Resilient Design: The Regional & Urban Scale

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....4 takeaways

1. What does Resilient Design mean and why is it important to my practice of architecture and regional and urban design?

2. What is the relevance of resilient design in solving for climate change challenges such as drought, flooding and sea level rise?

3. How do I adapt my practice to include Resilient Design?

4. What are some examples of Resilient Design at the larger scale?
1) What does Resilient Design mean and why is it important to my practice of architecture and urban and regional design?

...resilient design means your design solutions can adopt and adapt to changing conditions. Change is the only constant.
"natural disasters are snapshots of expected long term changes."

D. Williams Fau “Sea Level Rise Conference

Andrew 92’ $30 billion

Katrina 05’ $108 billion

Sandy 12’ $150 billion...+
wind & form
too much water and not enough water. **CHALLENGE:** design solutions that *increase storages* while providing walkable, sustainable communities that are resilient to sea-level rise and mitigate wind damage.

**flooding & drought**
2) What is the relevance of resilient design in solving for climate change challenges such as drought, flooding and sea level rise?

...climate change challenges fall into 2 headings: the first is how does your design reduce/eliminate carbon pollution - therefore slowing the acceleration of global warming; secondly, the design must solve for those impacts that are occurring or will occur?
CHANGES

- change in weather patterns – flooding & drought
- change in productivity zones
- reduction of terrestrial land mass
- loss of arable lands for food.
- changes to biomes
- exponential increase in carbon loading
- increases to carbon footprint in developing countries
- exponential population growth

...this is not the final pattern ...

educate – adopting, adapting, and resilience.
reality check......

6,366.0 = Radius of Planet (km)

509,264,182.6 = Surface Area of Planet (km^2)

[ 71% Water ]

29% = 147,686,613.0 (available land in km^2)

7,000,000,000.0 = Number of People

21,098.1 = Square Meters Per Person

[ 227,097.9 = Square Feet Per Person ]

5.2 = Acres Per Person

[ 33% desert / 24% mountains ]

so...13,805,153.0 = Earth Arable Land (km^2)

so...21,228.2 = Arable Land per Person (ft^2)

~0.5acre = Arable Land/Person

carrying capacity ~ average water consumption / person / day = 80 gallons = 10cuft or

.00025 acre-feet x 365 x 4 = 1/3 acre of storage for family of 4.
urban design that:

> mitigates flooding and drought.

> is walkable and incorporates micro-climates.

> plans transitional infrastructure and buildable zones to adapt to sea-level rise.

> stores and cleans up stormwater in bio-uptake parks.

> reduces heat-island effect.

> improves public transit.

> establishes regional greenbelt connections.
3) How do I adapt my practice to include Resilient Design?

to do list...

a) learn the climatic-ecological history of your region(s) of practice.

b) connect with groups that are studying and doing applied research that can inform your design and planning work (ipcc, universities, aia/kc).

c) establish inner-office links to government and civic officials (long view planning groups, climate change study groups, post-disaster recovery groups) – lead, get involved.
...at what point do the apparent changes in climate radically change our design approach?

...is this new approach appropriate to the scale of the challenge?

[arrow shows 300 mile change in 16 years]
since natural processes created the present pattern what does it “want to be” when it is informed by changing processes?
1. Carrying Capacity - the total rainfall within the region is that region's water budget.

2. Each landuse spatially contributes its share to the region's water budget.

3. Recycle and reuse stormwater, graywater and wastewater at a rate commiserate with use.

4. Integrate surface and groundwater storage areas into the urban and regional patterns – use gravity.

hydrology for architects
Climate changes have multiple impacts…

The impacts from the loss of terrestrial land will cost trillions of dollars with no net benefit… and the loss of aquifer storage (loss of potable water) to every coastal city in the world.
4) What are some examples of Resilient Design at the larger scale?

Case studies:

**Southeastern Florida Coastal Zone** – sea level rise adaption, Transit, Agricultural Preservation, Sustainable Potable water Storage, Flood Mitigation, Post-Disaster Planning.

**Mississippi River: Ecosystem Services**

Adaption - a gravity powered flood protection, aquifer recharge, agricultural soil rehabilitation and improved navigation system plan.

**Mini Interventions** – small projects illustrating resilient design.
Water, Food & Jobs – Conservation Boundaries

.....smart growth, based on natural resources ability to supply needs......
sustainable regional design process & analysis
1999 AIA HONOR AWARD FOR URBAN AND REGIONAL DESIGN

1 pre-settlement 1900
- high-dry elevations
- resilient to storms
- provide flood protection
- prime aquifer recharge

2 existing conditions conflicts
- growth in flooded areas
- sea level rise and hurricanes
- drained- loss of potable water storage, increase salt water intrusion

3 sustainable principles
- locate where to develop or move population out of harms way.
- increase water storages & local food supply
- t.o.d. / jobs

4 sustainable development 2050...
- design a system-solution
- transportation, aquifer recharge, flood protection, local food and jobs...make incremental steps toward a regional vision.
reduction of land area & aquifer

climate change - sea level rising zone - transition from fresh to salt water ecology.

loss of gravity-fed storm water system

salt water intrusion zone

new tidal ecology

100% flooding of westward communities & agriculture – water / soil chemistry to brackish

significant change in natural system functioning – changes to biome?

population increase but land area decrease

building foundations, roadways, fiber optics... and all drainage systems impacted

the changing conditions
evolving this pattern to adapt to climate change

resilient adaptive land use

+ ecosystem health - reclaim reconstitute wetlands – no build zones

+ protection from climate change impacts:
  water storage in hydric parks

+ increased land value and ecological functioning
a million storages, gravity fed – mitigating flooding and drought.
1) Define community-based disaster resilience for the built environment. **Learn and tell a story about the place, empower the community with the physics and natural system sciences.**

2) Identify consistent performance goals and metrics for buildings and infrastructure and lifeline systems to enhance community resilience. **Function unplugged, net zero +; passive design; 100% walkability.**

3) Identify existing standards, codes, guidelines, and tools that can be implemented to enhance resilience. **GIS mapping of fema impact zones; wetlands protection; preservation and protection of additional green/blue national park systems.**

4) Identify gaps in current standards, codes, and tools that if successfully addressed, can lead to enhanced resilience. **Create new codes are reactive and should be proactive.**
Meeting the challenge of sustainable design.

“Daniel William’s Sustainable Design is . . . a thoroughly practical call for the design professions to take the next steps toward transformation of the human prospect toward a future that is sustainable and sustaining of the best in human life lived in partnership not domination.”

—From the Foreword by David W. Orr, the Paul Sears Distinguished Professor of Environmental Studies and Policies and Chair of the Environmental Studies Program at Oberlin College

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Architects identify “sustainability” as the most important change in the future of their profession. Sustainable Design: Ecology, Architecture, and Planning is a practical, comprehensive guide to design and plan a built environment compatible with the region’s economic, social, and ecological patterns.

In this book, Daniel Williams challenges professionals to rethink architecture and to see their projects not as objects but as critical, connected pieces of the whole, essential to human health as well as to regional economy and ecology. Comprehensive in scope, Sustainable Design answers key questions such as:

• How do I begin thinking and designing ecologically?
• What is the difference between “green design” and “sustainable design”?
• What are some examples of effective change I can make that will have the most impact for the least cost?

Written for architects, planners, landscape architects, engineers, public officials, and change agents professionals, this important resource defines the issues of sustainable design, illustrates conceptual and case studies, and provides support for continued learning in this increasingly central focus of architects’ and urban planners’ work.

Williams’s book features winning projects from the first decade of the AIA’s Committee on the Environment (COTE) Top Ten award program.

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