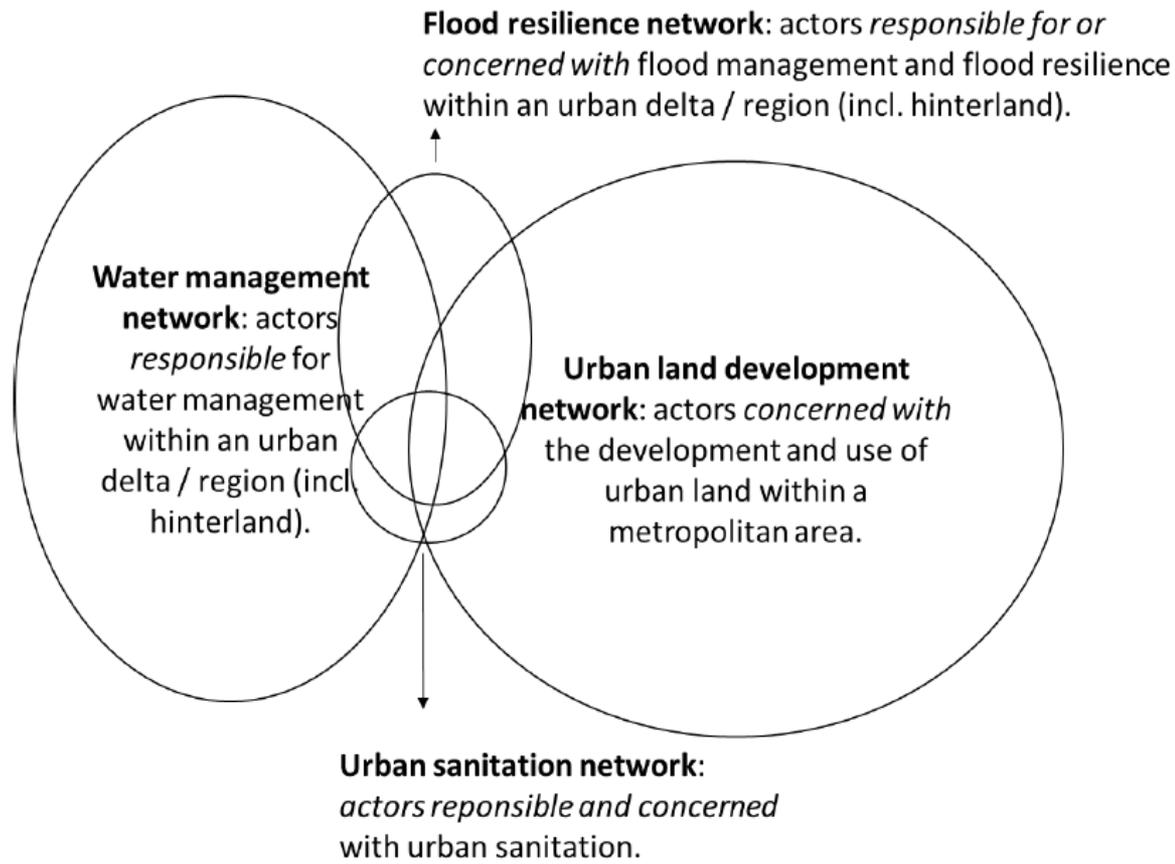
A coordination problem between flood management issues on the one hand and urban development management on the other appears to be prevalent (Romero-Lankao et al., 2018); i.e. the US city of Houston (Sebastian et al., 2017), and observed in other nations (Thaler et al., 2016)

Sectoral approaches to urban management issues like transport, sewage, drainage, waste collection & processing, land use planning and construction of buildings raises the institutional complexity surrounding urban flood resilience (van Bueren et al., 2012)

A strive for urban resilience implies that many institutional actors are involved both in the creation of urban flood risk and its future mitigation, requiring organizations to act against their own short term interests, while it is uncertain how future effects of different interventions work out for those involved.

