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## **RESILIENT DESIGN: ECOLOGICAL INFRASTRUCTURE**

Columbia University in the City of New York

Graduate School of Architecture Planning and Preservation / GSAPP A6832

FALL 2018 UD Seminar II

**Day/Time:** Tuesdays 3:00pm-5:00pm **Location:** WARE Lounge Avery Hall

Note: Some books are on our seminar shelf #409 or on reserve at Avery Library

### **Instructors:**

**Prof. Kate Orff RLA** [ko2111@columbia.edu](mailto:ko2111@columbia.edu)

In Coordination with Prof. Thad Pawlowski's Resilient Planning: Urban Transportation class

Office Hours Avery 411: Tuesdays 1pm-2pm by appt.

### **COURSE DESCRIPTION**

This course explores urban design practice through the lens of resilience. We will focus on emerging approaches and strategies to climate adaptation in the built environment, and integrating ecological, equity and cultural imperatives into next century forms of infrastructure. The course will meet periodically and share lectures with the Planning Seminar 'Resilient Transportation' taught by Prof. Thaddeus Pawloski. Throughout, readings, site visits and lectures that conceptualize the contemporary city as a living system will be interspersed with analyses of case studies of catalytic urban ecological design projects and emergent forms of design practice that synthesize infrastructure with public space. Our aim is to advance an understanding of urban design practice that is informed by the best ecosystem thinking that defines interventions at multiple scales with social and environmental purpose. Through faculty guidance and relevant readings, this seminar will facilitate informed discussion and exchange on dynamic, systems thinking, and imagine cities of the future as a living field of infrastructure and a hybrid of cultural and natural systems. We will also discuss and critique the concept of resilience as a position that lacks radical change at its core, particularly in the context of countries in different stages of the urbanization process.

### **FORMAT**

The class includes lectures by the instructors, invited speakers, library research, field trips, student-led presentations on case studies and readings, and discussions of timely issues. Students are expected to be prepared to discuss assigned readings and engage in active listening and a lively discussion during course time. During the first half of the semester, we will discuss the meaning of resilience and adaptation in the built environment via a series of lectures and readings. During the second half of the semester we will aim to advance and test a toolkit of methods and strategies for change by pairing case study research - an analysis, exploration &

explanation of systems and scales of resilient and adaptive infrastructure in the urban landscape with real and applied projects “sketches” in one of the "100 Resilient Cities" with speculation on future directions and opportunities. The seminar workflow aims to hone tools for research, analysis, decision making, and participation and reveal avenues of transformative, ecology-driven practice.

1. LECTURES AND CLASS DISCUSSION
2. CASE STUDY RESEARCH + CLASS PRESENTATION
3. SPECULATION + SKETCH EXPLORATION

### **Course Requirements**

Students are expected to do all of the assigned reading, to actively participate in class discussion, and to prepare questions for guest lectures and engage actively in dialogue. Students will be asked to work in small teams of no more than 2 to do a presentation & design study or “workshop” one key aspect of resilience within a designated city. This presentation is an investigation and critical understanding, to include drawings, diagrams and text, of one case study of a mode of practice and representative project(s) that emphasize synergistic thinking between community organizing, science, design and engineering in an urban context. Some class time will be dedicated to desk crits on this exercise. This presentation will be critiqued and translated into narrative and will serve as the basis for the brief final synopsis paper, due at the end of the semester. Students may also be asked to prepare 1-2 brief issues paragraph reactions to specific readings or to prepare and transmit questions in advance for invited speakers.

In order to reduce paper consumption, PDFs of readings will be made available on Courseworks/Canvas, and books will be placed on our reserve shelf in Avery Library where possible. Note that your final Design report (approximately 10-15 pages) must source at least two required or recommended readings. You are asked to regularly and thoughtfully participate in discussions, and to prepare questions for speakers, and responses to readings. You cannot miss more than 3 classes. Please inform the instructor in advance should you have to miss class for any reason.

### **Course Schedule**

9/04

#### **Week 1 INTRODUCTION TO RESILIENCE AS A PLANNING FRAMEWORK**

**Lecture & Discussion: Thad Pawlowski**

**Location: Ware Lounge**

An introductory discussion on the objectives and format of the course, and review of the course schedule and expectations with Kate and Thad. Initial lecture on methodologies and strategies for changing the conversation and integrating resilience, infrastructure and equity into urban design & planning practice by Thad Pawlowski. What is the agency of the urban designer and planner? What is resilience? What is adaptation? How can resilience as an applied framework advance new collaborations, planning practice, and policy?

