### LEARNING OBJECTIVES

<table>
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<tr>
<th>No.</th>
<th>Course Learning Objective</th>
<th>Related Departmental Competency</th>
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</table>
| 1   | To develop the knowledge basis and understanding of status quo (baseline) conditions in the water and sanitation sector in less developed countries; and how “problems are defined | - “Identify environmental engineering problems ...”  
- “Develop a depth of knowledge in one area within environmental sciences & engineering |
| 2   | To understand current trends in water and sanitation conditions and where current programs, economic growth, population growth, and demographic changes are headed (dynamic baseline) | - “Identify environmental engineering problems ...”  
- “Develop a depth of knowledge in one area within environmental sciences & engineering |
| 3   | To understand and think critically about the different types of policy interventions (instruments) that can be used to improve water and sanitation conditions in developing countries | - “Develop and design appropriate controls and facilities to solve environmental engineering problems.”  
- “Specify approaches for assessing, preventing, and controlling environmental hazards that pose risks to human health and safety.” |
| 4   | To understand the policy objectives (criteria) that governments and donors use to assess the outcomes of policy interventions in the water and sanitation sector | “Identify environmental engineering needs and objectives ...”  
“Demonstrate awareness of and sensitivity to the varied perspectives, norms, and values of others based on individual and ethnic/cultural differences” |
| 5   | To understand the causal links between policy interventions and outcomes; to critically assess the available evidence about how effective different policy instruments are in improving conditions in the water and sanitation sector | - “Explain the relationships between scientific knowledge, exposure, risk assessment, environmental management, and environmental policy.”  
- “Apply evidence-based concepts in public health decision-making” |
| 6   | To think critically about implementation issues and the lessons learned about implementation, monitoring and evaluation | - “Show familiarity with public health practice” |
| 7   | To develop critical writing and communication skills in order to better explain policy recommendations in the water and sanitation sector to decision-makers | - “Demonstrate written and oral communication skills related to environmental engineering”  
- “Analyze, interpret, and explain the results of original research” |
To learn how to read and synthesize professional and scientific literature on a policy issue in the water and sanitation sector

GRADING POLICY:

Grades for the course will be based on the following weights and are described further below:

<table>
<thead>
<tr>
<th>Graded Components</th>
<th>Due Dates</th>
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<tr>
<td>ASSIGNMENTS (60%)</td>
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<tr>
<td>Performance Indicators (20%)</td>
<td>Feb 24</td>
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<tr>
<td>Term Project – Systematic Literature Review (40%)</td>
<td>April 28 (on last day of class)</td>
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<tr>
<td>FINAL EXAM (40%)</td>
<td>May 9 at 4:00-7:00 pm</td>
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Assignments (60%):
- No. 1 – 15% - Performance Indicators (due Feb. 24)
- Term Project: Systematic Literature Review – 40% (due on the last day of class, April 28)

Participation in Class Debates, Student-led Discussions and In-Class Discussion (required):
- Debates: Everyone will participate in 1 of the 3 debates, on either the pro or con side, based on random assignment. Prompts and details for the debates will be distributed on Sakai.
- Student-led Discussions: Students (alone or in pairs depending on class enrollment) will present a summary and lead a student discussion for an assigned reading. The length of the presentation will vary between 20-30 minutes, according to the syllabus. Students who are not presenting are expected to participate in the discussion.
- Teaching Cases: There are six teaching cases during the semester. Students are expected to read the teaching case before class and come prepared for discussion (and/or presentation, if described in the teaching case assignment).
- In-Class Discussion: I encourage you to ask questions in class and to submit questions to me by email after a lecture.

Final Exam (40%):
- Date: May 9, 4:00-7:00 pm
- Description: The final written exam will consist of multiple short answer questions and one essay question based on the lecture material and required readings. You will be given a selection of questions from which to choose.
- Bring: You are required to bring your own blue book(s) (1 to 2) on which to write the exam. These may be purchased at the student store.