3) Flood resilience, why the topic of flooding! (Ili)

Institutional complexity within flood resilience



An overview of actor networks generally involved in urban flood resilience

4) Our case studies: Texas and Accra

To be able to understand urban flood risk management, it is important to analyse institutional complexities within which interventions are designed and implemented

To efficiently target flood resilience, an integrated approach of the urban and water management systems at the city level is required

In addition to the search for these inconsistencies, two other factors play a role in the analysis:

- The first deals with the relevance of place in analysing the system, and evaluating the contributions of various interventions to urban resilience
- The second component considers the importance for a system to maintain its identity: “a system retains its identity if key components and relationships are maintained continuously in space and through time” (Cumming and Collier, 2005, p. 10)

Houston is America's coolest city to live in, according to a bunch of nerds

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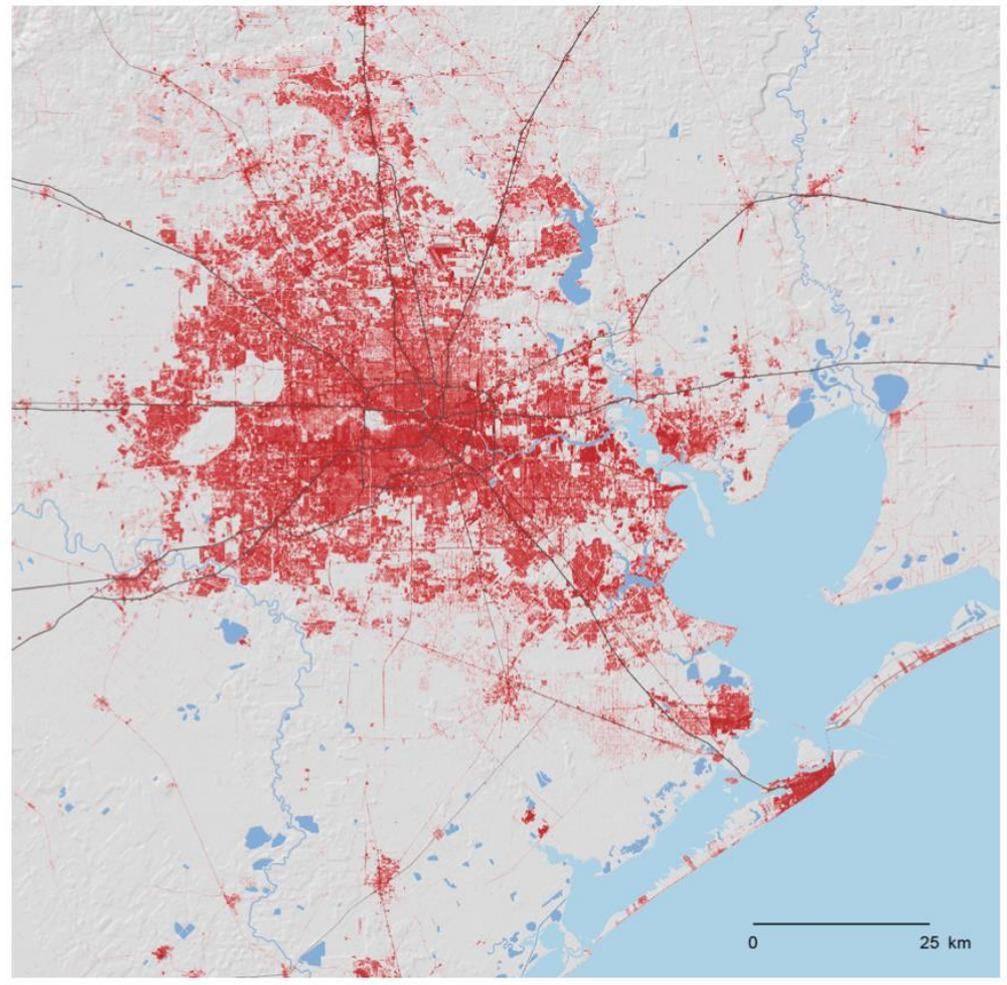
COMPOSTING IN BROOKLYN: A
GUIDE TO NOT BEING WASTEFUL &
INCOMPETENT

