



Urban Flood Management: Towards A Holistic Approach

Ecological Considerations: Why go this far?

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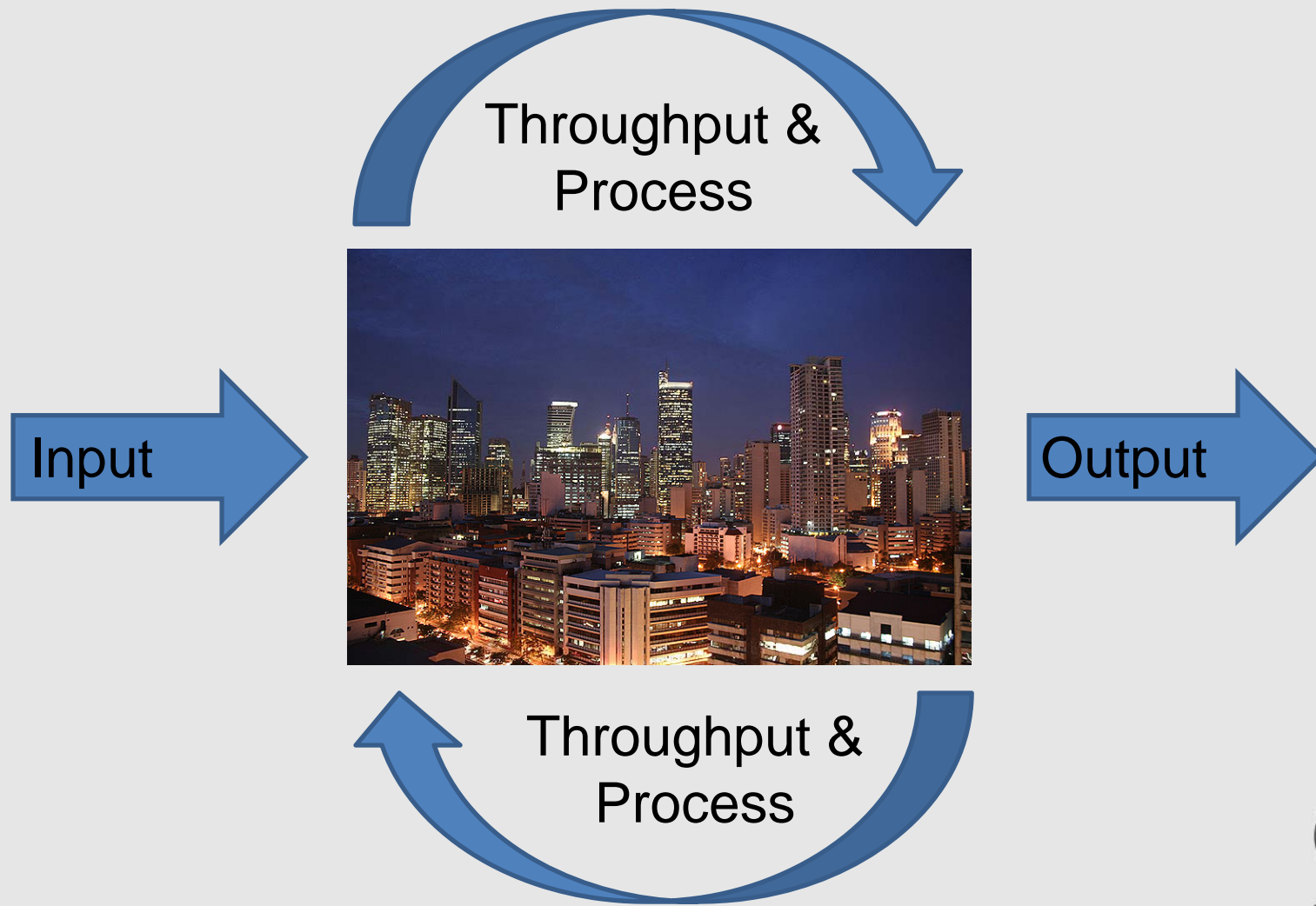
"A true report of certaine wonderfull ouerflowings of Waters, now lately in Summerset-shire, Norfolke and other places of England: destroying many thousands of men, women, and children, overthrowing and bearing downe whole townes and villages, and drowning infinite numbers of sheepe and other cattle"

Quote of Edward White, 1607 [1]



