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**"CLIMATE CHANGE – EMERGING EFFECTS ON PERUVIAN ECONOMIC DEVELOPMENT,
BIODIVERSITY AND HIGH MOUNTAIN NATIONAL PARKS"**

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INTRODUCTION

Peru lies near the intersection of several major factors affecting global climate including the Pacific El Niño current and the Inter-tropical Convergence Zone. It is also among the most biologically diverse countries on earth. Peru's enormous biodiversity is matched by an equally impressive human cultural and archaeological history that indicates that water, or the lack of it, is likely to affect Peru's national development path in a more direct and devastating manner than in most other countries. What is the emerging scenario for Peru with regards to climate change? What consequences might climate change have on Peru's development path and its enormous pool of biological resources? And what role have Peru's high mountain National Parks played, or might they play, in buffering Peru against the effects of climate change?

SETTING & BACKGROUND

Huascarán National Park, Peru encompasses the majority of the Cordillera Blanca mountain range which contains the highest tropical mountains and the largest tropical ice fields in the world. In the early 1990's the Canadian International Development Agency (CIDA) funded several programs in the area including the founding of an Environmental Sciences Master's Program at the University of Huaraz, directed by Dr. Dixon Thompson from the University of Calgary's Environmental Design Faculty, and the provision of financial and technical support for the development of the first Park Management Plan at Huascarán National Park.

The effects of climate change and glacial retreat were not considered major park management issues at that time. They certainly are now. Canadian support was directed towards implementing a public consultation program that involved multiple conflicting resource user groups at a time of great political upheaval in Peru – the time of the Shining Path guerrilla movement. The park management plan was ultimately completed and a new commitment adopted by park managers towards public consultation as a means for implementing more effective resource management programs.

Over the past 20 years there have been many achievements yet most have come through programs directed by external agencies, most notably The Mountain Institute of West Virginia. Furthermore these initiatives have failed to produce any significant change in the resource management policies, programs or capabilities of Huascarán National Park which remains mired in an excessively bureaucratic park management system directed from the capital city of Lima. A

management system that places tourism licensing, insurance and liability concerns over habitat conservation, restoration, water and waste management issues. The widespread grazing of cattle and introduced livestock by local indigenous communities in particular remains unchecked with no long term strategy in place to reduce this pressure and restore native habitat while providing viable economic alternatives to the local communities. In short, Huascarán National Park remains a victim of circumstance facing an increasingly dark future defined by retreating glaciers and decreasing water supplies.

STORM CLOUDS AHEAD

Peru is no stranger to the effects of climate change. It's archaeological treasures provide evidence suggesting that entire human cultures were extinguished by drought on various occasions prior to the arrival of the Europeans. The Nazca culture, creators of the famous Nazca lines on the south-west coast of Peru, and the Moché culture on the north-central coast are thought to have been extinguished by long periods of drought ¹. Over the centuries human cultures appear to have shifted between Peru's desert coast and its Andean interior in pursuit of reliable water supplies. The Incas, most noted for their great stone works are also renowned for their massive irrigation and public water systems.

Today Peru stands on the cusp of a major economic transformation due to its abundant mineral reserves and high global commodity prices. Under successive governments over the past fifteen years Peru has instituted important macroeconomic reforms, privatized industries, kept inflation in check and opened its economy to dramatically increased foreign investment and trade. These changes have spawned a fast growing internal market, widespread construction boom and the emergence of new export industries extending beyond Lima into the provincial areas. Peru can today pay off its entire national debt using its foreign reserves and still have plenty of cash remaining. It has near investment grade ratings from the major financial investment houses, Free Trade Agreements in place with the U.S., Canada and soon with China and is hosting the Asian-Pacific Economic Summit in November, 2008. While facing significant internal challenges Peru nonetheless has the best economic opportunity in its history to permanently change its national development trajectory. How might the emerging effects of climate change affect Peru's rosey economic forecasts? The current facts and emerging trends are cause for concern.

Over 70% of Peru's population is located along its desert Pacific coast and the western slope of the Andes. In addition, over 80% of Peru's electricity is generated from hydro plants on the western side of the Andes and over 90% of its food production and agricultural exports are produced here. Yet less than 2% of Peru's freshwater supplies drain to the western side of the Andes with the remaining 98% flowing east of the Andes into the Amazon Basin ².

1. 2007, Sommer, Birgit, Interview with Dr. Bernhard Eitel April 19th, 2007 – "Mystery of the Nazca "Landing Strips" Finally Solved", Unispiegal University of Heidelberg Press

2. 2008, Portocarrero, César, former Chief hydrologist Hidrandina Peru, Personal presentation March 18th for Seminar 'Water and Climate Change Effects in the Rio Santa Basin', Huaraz, Peru

Of the 2,500 km² of glacial ice fields found along the crest of the Andes between Colombia and Bolivia approximately 71% are located in Peru, and of this about 35% is found in the Cordillera Blanca ³. Monitoring of the Cordillera Blanca's ice fields has been conducted since the 1940's by the Glaciology Institute of Peru's national hydroelectric company Hidrandina with more recent support provided by Peru's National Environment Commission (CONAM) and a growing number of international institutions. Air photos, satellite images and ice core drilling at six locations in the Cordillera Blanca have been used to assess its changing ice mass. The results are concerning. From 1970 to 2007 an estimated 30% of the Cordillera Blanca's 723.4 km² of ice was lost with half of this occurring in the past ten years. The average linear retreat of the glaciers has more than doubled from an estimated 8.2m per year between 1948 and 1976 to an estimated 17.1m per year from 1977 to 2007 ⁴.

