



S F S THE SCHOOL
FOR FIELD STUDIES

Land Use, Natural Resources, and Conservation

SFS 3050

Syllabus

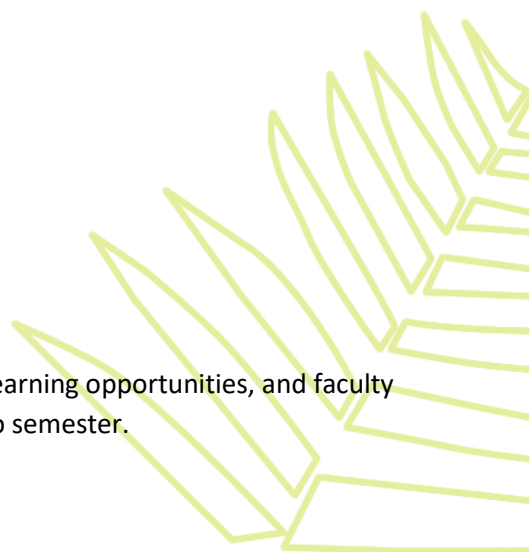
4 credits

The School for Field Studies (SFS)
Center for Climate and Sustainable Futures (CCSF)
Paro, Bhutan

This syllabus may develop or change over time based on local conditions, learning opportunities, and faculty expertise. Course content may vary from semester to semester.

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COURSE CONTENT SUBJECT TO CHANGE

Please note that this is a copy of a recent syllabus. A final syllabus will be provided to students on the first day of academic programming.

SFS programs are different from other travel or study abroad programs. Each iteration of a program is unique and often cannot be implemented exactly as planned for a variety of reasons. There are factors which, although monitored closely, are beyond our control. For example:

- Changes in access to or expiration or change in terms of permits to the highly regulated and sensitive environments in which we work;
- Changes in social/political conditions or tenuous weather situations/natural disasters may require changes to sites or plans, often with little notice;
- Some aspects of programs depend on the current faculty team as well as the goodwill and generosity of individuals, communities, and institutions which lend support.

Please be advised that these or other variables may require changes before or during the program. Part of the SFS experience is adapting to changing conditions and overcoming the obstacles that they may present. In other words, this is a field program, and the field can change.

Course Overview

Situated between the high plateau of Tibet and the sub-tropical plains of India, the Kingdom of Bhutan consists of some of the most rugged terrain in the world spanning a huge variation in altitudes and life zones. Within a North-South width of approximately 170 km, Bhutan's elevation varies from roughly 200 meters above sea level in the South to over 7,500 meters in the North. The rapid variation in elevation creates a diversity of landscapes and micro-climatic conditions that are ideal for a range of ecosystems and species to flourish. Essentially, about 60% of the Bhutanese still live in rural areas and practice mostly traditional forms of livestock rearing, agriculture and natural resource management. These management practices include both technical and spiritual aspects. Technical aspects include land management strategies such as terracing, plowing, sowing and planting. Spiritual practice relates to complex mixtures of Buddhism and ancient Bon practices. However, these practices are rapidly changing with democratization and modernization.

In this course we will consider natural resources in the context of local livelihoods through the lens of ecology and economics, and across regional, national and global scales. We will examine the implications of different land uses related to various agricultural practices and livestock rearing. Furthermore, we will consider historical and current land use trajectories to understand the impacts of such practices over time on ecosystem resilience. For example, what are the principal stressors to the local economy and the environment at local, regional and national levels? We will consider food security, both at the local and regional levels and link those to natural resource stressors. Furthermore, we will look for synergies between conservation (both biodiversity and agrobiodiversity) in relation to rural livelihoods and development.

This course is closely linked to the other two disciplinary courses in our program: Mountain Ecology and Political & Socioeconomic Dimensions of Environment. Conceptually, we will focus on the notions of resilience and multi-functionality and seek evidence for these in the field. Course lecture material will be complimented by field lectures, guest lectures, student led discussions and field exercises. Students will explore the science behind current local and global issues in conservation biology, land use, water resources, food production, biodiversity and climate change. The purpose of this course is to provide students with opportunities to develop a strong foundation of scientific knowledge on the natural environment and to build a tool kit of field research methodologies and analytical skills to uncover, test and describe the relationships between natural resources, land use practices and conservation.

