

From Recovery Funding to Rebuilt Homes: A System Dynamics Model of CDBG-DR Housing Recovery

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What is CDBG-DR?

Community Development Block Grant Disaster Recovery (CDBG-DR) is supplemental funding appropriated by Congress and allocated by HUD after a presidential disaster declaration. State and local grantees use these flexible funds for long-term housing, infrastructure, and economic recovery, especially where other assistance does not meet remaining needs.

Why Hurricane Harvey?

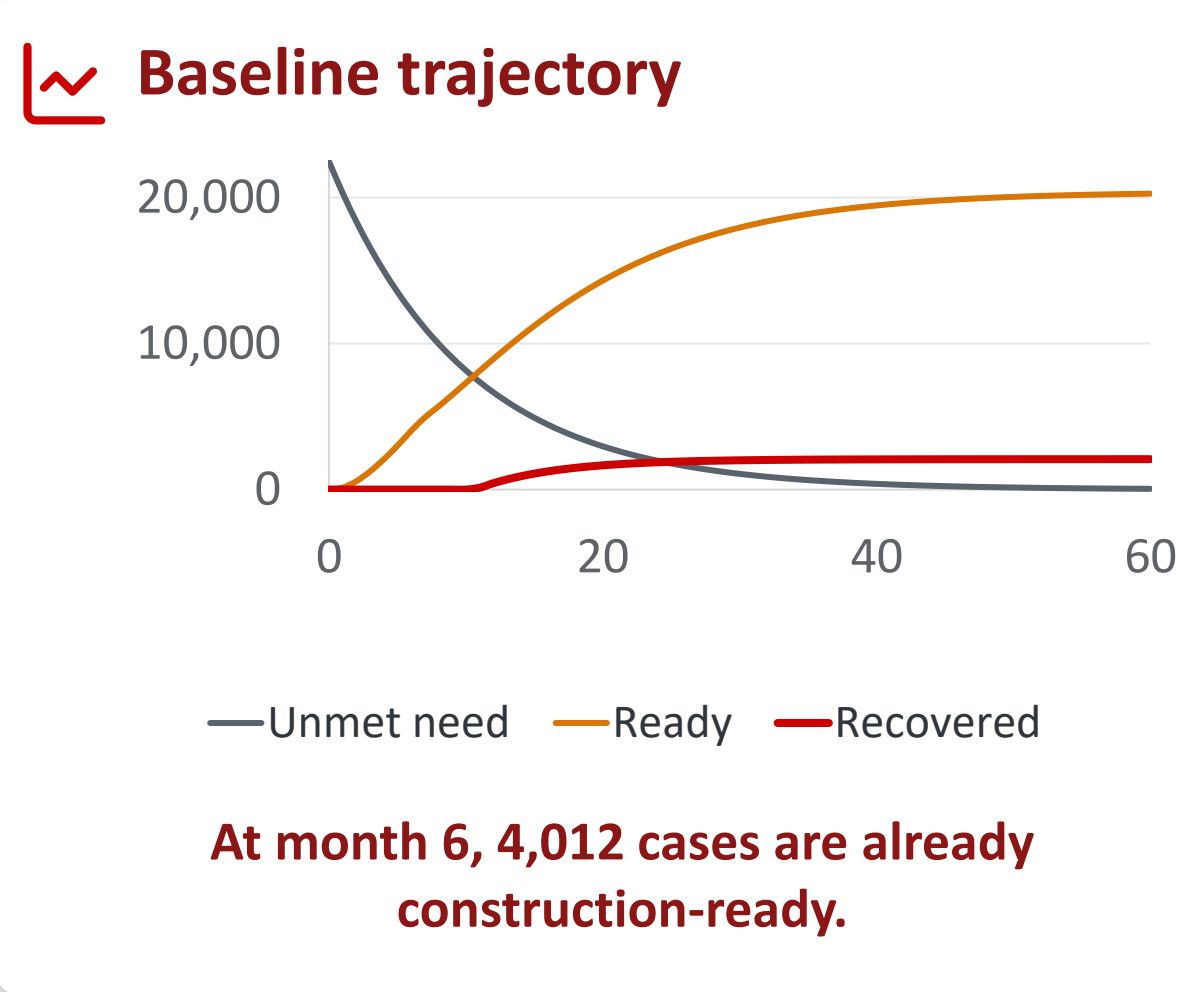
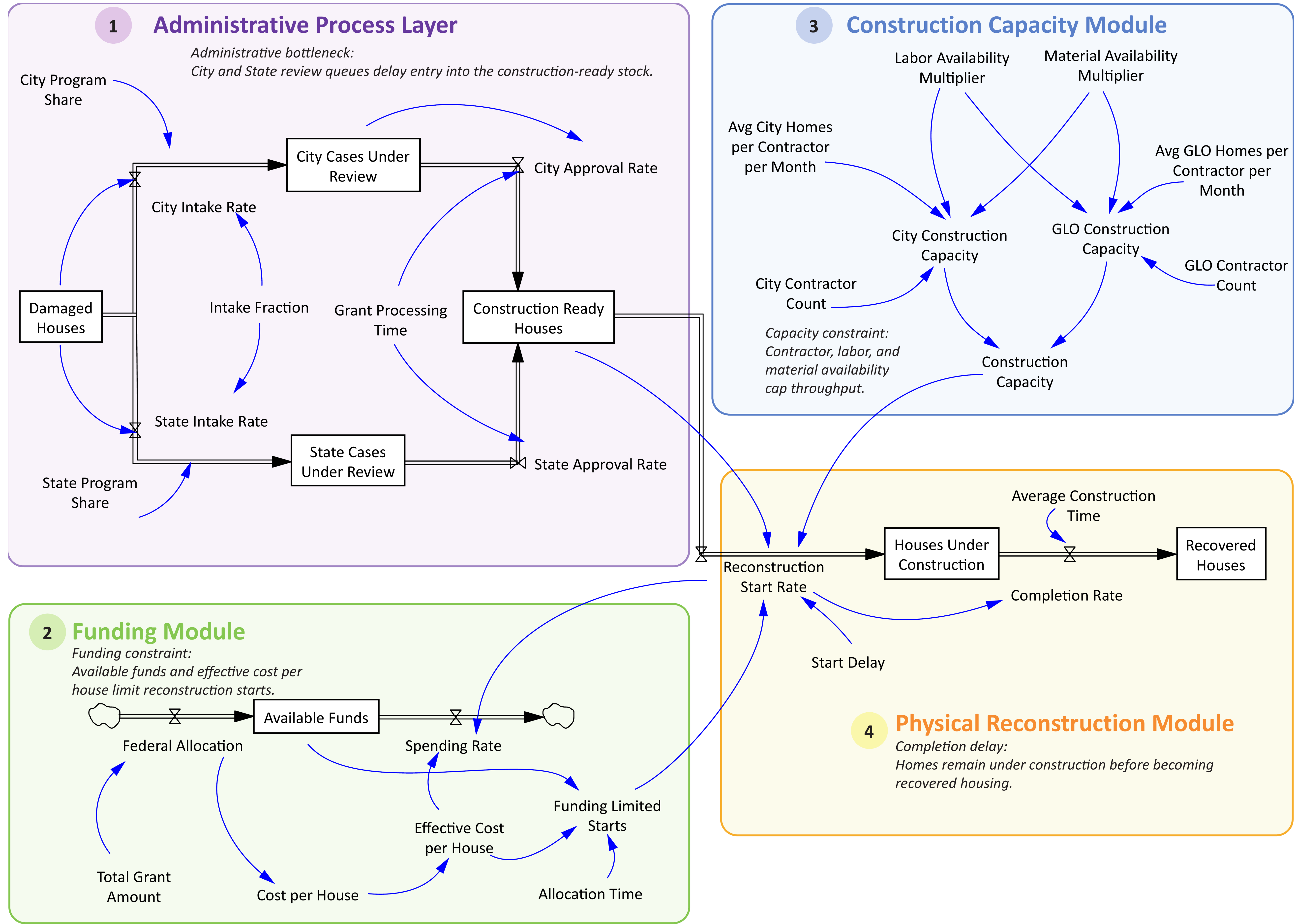
Harvey made landfall on the Texas coast as a Category 4 hurricane in August 2017 and produced catastrophic flooding across southeastern Texas. Long-term housing recovery then required households to pass through intake, eligibility review, funding, contractor assignment, construction, and completion. A snapshot of damage and dollars cannot show where this pipeline slows.

