

Sustainable Development: A Course Linking Science with Practice

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About the Course

This course explores how the peoples of an increasingly stressed planet earth can achieve better lives for themselves, their neighbors, and their posterity. Its focus is the long-term, large-scale pathways of human development that emerge from the intertwined systems of nature and society in what some have called the planet's "Anthropocene" epoch. Combining a theoretical framework grounded in sustainability science with in-depth case studies prepared especially for the course, it equips students to serve as "general practitioners" supporting the pursuit of sustainability: articulating shared goals, assessing progress, diagnosing obstacles, and building capacity for programs of action.

Required Text

Matson, P., Clark, W. C., & Andersson, K. (2016). *Pursuing Sustainability: A Guide to the Science and Practice*. Princeton University Press.

Chapters of the Matson et al. book are assigned in 16 of the course's 23 units; students and instructors should plan to obtain a copy. A few units also assign chapters from other books, such as Deaton's *The Great Escape* and Sterman's *Business Dynamics*, with full citations and links provided on each unit page.

Course Structure

Part 0 · Introduction

What tension between rising human well-being and a degrading planet defines the Anthropocene?

Unit 0.1 — The Challenge of Sustainable Development

How can human well-being be improved without degrading the planet's life support systems?

Two global trends frame the course: the unprecedented "great escape" in human well-being since the late nineteenth century, and the environmental degradation that has accompanied it. This unit examines the tension between them—and what it demands of development in the Anthropocene.

Unit 0.2 — Tragedies of the Commons

Why is sustainable development so hard?

Students play the Fishbanks simulation to experience firsthand how individually rational decisions can collapse a shared resource—and begin asking what arrangements make cooperation possible.

Part I • Sustainable Development as a Conceptual Challenge

What goals should sustainable development pursue, and who gets to define them? And on what resources must current and future generations draw in pursuing those goals?

Unit 1.1 — A Framework for Sustainability Analysis

How can we harness science to understand the complexities of the Anthropocene system?

Introduces the course's central analytical framework, linking human well-being (the ultimate goal) to the resources that serve as its capital, through the nature–society systems and actors whose interventions shape them.

Unit 1.2 — Goals for Sustainable Development

What kind of world do people want?

Explores conceptions of well-being and equity—from the Brundtland Commission through the OECD's well-being indices to the UN Sustainable Development Goals—and how communities negotiate shared goals.

Unit 1.3 — Resources for Sustainable Development I: Natural Resources

How do natural resources shape the prospects for sustainable development?

Surveys the natural resources—land, water, materials, energy, and life—that constitute the “fuel in the tank” for development, and how their stocks are changing around the world.

Unit 1.4 — Resources for Sustainable Development II: Anthropogenic Resources

How do anthropogenic resources shape the prospects for sustainable development?

Turns to the resources people have built—human, manufactured, social, and knowledge capital—and how they interact with natural resources to shape prospects for sustainability.

Unit 1.5 — Integrated Assessment of Resource Trends

Are we consuming too much?

Reviews methods for aggregating resource trends—including inclusive wealth accounting—to assess whether development trajectories can be sustained.

Part II • The Anthropocene as a Complex Adaptive System

How can we take seriously the complexity of the nature–society systems of the Anthropocene without getting lost in their details? And what do their dynamics mean for anyone who would intervene in them?

Unit 2.1 — System Dynamics

How can we analyze interactions of nature and society?

Moves from Part I's static view to the dynamics of coupled systems, introducing systems thinking through a structured debrief of the Fishbanks game.

Unit 2.2 — Stocks and Flows

How do these fundamental properties of nature–society interactions shape their dynamics as adaptive systems?

Stocks, flows, and feedbacks as the building blocks of system behavior, explored hands-on through a NetLogo simulation of carbon accumulating in the atmosphere.

Unit 2.3 — Complexity

How are system dynamics shaped by the non-linearities, multiple regimes, and tipping points that emerge from complexity?

Heterogeneity, novelty, and interaction make nature–society systems complex adaptive systems—with consequences, explored through simulation and exercises, for anyone who would intervene in them.

Unit 2.4 — Horizontal Connections

How do linkages among places—pollution externalities, trade, and migration—affect the pursuit of sustainability?

How flows of materials, organisms, and information connect distant places, so that the pursuit of sustainability in one region reshapes prospects in others.