THIS IS THE FANCIEST SPRING
PICNIC THAT UNDER \$20 CAN BUY

Houston is the 4th largest city in the US, located within a conurbation that is expected to grow to 10 million in 2014 (HGAC, 2016)

Greater Houston is a young and rapidly expanding city, with an 25% population increase since 2000

Archetype of urban sprawl with car-dependent, low-density, single-purpose development patterns with an abundance of paved-over surface (Brody et al., 2008, 2014; Blessing et al., 2017; Mankad, 2016)



The greater Houston metropolitan region, 2014

Urban sprawl: ‘The city now covers an enormous area of more than 1,500 sq km (...) t is the archetype of urban sprawl, where land is made readily accessible for real estate development on the city's ever expanding periphery”

Loss of habitat: ‘This unplanned growth has led to many problems (...) One is that vast acres of wetlands and prairie land - which soak up large amounts of rainfall - have been paved over’
Between 1992 and 2010, for example, White Oak Bayou in north-west Houston lost about 70% of its original wetlands.

A city for cars: ‘Another problem is that investment in flood control infrastructure - things like channels, dams and reservoirs - has failed to keep pace with the expansion of the city.’

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US & Canada

Why is Houston so vulnerable to devastating floods?

By Prof Philip R Berke
Texas A&M University

31 August 2017 | US & Canada

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Houston is now the flood capital of the United States

Parts of the Houston region have been hammered by more than 50in of rainfall since Hurricane Harvey made landfall, setting new records for the



SIGNAL
WORK
AHEAD

FUEL DEPOT

SPEED
LIMIT
35

NO PARKING
RIGHT LANE
ONLY

BRUCE'S SEAFOOD
Mon-Sat: 10am-6pm
1-800-773-3124
CLOSED SUNDAY

Port Arthur
OPERATIONS
HEALTH CARE
AND NO...

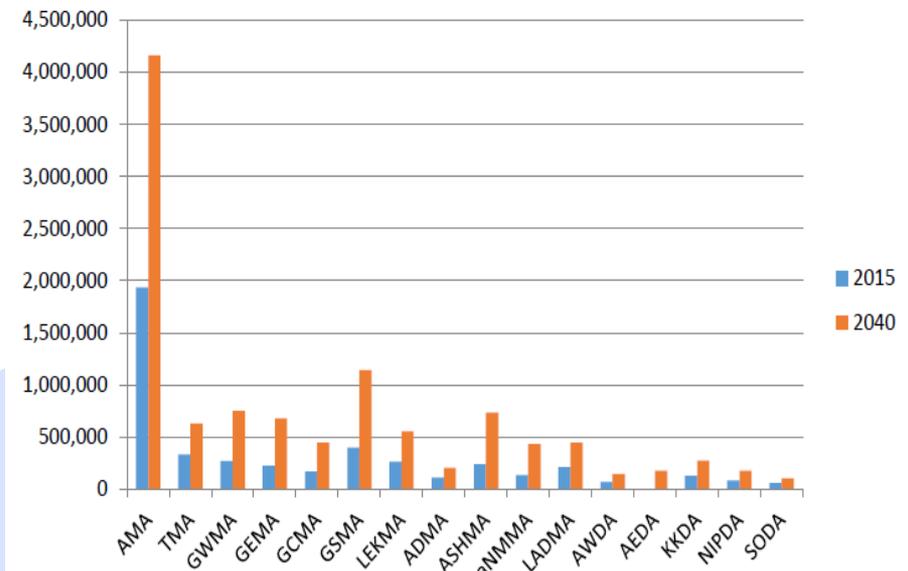
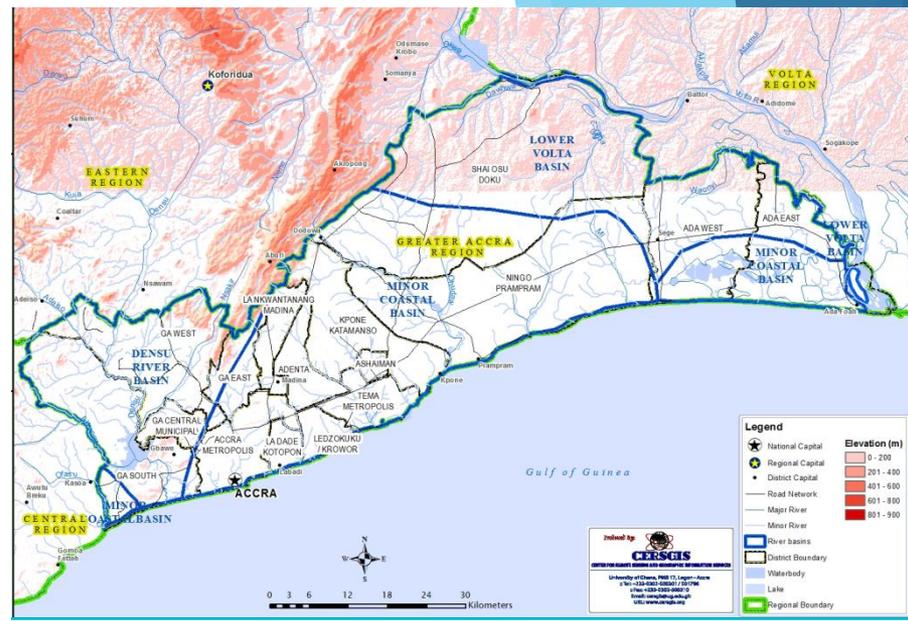
- Tropical storms clash with urbanization: Houston referred to as America's Flood Capital (Erdman, 2016).
- Clay soils and little topographic relief, creating wide and shallow flood plains in a humid, subtropical climate. In its natural state, the region would be covered by wetlands and coastal prairie that absorb, and store flood water, slowly releasing them into 22 bayous and creeks (Sebastian et al., 2017)
- Average annual rainfall is **1264 mm**, often a significant part of that amount received in a single event (deluges). Hurricane Harvey: **1016 mm** in *48 hours*



