Nature-Based Solutions for Urban Resilience to Climate Change

University of Washington
Department of Urban Design and Planning
Summer Course 2024 (Hybrid)
B-term: July 24 - August 22 (4 credits)
Instructor: Marina Alberti

Overview

This course explores the role of Nature-Based Solutions (NBS) in addressing the complex challenges posed by climate change in urban environments. Nature-based solutions are actions that leverage the power of nature to address societal challenges, providing benefits for both human well-being and biodiversity. By leveraging scenario planning, complex systems thinking, and case study analysis, students will learn how NBS can enhance resilience, support biodiversity, and address societal inequities. Grounded in an eco-evolutionary and multispecies perspective, the course emphasizes the interconnectedness of human, natural, and technological systems in shaping sustainable urban futures.

Scope

Environmental change is outpacing the adaptive capacity of cities, demanding a fundamental shift toward integrating evolutionary principles into urban planning. Nature-Based Solutions have emerged as a cost-effective strategy to enhance long-term resilience while contributing to decarbonization. However, the effectiveness of NBS depends on ecological and evolutionary dynamics, as rapid ecological and evolutionary changes can alter the ecosystem functions that NBS are expected to maintain. Integrating evolutionary insights into Nature-based Solutions (NBS) offers a powerful means to enhance adaptation to climate change by leveraging the natural capacity of species and ecosystems to evolve in response to environmental pressures.

This course critically examines how NBS can support urban adaptation to climate change, including responses to flooding, heat waves, and biodiversity loss. It explores the complex interplay of ecological, social, and governance factors that influence the design, implementation, and performance of NBS. By integrating a multispecies and eco-evolutionary perspective into NBS design, students will investigate how to enhance cities' adaptive capacity and ensure their long-term resilience.

Skills and Learning Outcomes

Upon completing the course, students will:

- Understand the concept of Nature-Based Solutions and their relevance to urban resilience.
- Identify NBS that deliver multiple environmental and social benefits.
- Apply eco-evolutionary and multispecies principles and frameworks to the design and governance of NBS.
- Evaluate the effectiveness of NBS in addressing urban climate challenges, including extreme weather and biodiversity loss.
- Assess key social, ecological, and governance factors shaping NBS implementation.
- Collaboratively prototype adaptive and equitable NBS strategies for real-world urban challenges.
- Gain insight into how digital twins—combining real-time monitoring, simulation, and AI prediction—can support the design and evaluation of NBS.

Course Structure

The course is structured into two main components:

1. Foundations and Frameworks

This component introduces the foundational principles and scientific context needed to understand and design Nature-Based Solutions for urban resilience. It covers:

- **Climate Change Science**: Drivers, impacts, and uncertainties relevant to urban areas (e.g., heatwaves, flooding, sea-level rise, biodiversity loss).
- **Eco-Evolutionary Dynamics and Multispecies Design**: Principles underpinning adaptive and inclusive urban systems.
- **NBS Frameworks**: Scenario planning, modeling tools, and evaluation methods for NBS effectiveness.
- **Societal Challenges**: Interlinked issues including climate adaptation, biodiversity conservation, and social equity.

2. Applied Design and Collaboration

This component emphasizes hands-on application of design methods to real-world scenarios:

- **Design Workshops**: Prototyping NBS for specific urban challenges, focusing on biodiversity and multispecies inclusion.
- **Scenario Planning Exercises**: Exploring NBS performance under various climate change scenarios and urban futures.
- **Case Studies**: Analysis of existing NBS projects to extract lessons and foster innovation.
- **Collaborative Projects**: Teams will develop strategies for integrating NBS into urban infrastructure and adaptation planning.

Methods

The course emphasizes active learning through the integration of analytical tools and participatory design approaches:

- Scenario planning to envision futures shaped by NBS.
- Collaborative workshops on multispecies design solutions.

- Interactive discussions on NBS trade-offs and synergies for biodiversity, equity, and resilience.
- Application of frameworks to real-world case studies for experiential learning.
- Use of simulation modeling to explore the dynamic performance of NBS under different urban and climate conditions.
- Introduction to resilience metrics for evaluating the long-term effectiveness, equity, and adaptability of NBS strategies.

Target Audience

The course is open to undergraduate and graduate students across disciplines, including urban ecology, environmental planning, and sustainability. It is also relevant for urban planners, policymakers, and professionals seeking to deepen their understanding of NBS and strengthen their adaptive planning skills.

Course Topics

- Introduction to Nature-Based Solutions: Definitions and Contexts
- Climate Change Scenarios and Urban Challenges
- Complexity, Integration, and Dynamics in NBS Design
- Case Studies: NBS to tackle Urban Heat, Flooding, Wildfire, Decarbonization, and achieve Biodiversity Conservation
- Eco-Evolutionary Perspectives on Urban Design
- Multispecies Equity in Urban Planning

Assessment and Deliverables

- Participation in scenario planning and design workshops – 25%
- Case study analysis and presentation – 20%
- Collaborative project on NBS prototyping – 25%
- Reflective essay on integrating multispecies equity – 15%
- Poster showcasing an NBS strategy from the practicum – 15%