Reading:

*"Resilience thinking: sustaining ecosystems and people in a changing world."* by BH Walker  
Island Press, 2006

9/11

**Week 2      NEXT CENTURY INFRASTRUCTURE : ECOLOGY & SOCIAL LIFE**

**Lecture & Discussion: Kate Orff**

**Location: Ware Lounge**

This class lecture and discussion with Kate O. will provide an overview of the ecosystem driven resilience concepts and examples of shocks and stressors facing global cities from sea level rise, to coastal erosion, to threats such as lack of sediment supply and sand mining. Design strategies will be presented that aspire to rethink urban design as socio-ecological change process and design strategies for combining regenerative Infrastructure with social agency.

Reading:

Toward an Urban Ecology, K. Orff, INTRODUCTION and SCALE Chapters (on Seminar shelf)

Frampton, Kenneth. *"Toward an Urban Landscape"* Columbia Documents of Architecture and Theory 4 (1995): 83-94 (on Courseworks/Canvas)

Klein, Naomi. *This Changes Everything* Simon & Schuster (2014) Introduction (in Drive)

Brenner, Neil. "The Agent" (in Drive)

**\*\*\*do the reading & prepare 3 questions for Kate**

9/18

**Week 3      THE RESILIENCE DIVIDEND**

**LECTURE: DR. Judith Rodin, Former President, The Rockefeller Foundation**

**Location: Ware Lounge**

Dr. Rodin will share themes and topics from her book *The Resilience Dividend: Being Strong in a World Where Things Go Wrong..* She will share examples from 100 RC / Rockefeller's work and highlight initiatives that span policy, strategy, design, funding and implementation.

Reading:

The Resilience Dividend Judith Rodin. (on the seminar shelf) it is suggested that you read the entire book over the course of the semester, however you may for the purposes of this seminar session focus on Introduction and Chapter I.

**\*\*\*do the reading & prepare 3 questions for Dr. Rodin - please submit your questions via CANVAS before class time.**

9/25

**Week 4      SOCIO-ECOLOGICAL INFRASTRUCTURE: CASE STUDY OF THE VENICE LAGOON**

**LECTURE:** Dr. Alberto Barausse, University of [Padova](#) ([Links to an external site.](#))[Links to an external site.](#) / LIFE VIMINE

**Location: Ware Lounge**

Reading:

Socio-Ecological \_\_\_\_\_ TBD

**\*\*\*do the reading & prepare 3 questions for Dr. Barausse - please submit your questions via CANVAS before class time.**

10/2

**Week 5      NATURAL CAPITAL: CASE STUDY OF MOZAMBIQUE  
DESIGN FOR BIODIVERSITY & INVESTING IN FORESTED LANDSCAPES**

**Ryan Bartlett, WWF, Washington DC**

This overview of the Natural Capital concept will cover designing for biodiversity, including plant communities, forest ecology, marine ecology and design principles to build resilience, reduce fragmentation and increase habitat. Example: Mozambique

- Plant-animal - interdependencies
- Invasive Species
- Spatial requirements of species
- Clean air benefits, economic and climate value of forests
- New paradigms of conservation planning and design

Reading: Natural Capital Assessment

10/09

**Week 6 SHOCK / STRESS: SEA LEVEL RISE**

**Class Debate ! RETREAT or REBUILD or \_\_\_\_\_**

**Staten Island NY / New Orleans LA / Shorecrest, Miami / Shishmaref, Alaska**

Surrendering to Rising Seas

<https://www.scientificamerican.com/article/surrendering-to-rising-seas/> (Links to an external site.)[Links to an external site.](#)

Eric Klinenberg "Adaptation"

<https://www.newyorker.com/magazine/2013/01/07/adaptation-2> (Links to an external site.)[Links to an external site.](#)

Elizabeth Rush

<https://urbanomnibus.net/2015/02/leaving-the-sea-staten-islanders-experiment-with-managed-retreat/> (Links to an external site.)[Links to an external site.](#)

On Miami:

<https://www.newyorker.com/magazine/2015/12/21/the-siege-of-miami> (Links to an external site.)[Links to an external site.](#)

