

## ENVR 582: Sanitation for Development

Fall Term 2016

Location: McGavran-Greenberg 2301

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<b>Class Hours:</b> Tu-Th 12:30 – 1:45	<b>Office Hours:</b> by appointment

**Background:** “Sanitation” can mean many things, but is defined in this course as the infrastructure and services for the safe management of human excreta (feces and urine.)<sup>1</sup> In plainer English, it’s the hardware and systems for safe collection, treatment and disposal or reuse of human feces and urine. This definition is consistent with current usage in international development and the WaSH (Water, Sanitation and Hygiene) sector.

Sanitation is critical for human health and dignity, yet over 2.5 billion of us (approximately 40% of us) don’t have access to “improved” or acceptable sanitation. Poor sanitation contributes to many of the approximately 800,000 deaths<sup>2</sup> a year of children under the age of five from diarrheal disease, and billions of infections with intestinal parasites, (especially worm infections,) which make a significant contribution to global malnutrition. Inadequate management of human excreta also creates major environmental problems of water pollution, leading to the “death” of rivers and lakes from anoxia and eutrophication.

This course presents the problems and context of inadequate sanitation in the developing world, and, more importantly, the types of solutions and approaches available to reduce these problems.

**Target audience:** This course is designed for undergraduate and graduate students who wish to understand the problems of inadequate sanitation, and current approaches with which these problems are addressed.

**Course Prerequisites:** There are no prerequisites for this course, except curiosity and an interest in the topic.

**Course Goals and Key Learning Objectives:** The goal of this course is to introduce participants to the many problems of inadequate sanitation in the developing world, and common technical and institutional approaches to resolving them. Put another way, the goal of this course is to enable students to become “practically literate” in the challenge of inadequate sanitation, so that they are able to understand and contribute to the global struggle for its improvement.

By the end of the course, successful students will be able to:

- a) Identify the nature and magnitude of health problems associated with inadequate sanitation (*Note: this contributes to ESE MSEE/MS/MSPH/MPH competency to “identify environmental engineering problems, needs and objectives.”/“develop a depth of knowledge in one area within environmental sciences and engineering”/ “Identify sources of environmental contaminants and processes that affect the movement, fate, and health effects of contaminants in the environment and human systems.”*)

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<sup>1</sup> In many languages, and in English in the past, Sanitation can refer to the entire system of environmental management for human health and has thus included water supply, solid waste management, air pollution control, and sanitary inspection of food handling. Some authors describe this broader group of activities as “environmental sanitation” or “environmental sanitation services”.

<sup>2</sup> Estimates have varied widely over the years. This one comes from the US Centers for Disease Control and Prevention page on diarrhea <https://www.cdc.gov/healthywater/global/diarrhea-burden.html> citing a 2012 study. Liu L, Johnson HL, Cousens S, Perin J, Scott S, Lawn JE, Rudan I, Campbell H, Cibulskis R, Li M, Mathers C, Black RE; Child Health Epidemiology Reference Group of WHO and UNICEF. [Global, regional, and national causes of child mortality: an updated systematic analysis for 2010 with time trends since 2000](#). *Lancet*. 2012;379(9832):2151-61.

- b) Identify the nature of environmental threats (especially to aquatic life) from wastewater pollution. *(Note: this contributes to ESE MSEE/MS/MSPH/MPH competency to “identify environmental engineering problems, needs and objectives.”/“develop a depth of knowledge in one area within environmental sciences and engineering”/ “Identify sources of environmental contaminants and processes that affect the movement, fate, and health effects of conaminants in the environment and human systems.”)*
- c) Identify the principal technical approaches to sanitation and wastewater management/ *(Note. This contributes to the ESE MSEE/MS/MSPH/MPH objectives to “Develop and design appropriate controls and facilities to solve environmental engineering problems”/“Show familiarity with public health practice.”)*
- d) Select, in a given physical and socioeconomic context, the most appropriate technological options to consider, and describe both advantages and disadvantages of these *options*. *(Note. This objective contributes to the ESE MSEE/MS/MSPH/MPH objectives to “Develop and design appropriate controls and facilities to solve environmental engineering problems”/“Show familiarity with public health practice.”)*
- e) Understand and describe the economic and institutional challenges of *sanitation* *(Note: this contributes to the MS/MSPH/MPH competency to “Develop an understanding of basic concepts in public health”/ “Demonstrate broad knowledge in the core fields of public health/ Show familiarity with public health practice.”)*
- f) Draw lessons from some case studies of successful sanitation interventions, and describe the contexts in which they may, or may not, be reproducible. *(Note: this contributes to the ESE MSEE/MS/MSPH/MPH objectives to “Develop and design appropriate controls and facilities to solve environmental engineering problems”/“Show familiarity with public health practice.”)*

