Econ 451: Building Resilient Urban Community as a Social-ecological Systems: Monitoring health and environment through citizen science

Fall 2016

SUSTAINABLE DEVELOPMENT ACTION LAB

(Nepal Study Center, University of New Mexico)

An Interdisciplinary Initiative

Instructor: ProfessorDr. Alok K. Bohara
bohara@unm.edu
(Guest Professor Mentors: Dr. Jennifer Thacher – Department of Economics and Dr. Mark Stone –Department of Civil Engineering)

Graduate Student Mentors
Samrat Kunwar, Soumi Chowdhury, Siobhan Yilmaz, Muhammad Adnan Shahid, & Veeshan Rayamajhee

PART A: Development of DEMP project

1. Tool building

- Data analysis and visualization (STATA)
- GIS mapping (ArcGIS)
- Survey design

2. Background assessment and literature review

- Understanding local urban eco-systems (preliminary data assessment of Public Preference for Improved Danda River research data)
- Lumbini environment assessment report
- Long-term monitoring of water air, and bio-diversity
- Role of citizen science
- Study of Bosque Ecological Monitoring Program (BEMP) and its curriculum
- Science of water testing (--air pollution tracking, bio-diversity tracking)
- Urban eco-system environment and health
- Evidence-based policy making
- Public awareness strategies and innovations

3. Planning and development of Danda Ecological Monitoring Program (DEMP)

- Review and refinement of DEMP proposal
- Development of monitoring curriculum, science, logistics,and protocol (e.g., review of BEMP, citizen science concept)
- Development of awareness strategies (e.g., creative banner, literature, App message and designs)

- Development of evidence-based policy making strategies
- Development of a Randomized Control Treatment (RCT) protocol for an *intervention* (survey development –e.g., science information/education and its impact on behavior)

4. Website presentation of the DEMP project outline and structure

Refining existing website pages:

http://pnfoundation.org.np/connecting-people-to-save-danda-river/
http://nepalstudycenter.unm.edu/SustainableResearchLab/SustainableDevelopmentLab.html

Deliverable:

Final DEMP proposal
Website structure

PART B: Implementation of DEMP project

Engaging YOGDAN student club
Lumbini Sustainable Circle Study Abroad Program
Fund generation for study abroad (student RAC, Study Abroad Committee –SAC, Rotary)

PART C: Development of multi-year student research and training grant

NSF's Change Makers undergraduate research training grant; NSF's PIRE
(Blending of DEMP proposal and Study Abroad Program proposal)

SYLLABUS OUTLINE ENDS HERE

OVERALL THEME OF THE SUSTAINABLE ACTION LAB

Need-Driven Research

Numerous academic programs all across the US are increasingly paying attention to providing students with learning opportunities that go beyond the classroom, including community service learning, one-on-one mentorship, volunteering shadowing, and community engagement. Often

known as the experiential learning, there is a growing effort to add research component to many of the community related engagements. The challenge is to make these types of community based learning rewarding, academically rigorous, analytical, scientific, and evidenced based. The proposed Sustainable Development Action Lab just does that.

Research-driven Solutions: Moving from Classroom, Computer Lab and Field Research to Action Research

Building on its successful doctoral field research activities of the past several years, NSC's Sustainable Development Action Lab (SDAL) is taking various initiatives to push the envelope further by undertaking research project that can also be implemented, monitored and evaluated. This interdisciplinary approach will involve faculty from different disciplines, who will work with the graduate and undergraduate students in a rich mentoring environment. This experiential research learning approach will encourage faculty and students to think outside the box in coming up with project solutions that are data driven, evidence-based, measurable, sustainable, and scalable. NSC's strong network of institutional collaborators in Nepal, and their resources are available to develop these initiatives in a mutually beneficial collaborative fashion.

A two-part Experiential Learning Structure

The lab will consist of two- learning components.

1. **Independent study (451/551)**: Working with graduate student mentors, the first phase will consist of undergraduate students, analyzing the baseline data already collected and/or planned by the NSC: scientific data, household baseline surveys, water and/or air quality data, citizen science data etc. The databases and problems are organized into a few modules. Using the statistical tools and visual methods (including GIS mapping, if necessary) students will identify the problem. Effort will also go into understanding the theoretical underpinning, but with an interdisciplinary and collaborative outlook. After a rigorous assessment of the problem, students will offer a practical solution. The solution could be an engineering device, educational awareness protocol, or even IT devices.
2. **Study abroad with community project**: The second phase of the process takes these designs and/or ideas and proposes a plan for implementation, monitoring, and evaluation. A fund raising strategy can also be a part of this phase.