Learning Objectives

Students will develop a conceptual and practical understanding of Bhutan's biological and agro-biological diversity, and global strategies for natural resource use and management. Specific learning objectives include the following:

1. Understand drivers of land use change and their consequences on biodiversity conservation and resource use.
2. Understand the relationships and tensions between policies related to natural resource management and on the ground realities.
3. Learn about issues related to biodiversity conservation in relation to changing socio-economic conditions and climate change and examine how conservation can be strengthened or threatened by different policies and practices.
4. Employ and become familiar with field research methods and analytical tools used in natural resource management and conservation of biodiversity.

Assessment

Our goal is to conduct ongoing assessment of student learning throughout the course and provide timely and constructive feedback. Some assignments encourage students to work together, to share ideas and knowledge. This allows students to take advantage of the range of backgrounds within the group. Assessment will be conducted on an individual basis, unless otherwise stated. The final course grade will be based on the following:

Assessment Item	Value (%)
Participation	10
Student led discussion	15
FEX 1: Payment for ecosystem services	15
FEX 2: White-bellied heron conservation	15
FEX 3: Forest resource assessment	15
Final Exam	30
TOTAL	100

Participation (10%)

During this program we will travel through many eco-regions and rural communities. We expect that you will be an active observer, constantly observing the landscape, livelihoods, and culture and participating in discussions regarding these observations. Active participation includes constructive engagement with the full range of course activities, respectful awareness of our cultural context, and responsible behavior as a group member who is involved in others' learning. There will be opportunities throughout the semester for constructive feedback.

Student-led Discussion (15%)

Can Forests be a Driver for Economic Growth? Bhutan has over 70% forest cover and is frequently lauded for being carbon neutral (even negative). The constitution even stipulates maintaining at least 60% forest cover for all times. However, can Bhutanese forests also be driver of economic growth? What is the tradeoff between forestry, conservation, and economic development within the Bhutanese context? Working in 5-6 groups, students will gather information, examine literature, watch the BLISS talk by Dr. Phuntsho Namgyel, and hold an interactive discussion in class on whether Bhutan's forests can be a driver for economic growth.

FEX 1: Payment for ecosystem services (15%)

As part of the PES field visit to a Richulum Watershed & PES scheme, Shari, Paro, the class will be divided into groups of 5-6. Each group will interact with Watershed Management group members. Each group will summarize their observations in a reflection paper, including the learnings about the Richulum PES Scheme, contribution to livelihoods and broader environmental policies, challenges and opportunities to strengthen PES Schemes in Bhutan.

FEX 2: White-bellied heron conservation (15%)

The field exercise focuses on practical conservation strategies for the Critically Endangered, White-bellied Heron, a species emblematic of Bhutan's riverine ecosystems and biodiversity hotspots. Students will assess key habitats along the Punatsangchhu, assessing key threats such as riverbed mining and hydropower impacts. Hands-on activities include interactions with local forest groups and conservation officials. Groups of 5-6 members will submit a group report about the challenges, issues and strategies for strengthening WBH conservation in Bhutan.

FEX 3: Forest resource assessment (15%)

Bhutan has over 70% forest cover and is frequently lauded for being carbon neutral (even negative). The constitution even stipulates maintaining at least 60% forest cover for all times. However, can Bhutanese forests also be driver of economic growth? What is the tradeoff between forestry, conservation, and economic development within the Bhutanese context? Working in 5-6 groups, students will gather information, examine literature, and watch the BLISS talk by Dr. Phuntsho Namgyel, and hold an interactive discussion in class on whether Bhutan's forests can be a driver for economic growth.

