

Environmental engineering

- Email: ychoi81@snu.ac.kr
- Course material/textbook:
 1. Lecture notes
 2. Davis & Masten (2014) Principles of Environmental Engineering and Science, 3rd ed.

Course objectives

- General background on environmental science and engineering
- Understand principles of environmental science
- Understand causes, effects, and engineering solutions for environmental problems
- Local to global scale
- Water, air, soil, waste, noise, ...

Evaluation

- Homework assignments [20%]
Midterm [30%], final [30%]
Attendance, etc. [20%]
- Plagiarism & cheating: 80% of the class low

Environmental engineering

Environmental engineering is manifest by sound engineering thought and practice in the solution of problems of environmental sanitation, notably in

- i) the provision of safe, palatable, and ample public water supplies,
- ii) The proper disposal of or recycle of wastewater and solid wastes,
- iii) The adequate drainage of urban and rural areas for proper sanitation, and
- iv) The control of water, soil, and atmospheric pollution and the social and environmental impact of these solutions.

(...)

(ASCE, 1977)

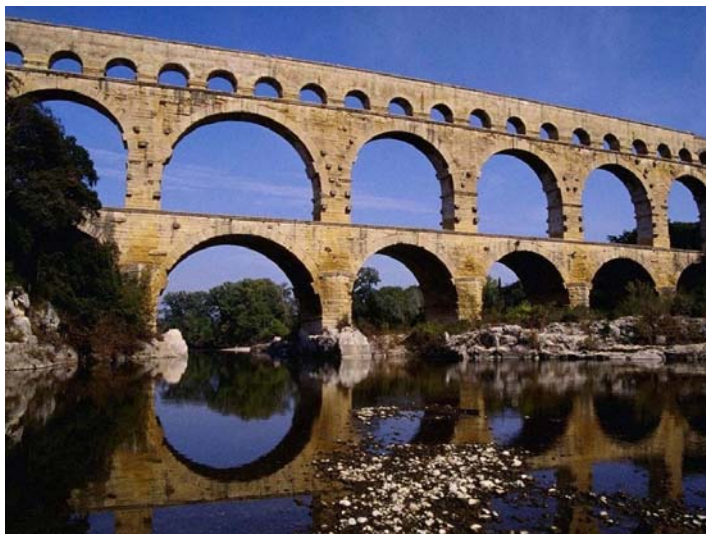
Environmental engineering

We will focus on principles of environmental chemistry and biology and their engineering applications that help improving human health and environmental soundness

Why Department of Civil and Environmental Engineering?

Environmental engineering

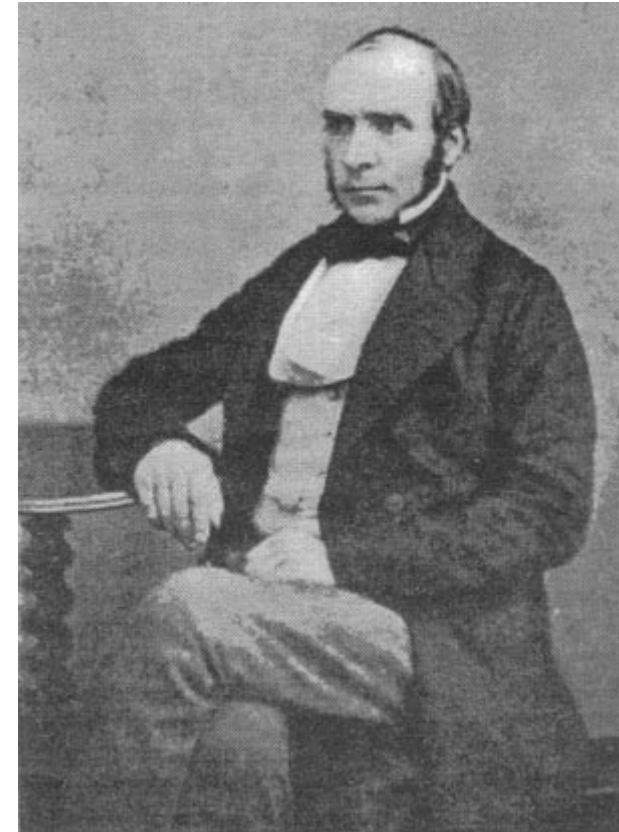
- It stems from civil engineering!
- Mid-1800s to mid-1900s: sanitary engineering (focused on providing safe drinking water)