Participating Faculty Members:

Dr. Alok K Bohara, Professor Department of Economics, Director, Nepal Study Center, UNM
Dr. Jennifer Thacher, Associate Professor, Department of Economics, UNM
Dr. Mark Stone, Associate Professor, Department of Civil Engineering, UNM

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ECON 451 (3 credits) / ECON 551 (1 credit)

FALL 2016
Professor Alok K. Bohara

Building Community Resiliency through Citizen Science: Health, Sanitation and Urban Ecology as a Social-ecological System
(Only limited seating available)

COURSE OUTLINE FOR FALL 2016
ASSESSMENT, ANALYSIS AND DESIGN

a. Status Assessment/Literature Review:

- Study of various environmental assessment literature and reports done in and around the urban center, Bhairahawa
- Study of various sanitation and WASH (water, sanitation, and health) programs currently being undertaken in and around Rupandehi district (nutrition programs, poverty alleviation programs, climate smart village program...)
- Ground water arsenic, irrigation, river, solid waste management, landfill etc...
- Eco-tourism, Lumbini,

b. Data Exploration to Identify Problems
Need-driven Research

- Understanding of knowledge, attitude, and behavior (KAB) of the urban dwellers regarding health, sanitation and urban ecology. Survey data exploration using Stata. Plots, charts, and basic visual, and descriptive data analysis...
- GIS mapping of water quality data, polygon raster image download, google map identify spatial location of industries and their proximity to channels, and river, and urban
- --Census data exploration / geographic boundaries, demographics
- (Three Surveys: Arsenic Study, water quality, health, and bio-diversity study; and Women's Hygiene (Kits))

c. Research-driven Solution
Synthesis of a and b leading to a solution: A community project proposal (Development of a <u>Science and Knowledge Platform</u>)

Students will propose a solution using analytical tools, scientific data, social sciences and behavioral theory, and local culture, norm and values.. A likely solution will be to develop a citizen science curricular protocol.

- environmental education / water quality tracking curriculum development along the line of BEMP's program
- community engagement, information dissemination, social media

- (Communicate with the LCS coordinator in Bhairahawa to gather information, if necessary.)

Expected Outcome for Undergraduates:

- Citizen Science CURRICULUM draft protocol proposal (e.g., training manual to train and implement it in three schools along the Danda River, Bhairahawa)
- RESEARCH POSTER summarizing a, b, and c as a research poster.

GUEST Lectures: Professor Jennifer Thacher, Dr. Mark Stone, Mr. Dan Shaw (BEMP, Director) ...

Graduate Student Mentors' Role:

An important part of this Action Lab pilot initiative is to develop a mentoring environment between the faculty, graduate students and the undergraduate students.

Expected role of graduate students:

- help run discussion sessions
- help with data analytics (Survey data handling, Census, Stata, GIS)
- mentor and oversee project proposal draft
- mentor and oversee research poster outcome.

STUDY ABROAD WITH COMMUNITY PROJECT
Community Service and Experiential Learning
(Intersession: December, 2016, 3 credits)

IMPLEMENTATION, MONITORING, EVALUATION

In December, the proposed community project outcome (citizen science curricular platform and protocol) will be implemented as a part of an Undergraduate Global Research Experiential Learning Study Abroad Initiative.

(Dr. Bohara, Dr. Thacher and Dr. Stone of the Department of Civil Engineering, and perhaps others will be engaged in developing this intersession study abroad program.)

--YOGDAN group (see below) can raise funds for the implementation side of it. Some members can also join the study abroad team and travel to Nepal for its implementation.

YOGDAN: An Undergraduate Interdisciplinary Research-Based Learning Program

This interdisciplinary initiative, organized by UNM's Nepal Study Center, is designed to promote experiential learning through community engaged research. UNM students have the opportunity to make a difference by collaboratively working on small to large-scale community based projects in Nepal. Building on its success with graduate research opportunities and an undergraduate study abroad, the UNM's Nepal Study Center is starting *YOGDAN* (contribution), an interdisciplinary global undergraduate research club. Collaborating with their Nepali counterparts, UNM students will work as a team to tackle economic, environmental, health issues in Nepal**.**

As the first project, students will use citizen science data to monitor, visualize, and analyze air, water, and bio-diversity in the urban town of Bhairahawa, Nepal. Using these scientific data, we hope to better understand the relationships between various stakeholders as a social-ecological system within the urban-rural setting of Bhairahawa. Students are then encouraged to come up with project ideas as solutions that are sustainable, cost-effective, socially acceptable, and scalable. Importantly, proposed student projects should provide opportunity for interdisciplinary engagements. This initiative --YOGDAN-- is also designed to generate opportunities for independent research, study abroad, community engaged research projects, and graduate student mentoring**.** Lessons learned from this can open up new challenges and opportunities across the geo-culturally diverse Himalayan landscape.