At least 30 damaging floods since creation of Harris County Flood Control District (1973), for example:

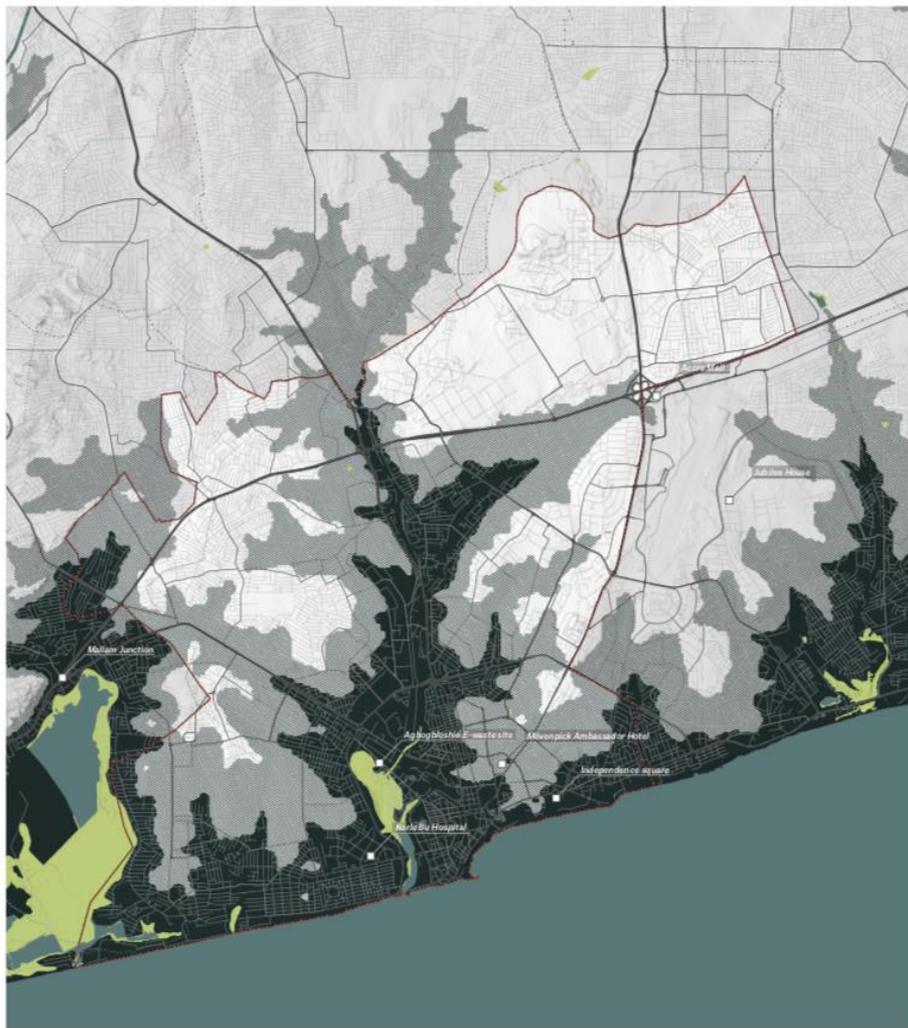
- Tropical Storm Allison (2001)
- Hurricane Rita (2005, no landfall, but many casualties during the evacuation)
- Hurricane Ike (2008)
- Tax Day Flood (2016)
- Memorial Day Flood (2015)
- Hurricane Harvey (2017)