Overall Grade:

Pass/Fail grades (graduate students):
- A grade of H indicates superior performance, over and above the mastery of basic concepts.
- A grade of P indicates satisfactory performance.
• A grade of L indicates a low pass and that the student has a poor understanding of numerous concepts covered in the course.
• A grade of F indicates a failure to understand the basic concepts covered in the course.

Other grades (undergraduate students and non-UNC graduate students):
• Grades will be converted to an A/B/C etc. scale for undergraduates and graduate students from non-UNC institutions that do not use a pass/fail grading system.

All students are bound by the UNC honor code: “It shall be the responsibility of every student at the University of North Carolina at Chapel Hill to obey and to support the enforcement of the honor code, which prohibits lying, cheating, or stealing when these actions involve academic processes or University, student or academic personnel acting in an official capacity.”
SCHEDULE AND READINGS

Part 1- Understanding Status Quo Conditions

Session 1 (Jan. 13) – Introduction, Conceptual framework, Ancient instincts, Systematic literature review assignment

In-class activities
- Introduction, Course Organization
- Discussion of Systematic Literature Review

Readings


Session 2 (Jan. 20) - Infrastructure Coverage, Dynamic Baseline, Water & Climate Change

In-class activities
- Student questions on MOOC videos
- Student WASH experiences

MOOC Videos
1.0 Facts About Water https://youtu.be/7JpwuBSv4vY
1.1 Global Water and Sanitation Coverage https://youtu.be/Ml3uSQz3YTE
1.2 Infrastructure Coverage (Electricity, Sewerage, Water, Telephone) https://youtu.be/vvB34Fzco58
1.3 Forecasts of Coverage https://youtu.be/qhY20OIPp7M
1.4 Conversation with Clarissa Brocklehurst https://youtu.be/uLjYvHZh00U

Effects of Climate Change on Water Utilities https://youtu.be/ntTwzkPU8Tg
Conversation with Clive Agnew https://youtu.be/ibmTPchPhfc

Other Videos to watch before class
- Hans Rosling: 2006 TED Conference in Monterey https://www.youtube.com/watch?v=hVimVzgdD6w

Readings


**Session 3 (Jan. 27) – Water Vending, Corruption**

**In-class activities**
- David Fuente - Presentation on the dynamic baseline: Forecasts of Coverage
- Student questions on MOOC videos
- Teaching Case No. 1: “USAID Mission to Haiti.”

**MOOC Videos**
2.1 Outrage Versus Strategy? [https://youtu.be/8D0aQrpUPZw](https://youtu.be/8D0aQrpUPZw)
2.2 Types of Vendors and Vendor Prices [https://youtu.be/XQIKPzADyYQ](https://youtu.be/XQIKPzADyYQ)
2.3 Money and Water Flows, Onitsha, Nigeria [https://youtu.be/QK_g4vu_738](https://youtu.be/QK_g4vu_738)
2.4 An Introduction to Corruption [https://youtu.be/IPhl-cKm4ko](https://youtu.be/IPhl-cKm4ko)
2.5 Corruption in South Asia [https://youtu.be/ViDWFUj88Ep4](https://youtu.be/ViDWFUj88Ep4)

**Other Videos to watch before class**
- Water and Sanitation for the Poor: Independent Providers (18 min.)

**Readings**


### Session 4 (Feb. 3) - Understanding the Supply-side - Costs & Technologies

**In-class activities**
- Student Questions on MOOC videos
- Student presentations on initial ideas for systematic literature review

**MOOC Videos**

3.1 Solution to Cost Calculation  [https://youtu.be/ThYhGYwQFQM](https://youtu.be/ThYhGYwQFQM)
3.2 Cost Components and More on Costs  [https://youtu.be/ZXWITS36xYM](https://youtu.be/ZXWITS36xYM)
3.3 Costs of Non-Piped Technologies  [https://youtu.be/apQWMRM7Qr4](https://youtu.be/apQWMRM7Qr4)
3.4 Condominial sewers and desalination  [https://youtu.be/3E0w11Ftdi0](https://youtu.be/3E0w11Ftdi0)
3.5 Conversation with Don Lauria - Part One  [https://youtu.be/-3Aojeihcj8](https://youtu.be/-3Aojeihcj8)
3.6 Conversation with Don Lauria - Part Two  [https://youtu.be/mYTJZWtIcEo](https://youtu.be/mYTJZWtIcEo)