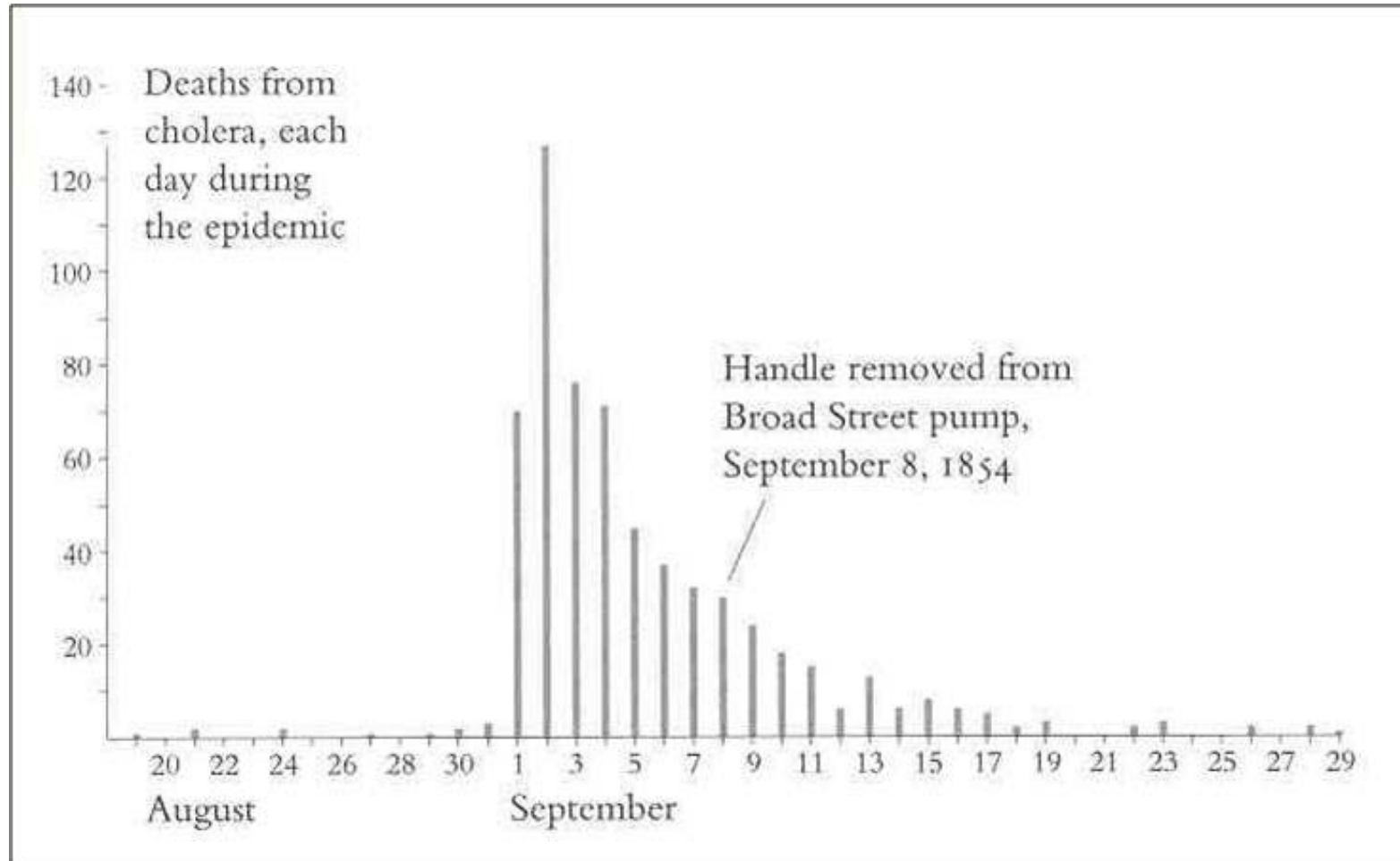
Roman waterway system

Pioneers of environmental sci. & eng.

