ArcDR^3 Architecture and Urban Design for Disaster Risk Reduction and Resilience

University of Washington BE 5xx | Urban Design and Planning 508 | Architecture 507

A BE / McKinley Futures Studio Proposal/Preliminary Syllabus for Winter or Spring 2021

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Students: 20-24 anticipated, from master degree programs in Urban Design, Architecture & Landscape Architecture.

EVOLUTIONARY REGENERATIVE SYSTEMS FOR ECOLOGICALLY, SOCIOLOGICALLY AND TECHNOLOGICALLY RESILIENT CITIES: THE CASE OF WESTPORT/SOUTH BEACH, GRAYS HARBOR COUNTY, WASHINGTON STATE, USA

This proposed studio will integrate with both the international inter-university ArcDR^3 Initiative,[1] and a US NSF-funded Coastlines and People (CoPe) Early-Concept Grant for Exploratory Research (EAGER) project on "Coastal Hazard Planning in Time,"[2] as well as on-going collaborative research with partners in Chile (CIGIDEN), Tohoku (IRIDeS), and Kobe University.

What is an 'Evolutionary Regenerative System'?

The studio will explore the concept of "evolutionary regenerative systems" as a particular mode of the Panarchic adaptive cycle: transformative resilience.[3] In this mode of social-ecological resilience, "building back better" includes anticipatory action and preemptive, pre-disaster planning that addresses pressing normative contradictions in a community's current, on-going identity and function. In other words, in anticipating the future impacts of environmental change, the community seeks out opportunities to correct chronic social injustices, ill-being, and ecologically unsustainable practices, and to "re-make" itself according to (re)examined core values. "Identity" is thus viewed as desirably malleable, not overturnable.

What is the Local/Regional Hazard to be addressed?

The Pacific coast and I-5 urban corridor of Washington State faces an estimated 10-15% chance of a major earthquake occurring along the Cascadia Subduction Zone (CSZ) within the next 50 years. Although rare -- with recurrence intervals of 250-500 years to approximately 2,500 years, depending on the magnitude – a CSZ megaquake would resemble such recent events as the 2004 Sumatran, 2010 Chilean, and 2011 East Japan earthquakes and tsunamis. A CSZ megaquake could kill more than 10,000 people and injure over 30,000 throughout the region, with economic losses exceeding $80 billion.[4] The region encompasses major cities and ports and isolated rural communities and indigenous tribes. Cut off from most of the North American continent by the Cascade Mountains and criss-crossed by complex and frequently flooding waterways, the region is vulnerable to a host of co-seismic hazards including landslides and liquefaction as well as tsunamis and seismic subsidence. However, unlike other subduction zones along the Pacific "Rim of Fire", the CSZ is eerily quiet, with long intervals between earthquakes (the last major tsunami-producing rupture occurred in 1700). Tectonic uplift and subsidence, however, is more obvious, and interacts with accelerating sea level rise in dramatic and varying ways at different points along the coast. The studio will make use of highly localized and precise projections of sea level rise as well as advanced models of tsunami inundation and co-seismic subsidence, to explore different time and spatial scales of environmental change and impacts on human settlement.

What are the Project Scales?

The studio will address design at multiple scales in time as well as space. Temporal scales will include (1) short-term projects for life safety in the event of a sudden earthquake and tsunami, including vertical evacuation structures, ground-based evacuation routes, assembly areas, and facilities and infrastructure

designed to support the community through a period of isolation immediately following an earthquake; and (2) longer-term projects that both enhance community well-being and current developmental goals as well as prepare it for possible relocation and resettlement after either an earthquake and tsunami, or long-term sea level rise. The temporal interactions of these different types of hazards will be a key driver of the design, since the impacts of an earthquake-subsidence-tsunami event can vary dramatically depending on when it occurs on the trajectory of sea level rise.

Spatial scales include individual buildings and sites for vertical evacuation structures and other prototypical buildings able to withstand flooding; open space and trail systems; and larger sites demonstrating evolutionary uses of land over time, e.g. uphill forest lands appropriate for camping, ecosystem monitoring and restoration, and ecologically low-impact resort development in the short term that may be adapted for community relocation after a catastrophic event, or retrofitting of existing development in low-lying flood-prone land that may gradually allow for increased encroachment of coastal wetland.