Final Exam (30%)

One comprehensive exam will be administered at the end of the course. Students will be examined on what they have been exposed to in class (lectures, discussions, etc.) and in the field, and what they have been asked to read. The exam allows students to draw on multiple concepts and experiences, and to synthesize information.

Grading Scheme

A	95.00 - 100.00%	B+	86.00 - 89.99%	C+	76.00 - 79.99%	D	60.00 - 69.99%
A-	90.00 - 94.99%	B	83.00 - 85.99%	C	73.00 - 75.99%	F	0.00 - 59.99%
		B-	80.00 - 82.99%	C-	70.00 - 72.99%		

General Reminders

Honor Code/Plagiarism – SFS places high expectations on their students and we hold students accountable for their behaviors. SFS students are held to the honor code below. SFS has a zero-tolerance policy towards student cheating, plagiarism, data falsification, and any other form of dishonest academic and/or research practice or behavior. Using the ideas or material of others without giving due credit is cheating and will not be tolerated. Any SFS student found to have engaged in or facilitated academic and/or research dishonesty will receive no credit (0%) for that activity.

"I approach coursework, fieldwork, and research with integrity and commit to full participation. I do my own work with honesty and give credit where it's due. I use tools and technology responsibly and only as permitted. I speak up when something conflicts with our shared values. I respect the communities we learn from and commit to ethical, non-extractive research that keeps knowledge connected to the places and people who share it with us."

Deadlines – Deadlines for written and oral assignments are instated to promote equity among students and to allow faculty ample time to review and return assignments before others are due. As such, deadlines are firm; extensions will only be considered under extreme circumstances. Late assignments will incur a penalty of 10% of your grade for each day you are late. After two days past the deadline, assignments will no longer be accepted. Assignments will be handed back to students after a one-week grading period. Grade corrections for any assessment item should be requested in writing at least 24 hours after assignments are returned. No corrections will be considered afterwards.

Content Statement – Every student comes to SFS with unique life experiences, which contribute to the way various information is processed. Some of the content in this course may be intellectually or emotionally challenging but has been intentionally selected to achieve certain learning goals and/or showcase the complexity of many modern issues. If you anticipate a challenge engaging with a certain topic or find that you are struggling with certain discussions, we encourage you to talk about it with faculty, friends, family, the HWM, or access available mental health resources.

Participation – Since we offer a program that is likely more intensive than you might be used to at your home institution, missing even one lecture can have a proportionally greater effect on your final grade simply because there is little room to make up for lost time. Participation in all components of the course is mandatory, it is important that you are prompt for all activities, bring the necessary equipment for field exercises and class activities, and simply get involved.

AI Usage for Assignments – SFS acknowledges the growing role of artificial intelligence (AI) tools in education and professional settings. While AI can be a valuable resource for learning and productivity, its use must align with the learning goals and integrity of each assignment. For this reason, students are encouraged to discuss the acceptable uses of AI for each assignment with the instructor. If you wish to use AI for any part of an assignment, consult with the instructor beforehand to ensure that its use adheres to the academic expectations of the course. Let's work together to navigate this evolving landscape responsibly!

Course Content

Type- L: Lecture, FL: Field Lecture, GL: Guest Lecture, FEX: Field Exercise, D: Discussion

***Required readings are in bold**

No	Topics Covered	Hours	Type	Required Readings
Land Use Principles, Management Theories & Tools				
1	Introduction to Land Use, Natural Resources, and Conservation We will discuss the expectations, goals, and purpose of the course, detailing overall content, field exercise (FEXs), grading system, and deadlines.	1.0	L	
2	Global Land Use and Land Cover Change We will examine global, regional, and national statistics on natural resources, human population, primary productivity, and current issues related to conservation, and natural resources.	1.0	L; D	Foley, et al. (2005).
3	Land Use in the Bhutan Himalayas Following the global land use discussion prior, we will transition to learn about natural resource management in Bhutan. We will explore different land use practices, natural resources, and strategies for biodiversity conservation globally, in the Himalayas, and in Bhutan.	1.0	L; D	Bruggeman (2018).