Projected based on 2010 Population and Housing Census (Ghana Statistical Service, 2012)

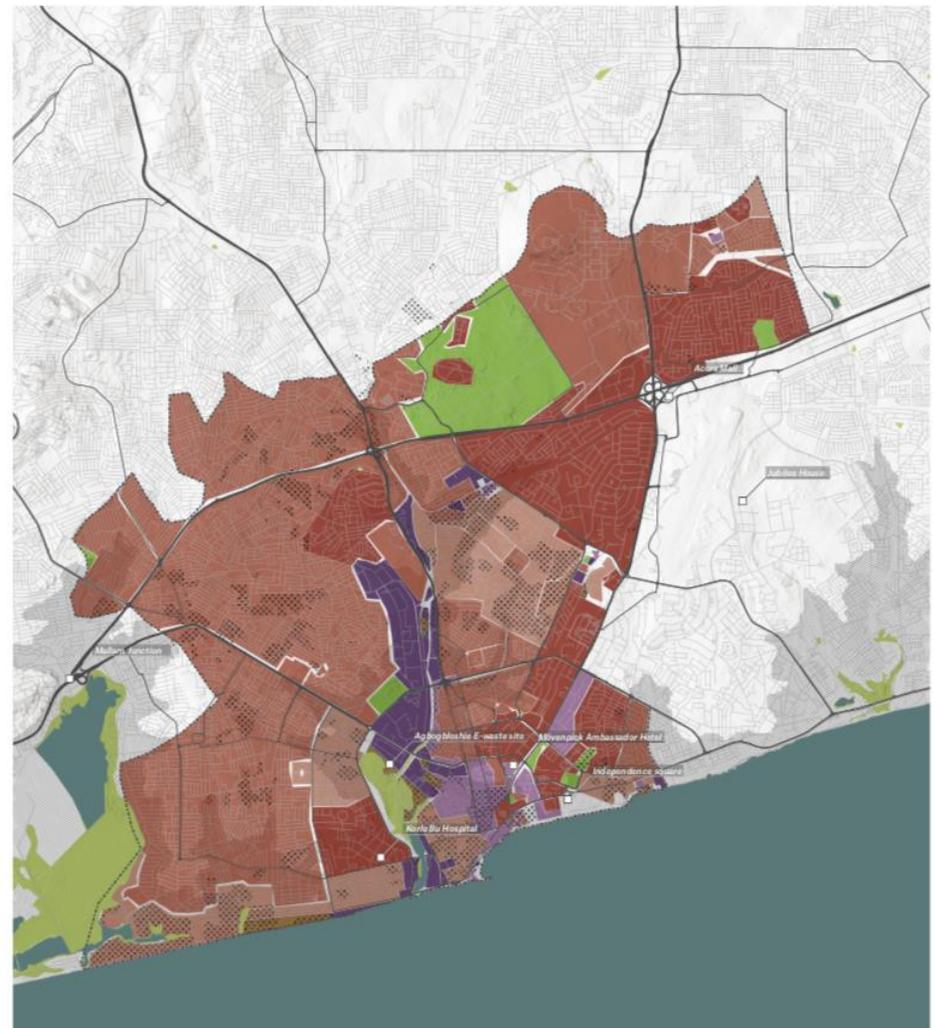




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Legend

- Waterbodies
- Wetlands
- Areas lower than 17m
- Areas between 17m and 34m
- AMA boundaries
- Watershed



