

Planning Sustainable Built Environments | SES 5465 | Spring 2023

V. 3/20/23

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Office Hours by Appointment: Mondays 1:00-4:00, Gund 334b or Zoom, <http://calendly.com/hannah-teicher>

Meeting Time and Location: M/W – 10:30-11:45, Gund L08, Gropius Room

Course Description

Modern infrastructure that invisibly delivers clean water and reliable power is often held up as a norm. Yet, in reality, it often fails, or fails to exist, depending on where it is located and who it is intended to serve. In the face of accelerating climate change and inequality, disruptions to modern infrastructural systems are becoming more and more frequent. This suggests the need for a paradigm shift in how built environment practitioners envision, plan and design for sustainable settlements. This course will begin with a critical historical grounding in sustainability, interrogating what previous framings have achieved and how sustainability interfaces with the current emphasis on resilience. We will then tap into current infrastructural theory, glean useful concepts for thinking through infrastructural interdependencies, disparities, cascading failures and exchanges between the Global North and South. We will bring these concepts to contemporary cases of failures, from power outages to water system disruptions, examining the role of policy, technical, and physical limitations as well as underlying structural processes such as racism and colonialism. Building on this foundation, we will turn to emerging solutions, drawing from theory and case studies. We will engage with current discussions of passive survivability, safe-to-fail methods, and decentralization to envision alternative approaches to sustainable infrastructure. In the final project, students will propose a pathway for scaling up an emerging alternative of their choice. Major assignments will be individual, but we will engage in a collaborative process to develop the tools to think through alternatives and develop cross-cutting strategies to take into future work.

Learning Outcomes

- Analyze key concepts in infrastructure theory and apply them to unfamiliar case studies.
- Evaluate the strengths and limitations of current best practices for sustainability and resilience.
- Based on engagement with theory and practice, propose mechanisms for increasing the uptake of emerging models for sustainability and resilience.
- Clearly communicate problems and solutions for sustainable built environments to relevant decision-makers.
- Identify and synthesize similarities across disparate planning projects and convey them in actionable form.
- Engage critically with readings from theory and practice to actively collaborate on building new conceptual models.

Schedule

W	Date	Day	Topic	Due 11:59 pm the night before
1	1/23	M	Introduction	
	1/25	W	History of Sustainability	
2	1/30	M	History of Sustainability	Reading response
	2/1	W	Sustainability and Resilience	
3	2/6	M	Infra. Theory: Disruptions	Reading responses – choose three out of four
	2/8	W	Infra. Theory: Cascading Risks	
4	2/13	M	Infra. Theory: Disparities	
	2/15	W	Infra. Theory: Global Perspectives	
5	2/20	M	NO CLASS	
	2/22	W	Infra. Practice: Best Practices	Reading response – choose one out of two
6	2/27	M	Infra. Practice: Guests	
	3/1	W	Infra. Practice: Evaluation	
7	3/6	M	Case Studies: Heat, Storms and Power California/Puerto Rico	
	3/8	W	Case Studies: Heat, Storms and Power California/Puerto Rico	Case study proposal
8	3/13		SRING RECESS	
9	3/20	M	Case Studies: Water Systems Mississippi/Nunavut	
	3/22	W	Case Studies: Water Systems Mississippi/Nunavut	Case study – 3/23
10	3/27	M	Learning from Failures	Case study response
	3/29	W	Alternatives: Framing	
11	4/3	M	Alternatives: Guest	Policy brief proposal
	4/5	W	Alternatives: Decentralization	Reading responses – choose two out of three
12	4/10	M	Alternatives: Community-led	
	4/12	W	Alternatives: Guest	
13	4/17	M	Alternatives: Guest Panel	
	4/19	W	Synthesis: Lightning Talks	Policy brief
14	4/24	M	Synthesis: New Sustainable Built Environments	
	5/3	W	<i>Final Exam Period</i>	Strategy synthesis

Format

The course is centered on a collaborative learning process including discussions, workshops, debates and case studies. Reading responses required before many of the classes will help ensure that we all show up prepared to engage, having thought about how we can extend and apply the material. The larger assignments, a case study and policy brief, take a practical, applied form. This is an opportunity to engage with the content of infrastructure disruptions as well as developing tools for proposing and applying solutions in practice. As part of the collaborative process, we will take the time to collectively analyze and reflect on each other's work to produce a larger body of knowledge. We will be grappling with emerging issues and working toward developing promising responses. There are few set or obvious answers in this iterative, creative process.