On Staten Island: Liz Koslov

<http://woods.stanford.edu/sites/default/files/koslov-retreat-draft-public-culture-2016.pdf> (Links to an external site.)[Links to an external site.](#)

On Shishmaref, Alaska

<https://www.nytimes.com/2016/08/20/us/shishmaref-alaska-elope-vote-climate-change.html> (Links to an external site.)[Links to an external site.](#)

Elizabeth Kolbert - chapter in Field notes from a Catastrophe

Lizzie Yarina, "Your Seawall Will Not Save You, *Places Journal*, March, 2018, found at: <https://placesjournal.org/article/your-sea-wall-wont-save-you/> (Links to an external site.)[Links to an external site.](#)

10/16

**Week 7 SHOCK/STRESS: WATER SCARCITY & INEQUITY CASE STUDY  
Rajasthan, India**

**Toward Traditional Water Architecture and Resilient Design**

**INVITED SPEAKER: A. MRIDUL ARCH.**

Prof. Mridul will discuss more broadly the water crisis facing Indian cities and show examples of his architectural work reviving step wells. While working on revival of centuries old abandoned step-wells and other water bodies, he has also replicated them by creating a new subterranean step-well to harvest about 17.5 million litres of rain-water.

Reading:

Water in India:

<https://timesofindia.indiatimes.com/city/jaipur/ancient-practices-dont-lead-to-water-crisis/articleshow/62965279.cms> (Links to an external site.)Links to an external site.

10/23

**Week 8 PREPARATION & FEEDBACK FOR CASE STUDIES AND DESIGN SKETCHES.**

During this session we will be meeting in the classroom to review progress on the Case Study Presentation (approx 15 min duration each) and the initial mapping & documentation of the Design sketch sites. Please be prepared to discuss your work.

10/30

**Week 9 SHOCK/STRESS: EARTHQUAKES, FLOODING, SOCIAL INEQUALITY**

**CASE STUDY: MEXICO CITY, MEXICO**

**INVITED SPEAKER: IÑAKI ECHEVERRIA ARQ.**

Prof. Echeverria (Columbia alum) will discuss the resilience challenges facing Mexico City more broadly and show examples of his firm's portfolio of works including the Lake Texcoco &

Required Reading:

Michael Kimmelman, Mexico City

Resilience Strategy for Mexico City, 100 RC <http://100resilientcities.org/strategies/mexico-city/> (Links to an external site.)Links to an external site.

11/06

Week 10                    **ELECTION DAY / NO CLASS**

11/13

Week 11                    **STUDENT CASE STUDY PRESENTATIONS & DISCUSSION**

Each student group should be prepared with a 10-15 min powerpoint on their case study of resilient infrastructure and to lead question and answer session re) its efficacy and impact.

11/20

Week 12+                    **STUDENT CASE STUDY PRESENTATIONS & DISCUSSION**

Each student group should be prepared with a 10-15 min powerpoint on their case study of resilient infrastructure and to lead question and answer session re) its efficacy and impact.

**THANKSGIVING BREAK 11/23-11/24**

11/27

Week 13                    **STUDENT CASE STUDY PRESENTATIONS & DISCUSSION**

Each student group should be prepared with a 10-15 min powerpoint on their case study of resilient infrastructure and to lead question and answer session re) its efficacy and impact.

*ERIC KLINENBERG LECTURE AT 5:30 DO NOT MISS IT !*

11/30                    Last day of classes

12/11                    **FINAL DESIGN SKETCH PROBLEMS DUE**

**please keep 10am-1pm free in your schedules this day for a pin-up**

12/20                    Grades due

**FINAL ASSIGNMENT**

## RESILIENT BY DESIGN: ECOLOGICAL INFRASTRUCTURE A6832

The assignment has two parts.

### A CASE STUDY PRESENTATION

Research one eco-infrastructural concept or project case study and present a profile of the project. Each student is responsible for working in a team of two to produce a brief 10-15 min oral presentation and critical analysis with speculative discussion of blue-green infrastructure constraints and opportunities of the project case study chosen. It is advised that students meet with the instructor prior to their presentation for guidance on overall approach and to shortlist research source material. Oral presentations will take place on 11/21 and 11/28. The best presentations have a clear structure, and an introduction, body and conclusion and large, clear graphics. Structure your presentation in outline form first and organize your ideas visually as a storyboard sketch if it is useful. **HOW DOES IT PERFORM AS INFRASTRUCTURE ? What are the boundaries of the system? What are the social and ecological facets of the design? Is it MULTI-PURPOSE? How does it change and adapt over time? How does it link back to people's ability to withstand future shocks and stressors?** Please include your full name and email/UNI on all submitted materials. A list of potential case studies is attached.

