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Climate Change and Its Impact on the Tropics

ENVI-3000 (3 credits)

Tanzania: Climate Change and Sustainability from Mount Kilimanjaro to Zanzibar

This syllabus represents a typical semester. Because courses develop and change over time to take advantage of unique learning opportunities, actual course content varies from semester to semester.

Course Description

This interdisciplinary summer course explores climate change and its social and natural impacts in East Africa. The program takes students to four diverse areas: the Zanzibar Archipelago, the Usambara Mountains, Mount Kilimanjaro, and the Ngorongoro Conservation Area with its surrounding communities. Through a combination of field visits, lectures, discussions, and hands-on activities, students engage with both natural and social sciences to study the ecology and societies of coastal and northern Tanzania. The program emphasizes climate change, its human impacts, and national and local solutions to this critical global issue. Through three complementary modules delivered by in-country faculty, researchers, and environmental custodians, students gain a comprehensive understanding of climate change challenges and the complexities of management solutions in East Africa.

Learning Outcomes

Upon completion of the course, students will be able to:

- Demonstrate familiarity with key climate change issues, research methods, and management approaches specific to East Africa.
- Analyze the complex interactions between climate change and East African ecosystems using field observations and scientific data.
- Compare and contrast the impacts of climate change on different communities and ecosystems visited during the course.
- Develop proposals for climate change adaptation or mitigation strategies tailored to the East African context.

Language of Instruction

This course is taught in English, but students will be exposed to local vocabulary related to course content through in-country expert lectures and field visits in a wide range of venues and regional locales.

Instructional Methods

SIT's teaching and learning philosophy is grounded in the experiential learning theory developed by Kolb (1984; 2015) and informed by various scholars, such as Dewey, Piaget, Lewin, among others. Experiential learning theory recognizes that learning is an active process that is not confined to the formal curriculum; "knowledge is created through the transformation of experience" (Kolb, 2015, p. 49). Learning involves both content and process. Learning is holistic and happens through various life experiences upon which students draw to generate new ways of knowing and being. Learning involves a community and is a lifelong endeavor. Learning is transformational. The suggested four-step cycle of a concrete experience, reflective observation, abstract conceptualization, and active experimentation embedded in the experiential learning model is not linear and might not always happen in that specific order, as any learning is highly context-dependent. These stages of taking part in a shared experience, reflecting on that experience by describing and interpreting it, challenging their own assumptions and beliefs to generate new knowledge, and ultimately applying new knowledge, awareness, skills, and attitudes in a variety of situations and contexts are important for students to engage in to become empowered lifelong learners.

Assignments and Evaluation

Assignment Descriptions and Grading Criteria

1) Climate change and Communities (CCC) Presentation (40%, each 20%, group work)
Students in study teams of 2-3 articulate the discourses from the assigned module 1 & 2 readings and prepare the presentation to the broader group. Each student is required to participate in the presentation, and the group will facilitate and manage the discussion. The presentation outline includes two parts. Part I is composed of a summary, a brief study area description, data collection methods and data analysis of each of the assigned readings, and Part II consists of the (ii) assigned readings' key findings focusing on climate change indicators, impacts on the respective ecosystems and the dependent local communities adaptations/responses and individual or group reflectional of the assigned readings discourse on climate change indicators, impacts, adaptation, and responses experiences in Tanzania SIT staff and professionals will contribute to the discussion.

2) Annotated Bibliography (20%, individual work)
Students write an annotated bibliography of any readings assigned for module 3. For the annotated bibliography, students are expected to critically review readings to better understand the key issues, arguments, and research within a respective excursion site. The assignment will be evaluated based on the table guidelines and the score for each subsection.

Sections	Section Description and Examples
1 Citation (10 points)	Drewery. W. (2004). *Human Development in Aotearoa. A journey through life*. Auckland, New Zealand: McGraw-Hill.
2 Introduction	In this article, Drewery reviews/examines/researches, describes… The author's purpose is to…

(10 points)	This investigates/challenges/reveals/highlights/defines… This article outlines/focuses on/looks at/contrasts/aims to…
3 Methods (20 points)	The research methodology comprises/uses/includes examples, semi-structured interviews, satellite imagery, pitfall traps
4 Summary (20 points)	The main findings of the study include/are/find/identify… The author describes/relates/demonstrates/concludes/compares/argues… The author provides a strong theoretical…
5 Summary (20 points)	One limitation of this study… There is a lack of supporting evidence which... It is relevant to this writer's own research because…
6 Evaluation (20 points)	This article will assist… Because the article is recent and from a reliable source… As a result of the research, it cannot be…

3) Personal narrative Essay (30%, individual work)

For this assignment, students are expected to write a personal narrative essay recounting their academic readings, field visits, discussions, interviews with local communities and experts, and learning experiences after completing the modules' excursions. Students are expected to integrate all field learning experiences into a well-structured personal narrative essay with a clear introduction, logical progression of ideas, and a concise conclusion.

