

**Fall 2009**

**Course EH524. Water and Human Well-Being**

**Class time:** Wednesday 10:30 am - 12:20 pm, HSPH, 665 Huntington Avenue.

**Instructor Name:** John Briscoe, Professor of the Practice of Environmental Engineering (SEAS) and  
Environmental Health (SPH)

**Instructors Phone Number:** 617 496 0944

**Credits:** 2.5

**Office Hours:**

Wednesday 12.30 – 2.00 HSPH, 665 Huntington Avenue, Building 1, Room 1304

Tuesday 3.30 – 5:00 SEAS, 29 Oxford St, Room 107B

### **Course Description**

Societies blessed with reliable, adequate supplies of good quality water have developed better than societies not so blessed. In order to provide adequate water security, societies invest in infrastructure and institutions to manage water resources more effectively, and to provide better water services. The course will explore the paths taken by now-rich countries and examine the consequences for human well-being, and will assess what is and what is not relevant from this experience for developing countries. Discussions will be organized around real-world case studies in which the instructor has been an active participant. The course will take an inter-disciplinary view and employ tools of history, hydrology, engineering, economics, political science and epidemiology.

### **Course Objectives**

At the completion of the course, you will be able to:

- 1) critically evaluate a water intervention from an engineering, economic, political and public health perspective
- 2) structure a policy process which will take into account different objectives and views of a variety of stakeholders.

### **Class Participation**

Active learning through class participation and discussion are an important component of the course. Students are expected to attend and participate in all classes. Students will be graded (maximum of 20 points) on the frequency and quality of their engagement in the class discussions.

### **Written Assignments**

#### **Homework:**

Prepare brief written assignments that critically evaluate select case studies. There will be four homework assignments which will be graded on a scale of up to 10 points each.

Required format: All homework assignments must be 2 pages or less. The assignment is due at the start of class on the date due.

### **Term project:**

Groups of three students of mixed background will be formed. Each group will choose a real-life water intervention (from a list given by the instructor, or other examples) and prepare a powerpoint to be given in 15 minutes to “the Minister of Development”. The presentation will:

- Describe the intervention from an engineering, economic, political and public health perspective;
- Describe what was successful and less successful in the intervention;
- Suggest what next steps the country might take in the water sector to improve human well-being.

The overall assignment will be given a grade of up to 50 points. The points assigned to each student will be determined by taking into account the contribution of each student to the team effort.

### **Grading Criteria:**

Each student will be graded using a cumulative scoring process, with elements as follows:

- Homework – 4 assignments, 10 points each = 40 points
- Class participation – 20 points
- Term project – a proportion of the up-to-50 points awarded to the team (to be explained in class!)

### **Texts and Reading Materials**

Readings will be from both published literature and the “grey literature”. Electronic links/PDF files of the papers will be available.

### **COURSE OUTLINE:**

#### **WEEKS ONE AND TWO: Introduction and some basic concepts**

Hydrology – the hydrological cycle, the statistics of extremes, climate change

Technology – storage, distribution, treatment, microbiology

Economics – cost-benefit analysis, incentives, multipliers

Epidemiology – water-related framework, issues of sequencing and interactions.

#### **References:**

- IPCC Report Chapter 3 on Water Resources. <http://www.ipcc.ch/pdf/technical-papers/ccw/chapter3.pdf>

- Twort's Water Supply, Sixth Edition, Arnold, by Don D. Ratnayaka et al, Arnold, 2009
- Gordon Maskew and Geyer, John Charles, and Okun, Daniel Alexander Fair, Water and Wastewater Treatment Volume 1: Water Supply and Wastewater Removal by, Wiley 1971
- Gilbert F. White, David Bradely and Anne White, Drawers of Water: Domestic Water Use in East Africa Univ Chicago Press, 1972
- Water Resources Sector Strategy, The World Bank, 2003
- Drinking Water and Health, National Academy of Sciences, 1977
- Briscoe J. "How Theory Practice Politics and Time Affect Views on the Indirect Economic Impact of Water Infrastructure", pages 351-362 in The Indirect Economic Impact of Dams, edited by R. Bhatia, R. Cestti, M. Scatasta and RPS Malik, Academic Foundation and The World Bank, New Delhi 2008.