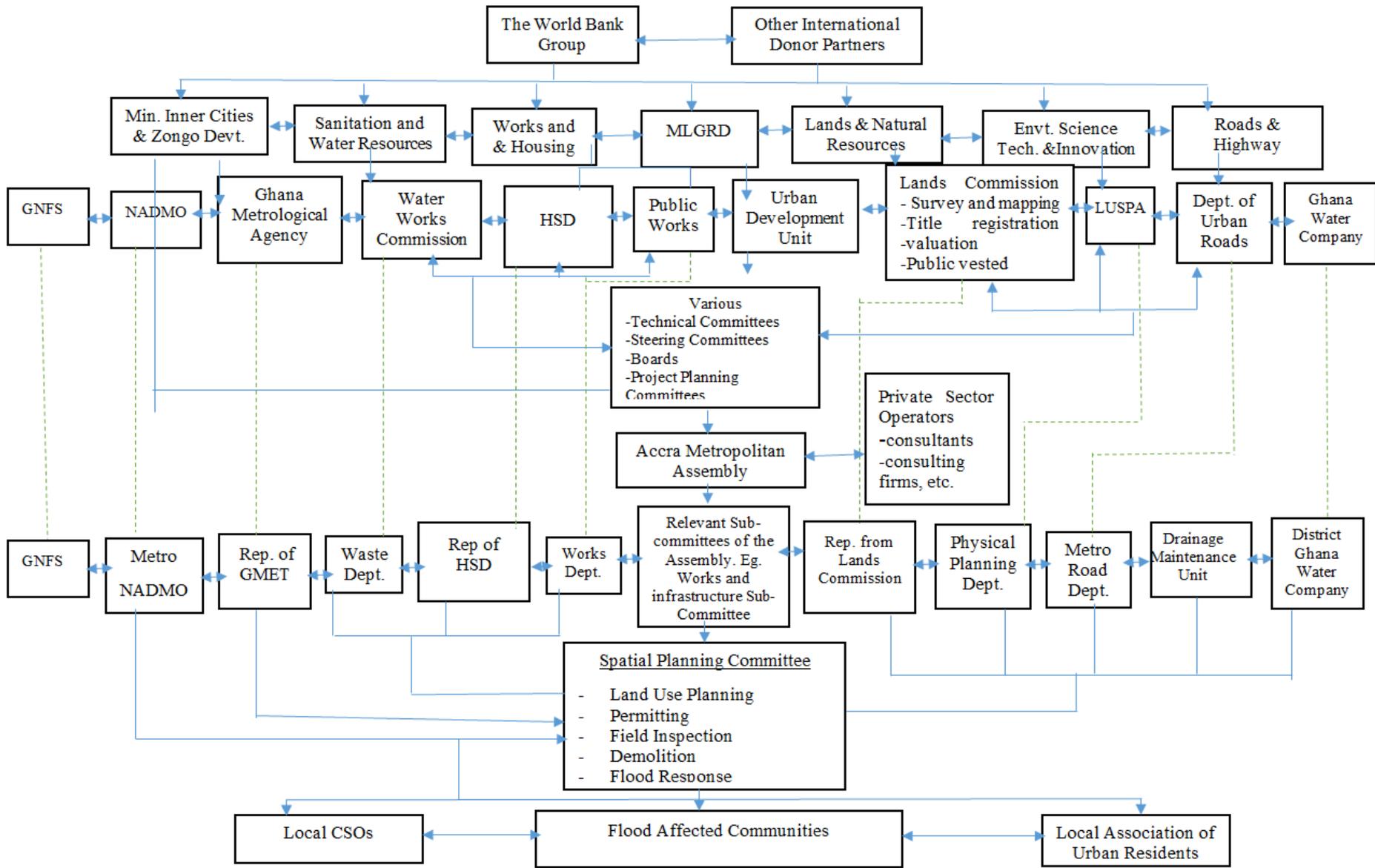
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Legend

