University of Iowa 2013-14
165:197 002 International Development: Development of Resilient and Sustainable Agricultural Watersheds
053:185 International Perspectives in Water Science and Management

December 27, 2013 - January 18, 2014

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COURSE DESCRIPTION

Objectives: The climate and land use changes that occurred in the last decades have increased the vulnerability of our water resources, both natural and man-made, thus requiring a systems approach for analyses that connect the biophysical characteristics of the river basin with the socioeconomic components of the water cycle. New and adaptable approaches, better suited to account for the risks associated with an uncertain future, are warranted to help ensure resilient and sustainable water governance. Sustainability is related in the present context to watershed communities that meet the environmental, economic, and social equity needs of its residents today without reducing the ability of future generations to meet their needs.

The main goal of the course is to gain a deeper understanding of the environmental and socioeconomic impacts of climate and land use change on the quantity and quality of water in agricultural landscapes using case studies in Northern India (Mewat District, Haryana). In Mewat, groundwater is the primary source of water. Available groundwater is limited to a few freshwater pockets and the remainder is saline. In fact, freshwater pockets are contained in the ground only in 61 villages out of 503 villages in Mewat. Saline groundwater cannot be utilized for domestic or agricultural purposes because of high levels of total dissolved solids. Despite this, most villagers continue to use saline water for their livelihoods. Many other problems arising from the limited freshwater supply are exacerbated by the mass extraction of freshwater which is outpacing the natural water recharge. If exploited at the current rate, fresh groundwater in Mewat is expected to be depleted within the next 10 to 15 years.

Specifically, we seek to better understand the adaptability, resilience, and sustainability of natural and built water systems given climate variability and land use dynamics by addressing the following questions:

1. What **best management practices for retaining and preserving the freshwater** in the foothill area of the region?
2. What are the **best strategies to avoid encroachment of saline water in the freshwater pockets**. Solutions include desalinization of the groundwater in low-lying areas.
3. What are the **socioeconomic and environmental trade-offs** associated with choices in management practices, floodplains, ecosystems, and water

infrastructure and what **governance and institutional arrangements** are **needed for a sustainable management** of the water resources in the region?

Academic Activities: This is a 3 SH credit course for junior, seniors, and graduate students with interest in watershed resource development from the scientific (geo-economics, agriculture, water resources, environment), engineering (water and energy infrastructure, energy production and management), and sustainability perspectives. To attain the course goals participant students will undertake research on watershed resources as related to agricultural development, governance, and poverty reduction through development of sustainable watersheds. Most of these activities will be conducted of the grounds of the Institute of Rural Research and Development (IRRAD) in Gurgaon, Haryana. We will visit village clusters in the Mewat District, and conduct education and outreach activities for both learning and sharing knowledge in relevant areas of interest. The day by day activities within the NGO will be complemented with afternoon and weekend cultural activities and networking: visits at Jaypur, Agra, Roorke, and Haridwar in Noth-West Indian. Field trips to cultural and historical sites strengthen participants' cultural awareness and promote networking.

The activities conducted with IRRAD will be echoed and expanded in the dialogue with academic partners in Department of Civil Engineering, IIT Delhi and Department of Water Resources Development, IIT Roorke. Besides the Mewat region water resources problems, the academic and professional dialogue will include the major (for both countries) theme of **flood mitigation**. The importance of direct interactions with local communities and other students and faculty during field trips cannot be underestimated. Many examples of student-student and faculty-faculty communications that continue to exist over the years based on the short, but intensive interactions during previous visits in the foreign countries.

The requirements for receiving 3 semester hours of credit would include readings, discussions, classroom and field activities, public presentations, and one final presentation at IRRAD before to return from India. Within six weeks of their return to the US, all UI students are expected to actively participate in a forum and share their experiences in India with the UI community.

PARTNER ORGANIZATIONS

The Institute of Rural Research and Development (IRRAD). The Institute is an initiative of the S.M. Sehgal Foundation registered as a trust since 1999 to further the wellbeing of rural communities in India (www.smsfoundation.org). IRRAD envisions rural people across India motivated and empowered to make their lives more secure and prosperous through education, better health, improved skills and supportive governance. The Institute develops need-based strategies and programs for poverty alleviation, undertakes research and creates knowledge on sustainable rural development, build capacities for rural development, and analyze the impact of local state and national policies on rural development. Academic partners at **Indian Institute of Technology at Delhi and Roorke** will facilitate interactions between faculty and student participants along the course themes.