Full descriptions of the assignments are included in Appendix A. The general purpose and weighting of the assignments is as follows:

- **Reading Responses** (40% of your grade): These eight writing assignments are intended for you to engage with the readings before class so that you can contribute to a productive class session. For many, you have a choice of one to omit to allow you some flexibility with your schedule.
- **Case Study** (20% of your grade): This individual assignment will allow you to delve into an infrastructural disruption in a location of your choice so that it will be relevant to your interests and also broaden the class conversation.
- **Policy Brief** (30% of your grade): This culminating individual assignment will allow you to propose an infrastructural solution of your choice, building on the conceptual topics and practical themes explored throughout the course.
- **Strategy Synthesis** (10% of your grade): This group assignment builds on the individual policy briefs and provides a forum for you to analyze and synthesize commonalities between individual proposals. This will build on concepts for infrastructural alternatives we have explored in class and may also propose new ones.

Assessment

The GSD uses a pass/fail grading system that is different from most other schools at Harvard and elsewhere. In this class, you need 60% to pass. 60-74% is a Low Pass, 75-89% is a Pass, and 90% and above is a High Pass. The majority of students will receive a Pass, and up to 25% of students will receive a High Pass. At the midterm, if you're on track to receive a Low Pass or below, I will send you a letter and we'll meet to discuss how you can improve.

Detailed grading rubrics for all of the assignments are included in Appendix B.

Late assignments

I will not accept late reading responses. However, there is some flexibility in which readings you choose to respond to, and each response is only worth 5 points. For the other assignments, if you will not be able to meet the deadline, please email me with the reason for being late and an alternative proposed deadline. If you submit by your proposed deadline, I will accept the assignment for full credit. If you do not email me, I will accept late assignments for half credit.

Attendance

I will not be regularly taking attendance and attendance does not directly affect your grade, however it will affect your learning which could affect your grade. I do not record or permit the recording or streaming of in-class sessions. You will primarily be learning from in-class discussions and exercises and this is not possible to reproduce by watching a recording. Participating via zoom tends to be awkward and disruptive. If you have to miss a class, you should discuss what you missed with a classmate.

Note: This syllabus is subject to change based on the needs of the class.

Appendix A. Assignments

Assignments should be uploaded to Canvas by 11:59 the night before the class for which they are due as listed in the course schedule. This deadline is intended to help you avoid doing late night work and also to allow me to review assignments before class so that I can integrate your questions and comments into the discussion.

1. Sustainability reading response (5%) – *due 11:59 pm 1/29*

- What surprised you about the 1972 Declaration of the United Nations Conference on the Human Environment? What stood out as being from a different time? What seemed like it could be from today?
- In Stockholm+50, what do you think are the most promising recommendations to close the action gap of the last 50 years and why?
- The response should be 250-500 words.

2. Infrastructure disparities/failures reading response (15%)

- Respond to three out of four sets of readings
- The response should be 250-500 words including:
 - Two concepts that seem useful for explaining infrastructural disruptions (1 para. per concept)
 - Two questions – something that didn't make sense, something missing, ideas about where to go from here, relationship to other cases you're familiar with; consider how your questions will help move the collective discussion forward

3. Infrastructure practice reading response (5%)

- Respond to one out of two sets of readings
- The response should be 250-500 words including:
 - One concept that seems useful for evaluating the effectiveness of infrastructure practice
 - Considerations for future directions for infrastructure practice - something included that surprised you, how evaluation falls short, components of implementation that are overlooked

4. Case study – learning from disruptions (20%) – *due 11:59 pm 3/23*

- Prepare a brief case study of a disruption to power, water, transportation or communication infrastructure in a location of your choosing
- Submit a 200 word proposal March 7th
- The case study should be 3-4 pages (1000-1500 words) and include the following elements:
 - Brief summary including impacts, both in general and considering equity
 - Stakeholders involved – public, private, NGO, community
 - Policies implicated
 - Policy, technical, physical, social, political limitations revealed
 - Potential responses
 - One diagram that represents either the limitations or responses

5. Case studies reading response (5%) – *due 11:59 pm 3/26*

- Read three case studies from those produced by the class and prepare a 250-500 word response considering:
 - Common themes and major differences between the case studies
 - Relationship between the case studies and major concepts we've covered so far, especially in the infrastructure theory section

