Concepts, Perspectives and

Practice of Resilient City Financing

with Case Studies and Prospects

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Outline

- Resilience Concepts
- Resilience Perspectives
- Practice of Resilient City Financing
- Case Studies
- Prospects

Resilience Concepts

ENGINEERING Resilience emphasizes the ability and speed a system to bounce back to its original condition after a disturbance.
 A single equilibrium point to which a system is returned.

Adapted from United Nations Human Settlements Programme (UN-Habitat), Trends in Urban Resilience 2017. See Wang, C. and Blackmore, J.M. (2009). Resilience Concepts for Water Resource Systems. Journal of Water Resources Planning and Management, 135/6: 528-554.

Resilience Concepts

ECOLOGICAL Resilience recognizes that systems can have multiple stable states that evolve and change—assuming the system remains functional—and values both persistence and adaptability.

Multiple equilibria to which a system returns or even evolves into new equilibria.

Adapted from United Nations Human Settlements Programme (UN-Habitat), *Trends in Urban Resilience 2017*. See Holling, C.S. (1973). Resilience and Stability of Ecological Systems. Annual Review of Ecology and Systematics, 4: 1-23. and Wu, J. and Wu, T. (2013). Ecological resilience as a foundation for urban design and sustainability. In: S.T.A. Pickett, M.L. Cadenasso, and B.P. McGrath (eds). Resilience in Urban Ecology and Design: Linking Theory and Practice for Sustainable Cities. Dordrecht: Springer, 211-230.

Resilience Concepts

SOCIAL-ECOLOGICAL Resilience "incorporates the idea of adaptation, learning and selforganization in addition to the general ability to persist disturbance" thereby capturing the ability of people transform their surroundings.

No true equilibrium as systems adapt and evolve through human intervention.

Adapted from United Nations Human Settlements Programme (UN-Habitat), *Trends in Urban Resilience* 2017. See Folke, C. (2006). Resilience: The emergence of a perspective for social-ecological systems analyses. *Global Environmental Change*, 16/3: 253-267.

Social-Ecological Resilience Features

Social-ecological resilience can be measured by: The *amount of disturbance* a system can absorb and still remain within the same state; The degree to which the system is capable of self (re)organization, and; The ability to build and increase the capacity for learning and adapting.

Adapted from United Nations Human Settlements Programme (UN-Habitat), *Trends in Urban Resilience 2017*. See Carpenter, S., Walker, B., Anderies, J.M. and Abel, N. (2001). From Metaphor to Measurement: Resilience of What to What? *Ecosystems*, 4: 765-781.

Resilience Concepts Compared

	NUMBER OF EQUILIBRIUMS	MEASURE FOR RESILIENCE	NATURE OF DISTURBANCES	EMPHASIS	
Engineering resilience	one	speed of return to the single equilibrium	 predictable external shocks 	 resistance and recovery efficiency, predictability 	
Ecological resilience	multiple	magnitude of shocks that can be absorbed, before the threshold to enter a new equilibrium is crossed, as well as degree of self-organisation and capacity for learning	 predictable and unpredictable external shocks 	 persistence adaptability, flexibility resourcefulness, efficiency, diversity 	
Social- ecological resilience	none, continuously changing	magnitude of shocks and stresses that are continuously absorbed, as well as advanced degree of self-organisation and capacity for learning by social-ecological systems	 predictable and unpredictable internal and external shocks and stresses 	 persistence adaptability, flexibility human potential to transform its surroundings (human agency) 	

Source: United Nations Human Settlements Programme (UN-Habitat), Trends in Urban Resilience 2017 at 5.