No	Topics Covered	Hours	Type	Required Readings
4	Traditional Land Use Practices We will discuss traditional practices of land uses in the Bhutanese Himalayas, such as tseri, sokshing and tsamdro. We will discuss pros and cons of such practices and how they have evolved over time. We will also review social restriction in traditional forest management systems, and its implications for biodiversity conservation in Bhutan.	1.0	L; D	Penjore and Raptan (2004). Wangdi, et al. (2014).
5	Application of GIS in NRM Students will be introduced to GIS, data structures and how to perform basic analysis in a GIS.	1.0	L	
Mountain Forests & Water Resources				
6	Natural Resources Management System & Challenges in Bhutan This class introduces the natural resource management (NRM) system in Bhutan, with a focus on the role of the Department of Forests and Park Services (DoFPS) in governing forests, biodiversity, water sources, and protected areas. Students will explore Bhutan's unique constitutional and policy framework that prioritizes conservation, such as the mandate to maintain 60% forest cover in perpetuity, and its alignment with the philosophy of Gross National Happiness (GNH).	1.0	L; D	Forest and Nature Conservation Code of Best Practices (2020).
7	Sustainable Forest Management in Bhutan This class introduces the principles and practices of sustainable forest management in Bhutan, emphasizing how forests are conserved while meeting ecological, economic, and social needs. Students will be introduced to Bhutan's diverse forest types and their significance to livelihoods, alongside the country's different forest management regimes, including Forest Management Units (FMUs), Local Forest Management Areas (LFMAs), Community Forests (CF), and Private Forests.	1.0	FL; D	Forest and Nature Conservation Code of Best Practices (2020).
8	Field Visit to Zonglela FMU Gain practical insights into one of the most important silvicultural practices for sustainable forest management. Engage in discussions on site-specific considerations, FMU operation, methods, and how such practices are applied in the Bhutanese context to balance conservation and utilization objectives.	2.0	GL; FL	

No	Topics Covered	Hours	Type	Required Readings
9	Community Forestry in Bhutan We discuss the traditional history and current practices of community forestry in Bhutan and compare these with practices in other countries. We look at sustainability of forest resources and study the technical, economic, and environmental aspects of Community Forests.	1.0	L; D	Wangdi (2006).
10	Water Resources, Watershed & Wetland Management in Bhutan Watershed and wetland management in Bhutan are integral to the nation's environmental and socioeconomic wellbeing. We will explore the traditional knowledge, community engagement, and modern scientific approaches for integrated water resource management in Bhutan and discuss conservation challenges to protect and sustainably manage these vital resources.	1.0	GL; D	Tariq, et al. (2021).
11	Valuing Ecosystem Services, Richulum PES, Shari, Paro We will visit the Richulum watershed under Shari Gewog and talk with a representative of the local community of the Richulum PES Management Group about the different conservation schemes they oversee that ensures clean water for the communities.	3.0	FL; D	MoAF (2012).
12	Community Based Springshed Restoration We will visit community based eco-restoration sites in Dawakha, Paro to observe field-level interventions for springshed and degraded landscape. Learn how local stewardship, traditional knowledge, and community participation contribute to long-term restoration success.	3.0	FL; D	Kaka, et al. (2021). Jambay and Uden (2022).
13	Harnessing Renewable Energy – Solar Lift Irrigation Systems to Enhance Water Security We will visit the community Solar lift irrigation scheme at Shaba, Paro to understand the concept and working of solar-powered lift irrigation systems. We will interact with the community members to gain deeper understanding about the sustainability, benefits, and challenges of using solar energy for irrigation in Bhutan's rural settings.	2.0	FL; D	DoE (2025).