**Course Requirements:** Students will be required to read and think critically about a range of articles and book abstracts about sanitation and health. Students will also be required to take part in basic exercises for the comparison of different technical options. Students must submit a **fifteen-page term paper** (double-spaced, including references) on an approach to sanitation problems in the developing world. The topic may be site-specific or global, and may include (but is not limited to) such topics as Ecological/Sustainable Sanitation (where the reuse of wastes plays a major role in the promotion), Community-Led Total Sanitation, Sanitation Marketing, etc. The paper must reflect critical consideration of the strengths and weaknesses or limitations of the approach. The course assessment will also include both a mid-term and a final examination. *(Note: this requirement contributes to ESE MS/MSEE/MSPH/MPH competencies to: “Demonstrate written and oral communication skills related to environmental engineering/Demonstrate written and oral communication skills related to environmental sciences and engineering issues within a public health context.”)*

**Grades:** Grades will be based on the sum of individual assessments as follows:

Mid-Term Examination	20%
Term-paper	30%
Final Exam	40%
Class Participation	10%

Classroom participation will be assessed on the basis of engagement during lectures (Q&A), and the class discussions/debates.

### **Course Policies:**

Regular attendance of the class is expected.

*Course Policies with Honor Code implications:* Term papers are a way to provoke individual learning about approaches to sanitation, and should reflect individual efforts. This means that while students

are encouraged to share ideas with each other about their topics, the papers should nevertheless reflect individual, not collective, effort on the topic. Similarly, students should be cognizant of the strict standards of the University on plagiarism, and all sources of ideas and text should be clearly annotated. Exams will be closed book, and no use of cellphones during the exam will be permitted.

*Missed exams.* There will be a midterm on Tuesday Oct 17 and a final exam on Friday Dec 9. To reschedule a missed exam, you must present a letter from your Healthcare Provider or from the Dean of Students that explicitly states that you were unable to attend the exam at the scheduled time.

**Course Resources:** These will be available on Sakai, and will consist largely of public domain materials available from the web.

**Syllabus Changes:** The instructor reserves to right to make changes to the syllabus, including the schedule and content of lectures, the paper assignment due date and test dates. These changes will be announced as early as possible.

Week	Session	Topic	Date	Readings/remarks and Assignments due
1	1	Introduction...course outline; Why Sanitation Matters	Tu 8/22/2017	
	2	Health Aspects...fecal-oral disease and its toll	Th 8/24/2017	Read first 3 chapters of: Sanitation and Disease (Feachem) in Epi folder on Sakai
2	3	Health Aspects Part II...epidemiology; what difference does sanitation make	Tu 8/29/2017	
	4	Work on group exercises on health	Th 8/31/2017	
3	5	Report Out on group exercise	Tu 9/5/2017	
	6	Sanitation and cholera in Haiti	Th 9/7/2017	Read UN outbreak report
4	7	Excreta and water pollution. DO, sag curves, and nutrients	Tu 9/12/2017	
	8	Environmental Role Play plus Intro to Sanitation Technologies/pit latrines	Th 9/14/2017	Scan the Sanitation compendium online Read role play set-up
5	9	Reading Day: Reading and Discussion of <b>Public and domestic domains in the transmission of disease</b> , Cairncross et al.	Tu 9/19/2017	Pete K on field work in India.
	10	Epidemiology and Interventions (Karen Yeatts)	Th 9/21/2017	
6	11	Septic Tank Design & Sewerage	Tu 9/26/2017	
	12	Technology Choice Exercise & Wastewater Treatment	Th 9/28/2017	
7	13	Review for Midterm	Tu 10/3/2017	Outline for Term Paper due
		Midterm Exam	Th 10/5/2017	<b>MIDTERM EXAM</b>
8	14	Fecal Sludge Management & Hazard Modeling	Tu 10/10/2017	

Week	Session	Topic	Date	Readings/remarks and Assignments due
	15	Introduction to interventions, development thought	Th 10/12/2017	
9	16	Reading Day/discussion on development approaches.	Tu 10/17/2017	Remarks: Pete K at water and health conference
		FALL BREAK	Th 10/19/2017	
10	17	Exam recap/CLTS role play	Tu 10/24/2017	
	18	Intro to sanitation Economics	Th 10/26/2017	
11	19	CLTS in practice	Tu 10/31/2017	Taught by Jonny Crocker
	20	Sanitation Finance: paying in the real world	Th 11/ 2/2017	Feedback on Indonesian case study
12	21	Sanitation marketing...in theory	Tu 11/7/2017	
	22	SanMark in Practice	Th 11/9/2017	Taught by Kaida Liang
13	23	Sanitation marketing...case studies	Tu 11/14/2017	
	24	Political Economy of Sanitation	Th 11/16/2017	
14	25	Course review 1	Tu 11/21/2017	<b>TERM PAPERS DUE</b>
		Thanksgiving	Th 11/23/2017	
15	26	Course Review 2	Tu 11/28/2017	
	27	Term Paper Presentations	Th 11/30/2017	
16	28	Term paper presentations/Q&A	Tu 12/ 5/2017	
		Final Exam at 2 PM	Fri 12/8/2017	<b>FINAL EXAM</b>