- High income residential areas
- Middle income residential areas
- Low income residential areas
- Industrial areas
- Commercial areas
- Airfield
- Parks
- Informal settlements
- Waterbodies
- Wetlands
- Slums
- Areas lower than 17m

Land use within AMA's jurisdictional boundaries (added with informal settlements/and or slums)

The flood hazard zones within AMA's jurisdictional boundaries



Institutional mapping for urban flood resilience in AMA

Two key issues emerged from the overview of institutional analysis of cumulative efforts of the institutions interviewed:

1) most of the respondents interviewed indicated that *unclear land administration and management practices is a key challenge undermining their efforts*, and those of other institutions - a phenomenon that was earlier noted by City Strength Diagnostics (2017)

2) institutional coordination and the need to streamline efforts is also a key challenge among all the institutions studied

Fragmentation and/or inconsistency (duplication; annulment and blind spots)

1) “Division of responsibilities for drainage management, including operation and maintenance, is spread across Hydrological Services Department (HSD), the Department of Urban Roads (DUR) and the Works Departments of the MMDAs, resulting in weak coordination, planning and enforcement” (City Strength Diagnostics, 2017)

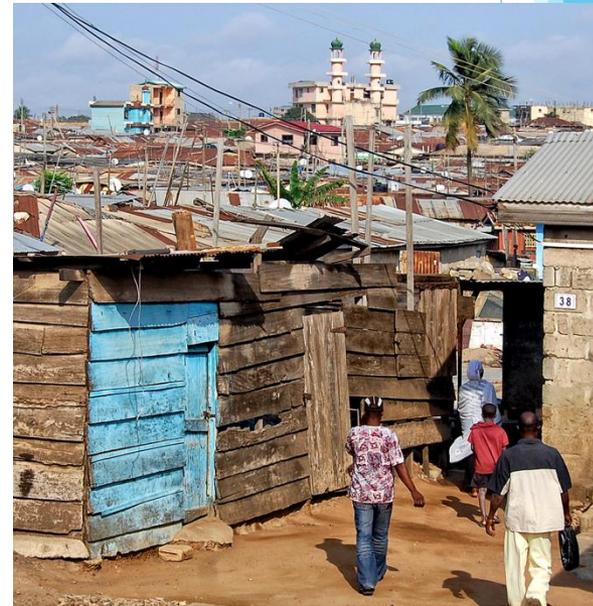
2) *Annulment* of efforts (new flood risk being created by an institution while the other is actively aiming to reduce it) does appear to be a severe problem

Spatial implications for the future vulnerability of the built environment

1) “*The root cause is lack of affordable housing combined with migration from the north, {forcing} people to settle in marginal lands {in this case} lands earmarked for recreation. They depend on their {informal} markets, close to the CBD and to where trucks with foodstuffs from the north arrive*”.

5) Spatial interdependency in resilience thinking

- Does taking small steps towards building flood resilience sufficient? What about the interdependency of project components?
- Land management : In Accra, acquiring lands for the upstream reservoirs, and keeping cleared lands downstream free from settlement - appears to be lacking
- Need for a better integration of institutional mandates, stronger collaboration
- Operationalization of inter-jurisdictional planning issues



6) Concluding thoughts

The importance of coordinated multi-level, multi-sector institutional efforts to reduce, manage and adapt institutions and the built environment to flood risks

Operating within and outside the studied area > how flood risk management was influenced by actions and behaviour of institutions at multiple levels

Need for the system perspective to be embedded in operation of cities and regions, having a perspective in planning as safeguard for planning futures

Societal transitions that needs to be made (i.e. low carbon, energy infrastructure, climate change, climate adaptation) > we need to consider the inclusion of systems understanding, to make appropriate planning changes