No	Topics Covered	Hours	Type	Required Readings
14	Can Forests be a Driver for Economic Growth? Bhutan has over 80% forest cover and is frequently lauded for being carbon neutral (even negative). A rule in the constitution even stipulates maintaining at least 60% forest cover. However, can Bhutanese forests also be drivers of economic growth? What is the tradeoff between forestry, conservation, and economic development within the Bhutanese context? Working in groups, students will gather information, examine literature, watch the BLISS talk by Dr. Phuntsho Namgyel, and prepare a 10-minute presentation to be delivered in class.	2.0	D	Kuensel Online, Forestry Can Be a Bigger Driver than Hydropower. Kuensel Online, Saving Bhutan's Forests.
15	Forest Resource Assessment We will conduct a forest resources inventory by taking measurements of DBH, height and other parameters of trees. This exercise will teach students to estimate volume of tree and biomass and how to survey understory vegetation and regeneration.	3.0	FEX	
Mountain Agriculture & Food Systems				
16	Agrarian Landscapes of Bhutan Bhutan is an Agrarian society with more than 50% of Bhutanese classified as subsistence farmers. However, land use statistics show only about 3% of the country's total land area as agricultural land. We will learn about different agricultural resources (field crops, vegetables, and horticultural crops), as well as livestock husbandry. We will try to understand constraints in farming and herding, and opportunities for food production and food self-sufficiency.	1.0	GL; D	Wangchuk (2015).
17	Agrobiodiversity & Development Visit the Agricultural Research and Development Center in Bajo to speak with experts on a range of topics that may include agrobiodiversity, agricultural development, seed preservation, development of new or improved crops, and the interplay of agricultural science with livelihoods and policy.	3.0	FL	
18	Agroecology & Sustainable Land Management We will examine different land management techniques (agroforestry, check dams, and other indigenous practices, such as land terracing) used for various agroecological farming systems in and around Tading Village, Samtse.	3.0	FL	Partap (1999). <i>Optional:</i> <i>Ted Talks, Pablo Tittone, Feeding the World with Agroecology (video).</i>

No	Topics Covered	Hours	Type	Required Readings
19	Biogas: Transforming Rural Livelihoods We will visit a biogas unit installed at Bondey, Paro, to offer students a hands-on learning experience on renewable energy solutions in rural Bhutan. Students will gain insights into the design, operation, and benefits of household-level biogas systems and learn how biogas technology transforms animal and organic waste into clean energy for cooking.	2.0	FL; GL	
20	Forests and Livelihoods During the homestay in Phobjikha, students will have the opportunity to interact with their host family and learn how rural communities depend on forests for their daily needs, such as firewood, timber, fodder, and non-wood forest products.	3.0	D	
21	Natural Resources-Based Small-Scale Enterprises We will visit some natural resource based economic enterprises in Paro/Thimphu. We will learn about production, marketing, and their contribution to food security and local livelihoods. Agriculture, forest, and livestock resources are central to rural livelihoods in Bhutan.	3.0	FL	Saxena (2001).
Biodiversity Conservation & Management				
22	Role of Institutions in Environmental Governance Here, we examine the significance of Bhutan as the last biodiversity refugia for conservation in the Himalayas. We will learn about various factors that place Bhutan at the center of conservation in the Eastern Himalayan region.	1.0	L; D	Banerjee (2016).
23	In-situ and Ex-situ Conservation Approaches in Bhutan We will visit the Nature Conservation Division, DoFPS, Thimphu and the National Biodiversity Center to learn about the in-situ and ex-situ conservation initiatives, and innovation technologies in Bhutan.	3.0	FL	
24	The Last Refugia for the Critically Endangered White-Bellied Heron We will visit the White-Bellied Heron Conservation Center at Changchey, Tsirang.	4.0	FL	

No	Topics Covered	Hours	Type	Required Readings
Natural Resource Management in a Changing World				
25	Emerging Natural Resource Issues & Opportunities The impacts of climate change pose fundamental challenges for current approaches to biodiversity conservation. We will review studies pertinent to climate change and identify common stressors to ecosystems due to changing climate in Bhutan. We will also examine major conservation issues, such as invasive species, disease outbreaks, and human disturbances in Bhutan.	1.0	L; D	Devereux (2004).
26	Securing Bhutanese Landscapes Capstone What will the future of land use, natural resources and conservation look like in the Himalayas, and specifically Bhutan? Topics include: Can Bhutan achieve food self-sufficiency? How can Bhutan secure conservation funds? Shifting values around land use and conservation and more.	1.0	L; D	Bolch (2012).
27	Final Exam Review	1.0	L; D	
	Total	50		
	UMN Instructional Hours*	60		