Cities Must Finance Resilience



Source: Global Facility for Disaster Reduction and Recovery https://www.gfdrr.org/sites/default/files/publication/Cities%20small.png





Increase in the variety and complexity of necessary project measures

Source: Jeb Brugmann (2011), Financing the Resilient City: A Demand-driven Approach to Development, Disaster Reduction and Climate Adaptation – An ICLEI White Paper, ICLEI Global Report, Bonn, page 18. This image adapted from Jeb Brugmann 2012), Financing the Resilient City, Environment & Urbanization, 24(1): 215–232, p. 223. *Assuming there are investors willing to take the risk.

ncrease in financial risk or uncertainty about real equiring non-conventional or non-market finance

returns

Value Capture as Low Risk, High Return



Jeb Brugmann 2012), Financing the Resilient City, Environment & Urbanization, 24(1): 215-232, p. 225.

What is Value Capture?*



Source: Adapted from Hong and Brubaker 2010.

*If you don't know you need to attend more RMLUI conferences.

What is Value Capture?*



Source: Peter Newman, Sebastian Davies-Slate, Evan Jones (2017). The Entrepreneur Rail Model: Funding urban rail through majority private investment in urban regeneration. *Research in Transportation Economics* 2017: 1-10

*If you don't know you need to attend more RMLUI conferences.

Resilience Value Capture

Applications

- Transfer of Development Rights
- Innovative Bonds that Capitalize savings and indirectly capture value by protecting it.
- Impacts fees
- Special assessments

Transfer of Development Rights

Money (\$\$) From Sale of Rights

Source: Arthur C. Nelson et al., (2011) The TDR Handbook. Island Press.

TDR Applications

Preserve open space Protect Wildlife habitat **Maintain Rural Character** Maintain Agriculture/Forest **Environmentally Sensitive Lands Infrastructure Capacity** Historic Preservation Low Income Housing Recreation **Renewable energy**

Source: Arthur C. Nelson et al., (2011) The TDR Handbook. Island Press.

New Jersey Pinelands Regional Approaches

Transfer of development rights Onsite density transfer/clustering Land banking Purchase of development rights Acquisition through impact fees Wetland protection/mitigation Land donation acceptance



https://smartgrowth.org/wp-content/uploads/2016/10/nj-pinelands.jpg

Limitations of TDRs in Practice

- Unnecessarily bureaucratic and complex
- Not regional → mostly within jurisdictions
- Does not lead to public ownership of important land though land donation possible
- Few (no?) regional resilience strategies using TDRs.
- Groundwork is laid for the next generation.

Federal Role → FEMA

HAZARD MITIGATION GRANT PROGRAM







\$14 billion and counting \rightarrow Up to 75% matching grants for:

Acquisition, demolition, relocation, reconstruction, or elevation of homes;

- Wind, wildfire, or earthquake-related structural retrofits of residences;
 - Local mitigation of flood and drought via projects include flood storage, green infrastructure, floodplain restoration, related.
- Local hazard mitigation plan required.
- Charlotte NC case study.

https://charlottenc.gov/StormWater/Flooding/Pages/FloodplainBuyoutProgram.aspx

Up to \$10 million/project & up to 75% federal match for "resilient infrastructure." Funds capital infrastructure projects that

"reduce risks, prevent loss of life, and lead to significant savings by reducing damage from natural disasters and lowering NFIP [National Flood Insurance Program] premiums". Local hazard mitigation plan required.

Funding for projects and planning that mitigate/eliminate long-term flood risk to NFIP-insured structures.

\$300 million and counting. Funding for mitigation of flood risk for structures as well as "projects addressing flooding on a community level" Local hazard mitigation plan required.

Bonds for Resilience

- Green Bonds
- Climate Adaptation Bonds
- Environmental Impact Bonds
- Local governments issue bonds, investors provide the capital, and taxpayers/ratepayers repay the investors over time with interest which can be **tax exempt**.

Green Bonds

- Green bonds use the private market to finance projects and infrastructure such as →
 - Renewable energy, pollution reduction, transportation innovations
- Financed through standard bond underwriting.
- Local governments capitalize the savings to local budgets between standard and green projects to help pay for often more expensive "green" projects.
- San Francisco >\$1 billion.

