

Future Impacts of Climate Risks, Challenges for Adaptation Policy

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Key Question:

*Are countries capable of long-term planning and **timely implementation** of adequate adaptation measures in face of **dynamic risk** from **multiple climate hazards** across decades?*

Currently:

- Some active planning, considerable conversation
- The focus is *not* comprehensive, very uneven as to hazards and vulnerabilities
- Relatively little implementation (compared to magnitude of risk)

Why So, and what can be done about it?



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Focus on two hazards:

- Coastal risk from long term sea level rise and extreme events (storms)
 - >>>Late 20th century “hundred-year” flood level attained ***annually*** at many locations by 2050, most locations by 2100 (IPCC SROCC report)
- Periods of extreme heat due to long term warming
 - >>>Preindustrial “fifty-year” heat event occurs now every 10 years, at 1.5°C every 6 years, at 2°C every 3 1/2 years, and at 4°C nearly every year (global average, over land).
- Most of the lessons drawn from these are applicable to other hazards increased by climate change.

General lessons for dealing with dynamic risk

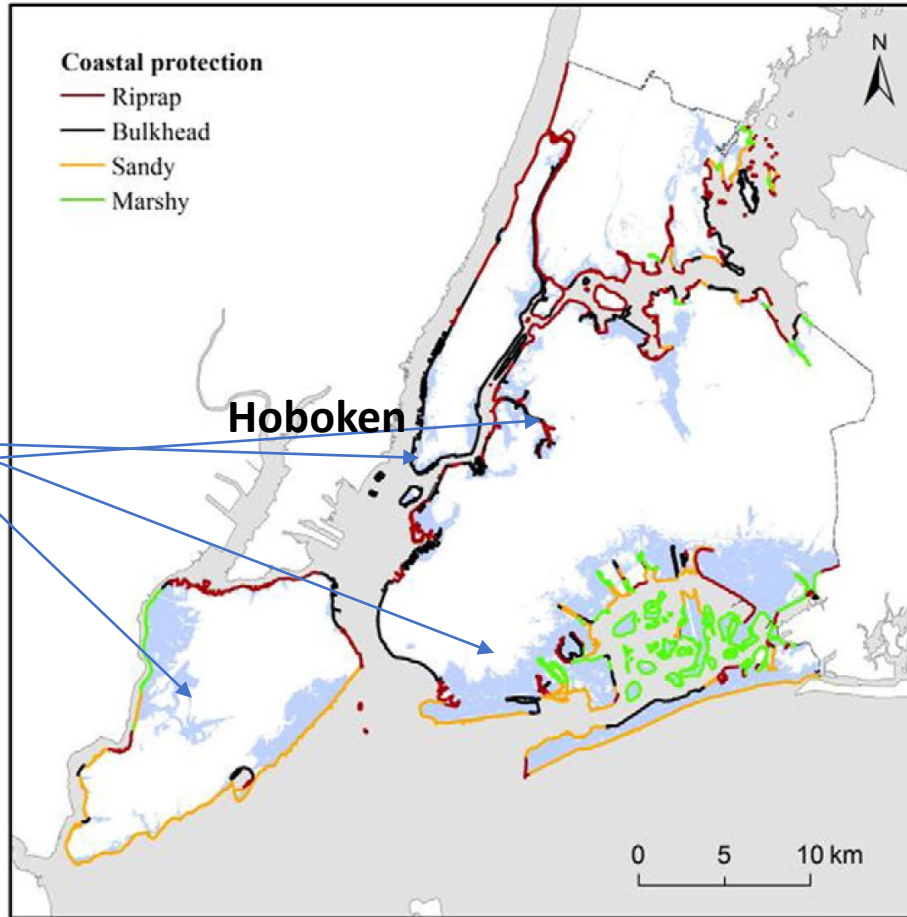
- Uncertainty is not a valid reason for inaction:
 - >> There is little uncertainty in 2050 sea level rise or temperature
 - >> Since typical time from conception of large-scale protection to its completion can be 30 years or more, the time to begin to implement adaptations aimed at 2050 risk is *now*
- However, implement flexibly to allow course correction during 2050-2100 time frame
- Inequity in outcomes (who benefits from implemented adaptation measures and who doesn't) is often the default situation. To make outcomes fair requires ongoing attention and engagement with stakeholders.