4) Participation (10%)

This includes active involvement in lectures, readings, discussions, and excursions using the following criteria:

- Attendance - promptness to class and positive presence in class.
- Active Listening - paying attention in class and during field excursions, asking appropriate questions, showing interest and enthusiasm (this includes body language), entertaining contradictory perspectives, taking notes.
- Involvement in Class Discussions - This means challenging yourself to speak up if you usually do not and allowing others to speak if you tend to dominate class discussions.
- Group Accountability – positive participation in the group during field excursions and classes; not keeping others waiting.
- Displaying Respect – culturally appropriate interaction with hosts, SIT program staff, SIT lecturers, and communities.

Assessment

Climate Change & Communities Presentation - 40% (20% ea.; module 1-2)
Annotated Bibliography for Module 3 - 20% (individual work)
Personal Narrative Essay - 30%
Participation - 10%

Attendance and Participation

Due to the nature of SIT Study Abroad programs, and the importance of student and instructor contributions in each and every class session, attendance at all classes and for all program excursions is required. Criteria for evaluation of student performance include attendance and participation in program activities. Students must fully participate in all program components and courses. Students may not voluntarily opt out of required program activities. Valid reasons for absence – such as illness – must be discussed with the academic director or other designated staff person. Absences impact academic performance, may impact grades, and could result in dismissal from the program.

Late Assignments

SIT Study Abroad programs integrate traditional classroom lectures and discussion with field-based experiences, site visits and debriefs. The curriculum is designed to build on itself and progress to the culmination (projects, ISP, case studies, internship, etc.). It is critical that students complete assignments in a timely manner to continue to benefit from the sequences in assignments, reflections, and experiences throughout the program.
Example: Students may request a justified extension for one paper/assignment during the semester. Requests must be made in writing and at least 12 hours before the posted due date and time. If the reason for the request is accepted, an extension of up to one week may be granted at that time. Any further requests for extensions will not be granted. Students who fail to submit the assignment within the extension period will receive an 'F' for the assignment.

Grading Scale

94-100%	A
90-93%	A-
87-89%	B+
84-86%	B
80-83%	B-
77-79%	C+
74-76%	C
70-73%	C-
67-69%	D+
64-66%	D
below 64	F

Program Expectations

- Show up prepared. Be on time, have your readings completed and points in mind for discussion or clarification. Complying with these elements raises the level of class discussion for everyone.
- Have assignments completed on schedule, printed, and done accordingly to the specified requirements. This will help ensure that your assignments are returned in a timely manner.

- Ask questions in class. Engage the lecturer. These are often very busy professionals who are doing us an honor by coming to speak.
- Comply with academic integrity policies (no plagiarism or cheating, nothing unethical).
- Respect differences of opinion (classmates', lecturers, and local constituents engaged with on the visits). You are not expected to agree with everything you hear, but you are expected to listen across difference and consider other perspectives with respect.
- Storing Your Work: Keep several copies of your work as back up and keep one copy accessible to you through an online forum, such as an attachment in your email, the course learning management system, or cloud-based storage. This way, your work will always be available to you despite technical issues. Lost files, deleted drives, or computer crashes are not excuses for late, missing work.
- Personal Technology Use: Cell phones and other personal electronics can be used for taking notes and other class activities. Off-task usage is not acceptable. You may be marked as absent for habitually using them for something other than classroom activities.

SIT Policies and Resources

Please refer to the SIT Study Abroad Handbook and the Policies section of the SIT website for all academic and student affairs policies. Students are accountable for complying with all published policies. Of particular relevance to this course are the policies regarding: academic integrity, Family Educational Rights and Privacy Act (FERPA), research and ethics in field study and internships, late assignments, academic status, academic appeals, diversity and disability, sexual harassment and misconduct, and the student code of conduct.

Please refer to the SIT Study Abroad Handbook and SIT website for information on important resources and services provided through our central administration in Vermont, such as Library resources and research support, Disability Services, Counseling Services, Title IX information, and Equity, Diversity, and Inclusion resources.