**Other Videos to watch before class**


**Readings**


### Session 5 (Feb. 10) – Understanding Demand for Improved Water and Sanitation Services

**In-class activities**
- Student questions on MOOC videos
- Class debate No. 1 – Water-related Health risks

**MOOC Videos**

4.1: Introduction to Modeling Household Water Demand [https://youtu.be/cs43N0X0WQI](https://youtu.be/cs43N0X0WQI)
4.5: Effect of Social Norms on Household Water Use [https://youtu.be/o9x5AdXpWeg](https://youtu.be/o9x5AdXpWeg)
4.6: Conversation with Marc Jeuland [https://youtu.be/pI4VteXi1rg](https://youtu.be/pI4VteXi1rg)

5.1: Facts About Water and Health [https://youtu.be/-nLJe-_2Ny8](https://youtu.be/-nLJe-_2Ny8)
5.3: Exercise on Health vs. Non-Health Benefits for Households With Water Sources Outside the Home [https://youtu.be/Sn76q60Ux5U](https://youtu.be/Sn76q60Ux5U)
5.4: Climate Change on Water and Health [https://youtu.be/jnig0DEY0is](https://youtu.be/jnig0DEY0is)

**Other Videos to watch before class**

- Water of Ayole [https://vimeo.com/131882215](https://vimeo.com/131882215)

**Readings**

**Water**


**Sanitation**


Class debate No. 1 – Proposition: “The health risks from poor water and sanitation are a relatively small, unimportant part of ‘portfolio’ of risks confronting poor households in low-income countries.”


**Session 6 (Feb. 17) - Water Development Paths**

*In-class activities*
- Student questions on MOOC videos
- Presentation by Jane Zhao on water development paths in 5 Asian cities
- Student-led discussion of Geels (2006)

**MOOC Videos**
- 6.0: Possible Solutions to the Water Development Paths Exercise [https://youtu.be/lgi8M23o1WQ](https://youtu.be/lgi8M23o1WQ)
- 6.4: Changing Course [https://youtu.be/C2d2zLAdH3g](https://youtu.be/C2d2zLAdH3g)
- 6.5: Capital intensity - England and Wales [https://youtu.be/HmRxhrHrPoE](https://youtu.be/HmRxhrHrPoE)
- 6.6: Conversation with Marie Hart [https://youtu.be/tftL4zQPXXU](https://youtu.be/tftL4zQPXXU)
- 6.7: Wrap-up and Reflections [https://youtu.be/4x8Cgg9c08Y](https://youtu.be/4x8Cgg9c08Y)

**Readings**


**Part 2 - Policy Interventions**

**Session 7 (Feb. 24) – Planning protocols**

**In-class activities**
- Discussion of Assignment No. 1 - Performance Indicators (due Feb. 24)
- Student questions on MOOC videos
- Video - Orangi: City of Hope
- Student-led discussion of Therkildsen (1988).

**MOOC Videos**

[to be provided]

**Other Videos to watch before class**
- Kumasi Strategic Sanitation Planning

**Readings**

**Participation**


**Designing Demand-Driven Rural Water Programs**


Background readings


Designing Demand-Driven Urban Sanitation Programs


Session 8 (March 3) – Water Pricing and Tariff Design

In-class activities
- Student questions on MOOC videos
- Student-led discussion of J-PAL (2011)
- Teaching Case #2 – Reform of Fayoum’s Water Tariff Structure

MOOC Videos

[to be provided]

Readings


Session 9 (March 10) – Designing Subsidy Schemes to Reach the Poor

In-class activities
- Student questions on MOOC videos
- Student-led discussion of Komives et al. (2007).
Class Debate No. 2 – Human Right to Water

MOOC Videos

[to be provided]

Readings


Class debate No. 2 – Proposition: “The United Nations Declaration establishing a human right to water and sanitation is a big step forward and will result in many more poor households receiving improved WASH services in the future.”