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### **WEEK THREE AND FOUR: Water and sewerage in London in 19<sup>th</sup> century**

The political economy -- Marx and Engels

Epidemiology and regulation -- Chadwick

Technology – sewage disposal and water treatment

Epidemiology – John Snow, Preston and Briscoe

#### References:

- Collected Works of Karl Marx and Friedrich Engels, 1844-45, Vol. 4: The Condition of the Working Class in England, by Karl Marx and Friedrich Engels (Hardcover - Aug 1975)
- Twort's Water Supply, Sixth Edition, Arnold, by Don D. Ratnayaka et al, Arnold, 2009
- Results of Different Principles of Legislation and Administration in Europe; of Competition for the Field, as Compared with Competition within the Field, of Service, Edwin Chadwick, Journal of the Statistical Society of London, Vol. 22, No. 3. (Sep., 1859), pp. 381-420.
- John Snow Snow on Cholera Commonwealth Fund 1936
- Briscoe, John, "Water supply and health in developing countries, Selective Primary Health Care revisited", American Journal of Public Health, Vol 74, No.9, pp 1009-1014, 1984
- Briscoe, John, "Intervention Studies and the Definition of Dominant Transmission Routes", American Journal of Epidemiology, Vol 120, No.3, pp 449-455, 1984.
- Vanderslice J and J Briscoe, "Environmental interventions in developing countries: Interactions and their implications", American Journal of Epidemiology, Vol 141, No 2, 135-144, 1995.

### **WEEKS FIVE AND SIX: Water in a megacity – drainage, water, sanitation in Sao Paulo, Brazil**

Priorities over time -- Jacoby

Health and water – Merrick and Neri

Evolution of legal and regulatory frameworks and forms of provision

Innovative technologies for provision (condominial and treatment) – de Melo

Payment for treated sewage -- Kelman

Urban development and water supply -- Guarapiranga and Billings

Inter-basin transfers – Piracicaba example

Challenges in assuring water supply for the future

#### References:

- Pedro R. Jacobi, "Households and environment in the city of São Paulo; problems, perceptions and solutions" Environment and Urbanization, Vol. 6, No. 2, 87-110 (1994)
- The Effect of Piped Water on Early Childhood Mortality in Urban Brazil, 1970-1976, Thomas Merrick, 1984, World Bank Staff Working Papers, Number 594

- Marcelo Neri *Trata Brasil: Saneamento e Saude*, FGV, Rio de Janeiro, 2007, [http://www3.fgv.br/ibrecps/CPS\\_infra/sumario.pdf](http://www3.fgv.br/ibrecps/CPS_infra/sumario.pdf).
- World Bank World Development Report: Infrastructure 1994. Washington DC. [http://www-wds.worldbank.org/external/default/WDSPContentServer/WDSP/IB/1994/06/01/000009265\\_3970716142907/Rendered/PDF/multi0page.pdf](http://www-wds.worldbank.org/external/default/WDSPContentServer/WDSP/IB/1994/06/01/000009265_3970716142907/Rendered/PDF/multi0page.pdf)
- Gesner Oliveira. The new Brazilian Water Regulatory Framework: SABESP, 2009 [http://siteresources.worldbank.org/EXTWAT/Resources/4602122-1213366294492/5106220-1234469721549/11.1\\_SABESP.pdf](http://siteresources.worldbank.org/EXTWAT/Resources/4602122-1213366294492/5106220-1234469721549/11.1_SABESP.pdf)

## **WEEKS SEVEN AND EIGHT: Rural water supply and sanitation in Bangladesh**

Cholera and diarrhea epidemiology – Coldwell, Spira, Briscoe

The tubewell revolution – for drinking and for irrigation

How people choose what water to use -- Briscoe

Economic change and demographic consequences -- Fatepur

Arsenic evolution and epidemiology – Newman and Harvey

Total sanitation approach – World Bank

### References:

- Briscoe, John, "The Role of Water Supply in Improving Health in Poor Countries (with special reference to Bangladesh)", American Journal of Clinical Nutrition, 31, pp. 2100-2113, November 1978.
- Briscoe, John, "Intervention Studies and the Definition of Dominant Transmission Routes", American Journal of Epidemiology, Vol 120, No.3, pp 449-455, 1984.
- Vanderslice J and J Briscoe, "Environmental interventions in developing countries: Interactions and their implications", American Journal of Epidemiology, Vol 141, No 2, 135-144, 1995.
- The World Bank Water Demand Research Team (J.Briscoe, first author), "The demand for water in rural areas: Determinants and policy implications", The World Bank Research Observer, 8, 1, 47-70, 1993.
- Briscoe, J: "Two decades of change in a Bangladeshi village", Economic and Political Weekly, Bombay, Vol XXXVI, Number 40, October 6, 2001
- Kar, Kamal and Pasteur, Katherine (2005). Subsidy of Self-Respect? Community Led Total Sanitation. An Update on Recent Developments. IDS Working Paper, 68 pages. Free in PDF format.
- R.B. Neumann, K.N. Ashfaq, A.B.M. Badruzzaman, M.A. Ali, J.K. Shoemaker, C.F. Harvey (2009) Ponds and irrigation pumping: Anthropogenic influences responsible for arsenic mobilization in Bangladesh. Nature, 2009, in press

