The Arequipa Nexus Institute
for Food, Energy, Water and the Environment

INTRODUCTION
Urbanization, agricultural intensification, and the mining of metal ores brought many economic and social benefits to the Arequipa region of Peru, and to the country in general. These activities have also contributed to the degradation of the region's air, soil and water resources. Landscape-level changes in the form of desertification, soil erosion and rapidly melting glaciers further impact local livelihoods, economies, infrastructure and ecosystems. Additionally, the region's changing and ambiguous natural resources ownership and use rights, inequitable development and high rates of poverty have resulted in increased food insecurity, overall socio-ecological vulnerability, and in some cases, social conflict.

These social, environmental and economic challenges are interconnected in complex ways, making the solutions landscape difficult to navigate, especially in the context of meeting the United Nations Sustainable Development Goals (SDGs). Increasingly, the world’s universities are playing a central role in creating, translating and promoting sustainable solutions. To accelerate the transition to sustainability in the Arequipa region of Peru, the Universidad Nacional de San Agustín (UNSA) and Purdue University, through the Center for the Environment, have partnered to create the Arequipa Nexus Institute—a large-scale research, education and innovation institute in support of a sustainable future.

CAPACITY & CAPABILITY BUILDING
Through strategic resource investments, the Institute will strengthen education programs, jump start research at the food-energy-water-environment nexus, and help position UNSA as a regional leader of sustainable development in Latin America.

A SYSTEMS APPROACH
The UNSA-Purdue partnership was initiated with a network of 21 interrelated, interdisciplinary research projects designed to identify regional interdependencies among food, water, and energy systems, and explore tradeoffs between land use and the environment. Supporting research infrastructure and activities were co-developed to leverage synergies among the projects.

The projects were developed either as a pilot study to gauge interest and capabilities, or as a short-term exploratory effort in preparation of a full-scale, long-term research program. Embedded within both tracks is analysis of different models for local and regional capacity building and information dissemination.

LONG-TERM SCIENCE COLLABORATIONS
Institute faculty design and implement collaborative projects that are shaping UNSA's long-term agenda for leadership in research, innovation, and technology transfer supported by strong outreach and engagement programs.

SOLUTIONS FOR A SUSTAINABLE PERU
Using the SDGs as a guide, the Institute engages in solutions-oriented research for sustainable use of natural resources with minimal tradeoff to the environment; and in partnership with local experts and stakeholder communities.
OUTPUTS AND OUTCOMES

Science Collaborations
160 faculty and staff researchers from Purdue (63) and UNSA (97) from 6 Purdue colleges and 10 UNSA colleges.

Projects integrate 29 postdoctoral scholars, and train 40 undergraduate students from Purdue (25) and UNSA (15).

21 collaborative, interdisciplinary research projects.

A network of 24 distinct field study locations throughout the Arequipa region.

Emphasis on career development through peer-reviewed research publications—currently 3 papers published and 26 in prep.

Capacity Building
4 thematic centers at UNSA support the Institute.

Annual technical workshops and symposia at Purdue attended by 150 UNSA faculty and students.

On-line training in the Soil and Water Assessment Tool for 50 researchers.

39 conference presentations at regional and international scientific society meetings.

Design and implementation of scientific instrumentation and laboratory capability unique to the region.

Co-development of new curricula in energy sustainability.

New programs in environmental monitoring and sampling.

Creation of 3 citizen science networks for environmental monitoring (soil, water, and air).

Design of new agricultural and environmental research and demonstration stations.

Sustainable Solutions
Design of UNSA campus net zero energy building.

22 active partner institutions (national and regional; government and NGO).

59 interviews and stories in the media (television, print, digital, radio) across Peru and the U.S.

PROJECT AT A GLANCE

Arequipa Soil Explorer
Sustainable agriculture and regional food security require healthy soil and clean water. Team members from the “Soil Health and Visualization” research project are providing a baseline assessment of the health, vulnerability and contamination of soils within the areas supporting Arequipa’s evolving, and highly stressed, agricultural economy.

The team began their collaboration by adapting the on-line Soil Explorer mapping platform developed at Purdue (https://SoilExplorer.net) for the Arequipa region. This tool provides practical, location-specific information about Arequipa soils, geology, and detailed agricultural land use maps accessible via the web, tablet or smart phone-based devices in English and Spanish.

The platform currently provides information about soil orders, soil moisture, pedogenic features, elevation, and hillshade. The next addition to the Arequipa Soil Explorer will include information on soil health and metal contamination collected through a citizen science network of regional farmers and UNSA undergraduate students. Other Institute project teams will incorporate hydrologic and climate data to the platform.

CONTACT
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