- Dr. John Snow
 - Cholera outbreak in London (1853)
 - Tracked 83 victims: most of them obtained water from a hand pump located on Broad St.
 - Low incidence at a workhouse and the Lion Brewery: own water supply



Pioneers of environmental sci. & eng.



Great medical advances in modern age

1. Sanitation (clean water and sewage disposal) – 15.8%
2. Antibiotics – 15%
3. Anaesthesia – 14%
4. Introduction to vaccines – 12%
5. Discovery of the structure of DNA – 9%

(British Medical Journal, 2007)

Environ. Eng. history in Korea

- Rapid economic growth since 1960
- Before 1980: most sewage and wastewater ran directly to rivers

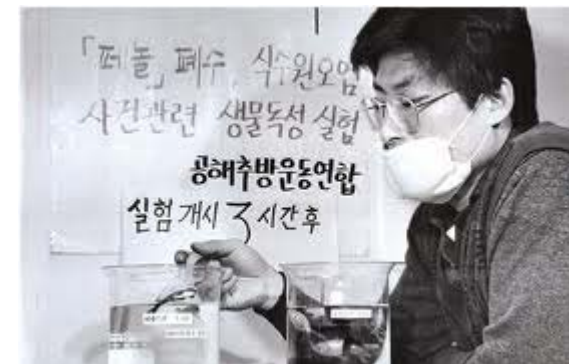


Nakdong-river phenol outbreak

- Ranked as #1 of the environmental outbreaks in Korea since 1950
- Occurred in the city of Gumi, Doosan electronics

Initial outbreak: Mar 16, 1991

- Burst in the pipeline that transports liquid phenol from a storage tank to a phenolic resin manufacturing plant
- 30 tons of liquid phenol were leaked and introduced to a drinking water reservoir that serves for 2+ million citizens around the city of Daegu (3rd largest city in Korea)



Nakdong-river phenol outbreak

<http://www.idaegu.co.kr>

- Citizens reported an objectionable odor in tap water → operators of the water intake facility added chlorine to the water
- Chlorination of phenol resulted in the formation of chlorophenols: much more odorous and more toxic than phenol!
- (At least) thousands of citizens became ill: headaches, nausea, abortion, etc.



Nakdong-river phenol outbreak

2nd outbreak: Apr 22, 1991

- The government allowed reopening the plant only 1 mo. after the initial outbreak
- Leak at the joint of the phenol storage tank 5 days after reopening
→ 1.3 tons of phenol were released to the reservoir

Follow-ups

- 24 personnel including employees of Doosan electronics and public officers were jailed
- Minister and vice minister of the Ministry of Environment were forced to retire
- Enacted [Act on Special Measures for the control of Environmental Offenses Illegal Check Control]

(National Archives of Korea, 2007)

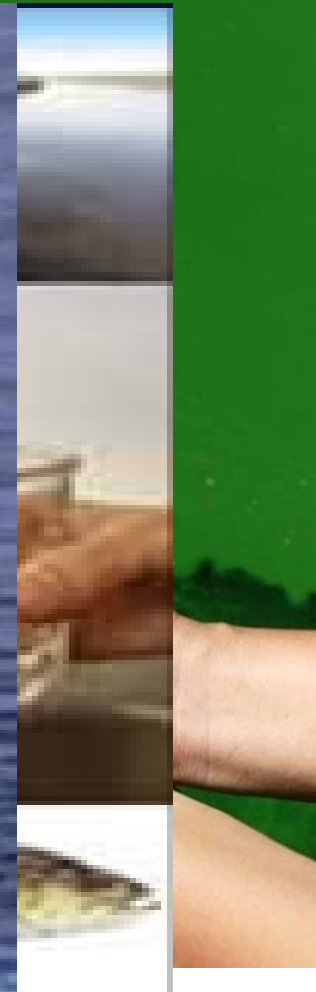
Environ. Eng. history in Korea

- Almost nothing in 1970s to Full coverage in 2000s

	1991	1996	2001	2006	2011
하수도보급률 (%) %population linked to sewer treatment system	35.7	52.6	73.2	85.5	90.9
하수시설처리용량 (천톤/일) Sewage treatment capacity (10 ³ ton/day)	5,258	11,452	19,230	23,273	25,228

e-나라지표, www.index.go.kr

Problem solved?



Reading assignments

- Textbook Ch1-1~4