## **WEEK NINE AND TEN: Regional water projects in the Punjab in 19<sup>th</sup> and 20<sup>th</sup> centuries**

Making the desert bloom – the colonial irrigation projects, model and impacts – Imran Ali

Partition and the Indus Waters Treaty -- Briscoe

Bhakra and economic impact – robustness and multipliers. Bhatia

Tubewells and groundwater – Tushar Shah

Advances – rights in Pakistan Punjab – World Bank

New threats – Briscoe and Qamar

### References:

- John Briscoe and Usman Qamar. Pakistan's Water Economy: Running Dry, Oxford University Press, 2007.

- Ramesh Bhatia et. al. "Bhakra Multipurpose Dam System, India", p 133-192 in Indirect Economic Impact of Dams: Case Studies from India, Egypt and Brazil, ed R Bhatia, R Cestti, M Scatista and RPS Malik, Academic Foundation, New Delhi 2008.
- Political Economy of Water Reforms in Pakistan By Professor Imran Ali, in John Briscoe and Usman Qamar. Pakistan's Water Economy: Running Dry, Oxford University Press, 2007.
- Tushaar Shah, Taming the Anarchy, Resources for the Future, Washington DC, 2009.

#### **WEEKS ELEVEN AND TWELVE : Aswan Dam – economic, environmental and health impacts**

Ethiopia's development -- World Bank

The logic and politics of Aswan -- Whittington

Schistosomiasis – Paul Ehrlich, Roger Revelle, de Wolfe Miller

Ex-post impact, robustness and indirect effects – IFPRI study

Benefit sharing and the Nile Basin Initiative -- Grey and Sadoff

Bujagali – KSG case, Mallaby

##### References:

- Whittington, D et al. "Water resources in the Nile Basin: the economic value of cooperation", Water Policy (2005) 227-252.
- F deWolfe Miller et al "Aspects of environmental health impacts of the Aswan High Dam on the rural population in Egypt", Progr. Wat. Tech, 11, 1, pp 173-180, 1978.
- World Bank (2006) Ethiopia Managing Water Resources to Maximize Sustainable Growth, Washington DC.
- Claudia W. Sadoff, David Grey, "Beyond the river: the benefits of cooperation on international rivers", Water Policy 4 (2002) 389–403
- Sebastian Mallaby, The World's Banker, Penguin, 2006

#### **WEEKS THIRTEEN AND FOURTEEN: Water development in the Brazilian Amazon**

Economic and environmental resources of the Amazon – World Bank

Health consequences, direct and indirect – World Bank

Tucuruí – impact and lessons. WCD and others

River transport and agriculture and environment

Balbina and environment

Rio Madeira – planning, energy, transport, environment, malaria... Marcia Castro

##### References:

- The World Bank, "Amazon Partnership Framework" in Brazil Country Partnership Strategy, World Bank, 2008
- Mark London 2007 The Last Forest, Random House
- Marcia Caldas de Castro, Diana O. Sawyer, and Burton H. Singer, "Malaria risk on the Amazon frontier", Proceedings of the US National Academy of Sciences, February 14, 2006 vol. 103 no. 7 2452-2457.
- Philip Fearnside "Brazil's Samuel Dam: Lessons for Hydroelectric Development Policy and the Environment in Amazonia", Environmental Management, Volume 35, Number 1 / January, 2005 Governor Eduardo Braga, Video on World Bank web-site <http://worldbank.org/br>
- Conservation Strategy Fund "Effects of Energy and Transportation Projects on Soybean Expansion in the Madeira River Basin", 2007, <http://conservation-strategy.org/en/project/amazonbasin/madeira>

**WEEKS FIFTEEN AND SIXTEEN: Student group presentations**

Enrollment is anticipated to be 18 students. Working in groups of 3 (six groups in all), each group will have a session of 30 minutes, with 15 minute presentation and 15 minutes of discussion.