What are your Strategic Definitions?

The studio will adapt and develop a community-engaged, local values-driven and assets-based, historically informed, participatory GIS-supported, multi-hazard scenario planning workshop and charrette protocol that has already been initiated in the community.[5] Basic parameters have already been incorporated into recommended updates to the community's Comprehensive Plan. As part of the NSF CoPe EAGER project with which the studio is integrated, students will work with community participants using data rich hazard scenarios based on a state-of-the-art geo-scientific probabilistic logic tree of CSZ rupture, and site- and community-scale virtual point-cloud models and immersive visualizations of the existing environment, to develop detailed design concepts that express new geonarratives that community participants hope to tell of future natural and built environmental change.

What is the impact of your Site Selection?

The participating community partner is South Beach and Ocosta School District in Grays Harbor County, Washington State, including Westport, a municipality of just over 2000 people but home to one of the USA's top 5 or 10 commercial seafood landing ports. Highly exposed to tsunami hazards, Westport sits at the end of a low-lying peninsula of mostly sand. Despite having a median household income that is barely more than half that of Washington State, the community has already demonstrated remarkable political will and social capital by constructing North America's first tsunami vertical evacuation structure at its local school campus in 2015-2016 – a project it funded entirely from its own local school district property taxes, without subsidy from the state or federal governments. Now, thanks largely to the trail-blazing spirit of this community, the Federal Emergency Management Agency has begun to fund such structures. Beginning in 2018, incorporation of broader hazard resilience into Westport's Comprehensive Plan Update is helping the City apply for FEMA assistance to build additional vertical evacuation structures.

What is the proposal's level of engagement with reality?

As described above, a great deal of groundwork has already been laid for the studio's engagement with established community priorities and actual, on-going activities in the region. Excellent working relationships have been forged between the University faculty and students, local and state officials, and civic leaders in and around Westport. The partnership is committed not only to enhancing the life safety of South Beach residents and visitors, but also to ameliorating its many chronic challenges of an aging population, poor access to healthcare, precarity of employment, and poor housing conditions. According to the definition of transformative resilience that drives this studio, truly robust strategies to mitigate hazards must also promote the everyday well-being of all community members, and have a transformative effect on those aspects of community life that do not accord with the community's highest values.

Designing along the "Ring of Fire"

In learning from the 2004 Sumatran, 2010 Chilean, and 2011 East Japan earthquakes and tsunamis, this studio will examine these case studies in their immediate and subsequent responses. In particular, efforts by ArchiAid and Toyo Ito and the Home for All Projects will be considered.
https://youtu.be/EL161ft6hLc
https://vimeo.com/153842592
https://vimeo.com/153845648

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[1] Including partners at UCLA, Tohoku University, Tsinghua University, University of Tokyo, UC Berkeley, National University of Singapore, National Taipei University of Technology, University of Hong Kong, University of Melbourne, and the Pontifical Catholic University of Chile.
[2] https://www.nsf.gov/awardsearch/showAward?AWD_ID=1940024
[3] Gunderson, L. H., & Holling, C. S. (Eds.). (2002). Panarchy: Understanding Transformations in Human and Natural Systems. Washington, DC: Island Press. Also Folke, C., Carpenter, S. R., Walker, B., Scheffer, M., Chapin, T., & Rockström, J. (2010). Resilience Thinking: Integrating Resilience, Adaptability and Transformability. *Ecology and Society* 15(4), 20.
[4] Resilient Washington Subcabinet Project Team, Washington Military Department's Emergency Management Division. Resilient Washington Subcabinet Report: Findings and Recommendations.; 2017. https://mil.wa.gov/asset/5ba420648fb16.
[5] *Localizing Hazard Mitigation: Recommendations for Westport's Comprehensive Plan Update*
http://mitigate.be.uw.edu/research-and-practice-2/research-and-practice/