

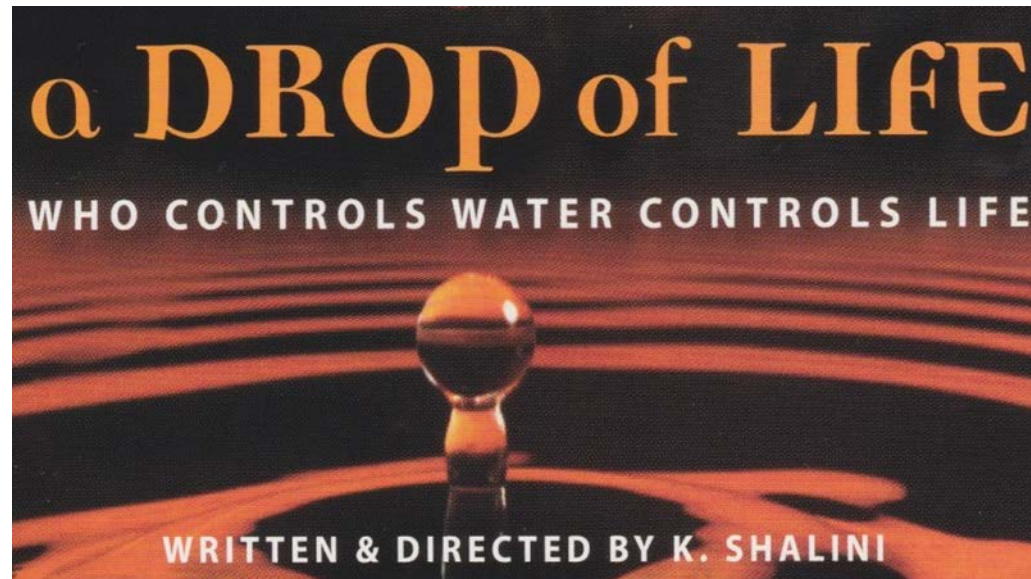


# Ethics and the Engineering Grand Challenges

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Short film: *A drop of life*



# The Unbalanced Equation: Technical Opportunities and Social Barriers in the NAE Grand Challenges and Beyond

Dean Nieuwma\* and Xiaofeng Tang

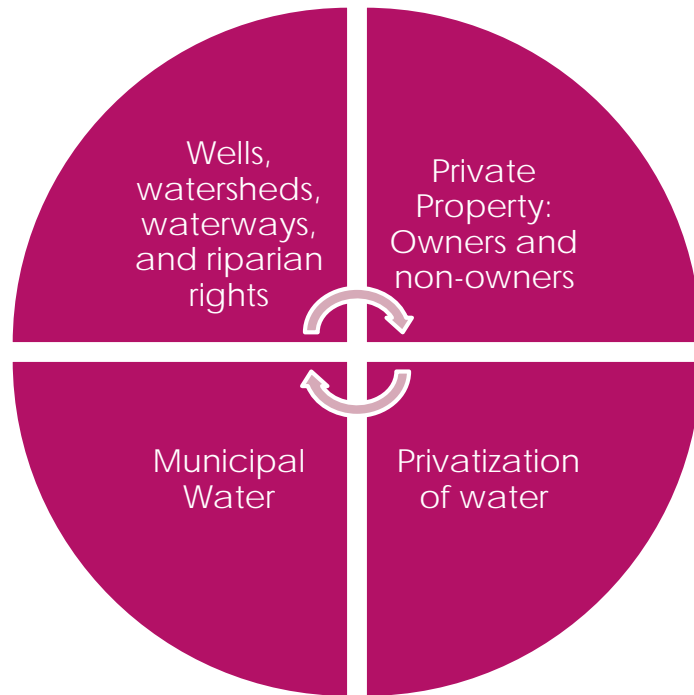
*Authors argue that the Grand Challenges report*

- ▶ relies on a problematic and increasingly outdated understanding of engineering as distinct and apart from the social contexts in which it is practiced
- ▶ endorses a conception of engineering that is “purely technical” at its foundation
- ▶ Is likely to constrain efforts to develop robust solutions to complex social problems in ways that enhance social justice

# The technical-social division

- ▶ “... problematic in how *Grand Challenges* translates complex sociotechnical challenges into narrowly technical challenges and then suggests that existing technologies or engineering developments currently on the horizon are capable of solving these technical challenges” (142).

# Example: Access to clean water as a social technical system



## Matters of ethics

- ▶ Justice questions in provision of water as a technical solution arising from a business opportunity:
  - ▶ Disregard for those whose traditional practices are deemed as having little value
  - ▶ No feedback or input gathered from those who "have no voice."
  - ▶ Who determines what is a public good?
  - ▶ Disregard for individual, private interests.

# Incorporating ethics into GCSP programs

- ▶ Require courses in ethics from departments of philosophy, etc.
- ▶ Create stand alone “Ethics and the Grand Challenges” courses
- ▶ Incorporate ethics into related Engineering courses:
  - ▶ Civil and Environmental Engineering
    - ▶ Water and ethics

# Sample Course: UVA

Syllabus  
STS 2500

The Engineer, Ethics, and Professional Responsibility  
Social & Ethical Elements of the Engineering Grand Challenges

Fall, 2019

Prof. R.W. Berne  
([rwb@virginia.edu](mailto:rwb@virginia.edu))

# Team leadership of class (20%)

- ▶ Your team will be responsible for the class assigned. The goal is to lead your fellow to gain a good understanding of the assigned readings, incorporating social and ethical considerations in understanding the particular Engineering Grand Challenge to be the subject of that class.
- ▶ Teams should strive for active student engagement, and are encouraged to introduce outside material during their presentations to the class.



# Oral Presentation & Essay (20%)

- ▶ A. Select an Engineering Grand Challenge that has meaning for you, personally and /or intellectually.
- ▶ B. Use 4 -5 sources from academic writing to raise social or ethical nodes of concern pertaining to that particular grand challenge and incorporate them into your writing of a 4-5 page critical essay. Build your argument from evidence, not just your opinion, in defending your stated position of concern.
- ▶ C. Prepare a 10-12 minute oral presentation supported by PowerPoint slides, in which you lay out and present the position you have taken in your paper.

# Exam Question

Nieusma and Tang argue that 'By stripping the social and political context of big social problems, *Grand Challenges* not only oversimplifies the nature of the challenges; it also fails to encourage engineers to assume prominent roles in collaborations initiated outside narrow technical realms'. The report's approach to the challenge of providing clean water and basic sanitation in developing countries showcases one such miss.

In addressing the grand challenge of providing consistent supply of clean water and sanitation services to developing countries, what broader, non-technical questions need to be addressed? How was the disconnect between 'engineer' and 'society' exemplified in the film *A Drop of Life*? What non-technical challenges were overlooked?

# Online Ethics Center (OEC)

[www.onlineethics.org](http://www.onlineethics.org)

Sample resources related to the Grand Challenges:

- ▶ “Infrastructure Adaptations in a Changing Climate” Webinar
- ▶ “A Response to Stealing in Cyberspace” Boston Globe editorial
- ▶ “Everyone Deserves Clean Water” video talk from APPE meeting
- ▶ Case Study: Deep Brain Stimulation Studies