6. Emerging alternatives reading response (10%)

- Respond to two out of three sets of readings
- The response should be 250-500 words including:
 - Two concepts that are useful for thinking through alternative approaches to infrastructure (1 para. per concept)
 - Two questions – something that didn't make sense, something missing, ideas about where to go from here, relationship to other cases you're familiar with; consider how your questions will help move the collective discussion forward

7. Policy Brief – scaling up emerging alternatives (30%) – due 11:59 pm 4/18

- Submit a 200 word proposal April 3rd
- Prepare a 5-page, illustrated policy brief (based on examples to be provided) proposing how an emerging alternative to power, water, transportation or communication infrastructure can be scaled up. Proposal types include but are not limited to a project, program, regulations, an organizational model, or financing.
- Page limit does not include references
- This is in a location of your choosing and to a scale of your choosing – neighborhood, local, regional, etc.
- The brief should include the following elements:
 - Problem the brief is meant to address and significance of the problem
 - Summary of proposal and objectives
 - Stakeholders and funding required
 - Interaction with other policies
 - Precedents demonstrating feasibility
 - Evaluation methods
 - Limitations and/or needs for piloting and demonstration projects
 - Communication design including 2-3 images or diagrams to capture the attention of the intended audience
- Prepare a 1-page version with a large image and short summary which will be used in class to categorize proposals and identify cross-cutting strategies.
- Prepare a lightning talk, length TBD based on number of students enrolled in the class

8. Strategy Synthesis -- infrastructural paradigm shifts – group project (10%) – due 11:59 pm 5/3

- Work with a group of students with proposals that raised similar themes to synthesize and develop a suite of cross-cutting strategies
- Students will determine groups during the final class
- Prepare a 2-page (750-1000 word) synthesis of 5-7 cross-cutting strategies drawing from your groups' proposals

- Write an introductory summary capturing the similarities between your projects
- For each strategy:
 - Devise a label that captures the main concept
 - Write a summary of the strategy

Appendix B. Grading Rubrics

Reading Response Grading Rubric – Assts. 1, 2, 3, 5, 6		
Criteria	Description	Points
Quality	Writing is grammatical and interesting	1
Clarity	Writing is logical and organized	1
Engagement	Response demonstrates critical reading and thinking and poses questions that move the class dialogue forward	3

Case Study Grading Rubric – Asst. 4		
Criteria	Description	Points
Writing Quality	Writing is clear, grammatical and interesting	3
Graphic Quality	Diagram clearly conveys a concept, memorable	2
Summary	Concise, captures all of the main concepts	2
Stakeholders + Policies	Specific about individual types, addresses interactions between types, demonstrates research into specific policies implicated	3
Limitations	Contends with ambiguities, uncertainties, and tradeoffs	3
Responses	Offers 2-3 feasible approaches to redressing the major failure investigated	3
References	Includes a variety of sources and perspectives, APA formatting	2
Proposal	Proposal that clearly addresses core issues of the class submitted on time	2

Policy Brief Grading Rubric – Asst. 7		
Criteria	Description	Points
Writing Quality	Writing is clear, grammatical, direct and compelling	7
Graphic Quality	Diagrams clearly convey concepts, document is designed to be memorable	5
Problem, Summary, Objectives	Concise and logical, communicates why the intended audience should care about the problem, how the proposal addresses it	3
Stakeholders, Funding + Policies	Specific about individual types, addresses interactions between types, demonstrates research into specific policies implicated	3
Precedents	Draws critical lessons from multiple precedents	2
Evaluation methods	Proposes feasible, relevant evaluation methods – can be quantitative or qualitative	2
Limitations	Contends with ambiguities, uncertainties, and tradeoffs	2
References	Includes a variety of sources and perspectives, APA formatting	2
1-pager	Captures highlights of the proposal, memorable	2
Proposal	Proposal that clearly addresses core issues of the class submitted on time	2

Strategy Synthesis Grading Rubric – Asst. 8		
Criteria	Description	Points
Collaboration	Synthesis clearly draws from all of the projects involved	2

Contribution	Strategies are clear, memorable and build on major concepts from the class while adding new perspectives grounded in case studies	3
Structure	Strategies are coherent as a set	3
Clarity + Quality	Writing is logical, organized and compelling	2

Appendix C. Reading List

Readings to be done before class on the date listed

Week 1

1/23: Intro – no reading

1/25: History of Sustainability

Caradonna, J. L. (2014). Ch.3 Eco-Warriors: The Environmental Movement and the Growth of Ecological Wisdom, 1960s-1970s. In *Sustainability: A history* (pp.89-111). Oxford University Press.

