

PONTIFICIA UNIVERSIDAD CATÓLICA DEL PERÚ - PUCP

FIELD SCHOOL PROGRAM IN PERU

**FIELD SCHOOL IN BIODIVERSITY, WATER RESOURCES AND CLIMATE
CHANGE IMPACTS IN THE CENTRAL ANDES OF PERU**

2014 SEASON

GENERAL INFORMATION

Course:	<u>BIODIVERSITY, WATER RESOURCES AND CLIMATE CHANGE IMPACTS IN THE CENTRAL ANDES OF PERU</u>
Location:	Lima - Pisac - Puerto Maldonado.
Time period:	18 days
Number of hours:	150 hours.
Coordination:	Silvia Rosas
Professors:	Fabian Drenkhan
Professors Assistants:	Karin Bartl

SUMMARY

The course is dedicated to advanced and postgraduate international students in natural sciences. In order to provide a holistic view of actual socio-environmental challenges in the Central Andes, the classes consist in two thematic blocks: a biogeographical focus on the one and a glaciological-hydrological focus on the other hand. The students will acquire expert knowledge in theoretical and computer-aided practice lessons. There will be thematic field trips.

The central course objective is to provide students interdisciplinary key knowledge and a process comprehension of the principal drivers determining biodiversity and actual challenges of changing ecosystems in Peru and the tropical central Andes.

COURSE OUTCOMES

Upon completion of the course the student will be able to:

- Explain principle concepts of ecology and biogeography
- Analyze ocean interactions with coastal and Andean climate linked to prevailing ecosystems

- Comprehend main concepts of tropical glaciers and its relationship with water supply and the need of an integrative risk assessment
- Detail implications of climate change impacts in Andean-Amazonian ecosystems
- Comprehend the relevance of biodiversity, benefits of ecosystems services, conservation efforts and sustainability management

COURSE REQUIREMENTS

Attendance and Participation

It is expected that students will commit to attend classes and guided visits and will actively participate in each of the planned activities of the course.

METHODOLOGY

The activities in this program shall be aimed at developing different types of skills being organized in two types of methodologies:

a. Lectures

Block I: The Peruvian Coastal Ecosystems

The Peruvian coast is also dominated by one of the world's driest deserts, despite lying so close to the sea. Its cliffs, islands and beaches are home to a variety of guano birds such as pelicans, albatrosses and boobies whose guano earned Peru untold wealth as fertilizer in the mid-nineteenth century. The coast also features birds such as Humboldt penguins and mammals such as seal lions, in both fine and droll varieties. Further out to sea one can spot dolphins and whales gamboling in the waves.

Block II: Andean Biodiversity, ecosystem impacts and sustainable management

Within the last decades, human-induced ecosystem changes at accelerating rates have led to a large degradation of natural resources and loss of biodiversity. This nourishes both concerns but also efforts about and towards a future sustainable management of ecosystem services where human livelihoods and well-being highly depend on [Millennium Ecosystem Assessment, 2005].

Block III: Tropical glaciers, Water resources and related hazards

In tropical South America almost all main rivers originate from glaciers situated mostly beyond 5000 m a.s.l. in the Cordilleras of the Andes. They concentrate a total area of 2493 km² which corresponds to more than 99% of all tropical glaciers worldwide with the biggest fraction of 71% in Peru, primarily in the Cordillera Blanca and Vilcanota.

Over the last decades, especially as of the second half of the 80's, the Cordillera Vilcanota has been affected by massive ice loss with an average reduction of 30% in glacier area and 45% in volume. Hanshaw and Bookhagen calculated an average glacier area decline of 5.5 km² y⁻¹ for the Vilcanota area. Furthermore, the Cordillera Vilcanota is potentially influenced by the interannual El Niño Southern Oscillation (ENSO). There is a broad discussion about the probability of more frequent and intense El Niño events featuring generally strong negative glacier mass balance triggering glacier vanishing.

As virtual water towers, glaciers have been the sustention of Andean and coastal societies for thousands of years as direct freshwater supply, agriculture irrigation and subsequent hydropower generation source. Around 62% of the nearly 30 million encompassing population

in Peru are living in the Pacific coast including all bigger urban areas of the country. They have to cope with only 1.8% of the natural national water resources and are highly vulnerable to in the outer tropics naturally prevailing seasonal variability of precipitations and river runoff. Within this framework, direct glacier and high Andean lake water discharge constitute a vital continuous water supply and represent a buffering effect of climate's seasonality. This natural buffering system is likely to deteriorate triggered by allover retreating glaciers and changes in climatological patterns. A sustainable future water supply might not be guaranteed especially during low-level runoff dry season while Peru's population, agriculture and mining activities are growing significantly.

Ice shrinkage, an associated rise of water levels of adjacent lakes and new lake formations constitute determining drivers for glacier-related hazards. On February 1998, a debris flow of 25 million m³ buried the village Santa Teresa and destroyed the Machu Picchu hydropower plant station in the Vilcanota area. In order to provide a basis for a disaster risk reduction and climate change adaptation in Peru, efforts have produced strategies and an establishment of integrated hazard assessment and risk management of high mountain disaster.

b. Field work (Field Trips)

The students will acquire expert knowledge in theoretical and computer-aided practice lessons. There will be thematic and cultural field trips:

- a) Costal desert, fog oases and marine biodiversity: Lúcumo Valley in Lurín and Palomino Islands in the Pacific Ocean.
- b) Tropical glaciers of the Central Andes: Marconi or Chicón and Pituciray Mountains in the Vilcabamba and Cusco area; and
- c) Tropical rainforest (Puerto Maldonado): navigation on the Madre de Dios River and Sandoval Lake. During the trip we will be able to observe the local farms, while groups of birds pass over the boat. Opportunity to see families of Ronsocos, the largest rodents in the world.

SCHEDULE OF ACTIVITIES

This Field School is scheduled to take place on July, for a period of 18 days.

Date	Topic	Activities
Fri 11	Go back in time and live the best of the Colonial and Republican times of Lima.	City tour of Lima
Sat 12	Basic concepts of ecology Biodiversity	Lectures
Sun 13	Peruvian coastal ecosystems Fog oases "Lomas"	Lectures
Mon 14	Excursion of Lúcumo Valley in Lurín	Field trip
Tue 15	Palomino Islands in the Pacific Ocean	Field trip
Wed 16	Flight to Cusco	
Thu 17	Global climate change in the Central Andes Sustainability and Ecosystem management	Lectures
Fri 18	Climate of South America Basic concepts of glaciology	Lectures
Sat 19	Andean Communities (Pisac)	Tour of Pisac
Sun 20	Glaciers and Water Resources	Lectures

	Impacts on Glaciers and water Resources	
Mon 21	Glacier excursion	Field trip
Tue 22	Andean-amazonian ecosystems	Lecture
Wed 23	Transfer to Aguas Calientes	Field trip
Thu 24	Tour of Machu Pichu	Field trip
Fri 25	Transfer to Puerto Maldonado; Final exam	Field trip
Sat 26	Tropical rainforest (Puerto Maldonado)	Field trip
Sun 27	Tropical rainforest (Puerto Maldonado)	Field trip
Mon 28	Flight to Lima	

EVALUATION

Final Grading for the Course will be based on 100 points. Grading scale: A (90-100%); B (80-89%); C (70-79%); D (60-69%); F (0-59%).

Assignment	Point Value	Course Percentage
Activities	40	40%
Final report	35	35%
Performance during the program	25	25%