Climate Adaptation Bonds

- Use standard bond underwriting to use capitalized savings or new revenue streams for →
- Water-efficient technology.
- Wind-, flood-, and heat-resilient building materials for both new and retrofitting.
- Infrastructure upgrades.
- Development relocation.
- European Bank of Reconstruction & Development.

Environmental Impact Bonds

- EIBs finance water, green and natural infrastructure connected to flood resilience, climate adaptation, or water quality.
- Performance targets are established.
- If metrics meet or exceed targets, investors get a higher bonus return derived as a share of local government savings.
- If targets are not met, investors receive standard return because local government is not saving.
- Atlanta, DC, Baltimore examples.

Bond Financing Options

- Long term infrastructure cost savings can be capitalized into higher bond issues.
- Property value protection can lead essentially to inelastic market response.
- Protecting communities from adverse outcomes can unlock new development.
- New development can pay impact fees used to help finance the bonds.

Impact Fees

To the extent that public investments in resilience have metrics allowing for level of service, service areas, and attribution of costs to new development with corresponding benefits to new development, **impact fees** can help.

Special Assessments

Special assessment districts can internalize the cost of **property value preservation** through a variety of formulas.

Pricing Risk

U.S. counties facing the greatest risk from earthquakes, hurricanes, and other catastrophes have the highest and quickest rising home values.

	Homes	Average home value	Appreciation	n since 2012
Very high risk	19,674,094	\$325,187		55%
High risk	14,126,981	237,228		43
Moderate risk	13,201,595	219,985		40
Low risk	11,856,646	247,222		35
Very low risk	12,422,535	223,375		30

Source: Attom Data Solutions

Source: https://www.greenbiz.com/article/next-year-resilience-will-become-new-normal

Bloomberg 💵

Property Assessed Clean Energy (PACE) Financing

- Innovative method to finance energy efficiency and renewable energy on private property.
- Special district created and issues bonds to fund PACE improvements for enrolled properties.
- Property owners repay over 10-20 years through special assessments secured by the property and paid as part of the property tax.
- By 2019, 200,000 homeowners, \$5 billion invested in California, Florida, Missouri.

Source: https://www.energy.gov/eere/slsc/property-assessed-clean-energy-programs

Prospects

• If resilience investments create value \rightarrow

Recapture it or leverage it.

 In NYC, properties that overlook green roofs pay higher rents →

Increase supply by capturing the incremental value and using it to subsidize new green roofs.

 We should create a resilience value capture bounty for scalable ideas.

Prospects → Expand PACE

- PACE works but it is **limited** to energy efficiency.
- PACE could be **expanded** to resilient infrastructure investments in hazardous areas.
- Financing would be similar, through special assessments on benefiting property.
- However, unlike the current PACE, all property in the assessment district would need to be assessed.

Expanded PACE on Steroids

- PACE regular and expanded imposes assessments on benefiting property.
- It may be in states' interest to encourage PACE and PACE⁺ through →
 - State loan guarantees
 - At tax exempt/double tax-exempt rates
- The Federal government could create mechanisms to encourage state support of PACE and PACE⁺ but leaving implementation to the states.

May you live long and be Resilient

Exploring Local Disaster Resilience Funding Options

(abridged version)

John Travis Marshall Associate Professor Georgia State University College of Law

(with thanks to Arthur C. Nelson, Julian Juergensmeyer, and Donovan Finn)

Rocky Mountain Land Use Institute

March 5, 2020



Funding and financing local climate resilience initiatives looms as major challenge

- 21st Conference of Parties (COP21), which yielded the 2015 Paris Climate Accord, participating countries highlight funding for climate resilience projects as a major challenges for national and subnational gov'ts (Banahan)
- U.S. climate adaptation initiatives are slow-paced and insufficient (Milne)
- Few adaption plans set forth the necessary funding strategies to complete adaptation projects (Rosenbloom, 2013)
- Common local gov't 'playbook' for financing projects not adequate to address climate change challenges (Rosenbloom, 2013)



Disasters Have <u>Also</u> Taught That Local Recovery Is Slow and Greatly Underfunded

- Federal recovery funds arrive slowly . . .
- A fraction of the community's "bill" for longterm recovery is covered by private insurance, flood insurance, federal grant funds, and philanthropic dollars.
- Who suffers most?