*[UMN defines](#) an instructional hour as a 50-minute block. SFS syllabi are written in full 60-minute hours for programming purposes. Therefore 50 full hours = 60 UMN instructional hours (for four credit courses) and 25 full hours = 30 UMN instructional hours (for two credit courses).

Reading List

***Required readings are in bold**

1. **Banerjee, A., & Bandopadhyay, R. (2016).** Biodiversity hotspot of Bhutan and its sustainability. *Current Science*, 110(4), 521-527. doi:10.18520/cs/v110/i4/521-527.
2. **Bolch, T., Kulkarni, A., Kääb, A., Huggel, C., Paul, F., Cogley, J. G., . . . Stoffel, M. (2012).** The state and fate of Himalayan glaciers. *Science*, 336(6079), 310-314. doi:10.1126/science.1215828.
3. **Bruggeman, D., Meyfroidt, P., & Lambin, E. F. (2018).** Impact of land-use zoning for forest protection and production on forest cover changes in Bhutan. *Applied Geography*, 96, 153–165. doi:10.1016/j.apgeog.2018.04.011.
4. **Devereux, S., and Edward, J. (2004).** Climate change and food security. *Climate Change and Food Security. IDS Bulletin* 35.3: 22-30.
5. **DoE (2025).** Landscape Assessment of Renewable Energy-Powered Lift Irrigation Systems in Bhutan. Department of Energy, Ministry of Energy and Natural Resources, Royal Government of Bhutan.
6. **Foley, J.A., DeFries, R., Asner, G.P., et al. (2005).** Global consequences of land use. *Science*, (309) 5734, pp. 570-574, DOI: 10.1126/science.1111772.

7. **Jambay and Uden (2022).** Springshed: identifying recharge areas of drying springs and lakes with water quality in Southwestern Bhutan. Tarayana Foundation.
8. MoAF,(2012), Benefit-sharing for Ecosystem Services with emphasis on Poverty Reduction. MoAF, Thimphu Bhutan.
9. **Penjore, D., and Raptan, P. (2004).** Trends of forestry policy concerning local participation in Bhutan. In: HARADA, K. and KANAGAWA, M. N. (eds.) Policy Trend Report 2004. Institute for Global Environmental Strategies
10. Pratap, T. (1999). Sustainable land management in marginal mountain areas of the Himalayan region. Mountain Research and Development, 19(3), 251-260.
11. **Saxena, K. G., K. S. Rao, K. K. Sen, R. K. Maikhuri, and R. L. Semwal. 2001.** Integrated natural resource management: approaches and lessons from the Himalaya. Conservation Ecology 5(2): 14. [online] URL:<http://www.consecol.org/vol5/iss2/art14/>.
12. **Tariq, et al. (2021).** A Critical Review of Water Resources and Their Management in Bhutan. Hydrology 2021, 8, 31.
13. **Wangchuk, K., & Wangdi, J. (2015).** Mountain pastoralism in transition: Consequences of legalizing Cordyceps collection on yak farming practices in Bhutan. Pastoralism, 5(1) doi:10.1186/s13570-015-0025-x
14. **Wangdi, R., and Tshering, N. (2006).** Is community forestry making a difference to rural communities. A comparative study of three community forests in Mongar Dzongkhag, A Series of case studies on Community-Based Forest and Natural Resources Management in Bhutan. Ministry of Agriculture.
15. **Wangdi, S., Norbu, N., Wangchuk, S.& Thinley, K. (2014).** Social restriction in traditional forest management systems, and its implications for biodiversity conservation in Bhutan. Bhutan Ecological Society.