

**Urban Flooding in the United States
Workshop
Hyatt Regency Houston Galleria
Houston, Texas
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WORKING GROUP REPORTS

The themes for each working group were identified by the committee. The bulleted points from participants, which were not edited by the committee and are not in priority order, are presented below.

Physical Group

Hydroclimatological Aspects of Acute and Chronic Flooding

The climate dimension

- Houston is at nexus of 3 extreme precipitation types (tropical storms, thunderstorms and Gulf humidity origin). The problem is amplified by low topography and a dense urban environment
- There seems to be an upward trend in intensity and volume of rainfall (need to study more detailed characteristics of storms). But no definitive information exists

Design-to events

- In urban areas the “moving storm” needs to be addressed. The direction of the storm (e.g., transverse or across the basin) matters. This can be addressed with almost 30 years of radar data
- The design rains used exclude tropical storms (excuse is that they are outliers)
- There is a need to reassess the risk levels (1 percent or 100 years) in flood insurance. Move to 500 years

Rainfall-runoff transformation and management of risks

- Urban flooding is distinct from less-developed land flooding in that the 100-year storm does not necessarily lead to a 100-year flood within only the low-lying landscape (defining the 100-year flood-plain). Due to complex drainage systems, the highly variable distribution of impervious surfaces, and variations in sheet flow and pipe drainage, the directionality of the storm and its spatial coverage matters more. A modest storm can lead to severe urban floods. Hence, the applicability of the 100-year flood zone in an urban setting is questionable. Need local hazards mapping.
- Detention and conveyance of extreme events (e.g., 100 year event) both need to be considered

Development, Regulation, and Changes in Land Use and Land Cover

Development patterns

- Management of sheet flow during partial development (and to full-development of area) needs to be addressed
- Houston has neighborhood drainage systems and bayous. They are not well-coordinated and connected. Sometimes the sheet flow and pipe flow are directed in opposing directions
- Current or heritage infrastructure are especially lacking in conveyance
- The transportation infrastructure and the hydraulic drainage infrastructure are not well coordinated. In some cases sheet flow runoff is placed in streets

Shortcomings in regulations

- Mortgages, banks, and FEMA do not require flood insurance for those who are in the flood zone and for the duration of the loan. About two-thirds of homeowners drop flood insurance within five years
- Regulations are needed for CFR 44.60.3
- Financing local improvement districts is a challenge
- Individual homeowner flood-proofing is not allowed under federal regulation. Raising elevation is allowed. Commercial space is allowed flood-proofing. Individual homeowners should be allowed flood-proofing

Innovation and Blue-Green Development

Modeling needs for exploration of design alternatives

- Houston's situation needs two-dimensional and more sophisticated hydrologic and hydraulic modeling
- There is guidance on two-dimensional modeling, but not enough detail
- Two-dimensional modeling is expensive and needs inputs that are not readily available
- Substantial damage estimate software from FEMA (part of current Senate Waters bill) needs to be updated as a software. Also its application needs to be informed by local knowledge because inundation depths and property values are different in different settings
- Modeling the pipe network and conveyance may not be as important to the generation of overland flow and their geographic patterns

New design criteria, regulation, and enforcement

- Zero-impact regulation on development means that with the land-use change, the peak flow downstream is same as predevelopment. This usually leads to construction of detention structures
- Depending on the type of detention design, different percentages of new development are set aside for detention. Numbers like 10 percent to 15 percent are typical
- In development, even with zero-impact criterion, it is very difficult to allocate more space to detention if in retrofit-mode
- Maintenance of drainage infrastructure over the long term is an issue. Reliance on public is risky
- City and public works are in reactive mode due to limited resources and excess of cases. There is less opportunity to be proactive in flood-proofing new development

Social Group

Differential Impacts in Mapped and Unmapped Areas

So much loss occurs outside the mapped floodplain, yet states are lower in these areas in:

- Insurance coverage
- Preparedness
- Experience
- Storm sewer capacity and improvements
- Development restrictions with respect to fill

Intersectionality Among Socially Vulnerable Populations

Who is impacted?

- Renters: Percent income on rent, flood insurance, few housing options if displaced by damage or upgrades
- Elderly: fixed income, deferred maintenance (e.g., foundations, roofs), target for post-flood fraud and price gouging
- Disabled: make less repairs, targets for post-flood fraud and price gouging
- Language proficiency: written materials, canvassing, non-profit capacity, (150 languages in the 211 system)
- Income: many properties are bought by contract, not mortgage (no insurance requirement), reduced eligibility for post-disaster funds due to back taxes, repairs more based on recycling than replacement
- Citizen status: fear of coming forward, reporting
- New residents: unfamiliarity can lead to agreeing to bad deals by insurance companies
- Older neighborhoods: drop insurance after the mortgage is paid, low or no previous flood experience

Institutional Resources and Structures Designed Around Low Frequency Flooding

Many resource streams are not available with chronic flooding:

- Individual assistance
- Donor funds for nonprofits
- National attention
- Pre-disaster mitigation (elevation grants)

Nonprofit Organizations Successful, but Resources Insufficient

Successes:

- Disaster case management
- Good coordination among organizations

Challenges:

- Underfunded
- Highly dependent on government funding
- Lack substantive coordination with local government
- Lack of inclusion in communication and planning for recovery and infrastructure
- Mental health resources: lack of awareness and adoption
- People are more isolated

Other institutions: civic clubs, homeowner associations, churches

Some Important Groups Missing Today

- People of color
- Houses of worship
- Non-English speakers
- Public health
- Municipal representatives with a focus outside the built environment

Information Group

Flood Maps: FEMA SFHA

How are they being used?

- Linked on webpages, National Weather Service
- Impacts are tracked separately
- Land cover change, population change
- The boundary is treated as dichotomous, but it is not
- Do not convey risk, convey whether to buy insurance
- Harris County Flood Control updates floodplain maps themselves
- Need to bake in green infrastructure data
- FEMA maps only one factor: also use claims data, repetitive loss, and channel analysis tools
- Overall: use the maps, but not as the main means for understanding flood risk

How do We Balance Multiple Data Streams?

- Need agencies to come together to establish a common standard
- Scale is very important; need to tailor to a specific district or decision area

Integrated Management

- Align jurisdictional plans to the county mitigation plan
- Get the response professionals more involved in proactive planning
- Issue of who will pay for impact and risk reduction
- Risk communication is important

Action and Decision Making Group

Urban Setting

- Claims payments are tied to permits for compliance and mitigation
- Increased cost of compliance is insufficient, \$30,000 is not enough
- Penalties (and incentives) to manage repetitive loss properties
- 311 data: during events and dry days

Mapping and Risk Information

- Need information on nonriverine flooding to increase awareness and available funding

Mapping: Proposed Approach

- Area exposed to severe rain events (e.g., > 17 inches) with adverse topography
Consider extending the mandatory purchase to this area

Technical Assistance and Investments

- FEMA: allow direct allocation to cities and counties (rather than states) post event to decrease administrative expense and increase disbursement speed (especially for buyouts)
- FEMA: introduce an ability to force a buyout
- FEMA and Department of Transportation: require transportation departments to evaluate and address impacts on floodplain management
- Small Business Administration (or other source of loans): expand individual low-cost loans to cities and counties (rather than states) for larger scale mitigation
- FEMA: improve consumer information regarding flood losses to potential buyers