(Photos from left: AFP/Getty Images (9.2.05); Colo. Springs Gazette





Superstorm Sandy (2012) & Hurricane Harvey (2017) Unmet Needs Estimates

Superstorm Sandy Unmet Needs: New York City

- \$9.2 billion in unmet needs, including:
 - repair & mitigation for affordable housing units
 - enhanced coastal protection for neighborhoods
 - stormwater management & green infrastructure

	Hay	mat Need Refere	6	Of which accordated				Mar	d Covered	
	UIII	net weed before	L '	or which, associated				INCO	a covered	
Category		CDBG-DR		with Resiliency	% of Total	CD	BG-DR Funding*	by	CDBG-DR	
Housing		5,300,000,000		1,000,000,000	39%		2,968,056,000		56%	٦
Business		2,400,000,000		200,000,000	18%		91,000,000		4%	
Infrastructure*		4,900,000,000		3,600,000,000	36%		515,420,000		11%	
Other City Services		900,000,000		50,000,000	7%		336,580,000		37%	
	\$	13,500,000,000	\$	4,850,000,000		\$	3,911,056,000		29%	
					Planning/Ad		287,820,000			
							4,198,876,000			
								4	(10

Table: CDBG-DR Allocations in Relation to Unmet Need (\$ in '000s)

Superstorm Sandy (2012) & Hurricane Harvey (2017) Unmet Needs Estimates

Superstorm Sandy Unmet Needs: New York State

- \$15.2 billion in unmet needs, including:
 - Repairs to rental and homeownership units
 - Mitigation initiatives including home elevation, critical systems (e.g., HVAC) elevation
 - Small business and seasonal business assistance

Table 2: Estimate of Unmet Needs for Hurricane Irene, Tropical Storm Lee and Superstorm Sandy in Millions (excluding New York City)

	AP/	415	APA15 (w/ HUD Construction Cost Multiplier)			
	Unmet Need (Based on HUD Allocation Methodology)	Unmet Need (Based on NYS Methodology)	Unmet Need (Based on HUD Allocation Methodology)	Unmet Need (Based on NYS Methodology)		
Housing	\$1,294	\$1,294	\$1,863	\$1,863		
Economic Development	\$476	\$476	\$685	\$685		
Infrastructure	\$1,719	\$12,672	\$1,719	\$12,672		
Total	\$3,489	\$14,442	\$4,267	\$15,220		



5

Source: GOSR Programmatic Data (November 2016). HUD high construction cost multiplier of 1.44 applied after state interventions for housing and

Superstorm Sandy (2012) & Hurricane Harvey (2017) Unmet Needs Estimates

Hurricane Harvey Unmet Needs: Harris County

- \$12.9 billion in unmet needs, including:
 - Rental and homeownership repairs
 - Residential and commercial property buyouts

6

Neighborhood drainage systems

Category	Losses/Gap	CDBG-DR Investments*	Other Known Investments	Remaining Unmet Need	
Housing	\$7,458,498,829	\$837,097,816	\$3,671,644,866	\$2,949,756,147	
Owner-Occupied Housing	\$1,729,324,743				
Residential Property Insurance/TX Windstorm	1,644,387,050		\$1,411,214,085		
National Flood Insurance Program	\$1,894,715,877		\$1,894,715,877		
Other Housing and Disaster Related Expenses	\$760,850,000		\$65,000,000		
Rental-occupied Housing	\$628,287,775				
Public Housing Authority Housing	\$933,384		\$714,904		
Harris County Buyout Program (Pub L. 115-31)	\$800,000,000		\$300,000,000		
Infrastructure	\$10,868,969,302	\$222,519,672	\$698,910,323	\$9,947,539,307	
FEMA Public Assistance	\$868,774,302		\$679,910,323		
Rebuild Texas	\$10,000,195,000		\$19,000,000		
Grand Total (Housing	640 227 460 424	64 050 C47 400	ÉA 370 FFF 480	640 007 00F 4F4	