Zavestoski, S. (2018). Sustainability and the reframing of the world city. In Caradonna, J. L. (Ed.), *Routledge handbook of the history of sustainability* (pp.219-232). New York, NY: Routledge.

Week 2

1/30: History of Sustainability

United Nations (1972). Ch.1 Declaration of the United Nations Conference on the Human Environment. In *Report of the United Nations Conference on the Human Environment*.

SEI and CEEW (2022). Stockholm +50: Unlocking a Better Future, Summary for Policymakers.

<https://www.stockholm50.report/summary-for-policymakers.pdf>

2/1: Sustainability and Resilience

Simon, D., Griffith, C., & Nagendra, H. (2018). Rethinking urban sustainability and resilience. *Urban planet: Knowledge towards sustainable cities*, 149-162.

Elmqvist, T., Andersson, E., Frantzeskaki, N., McPhearson, T., Olsson, P., Gaffney, O., ... & Folke, C. (2019). Sustainability and resilience for transformation in the urban century. *Nature sustainability*, 2(4), 267-273.

Week 3

2/6: Infrastructure Theory – Disruptions

Graham, S. (2010). When infrastructures fail. In *Disrupted cities* (pp. 13-38). Routledge.

Bowker, G. C., & Star, S. L. (1999). Sorting Things Out: Classification and Its Consequences, Table 1.1., In *Some Tricks of the Trade in Analyzing Classification*. p. 35.

2/8: Infrastructure Theory – Cascading Risks

Dodman, D., B. Hayward, M. Pelling, V. Castan Broto, W. Chow, E. Chu, R. Dawson, L. Khirfan, T. McPhearson, A. Prakash, Y. Zheng, and G. Ziervogel, 2022: Cities, Settlements and Key Infrastructure, Sections 6.1.3, 6.2.2.3, 6.2.4-6.2.6 In: *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.

Brockway, A. M., & Dunn, L. N. (2020). Weathering adaptation: Grid infrastructure planning in a changing climate. *Climate Risk Management*, 30, 100256.

Week 4

2/13: Infrastructure Theory – Disparities

Coleman, N., Esmalian, A., & Mostafavi, A. (2020). Equitable resilience in infrastructure systems: empirical assessment of disparities in hardship experiences of vulnerable populations during service disruptions. *Natural Hazards Review*, 21(4).

Hendricks, M. D., & Van Zandt, S. (2021). Unequal protection revisited: planning for environmental justice, hazard vulnerability, and critical infrastructure in communities of color. *Environmental justice*, 14(2), 87-97.

2/15: Infrastructure Theory – Global Perspectives

Cross, J., & Neumark, T. (2021). Solar power and its discontents: Critiquing off-grid infrastructures of inclusion in East Africa. *Development and Change*, 52(4), 902-926.

Guma, P. K. (2022). On tackling infrastructure: the need to learn from marginal cities and populations in the Global South. *Journal of the British Academy*, 10, 29-37.

Week 5

2/20: No Class

2/22: Infrastructure Practice

Envision Sustainable Infrastructure Framework Guidance Manual, v3, 2018, Intro pp.4-19, QL3.1 Advance Equity and Social Justice pp.48-51, LD2.2 Plan for Sustainable Communities pp.74-75, CR2.3 Evaluate Risk and Resilience pp.172-175, CR2.5 Maximize Resilience pp.178-179

UNEP, International Good Practice Principles for Sustainable Infrastructure: Integrated, Systems-Level Approaches for Policymakers, Second Edition, 2022, Definitions and Introduction pp.9-17, Principle 2. Responsive, resilient, and flexible service provision pp.21-23, Principle 3. Comprehensive lifecycle assessment of sustainability pp.24-25, Principle 6. Equity, inclusiveness and empowerment pp.30-31

Week 6

2/27: Infrastructure Practice – Guest

Review Envision from previous week, read additional sections of interest

3/1: Infrastructure Practice – Evaluation

City Water Resilience Framework (2019), pp.4-11, 64-65, Annex B

Resiliencemetrics.org, Indicators and Metrics: Introduction, Bounding and Assessing Context, Exploring and Identifying Indicators, Selecting Indicators and Identifying Metrics (you may want to browse additional sections)
<https://resiliencemetrics.org/indicators-metrics>

Week 7

3/6: Case Studies – Extreme Heat, Storms and Power Impacts

California and Puerto Rico - media, plans and policies to be provided on Canvas

3/8: Case Studies – Extreme Heat, Storms and Power Impacts

California and Puerto Rico - media, plans and policies to be provided on Canvas

Week 8

3/13: Spring Recess

Week 9

3/20: Case Studies – Water System Failures

Jackson, MS and Iqaluit, Nunavut - media, plans and policies to be provided on Canvas