Readings for Debate:


March 17 – Spring break

Session 10 (March 24) – Information Treatments

In-class activities

- Student questions on MOOC videos
- Student-led discussion of Gertler et al. (2015)
- Teaching Case No. 3 – What should Modi do?

MOOC Videos

[to be provided]

Other Videos to Watch Before Class

- UNICEF – Dividing the Mango; Meena’s Three Wishes; I’m Meena
  https://www.youtube.com/watch?v=WA1AH1DbQM4
  https://www.youtube.com/watch?v=iumgE0jEJNc

Readings


Community-Led Total Sanitation


Session 11(March 31) – Changing Institutions: Privatization

In-class activities
- Student questions on MOOC videos
- Student-led discussion of Dumol (2000)
- Teaching Case #4 – The Privatization of Water in Cartagena, Colombia

MOOC Videos

[to be provided]

Other Videos to watch before class
- The World Bank – Public Water, Private Partners (27 min)

Readings


Session 12 (April 7) – The UK Privatization

In-class activities
- Student Questions on MOOC videos
- Class Debate #3: Should UK private water companies be returned to public ownership?
- Student Presentations on Systematic Literature Review “Lite”

MOOC Videos

[to be provided]

Readings

[to be provided]

Class Debate #3: UK private water companies be returned to public ownership?

Background reading for class debate:

Session 13 (April 21) - Regulation of Water Utilities

In-class activities
- Student Questions on MOOC videos
- Teaching Case #5 “Regulating Privatized Water Utilities in Manila.”
- Student Presentations on Systematic Literature Review “Lite”

MOOC Videos
[to be provided]

Readings


Session 14 (April 28) – Priority Setting: Economic Analysis of Water and Sanitation Projects

In-class activities
- Whittington Lecture on priority setting
- Teaching Case #6 - “Ek Son Chan and the Transformation of the Phnom Penh Water Supply Utility.”
- Student Presentations on Systematic Literature Review “Lite”

No MOOC Videos

Other Videos to watch before class
- Kabuku Water Project Kenya: Sustainability- Productive Uses of Water
Readings


**Exam:** Tuesday, May 9, 4:00-7:00pm
Description of Assignment #2 – Systematic Literature Review “Lite”

I want students in the course to learn to conduct a systematic literature review and explore in depth the literature on a WASH-related topic in which they are especially interested. A good literature review should critically appraise what is already known about a subject and identify gaps in knowledge (what is not yet known) from existing studies. Systematic literature reviews structure the search process and data extraction from existing studies systematically and transparently with explicit and reproducible methods.

Students will work in pairs on this assignment because it is important to have a way to control for individual biases in the assessment of a specific literature. You are encouraged to discuss different possible topics for your literature review with other students in class and find a “partner” with similar interests to you. If you are unable to find a suitable partner, you can do your literature review by yourself. However, I prefer that students work in pairs.

Review Topics

Students (in pairs) will select a topic that may be a policy/program intervention(s), technologies, or a specific scientific question/issue related to water and/or sanitation as the focus of their literature review. I suggest reviewing the syllabus to determine general topics of interest and then narrowing further based on discussions and/or preliminary searching.

On Friday, Feb. 3, students will make presentation to class on the proposed topic of their literature review and preliminary findings from a potential database they have begun to search.

It is recommended that students do some preliminary searching of existing literature and reviews to ensure that there are sufficient primary studies on their proposed topic; that the topic is narrow enough; and there have not been any recent systematic reviews on the same topic. As a benchmark, a search that yields less than 100 articles is likely too narrow in scope while more than 10,000 may be too large. Most will fall in the range of 1000-5000 articles.