Course Schedule

**Please be aware that topics and excursions may vary to take advantage of any emerging events, to accommodate changes in our lecturers' availability, and to respect any changes that would affect student safety. Students will be notified if this occurs*

This course takes the form of interrelated modules that incorporate excursions, lectures, readings, discussions, and assignments including group presentations:

Module 1: Sustainability and Climate Change Impacts on Farmers and Forests
(Magamba NR, Usambara Mountains, and Mt. Kilimanjaro)
This module emphasizes the influences of climate change on forests and farmers in the Eastern Arc Mountains of northeastern Tanzania. Students travel to the picturesque West Usambara Mountains to study climate refugia, the diverse endemic plants and animals of highland forests, and, most importantly, the impacts of recent climate change on the

environment and the productivity Shambaa farmers. As a case study, students consider the climate change debate surrounding the melting glaciers on Mount Kilimanjaro and the implementation of sustainable solutions to mitigate its effects on Chagga communities. Students further consider and analyze the roles and responsibilities of stakeholders in this particular climate change debate: international organizations, state government, parks, NGOs, local communities, scientists, and tourists.

Required Readings:

Andrew, S. M., & Sembosi, S. J. (2017). Spatial and temporal dynamics of land use and land cover in and around Magamba Nature Forest Reserve, Lushoto, Tanzania. *Tanzania Journal of Forestry and Nature Conservation*, *86*(2).

van der Plas, G. W., Rucina, S. M., Hemp, A., Marchant, R. A., Hooghiemstra, H., Schüler, L., & Verschuren, D. (2021). Climate-human-landscape interaction in the eastern foothills of Mt. Kilimanjaro (equatorial East Africa) during the last two millennia. *The Holocene*, *31*(4), 556-569.

Kaganzi, K. R., Cuni-Sanchez, A., Mcharazo, F., Martin, E. H., Marchant, R. A., & Thorn, J. P. (2021). Local perceptions of climate change and adaptation responses from two mountain regions in Tanzania. *Land*, 10(10), 999.

Module 2: Sustainability and Climate Change impacts on herders, wildlife, hunters & gatherers (Datoga and Maasai communities; Ngorongoro Conservation Area and surrounding areas)

This module engages climate change and its impacts on northern Tanzania's hunters and gatherers, pastoralists, wildlife, and grasslands. Students travel to Lake Eyasi, Engaresero, and Arash villages, in Loliondo, and Ngorongoro Conservation Area - including a visit to Ngorongoro Crater - to identify and investigate the impacts of recent climate change on plant communities, grazing and migrating wildlife species (such as wildebeests and zebras), and the livelihoods of the Maasai, and hunters and gatherers societies, who keep cattle, camels, donkeys, and small stock, and depends on hunting and gathering food from the environment, respectively. Presentations by professionals and state officials introduce the impacts of climate change and promote solutions for sustainability in state and protected areas. These approaches often favor the government and international tourism at the expense of rural Tanzanians.

Required Readings:

Mawakaje, A. G. (2013). The Impact of Climate Change and Variability on Agro-pastoralist's economy in Tanzania. *Environmental Economics*, *1*, 30–38. http://hdl.handle.net/20.500.11810/1774

Kupika, O. L., Gandiwa, E., Kativu, S., & Nhamo, G. (2017). Impacts of Climate Change and Climate Variability on Wildlife Resources in Southern Africa: Experience from Selected Protected Areas in Zimbabwe. In *www.intechopen.com*. IntechOpen. https://www.intechopen.com/chapters/56873

Module 3: Sustainability and Climate Change Impacts on Coastal Communities and Marine Environments (Zanzibar Archipelago)

The module addresses the marine ecosystem and climate change. Time in Zanzibar highlights the complexities of marine conservation and natural resource management, particularly among communities dependent on the ocean for their livelihood. The group discusses mangrove forests, sea grass beds, coral reefs, and a field group study at Chumbe Coral Park about the effect of higher sea surface temperatures on coral beaching. From multiple management standpoints - those of the government, scientists, *and* local communities - students consider the complexities of climate change mitigation strategies. Lastly, the group wrestles with climate change policies and the inner workings of climate politics in the western Indian Ocean.

Required Readings: *Please note these readings are cross-listed in the ENVI-3500 course. In this module, we focus on the issues and findings of each of these studies, while in the partner course we further discuss the methods, methodologies, and research approach in each study.*

de la Torre-Castro, M., Lindström, L., Jiddawi, N., Pike, F., & Max, A. (2022). Women and adaptive capacity to climate change in East African seascapes – Zanzibar as an example. *Frontiers in Marine Science*, *9*(931883). https://doi.org/10.3389/fmars.2022.931883

Edwards, A. J. (2021). Impact of climatic change on coral reefs, mangroves, and tropical seagrass ecosystems. In *Climate Change Impact on Coastal Habitation* (pp. 209–234). CRC Press.

Makame, M., Shackleton, S., & Filho, W. (2021). Coping with and Adapting to Climate and Non-Climate Stressors Within the Small-Scale Farming, Fishing and Seaweed Growing Sectors, Zanzibar. *Research Square (Research Square)*, 1–26. https://doi.org/10.21203/rs.3.rs-1083174/v1