3/22: Case Studies – Water System Failures

Jackson, MS and Iqaluit, Nunavut - media, plans and policies to be provided on Canvas

Week 10

3/27: Learning from Failures

Three case studies of your choosing by others in the class

3/29: Emerging Alternatives – Framing

Helmrich, A. M., & Chester, M. V. (2022). Reconciling complexity and deep uncertainty in infrastructure design for climate adaptation. *Sustainable and Resilient Infrastructure*, 7(2), 83-99.

Clark, S. S., Seager, T. P., & Chester, M. V. (2018). A capabilities approach to the prioritization of critical infrastructure. *Environment Systems and Decisions*, 38, 339-352.

Week 11

4/3: Guest

Sample policy briefs: TBD

Wolsink, M. (2020). Framing in renewable energy policies: a glossary. *Energies*, 13(11), 2871.
Especially: decentralized, distributed, intermittency; public, private, or common good; peer-to-peer.

4/5: Emerging Alternatives – Decentralization

Kelly-Pitou, K. M., Ostroski, A., Contino, B., Grainger, B., Kwasinski, A., & Reed, G. (2017). Microgrids and resilience: Using a systems approach to achieve climate adaptation and mitigation goals. *The Electricity Journal*, 30(10), 23-31.

Stoler, J., Jepson, W., Wutich, A., Velasco, C. A., Thomson, P., Staddon, C., & Westerhoff, P. (2022). Modular, adaptive, and decentralised water infrastructure: promises and perils for water justice. *Current opinion in environmental sustainability*, 57, 101202.

Week 12

4/10: Emerging Alternatives – Community-led

Allen, E., Lyons, H., & Stephens, J. C. (2019). Women's leadership in renewable transformation, energy justice and energy democracy: Redistributing power. *Energy Research & Social Science*, 57, 101233.

Ojha, H., Neupane, K. R., Khatri, D., Devkota, K., Maskey, G., Dahal, N., ... & Kovacs, E. K. (2020). Urban water security in South Asia: Crucial policy lessons from the Nepalese town of Bidur. *World Water Policy*, 6(2), 259-266.

4/12: Guest

Week 13

4/17: Panel Discussion

4/19: N/A

Week 14

4/24: Synthesis

Three policy briefs of your choosing by others in the class

Appendix D. Additional Information and Resources

Writing Services

The GSD provides free one-on-one tutoring sessions with writing tutors who are current GSD students with a strong background in both writing and design. Tutors can assist with ethical citation practices and avoiding plagiarism through proper paraphrasing, summarizing, quoting, and notetaking strategies. [Make an appointment](#) or explore our other offerings at [Writing Services](#).

Digital Media Workshops

The Digital Media Workshops are a GSD resource for students to learn a range of fundamental and emerging design technologies and techniques. Tutorials are led by students for students and serve as a platform for interdisciplinary learning, sharing, and serendipity. All offerings are in-person and simultaneously streamed online for direct participation. Recordings of past workshops and schedule details can be found on the DMW Canvas site. The schedule is also available on GSD Now, and weekly announcements will be sent via email.

Student Wellbeing

Please reach out to the [GSD Office of Student Affairs](#) if you are experiencing personal challenges or hardship.

Disability Accommodations

Harvard University values inclusive excellence and providing equal educational opportunities for all students. Our goal is to remove barriers for disabled students related to inaccessible elements of instruction or design in this course. If reasonable accommodations are necessary to provide access, please contact Kelly Wisnaskas at ktwisnaskas@gsd.harvard.edu. Accommodations do not alter the fundamental requirements of the course and are not retroactive. Students should request accommodations as early as possible since they may take time to implement. Students should notify the above contact at any time during the semester if adjustments to their communicated accommodation plan are needed.

Commitment to a Safe Learning Environment

A free environment for academic pursuits requires reasonable conduct, both in academic and non-academic affairs, by all members of the school. The faculty may impose discipline or penalties on individuals for acts that disrupt or endanger the university community's pursuit of teaching, learning, and research in an atmosphere of free inquiry and personal and psychological security. The faculty may consider sanctions whether or not civil or criminal penalties are imposed. Violations of specific domains considered here include, but are not limited to, plagiarism, sexual and racial harassment, the use of physical violence, and lying to an officer.

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