The Santa River captures all drainage coming off the western side of the Cordillera Blanca. The Santa River watershed occupies over 12,000 km², nearly 30% of the surface area of the region of Ancash. Stream flow data from the Santa River remains confusing and further research is urgently needed. However regional precipitation was measured at above the historical average between 1977 to 2007 while stream flows in the Santa River remained flat and recently have begun to decline ⁵. Declining stream flows in the face of increased precipitation and increased glacial melting are cause for concern. Similar and worse scenarios are now emerging from other areas in the Peruvian Andes.

The Santa River provides hydroelectric power and irrigation water to a considerable portion of Peru's north-central coast including power supplied from the Cañon del Pato generating station and water delivered to the large Chincas and Chavimochic coastal irrigation systems. Threats to primary food production areas are a major concern in a country with only 2.9% arable land, one of the smallest arable land bases on earth ⁶. Should these trends continue the implications for Peruvian power and food supplies are likely to be severe.

The World Health Organization has identified Peru as the third highest risk country on earth for climate change impacts on human health. Diseases and disease vectors are now appearing at higher elevations and in locations never previously reported. As freshwater supplies dwindle to human populations on the west side of the Andes the risk of increased human migration to the eastern slope of the Andes increases as people are likely to relocate in search of more reliable fresh water supplies and productive lands. This is likely to place more people in contact with malaria, dengue and other migrating disease vectors. The eastern slope of the Peruvian Andes is also one of the world's mega biodiversity centers that continues to be impacted mainly by unregulated human colonization. Increased colonization pressure leading to increased forest and species loss now appears likely.

3. 2008, Zapata, Marco, Glaciology Dept. Coordinator INRENA, Peru, Personal presentation March 18th, for a Seminar on 'Water and Climate Change Effects in the Rio Santa Basin', Huaraz, Peru

4. Ibid

5. 2008, Portocarrero, César, former Chief hydrologist Hidrandina Peru, Personal presentation March 18th for a Seminar on 'Water and Climate Change Effects in the Rio Santa Basin', Huaraz, Peru

6. 2007, International Fund for Agricultural Development "Rural Poverty Portal – Peru Statistics", United Nations Population Fund.

AWAKENING TO THE DANGER

How is Peru preparing to deal with these emerging challenges? On one hand Peru's strong economic situation allows it an opportunity to dedicate resources to the problem. Yet the country has only begun to recognize the situation.

A National Water Authority whose first objective is to develop a National Water Policy and Plan was only created in March of this year. The current Water Law, passed in 1963 and its regulations passed in 1983, are hopelessly ineffective and unenforceable. The current regulations employ no economic instruments, no charges on water consumption and no incentives to promote conservation in the rural areas. A proposed new water law with new institutional and regulatory structures is currently being prepared. This proposal seeks to establish watershed management authorities that supercede jurisdictional boundaries when dealing with water management issues. The United Nations Development Program is currently funding the development of a National Climate Change Strategy for Peru which includes an evaluation of the changes occurring and likely to occur in the Santa River basin.

PRIORITIES

The initiatives now underway must be completed and implemented with high level political commitment. Water consumption must be tied to costs and economic incentives for conservation across all industries and jurisdictions. Greater investments are needed to expand the availability and use of more efficient agricultural irrigation systems.

The use of Peru's growing natural gas supplies to help fuel its electrical generating stations and to reduce the country's reliance on hydro power needs to be considered. A National Colonization Control Strategy and Plan is urgently needed and zoning controls imposed along the eastern slope of the Andes by all political jurisdictions based on the protection of parks and reserve areas. Significant investments in desalinization plants will be required to reduce the demand for water for human consumption in the major coastal cities like Lima.

As for Huascarán Park and the Cordillera Blancaequitable alternatives must be defined with local communities to eliminate the grazing of introduced livestock inside the Park. This should be combined with a major reforestation program centered on reforesting the valleys above the main population centers located along the Santa River. Greater coordination between Huascarán National Park managers and the University of Huaraz's Environmental Faculty is needed to ensure applied research and ecosystem management principles are firmly placed at the center of Park management decisions. Finally, long term technical and administrative support is urgently needed for the new Santa River Watershed Management Authority which is just now being created as a result of the new Water legislation in Peru.

Over the years Canada has been a strong ally of Peru. It has a history of providing technical support to environmental efforts in the Cordillera Blanca region. In this the year of the Canada – Peru Free Trade Agreement and in light of ominous challenges to Peru's promising economic future, we must show our partnership and support, and not wait until its too late or too costly to act.