- **Extreme Heat & Public Health**

1. CASE STUDY: MILLION TREES NYC, Singapore “Cool Lots”
2. SPECULATION: Melbourne Reforestation

*Additional resources of interest & links*

*Heat Wave, by Eric Klinenberg*

City of Chicago Green Alley Program [http://ccap.org/assets/The-Value-of-Green-Infrastructure-for-Urban-Climate-Adaptation\\_CCAP-Feb-2011.pdf](http://ccap.org/assets/The-Value-of-Green-Infrastructure-for-Urban-Climate-Adaptation_CCAP-Feb-2011.pdf) (Links to an external site.)Links to an external site.

Urban soils: Long Dock Park [http://www.reedhilderbrand.com/works/long\\_dock\\_park](http://www.reedhilderbrand.com/works/long_dock_park) (Links to an external site.)Links to an external site.

1. **Sea Level Rise & Coastal Erosion**

1. CASE STUDY: Dutch Sand Engine / “Sand Motor” project, Deltares

## 2. SPECULATION: SURAT, India. Tapi River Project and Coastal Protection

### *Additional resources & links*

West Cote Blanche Bay vegetated terracing to build marsh <https://www.lacoast.gov/reports/managers.asp?projectNumber=tv-15> (Links to an external site.)  
[Links to an external site.](https://www.lacoast.gov/reports/managers.asp?projectNumber=tv-15)

Mangrove Restoration for Coastal Protection, Red Cross, Vietnam

The San Francisco Bay Living Shorelines Project & Horizontal Levee Concept [http://www.sfbaylivingshorelines.org/sf\\_shorelines\\_science.html](http://www.sfbaylivingshorelines.org/sf_shorelines_science.html) (Links to an external site.)  
[Links to an external site.](http://www.sfbaylivingshorelines.org/sf_shorelines_science.html)

### 1. Rainfall Flooding & Informal Settlement

1. CASE STUDY: \_\_\_\_\_
2. SPECULATION: \_\_\_\_\_ Montevideo?

### *Additional resources & links*

City of Portland, OR green streets <https://www.portlandoregon.gov/bes/45386> (Links to an external site.)  
[Links to an external site.](https://www.portlandoregon.gov/bes/45386)  
Fourth Ward Stormwater Park, Atlanta <https://www.hdrinc.com/portfolio/historic-fourth-ward-park> (Links to an external site.)  
[Links to an external site.](https://www.hdrinc.com/portfolio/historic-fourth-ward-park)

Prof. Andrea Silverman (NYU) on the use of treated wastewater for vegetable irrigation

### • River & Canal Restoration

1. CASE STUDY: Bishan Park, Singapore, Atelier Dreiseitl <http://worldlandscapearchitect.com/kallang-river-bishan-park-singapore-atelier-dreiseitl/> (Links to an external site.)  
[Links to an external site.](http://worldlandscapearchitect.com/kallang-river-bishan-park-singapore-atelier-dreiseitl/)
2. SPECULATION:

Canal Nacional, Mexico City

Dilúvio Stream, Porto Alegre, Brazil

El Alto River Corridor, La Paz Bolivia

### *Additional resources & links*

*Gowanus Lowlands, SCAPE*

Rotterdam Water Plaza, De Urbanisten

Bullitt Center building, uses constructed wetlands and green roof to treat graywater for reuse <http://www.bullittcenter.org/building/building-features/wastewater-use/> (Links to an external site.)[Links to an external site.](#)

Georges Descombes, River Aire Project, Geneva Switzerland

Trinity River Corridor Project, Dallas TX

Rio Besos, Barcelona (see Living Systems book on Seminar Shelf)

Mill Race Park, (Columbus, Indiana)