Comparison of NYC and Shanghai Preparation for similar tropical cyclone surge

Historical record flood levels: Sandy~1/300yr event, Winnie ~1/100yr event

NYC

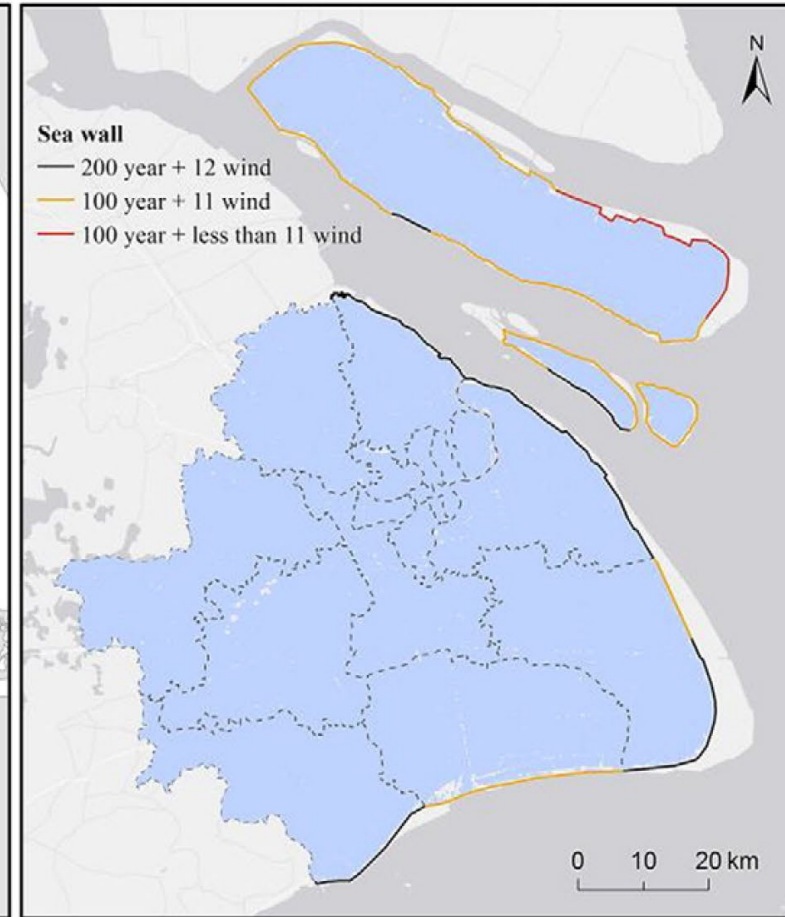
Hurricane Sandy Inundation (2012)
(Blue area flooded as surge exceeded protection)



a

Shanghai

Typhoon Winnie (1997)
(Blue area would have flooded if no protection)



b

Xian et al, Science of The Total Environment
610-611, p.1251-1261



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Coastal Protection NYC and Shanghai



**Protection for Manhattan
was static for many decades
before Hurricane Sandy**



**Protection for Shanghai
had improved after typhoons
in 1962, 1974, 1981**

Hoboken (New Jersey) subway station 2012 - - - and 1992



Hurricane Sandy (2012)



Northeast Storm (1992)

This and several earlier near misses did not result in comprehensive protection



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Comparative responses/policy barriers

- **Psychology:** people, and often institutions, have short memories but disaster stimulates action: Shanghai experienced 3 events, high exposure, hundreds of deaths.
 - >>>1953 North Sea Storm (thousands of deaths) stimulated construction of Thames Barrier and modern defenses in Netherlands
- **Governance structure:** federalism has its advantages, but multilayer federal system separates **revenue** from many adaptation implementation obligations (e.g., US)
 - >>>UK, China have more unitary governance
- **Perverse political incentives** often favor spending money on post-disaster clean-up rather than *ex ante* prevention and adequate incentives from household insurance



Such complex situations too often lead to unfair outcomes

- Adaptation to extreme heat largely privatized but the public component, e.g., siting cooling centers, is rarely implemented with a view toward assuring access for vulnerable populations (three-city US study).
- Several government flood programs have had inequitable outcomes, one of these due to blind use of cost-benefit analysis (this may now be changing) forcing relocation
- Sometimes efforts to avoid harming those vulnerable in one dimension produce maladaptive consequences in another: recent NYC experiences with flooding of illegal basement apartments in wake of remnants of Hurricane Ida (2021). Lack of code enforcement appears to have been an unfortunate way to deal with a housing crisis.

Some fixes, none easy

- **Finance:** Episodic availability of funding tied to disaster assures we will never catch up with changing risk. Need continuous stream of long term finance to underwrite need for long term planning and implementation.
- **Governance structure:** renovate/transform so as to assure local/regional/central governments coordinate planning, finance, implementation of adaptation.
- **Institutional arrangements** within governance levels: Need permanent adaptation bureaucracy to maintain institutional memory
- **Insurance** provision and enforcement need reorganization to include household resilience investment incentives. Otherwise either governments become payer of last resort or people are simply cut loose. Neither is sustainable.
- **Perverse political incentives?: transformative approach to adaptation needed**