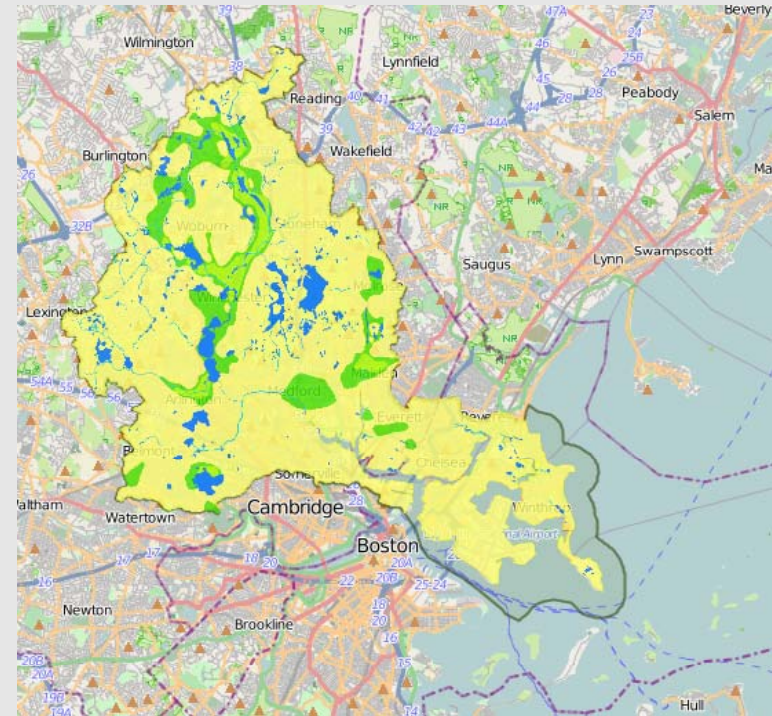
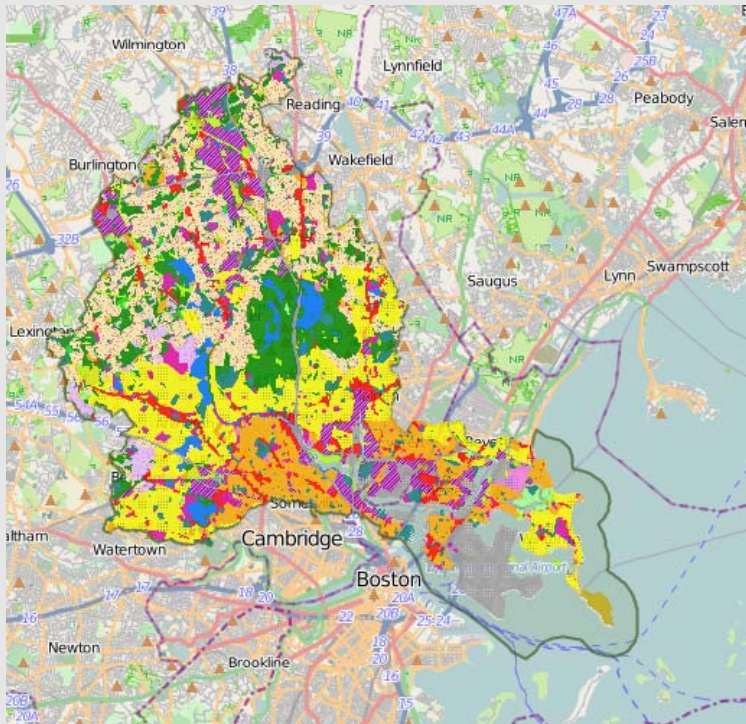
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Cities: "Metabolic" Units



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“Natural” and “Built” Urban Watershed



Mystic River Watershed, Boston, USA [3]

Ecological transformation....?



THAILAND.... OCTOBER 2011



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[4]



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Lessons Learnt from Thailand

- Combine **traditional knowledge & modern technology**
- Aim at **long-term social and economic benefits** -
Short-term financial benefit is not sustainable
- **Holistic approach** in planning and management –
prevention + adaptation + coping + mitigation
- **Institutional reforms for cross sectoral engagement
are urgent**
- More **applied research – prediction and response**
- **Increase ability to cope** with flooding consequences
– flood protection and resilience measures for all
entities (incl. industry)



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TROPICAL STORM 'ONDOY' – SEPTEMBER 2009



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Tropical Storm 'Ondoy' – Lessons Learnt

- More **comprehensive urban planning** (last Master Plan from 1900s)
- **protection of natural urban watersheds**
- Adequate weather alert system
- property development regulations
- solid waste management system
- civil-defence planning
- permeable materials for road lining



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CHERRAPUNJI, INDIA
“catchment dilemma”



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Cherrapunji



watershed ignored !

- 12'000 mm annual rainfall
- High water scarcity
- No rainwater collection
- Heavy deforestation
- Depletion of water levels due to:
 - unscientific coal mining and stone quarrying
 - unregulated use of groundwater



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Lessons Learnt from Cherrapunji

- Use **rainwater** as a **water (re)source**
- Revival of **traditional** rain water storage supplemented by **improved modern technology**
- **Regulation** of groundwater use
- **Equitable distribution** of water
- High economic impacts of un-sustainable **behavior** and **consumption patterns**

Ecology matters!