## **5. Riverine Flooding, Pollution & Inequity (2 groups?)**

1. CASE STUDY: Holland's Room for the River Project (see "Going with the Flow") <http://www.nytimes.com/2013/02/17/arts/design/flood-control-in-the-netherlands-now-allows-sea-water-in.html?mcubz=0> (Links to an external site.)[Links to an external site.](#)
2. SPECULATION:

Pune, India Mula Mutha River Conservation & River Revitalization

*Additional resources & links*

Buffalo Bayou Restoration / Addicks Reservoir

<http://www.swagroup.com/projects/buffalo-bayou-park/> (Links to an external site.)[Links to an external site.](#) [https://www.washingtonpost.com/news/post-nation/wp/2017/08/28/houston-releases-water-from-two-dams-in-attempt-to-prevent-uncontrolled-overflow/?utm\\_term=.896a3d2cb4aa](https://www.washingtonpost.com/news/post-nation/wp/2017/08/28/houston-releases-water-from-two-dams-in-attempt-to-prevent-uncontrolled-overflow/?utm_term=.896a3d2cb4aa) (Links to an external site.)[Links to an external site.](#)

Omega Center for Sustainable Living, New York, indoor constructed wetland for wastewater treatment and aquifer recharge <https://www.eomega.org/node/18008?nid=17962> (Links to an external site.)[Links to an external site.](#)

## **6. Waste & Water Ecological Infrastructure**

1. CASE STUDY solid waste management & Tzu Chi recycling center in the city of Penang Island, Malaysia
2. SPECULATION: Byblos, Lebanon Solid waste, water clean up & recycling initiative

*Additional resources & links*

<https://www.thenatureofcities.com/2018/06/19/resilience-not-always-good/> (Links to an external site.)Links to an external site.

<https://www.thenatureofcities.com/2017/10/11/human-diconnect-trash-management/> (Links to an external site.)Links to an external site.

## 7. Shock / stressor: Inadequate Public Transportation Systems

1. CASE STUDY: Atlanta Beltline
2. SPECULATION: El Paso and Juarez International Beltway Concept / Integrated Multi-purpose Transportation and Landscape Infrastructure

### *Additional resources & links*

21 st Paso Robles Green Street, SVR design <https://landarch.com/award-winning-21st-street-turns-roadway-into-green-and-complete-street/> (Links to an external site.)Links to an external site.

Santa Monica Borderline Neighborhood Living street design

(woonerf) <http://nelsonnygaard.com/projects/santa-monica-borderline-neighborhood/> (Links to an external site.)Links to an external site.

Town Branch Commons, SCAPE

## 8. Shock/ stressor: Ecological Infrastructure Collapse

- **CASE STUDY: Sedimentation and Bayland Replenishment projects.**

**Public Sediment SCAPE, Life Vivine**, Louisiana Sediment Diversion Project, Mississippi River Mid-Basins Sediment Diversions Program, (see also: Changing Course competition & The Dredge Research Collaborative

- **SPECULATION:** Can Tho & Mekong Delta

### *Additional resources & links*

Greater New Orleans Urban Water Plan <http://livingwithwater.com/> (Links to an external site.)Links to an external site.

<https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2013EF000184> (Links to an external site.)Links to an external site.

<https://e360.yale.edu/features/why-the-worlds-rivers-are-losing-sediment-and-why-it-matters> (Links to an external site.)Links to an external site.  
[http://www.geologicnow.com/9\\_Dredge.php](http://www.geologicnow.com/9_Dredge.php) (Links to an external site.)Links to an external site.

SFPUC Headquarters Building, indoor + outdoor fill and drain wetland to treat wastewater and reuse for toilet flushing <http://www.sfwater.org/index.aspx?page=583> (Links to an external site.)Links to an external site.

## 9. Shock / Stressor Water Contamination / Waste Water to Urban Productive Wetlands

- CASE STUDY: The Kolkata Wetlands & fish pond system

### 1. SPECULATION: Montevideo Pantanal & Pantanos Creek Basin

Additional resources and links

Desert Living Center, NV, constructed wetland for wastewater treatment <https://architizer.com/projects/desert-living-center/> (Links to an external site.)Links to an external site.

“Using Constructed Wetlands to Treat Wastewater”

<https://dirt.asla.org/2010/09/10/using-constructed-wetlands-for-wastewater-treatment/> (Links to an external site.)Links to an external site.