Thoughtful pre-disaster housing & community development programs pay post-disaster dividends – 6 examples

Community Development Investments Matter

Neighborhood assets can improve the futures of children and families



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> GeorgiaState University: OF LAW

1. Neighborhood preservation & affordable housing initiatives jump start recoveries

- Ample regional housing stock is a key to recovery.
- Consider whether there's balance between homeowners and renters.
- Good rental housing options essential for first responders, teachers & service industry.
- Older homes, if suffering from deferred maintenance, can see post-disaster repair costs exceeding home values
- Vigilant code enforcement helps prevent dilapidation AND [ideally] serves as possible lever to secure title to abandoned properties and redevelop neglected structures and lots as affordable housing.





2. *Temporary* housing is critical to communities' recovery

- Site control often biggest obstacle
- Allows displaced families to return home immediately.
- Frees hotels for housing contractors and other construction workers
- Post-disaster short-term housing options should be memorialized in local planning documents.
- Short-term housing can be repurposed for community needs as residents move back home



GeormaState

COLLEGE



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DEVELOPER MITIGATION OF IMPACT ON NEED FOR CLIMATE CHANGE INFRASTRUCTURE

LEGAL STANDARDS

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EXACTIONS

- I follow the practice of most lawyers and planners in using the term "exactions," even though I lament the negative vibes that the term emits.
- A more appropriate label for developer funding of infrastructure requirements that are nexus based, proportionate, and used to internalize the costs of development rather than pass them on to local governments and their taxpayers would be something like" proportionate share mitigation requirements." On the other hand, if the costs of providing new infrastructure is passed on to the local taxpayers, it is they who are being "exacted" from by being required to subsidize developer profits.

ALTERNATIVE ANALYSIS: VALUE CAPTURE

- "Value capture refers to the recovery by the public of the land value increments (unearned income...) generated by the actions other than the landowner's direct investments....Although all such increments are essentially unearned income, value capture policies focus primarily on the increment generated by public investments and administrative actions, such as granting the permission for the development of specific land uses and densities. The objective is to draw on publicly generated land value increments to enable local administrations to improve the performance of land use management and to fund urban infrastructure and service provisions. The notion is that benefits provided by governments to private landowners should be shared fairly among all residents." Martim, Smolka
- In the U.S. the concept is primarily implemented through impact fees and transferable developments rights although the former focus on infrastructure costs associated with new development rather than the value created by development permission for the developer

LEGAL STANDARDS

- There is no reasonable distinction among in-lieu fees, mitigation fees, and impact fees. All are fees charged by government as a condition for land development approval (as distinguished from charges such as user fees and taxes, discussed below). All are embraced by the Court's term "monetary exaction," and thus all are now subject to the nexus and proportionality requirements of *Nollan* and *Dolan*.
- Professor David Callies

THE NOLLAN/DOLAN TEST: DUE PROCESS

The Nollan-Dolan Two Pronged Nexus Requirement

- First, an "essential nexus" must exist between the asserted legitimate state interest" and the permit condition imposed by government. Nollan v. California Coastal Comm'n.; Dolan v. City of Tigard.
- Second, if the required nexus to a valid public purpose exists, the court must then analyze the "degree of connection" between the exaction and the "projected impact" of the proposed development. There must be "rough proportionality" between the two. *Dolan*..

DUAL RATIONAL NEXUS TEST

A rational nexus between the need for additional capital facilities and the growth in population generated by the development; and



A rational nexus between the funds collected and the benefits accruing to the development itself.

DUAL RATIONAL NEXUS TEST

Developer provisions may be no more than the government's infrastructure costs that are reasonably attributable to the new development, and



The new development must benefit from the expenditure of the required developer provisions.



- Can Developer Mitigation Requirements Play a Role?
- If So, What About Existing Deficiencies?