Dates

Jan. 13 Initial lecture on conducting a systematic literature review
Feb. 3 Students will make a presentation to the class on the topic of their literature review and the results of a preliminary search of a database they have searched.
April 7 Student presentations on the results of their systematic literature review “lite”
April 21 Student presentations on the results of their systematic literature review “lite”
April 28 Student presentations on the results of their systematic literature review “lite”
April 28 The written assignment is due on Friday, April 28 (email and hard copy).
Assignment Outputs

1) Journal-style systematic review (April 28)

The final systematic review with narrative synthesis should follow standard journal formatting: introduction, methods, results, discussion, conclusion, bibliography. We recommend generally formatting the paper as a systematic review for PLoS ONE (http://www.plosone.org/static/guidelines#systematic), but I do not expect a discussion on bias nor a meta-analysis.

Systematic review components included within your systematic review should at least clearly convey the following (you may reference the PRISMA statement and checklist at http://www.prisma-statement.org/statement.htm for a complete list of systematic review components, but you are not expected to follow all of them):

- Research question;
- Methods:
  - Description of screening and search strategy, search terms used; and
  - Search results throughout the screening and search process (full search terms may be included in Supplementary Materials if space is limited).
  - Inclusion and exclusion criteria.
  - Database: 1 database selected for search. Suggested databases will be given during the presentation. While multiple databases are typically searched in a systematic literature review, due to time constraints we will limit the search to a single database. Students considering submitting their manuscript to a journal after the semester, however, may want to consider adding additional database(s) to their review.
  - Basic descriptive statistics, a narrative synthesis (not meta-analysis) and discussion of the results.
- Appendices:
  - Submit via email the excel database that was used for screening and data extraction.

Students should design their search strategy with their partner. After final search terms are established, students should screen the results separately based on the inclusion and exclusion criteria, then compare and systematically resolve differences.

Once the search and screening has been done systematically, I’d like you to limit the final number of papers for data extraction and review to a quantity reasonable for you to review in the course of the semester (e.g. +/- 10). The exact number will depend on your topic and results. For example, if the results of your final screening include more than 10-15 articles, decide how to limited the articles you reviewed (i.e. the most recent publications through more narrow inclusion criteria; random sample; purposive sample, etc.) as best fits your paper. Describe this within the methods section of your paper. If, however, your original search and screening strategy yields less than 10 papers (i.e. 5+) because of the nature of the state of that literature, it is not necessary to arbitrarily expand the search to increase the final number the articles. We are not prescribing a minimum number.
Readings on Conducting a Systematic Literature Review


Examples of Systematic Literature Reviews

(Before class, select and fully read one article that you find most interesting. Skim the remaining articles to be familiar with the general format of systematic reviews and similarities/differences between them.)

Water/sanitation interventions and diarrheal diseases


Water/sanitation interventions and HIV/AIDS


Water quality


**Marketing water and sanitation technologies**


**WaSH in schools and education**


**Improved cookstoves and adoption**


**Costs and benefits**


**Other Recommended Resources and Readings**

Cochrane Collaboration Handbook: [www.cochrane.org/resources/handbook](http://www.cochrane.org/resources/handbook)

3ie’s (International Initiative for Impact Evaluation) systematic review database on the effectiveness of social and economic interventions in low- and middle-income countries: [http://www.3ieimpact.org/evidence/systematic-reviews/](http://www.3ieimpact.org/evidence/systematic-reviews/)


evidence to inform management and policy-making in the health field. Journal of Health Services 
Research & Policy, 10(suppl 1), 6-20.


**Additional resources for systematic reviews and meta-analyses recommended by Dr. Charlie Poole in EPID 731**

Borenstein M, Hedges LV, Higgins JPT, Rothstein HR. Introduction to meta-analysis. Chichester: 


Sterne JAC (ed). Meta-analysis in STATA: An updated collection from the Stata Journal. Stata Press, 
2009.
Note on WASH Interventions and Health:

**Understanding the link between water and sanitation interventions and health improvements is essential for the economic evaluation of water and sanitation projects. However, this subject is not discussed in detail in this course because it is covered elsewhere in the ENVR curriculum. Students are encouraged to do the following background readings if they are not familiar with the causal relationships between improved water and sanitation infrastructure and health outcomes:**

**Linking improved water and sanitation conditions to health outcomes – Selected Readings**