Whitney Water Purification and Treatment Plant, Steven Holl

Sidwell Friends School - courtyard and constructed wetland <https://dirt.asla.org/2009/06/18/innovations-in-sustainable-site-technology/> (Links to an external site.)Links to an external site.

Arcata Wastewater Treatment with constructed wetland, California <http://www2.humboldt.edu/arcatamarsh/> (Links to an external site.)Links to an external site.

## **B SPECULATION & DESIGN SKETCH**

Select one site from the below list and initiate an eco-infrastructure design process. A suggested methodology is below.

It is suggested that you cite one of the case studies presented by you or one of your classmates.

### **METHODOLOGY**

#### **1. ANALYSIS (Due for in-class discussion November 14)**

##### **1. SITE ANALYSIS** Source Google earth imagery at three scales - bioregion, local context and detail

1. Do a diagram overlay of water systems - rain/storm flooding, waterways, tidal/flooding, water utility networks (including wastewater, storm drains, and potable water)
2. Do a diagram of soil types and water table depth from surface to understand stormwater infiltration potential
3. Do a diagram overlay of social spaces and needs, considering areas adjacent to the site  
Do a diagram of one critical ecosystem layer - aquatic or terrestrial habitat? Plant Ecology? Forest types? soils? polluted waterway?
4. Climate analysis - Analyze site-specific data on insolation, prevailing winds and precipitation.

##### **1. INFRASTRUCTURE VULNERABILITY**

1. Analyze the selected site and its networks of hard and soft infrastructure including public space. Define parameters being measured and describe their social, environmental and

economic implications within their sphere of influence and the overall systems in which they operate. Clearly identify weaknesses associated with the infrastructure and describe the predicted systems vulnerability in the future.

2. Does it flood? Will it? Is it within the wave zone? What are other vulnerabilities?

## 1. CULTURE & SOCIAL SPACE POTENTIAL

1. Overlay a quick demographics analysis, social vulnerability analysis as you define it
2. Analyze local tradition and customs relevant to the systems under consideration.

## 1. APPROACH NARRATIVE

1. WRITING. Define a theoretical project. Combine water infrastructure and social space / public program transformation to develop a new ecological infrastructure and public space proposal. Write one paragraph **narrative** of your project approach
  - Indicate top 5 drivers for your project clearly and specifically
  - This project should possess climate-resilient, livable, compact urban form suitable to local conditions as well as for mixed-income users

## 1. DRAWING

1. PLAN / Sketch a plan at 2 scales

Develop an **overview plan** view, using a 5-minute-walking radius (1/4 mile) as a community size parameter, indicating key features within the walking radius

- Based on site attributes propose a basis for the design of a dense, mixed-use urban neighborhood under specific climate conditions

1. SECTION / Sketch a Cross-section highlighting key issues

Develop the most characteristic existing condition **cross-section** including:

- key resilience issues/ site vulnerabilities/ public space deficiencies
- the key elements currently on-site
- a human figure for scale
- Develop a design response in a refined cross-section
- Indicate proposed infrastructure interventions
- Show new elements of public space

## III. POLICY & DESIGN TRANSFORMATION

1. **Define a policy change and your project champions** needed to enable implementation for your design proposals. Clearly state:

- Which **policy** would need to be changed or introduced to allow your project to advance

- Propose a potential **funder** (and the benefit to that funder to support the project)
- Indicate a champion/ **leader** (from local, regional, national, or international context) that would take the project

## PIN-UP - PRESENTATION

**Structure your proposed project** development to be presented during the final review:

Part A: **Name** and frame the project.

- Project title
- Narrative - 200 words
- Make your presentation easily comprehensible - layers of complexity should not blur your project's legibility.

Part B: Refine and clarify **site analyses**:

- Climate analysis
- Mobility
- Culture & Demographics analysis
- Infrastructure vulnerability

Part C: **Project Design**

- Plan
- Sections
- Phasing
- Precedents

Part D: **Value proposition**

- Use Cost-Benefit Tools presented earlier in the semester to make a business case for the project.
- Propose value creation scenarios with intention to ground the design intervention into the realm of a realistic proposal.

Part E: Project **impact** at scale

- What is the net effect of scaling this project? Describe the policy implications by isolating specific metrics from your theoretical case study.
- The policies should be applicable at the scales necessary to affect the change that can replicate the system to a scale at which that change can affect applicable transformation representative of the desired environmental, performance, and urban design transformation.
- The analysis should also include at a minimum relevant studies of climate, geography, settlement patterns, culture, existing infrastructure investments, and economic considerations.

