

The Reconstruction Gap

A System Dynamics Analysis of Post-Harvey Housing Recovery

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The reconstruction gap emerges when documented housing need moves through administrative review, funding availability, construction capacity, and physical reconstruction at different rates.

Why it matters

- Post-disaster housing recovery is often reported with static counts of damaged homes, allocated funds, and completed reconstructions.
- These snapshots do not explain why recovery delays persist after resources are committed.
- Houston after Hurricane Harvey is a high-need case; the Texas General Land Office reported 22,476 owner-occupied unmet-need cases in Houston.

Objective

Develop a system dynamics model of CDBG-DR-funded owner-occupied housing recovery after Hurricane Harvey. Represent the reconstruction gap as a dynamic process rather than a static difference between damaged and repaired homes.

Research question

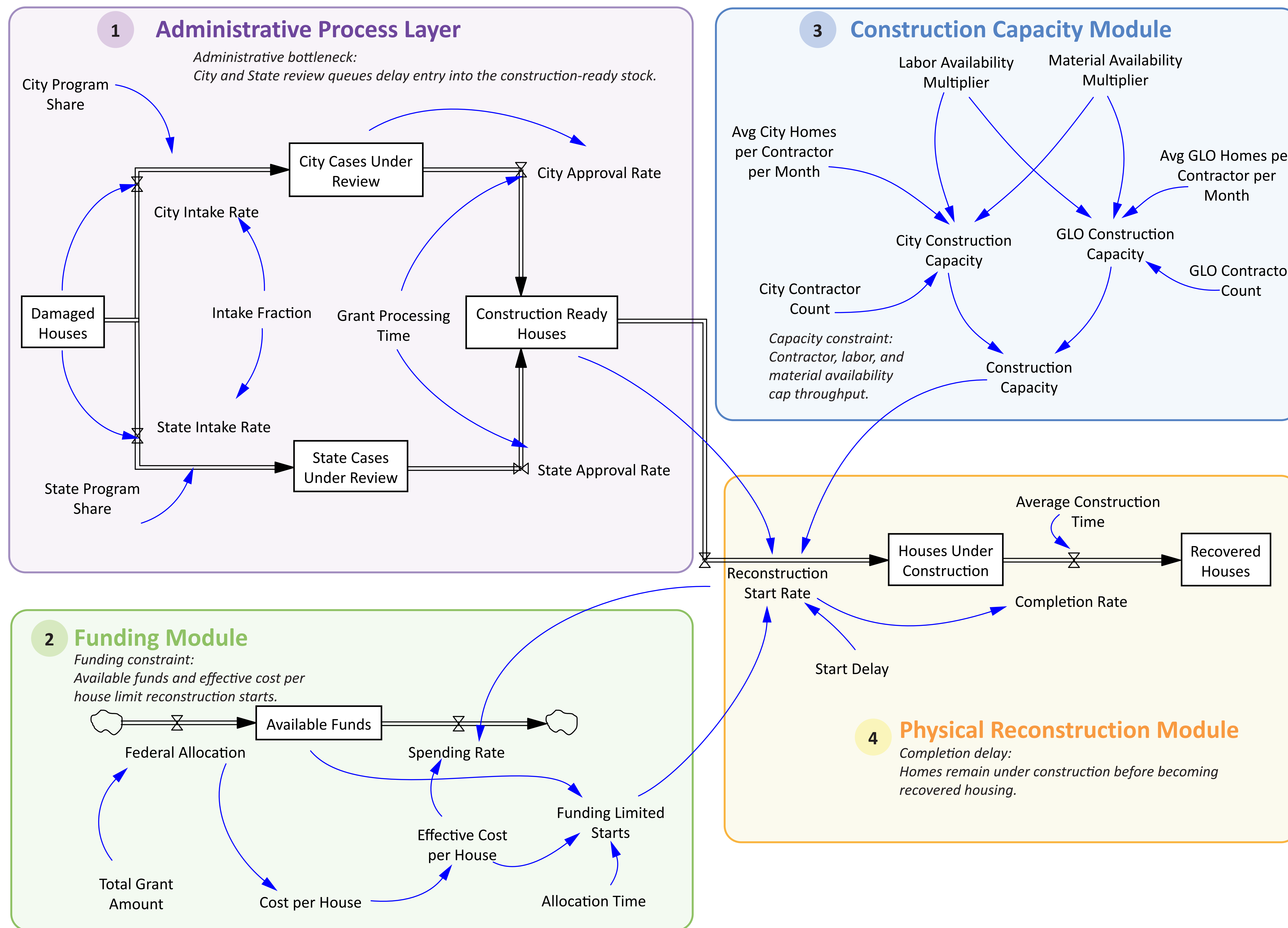
How do CDBG-DR program structure and Implementation conditions influence the pace of owner-occupied housing recovery after Hurricane Harvey?

Model modules

- 1 Administrative Process Layer
- 2 Funding Module
- 3 Construction Capacity Module
- 4 Physical Reconstruction Module

Figure 1. How the reconstruction gap emerges

System dynamics structure of the CDBG-DR reconstruction pipeline.



Preliminary model result

22,476

documented owner-occupied unmet-need cases

≈2,080

modeled supported completions

≈20,396

remaining reconstruction gap

≈9.3%

supported share under current assumptions

Under current budget and cost assumptions, funding creates a hard ceiling on completed reconstruction.

Applications

- Diagnose bottlenecks:** Identify whether recovery is limited by funding, administrative processing, construction capacity, or completion delays.
- Test policy scenarios:** Compare faster approvals, earlier funding, increased contractor capacity, or owner cost per home.
- Support recovery planning:** Translate program rules and implementation delays into a dynamic decision-support model.

Key Findings

- The gap is dynamic: sequential delays shape recovery outcomes.
- Bottlenecks interact: administrative queues, funding limits, and construction capacity jointly shape recovery pace.
- Static counts are not enough: the model explains why substantial resources may still leave a large unmet reconstruction gap.

Policy levers

- Approval speed
- Allocation timing
- Cost per house
- Contractor capacity

Future work

- Validate against observed applications, approvals, obligations, disbursements, starts, and completions.
- Run sensitivity tests on cost, allocation timing, approval rates, and contractor capacity.
- Extend the model to broader household recovery outcomes.

Selected references & acknowledgment

1. Texas General Land Office (2025). State of Texas Plan for Disaster Recovery: Amendment 18.
 2. HUD PD&R (2019). Housing Recovery and CDBG-DR.
 3. HUD OIG (2022). City of Houston Hurricane Harvey Program challenges.
- Acknowledgment: Supported in part by HUD Award # H21749CA. Findings are those of the authors and do not reflect HUD's official position or views