Unit 2.5 — Vertical Connections

How does the generation and propagation of novelty in the Anthropocene affect sustainable development?

How novelty—biological, technological, institutional—propagates up and down the hierarchical levels of the Anthropocene system, from local to global.

Unit 2.6 — Actors, Institutions and Power

How does the unequal distribution of power among actors affect the pursuit of sustainability?

Sustainable development is a redistributive agenda that meets resistance from incumbent interests. This unit examines how actors, institutions, and power shape what change is possible.

Unit 2.7 — Inequality

How does inequality arise and persist in complex adaptive systems?

Within-country inequality has surged since 1980. This unit asks how inequality emerges and persists in complex adaptive systems—explored with a NetLogo wealth-distribution model—and why it matters for sustainability's equity goals.

Unit 2.8 — Synthesis

How do interactions among the elements of nature–society systems shape pathways of development in the Anthropocene?

Assembles the elements of Part II into an integrated framework for analyzing nature–society systems, applied across the course's teaching cases.

Part III • Capacities Needed for the Pursuit of Sustainability

What does it take to get things done? What strategic capacities do individuals, communities, and organizations need to turn shared goals and scientific understanding into action?

Unit 3.1 — Capacities Overview

What capacities are needed to guide development pathways toward sustainability?

Frames the capacity-building agenda: why agreement on goals and understanding of system dynamics have so often failed to produce action, and what six strategic capacities can do about it.

Unit 3.2 — Capacity to Promote Equity

How can we promote equitable distribution of the earth's resources within and between generations?

Equity as the heart of sustainable development: what it takes to pursue fair distribution within and across generations despite entrenched power imbalances.

Unit 3.3 — Capacity to Measure Progress

What is needed to measure progress toward sustainability?

How measurement guides—and can distort—the pursuit of sustainability, and what science and practice teach about building better measurement systems.

Unit 3.4 — Capacity to Adapt

How can societies mobilize resources to cope with unexpected shocks and changing conditions?

Adaptation as the ability to keep development on track in the face of shocks and surprise—and its limits.

Unit 3.5 — Capacity to Govern Cooperatively

How can we work together to achieve what we cannot achieve alone?

How diverse actors with competing interests and unequal power nonetheless manage, sometimes, to govern shared resources cooperatively.

Unit 3.6 — Capacity to Link Knowledge with Action

How can we ensure that knowledge for sustainability is utilized in practice?

Why so much research never informs action—and the conditions under which knowledge becomes genuinely usable in practice and policy.

Unit 3.7 — Capacity to Transform Development Pathways

How can we move whole sectors or regions onto more sustainable development pathways?

The culminating capacity: orchestrating the others to shift entire sectors and regions—not just isolated projects—onto more sustainable pathways.

Part IV · What's Next for the World and for You

What does the pursuit of sustainability look like from the actor's seat rather than the analyst's?

Unit 4.1 — What's Next

How do leaders catalyze progress in the pursuit of sustainability?

Reflections on moving from learning to action: how individuals and institutions have caught the opportunities of crises to bend development pathways toward sustainability.

Course Library

Teaching Cases — In-depth case studies of sustainable development over the long term in particular places—London, Alaska, and Appalachia—prepared especially for the course and returned to throughout the semester as testbeds for its frameworks.

Student Cases — The course's applied assignment: students take on the role of outside evaluators of a real region's pursuit of sustainability, conducting expert interviews and producing a policy memo. Research guides for Uganda, Acre, and the Pearl River Delta give students a running start.

Learning Games — Learning-by-doing resources deployed across the course: the Fishbanks fishery simulation, NetLogo models of carbon stocks and wealth distribution, and hands-on exercises in non-linear dynamics, each with student and instructor guides.

Access, License, and Adaptation

The course is free and open access, with no enrollment or account required. This syllabus and all course materials—course units, teaching cases, student cases, and course games—are available under the [Creative Commons BY-NC-SA 4.0 license](#), and instructors are welcome to adapt them for their own classrooms, free of charge. Readings in the course favor open-access sources wherever possible, though the required text and a few other readings must be purchased or accessed through a library. For questions, contact [Alicia G. Harley](mailto:alicia_g.harley@hks.harvard.edu): alicia_g.harley@hks.harvard.edu.