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**MUMBAI 26 JULY 2005,
THE MITHI RIVER**



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[9,10, 11]



Lessons Learnt from Mumbai floods and the Mithi River

- **Protection of surface water bodies** and natural drains is crucial for flood protection
- **Integrated solid waste and wastewater management** is necessary to prevent additional sedimentation and clogging
- **Bio accumulation** of pollutants leads to severe health issues for the local population
- **Urban poverty and natural water drains – the dichotomy**

Natural and Social Ecology matters!



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Common threads

high mitigation costs..... **Choking** natural “breathing ability of cities”.....uncontrolled development ..natural flood defenses hit....increase in impermeable surfaceshigh densities .. **Ageing**, limited or poorly maintained drainage, sanitation and solid waste **infrastructure**.... over-extraction of groundwater ..land subsidence .tenure laws.....prevailing weakness in coping abilities....regulations weak or violated**natural watershed**

Ecology scribbled !



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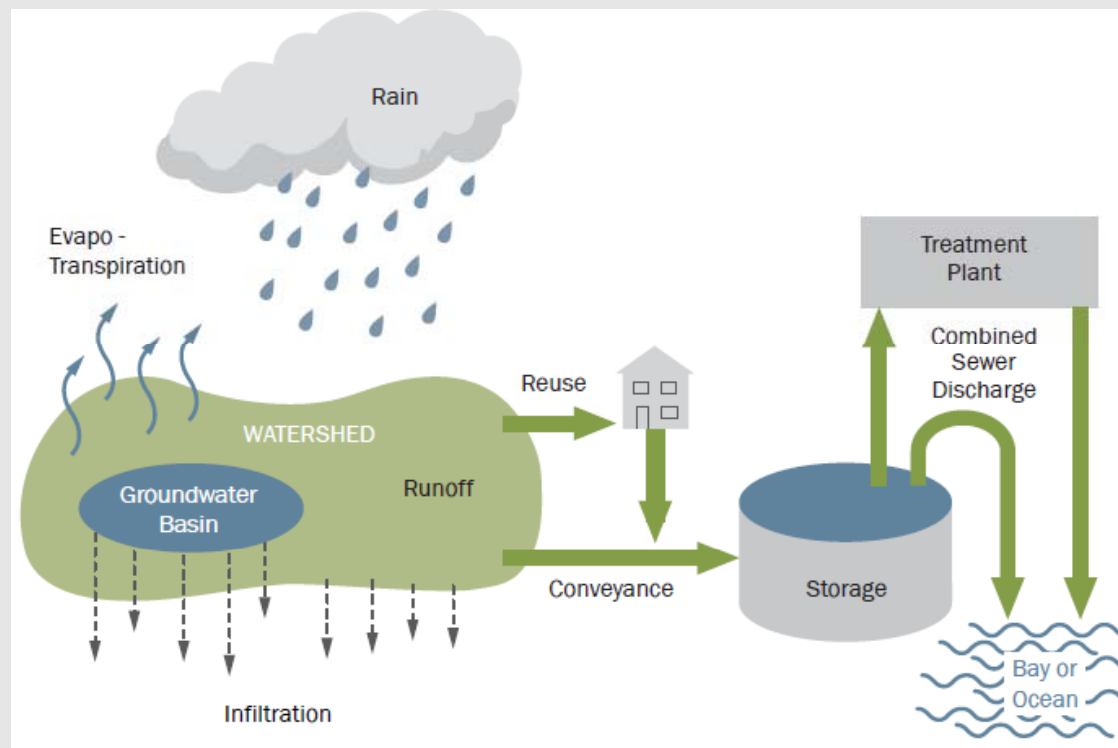
**SAN FRANCISCO..... URBAN
WATERSHED FRAMEWORK –
a new approach to urban water management**



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San Francisco: Key Challenges

- Aging water & sewerage infrastructure
- Regional seismic activity
- Flooding, sea level rise
- Benefits to impacted communities
- Economic and environmental Sustainability



San Francisco: Holistic Approach

- Watershed characterization
- Screening watershed alternatives for collection system goals - balancing **green** and **grey** solutions
- **The triple bottom line** – sustainability analysis - to optimize financial, social and environmental benefits.
- **Communities transparency** in option selection
- **Recalibration** of the hydraulic and hydrologic model
- **Risk based asset management** – using performance based green infrastructure
- **Institutional balance** – Water, Power, Sewer – San Francisco Public Utilities Commission



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San Francisco: grey and green solutions

- Collection systems in streets/parking lots
 - Permeable pavements
 - bioretentions planters
- Building collection systems
 - Green Roofs
 - Underground detention basins
- Collection system projects applied in large spaces
 - Bio retention basins
 - Rain gardens
 - Wetlands



References

- [1] *Newes out of Summerset shire*, originally printed in 1607 for Edward White, reprinted by Ernest E. Baker in 1884, wood cut.
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- [4] U.S. Marine Corps photo by Cpl. Robert J. Maurer
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- [6a] Theresa S. Samaniego, *Turning disaster prone metro into a safe, sustainable haven*, Philippine Daily Inquirer, 10 August 2012.
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