Part F: Project **replicability**

- Apply analyzed strategies and define challenges and advantages for their replicability.
- Explore possibility for introduction of additional methods.
- Related to urban morphology and resilience, research systemic, passive impacts of public realm and built environment on the micro-climate: urban geometry, insolation, radiant heat energy, urban ventilation, configuration of vegetation, albedo, sky-view factor, anthropogenic emissions, and habitat of species.
- Pay attention to the quantifiability and measurability.

#### Part G: Performance **metrics**

- Propose prescriptive measures and performance standards for the design to be integrated into leading urban-scale rating systems.
- Test the proposed design by the application of available sustainable urban design performance standards such as LEED ND, Living Communities, One Planet, and Envision.

**Visualizations Deliverable:** Each team to submit at least three (3) visualizations that represent the design across scales, ranging from the micro scale, through the scale of the neighborhood, all the way to the macro scale of a metropolis, megalopolis or region, depending on the targeted issue.

More specific directions:

#### **Final Submission Visualizations requirements:**

Include a minimum of 3 visualizations that would best describe the project - ideally at three representative scales:

- Macro scale locating the intervention in the larger context indicating infrastructural and other relevant links, edges, axis, connections, cuts, etc
- Neighborhood scale - urban fabric morphology
- Micro scale - section or an axon depicting a representative piece of both residential/ mix-use unit and public space

Possible options:

- hybrid drawings
  - large scale or detailed sections
  - composite diagrams & sectional perspectives
  - organizational schemes
  - plans with overlays
- 
- Visualizations are not required to include exclusively digitally created material. Scanned hand drawn sketches are appreciated.
  - Flow Diagrams and renderings, as an overlay or individual pages, are also welcome.
  - Please don't forget to label and run a spell check.
  - Please submit at 300dpi in \*.tiff format – Dropbox/ Google Drive location to be provided

## Bibliography

Students should consider reviewing these books as background reading and reference materials:

*“Resilience thinking: sustaining ecosystems and people in a changing world.”* by BH Walker  
Island Press, 2006

The Resilience Dividend : Being Strong in a World Where Things Go Wrong by Judith Rodin,  
Public Affairs 2014.

The Sixth Extinction, and Field Notes from a Catastrophe by Elizabeth Kolbert

This Changes Everything by Naomi Klein (2015)

Collapse: How Societies Succeed or Fail by Jared Diamond (2011)

Common Wealth: Economics for a Crowded Planet Jeffrey Sachs, (2009)

Toward An Urban Ecology, by Kate Orff Monacelli Press, 2016

Water Infrastructure: Equitable Deployment of Resilient Systems Bry Sarte & Morana Stipisic,  
Columbia GSAPP, 2016

Silent Spring by Rachel Carson

Soil Not Oil by Vandana Shiva

Designing Our Way to a Better World by Thomas Fisher

Small Scale, Big Change: New Architectures of Social Engagement Lepik & Bergdoll, eds.

Friedman, Thomas L. “The Ten Forces that Flattened the World” in *The World Is Flat 3.0: A Brief History of the Twenty-first Century* (New York: Farrar, Straus Giroux, 2007)

Mostafavi, Mohsen and Gareth Doherty, eds. *Ecological Urbanism* (Baden, Switzerland: Lars Muller Publishers,

2010).

Owen, David Green *Metropolis: Why Living Smaller, Living Closer, and Driving Less Are the Keys to Sustainability*, 2009

Steffen, Alex ed. *Worldchanging: A User’s Guide for the 21st Century* Abrams, 2009

Misrach, Richard and Orff, Kate *Petrochemical America*, Aperture 2012

The Diversity of Life E.O. Wilson

Picon, Antoine: *Constructing Landscape by Engineering Water*. ETH, 2005 (in drive)

Stewart Pickett, *Resilient Cities*

Gandy, Concrete and Clay,\

Dept of Design and Construction, *Water Matters*, p 7-16

Ellsworth and Kruse, Making the Geologic Now, p28-32

<http://woods.stanford.edu/sites/default/files/norgaard-emotions-denial-nonparticipation-2006.pdf> (Links to an external site.)Links to an external site.