ITINERARY (dates from last year's program)

Dates	**Location**	**Host**	**Comments**
Dec 27- Jan 1	Gurgaon	IRRAD	Includes Mewat site visits
		IIT Delhi	Specific dates to be determined

Jan 1 - 3	Roorke	IIT Roorke	Includes Haridwar
Jan 4-6	Gurgaon	IRRAD	
Jan 7-9	Jaipur-Agra		
Jan 10-13	Gurgaon	IRRAD	

Course Director: Marian Muste is Research Engineer at IIHR-Hydroscience & Engineering (IIHR), The University of Iowa (UI). He is Adjunct Professor with the Civil & Environmental Engineering Department and Geography and has a complementary appointment with the UI's International Program. He holds graduate degrees in civil and environmental engineering. His most recent area of research is the development of large-scale data/information management systems, sensors and senor networks, and their implementation in research and education focused on sustainable use of water and land resources. Dr Muste is expert for UNESCO and World Meteorological Organization projects. He has extensive international experience as a Fulbright Fellow (2004, 2006, and 2009) and grantee of the Japan Society for the Promotion of Science (2001). Since 2001, he is instructor of the International Perspectives in Water Science Resources and Management organized by IIHR.

Course Instructor: Allen Bradley is a Professor in the Department of Civil & Environmental Engineering, and a Research Engineer at IIHR-Hydroscience & Engineering (IIHR) at The University of Iowa. He holds graduate degrees in civil and environmental engineering. His research expertise is in hydrology and water resources, including watershed modeling, river forecasting, and risk assessment, and he has contributed to international research activities through the Hydrologic Ensemble Prediction Experiment (HEPEX) Project. Dr. Bradley teaches courses in hydrology and hydraulics, water resources engineering, and atmospheric sciences. He has also participated as an instructor in two International Perspectives in Water Science Resources and Management courses through IIHR.

List of References, Web Sites, and other related material:

The most comprehensive information about the course can be found on the IIHR's International Perspective Website – history of our course offerings in India 2011, 2012 (http://www.iihr.uiowa.edu/education/international-perspectives/): projects, itineraries, blogs, additional information

Books/Papers

Chaturvedi, M.C. (2011). India's Waters. Environment, Economy, and Development, Taylor & Francis Group, LLC, Boca Raton, FL.

FAO (2009). Coping with a changing climate: considerations for adaptation and mitigation in agriculture. *Food and Agriculture Organization of the United Nations*, Rome.

Foster, S.S.D. and Chilton, P.J. (2003). Groundwater: the processes and global significance of aquifer degradation. *Philos Trans R Soc Lond B Biol Sci*, Vol. 358(1440), 1957-1972.

Gee, G. W. (1988). Groundwater Recharge in Arid Regions: Review and Critique of Estimation Methods. *Hydrological Processes*, Vol. 2(3), 255-266.

IAB (2000). *Indian Agriculture in Brief (27th edition).* Agriculture Statistics Division, Ministry of Agriculture, Government of India, New Delhi.

Websites:

Institute of Rural Research and Development – our host in India (http://blog.irrad.org/)
India Water Portal: http://www.indiawaterportal.org/
Bibliography on Desalination: http://ciwr.ucsc.edu/desalplanning/biblio/
Wikipedia for web sites: http://simple.wikipedia.org/wiki/Desalination

For more information:

The India Winterim program application is available on the Study Abroad web site (under the "Application" tab): http://study-abroad.uiowa.edu/programs/details/index.php?crse=197#application

The application deadline is **Friday, September 27th at 5:00 PM**. Applications must be submitted in-person to the Study Abroad office's front desk in 1111 UCC.

Contact Professor Marian Muste (marian-muste@uiowa.edu) or Allen Bradley (allen-bradley@uiowa.edu)

For information about financial aid possibilities, go to http://international.uiowa.edu/study-abroad/financial-aid and click on either "undergraduate scholarships" or "graduate fellowships."