Why System Dynamics?

System Dynamics represents accumulated cases and resources as stocks, movement between stages as flows, and program rules as constraints and delays. This makes it possible to test the whole recovery process over time and identify whether administrative processing, funding, construction capacity, or completion delay is controlling outcomes.

Research question: Which constraint controls the number and timing of completed owner-occupied reconstructions over 60 months?

System Dynamics model of the CDBG-DR reconstruction system



Documented inputs + parameters

- 22,476 documented unmet-need cases
- \$562.28M documented HAP budget
- Month 6 funding pulse (simplified timing)
- \$270,000 modeled effective cost/home
- 400 homes/month modeled capacity
- 4-month contract-informed delay

Baseline diagnosis

2,080

model-supported completions by month 60
(9.26% of documented unmet need)

FUNDING IS BINDING

Start rate = MIN
(administrative readiness, funding-limited starts, construction capacity)

Peak funding-limited starts: 326 homes/month
Construction capacity: 400 homes/month

Unit cost changes recovery scale.
Funding timing changes recovery pace.

Implications for recovery planning

Scale

Budget and effective cost per home determine the ceiling on completed homes. A 20% lower cost raises completions to 2,603; a 20% higher cost lowers them to 1,735.

Pace

Funding timing does not change the final ceiling, but it changes how quickly the program reaches it. The 90% milestone shifts from month 21.25 to 30.25 when availability moves from month 3 to month 12.

Next step

Calibrate provisional inputs against observed applications, approvals, obligations, disbursements, starts, and completions. The calibrated model can then compare policy scenarios before implementation.