

SP.723: D-Lab III: Dissemination: Implementing Innovations for the Common Good  
Susan Murcott  
Lecture Notes

Session 5, 2/22/07

## Two Videos

1. “Clean Water for 1 Billion People – the Nepal Water Project”  
<http://techtv.mit.edu/file/718/>
2. “Arsenic: Largest Case of Mass Poisoning in History”  
<http://techtv.mit.edu/file/711/>

## Lecture - Co-evolutionary Design for Development (Susan Murcott)

- Traditionally engineers were trained to design with two main criteria
  - The technical criteria
  - The cost-benefit analysis
- This has gotten more complex today
- *Small is Beautiful*, by E. F. Schumacher. “Appropriate” or “Intermediate” technology defined as:
  - Simple design and production
  - Low cost
  - Use local materials for local use
  - Rural focus
- Green design: design for the environment
- Sustainable development - How can we design for sustainability?
  - Sustainable design – defined alternatively as balance or equity
  - The design process (standard textbook version)
    - Maybe one can design a computer chip or a cell phone this way, where you don’t necessarily have to interface with humans
- Co-evolutionary design for development
  - Here it is more essential that you start with community partnership
  - It’s for a similar reason that the IDEAS competition requires that you start with a community partner
  - 19<sup>th</sup> century MIT was a bastion of learning practical lab science, instead of just theory. Today, we need to think of the world as our practical lab environment, and work practically and realistically
    - It’s important to use local materials
- Arsenic contamination in Nepal and the search for solutions over the past 6 years has enabled us to conceptualize this model of “co-evolutionary design.”
  - My MIT student teams were the ones who, together with the Nepal government Dept. of Water Supply and Sanitation (DWSS) identified arsenic in Nepal
  - Arsenic causes skin diseases and cancers

- The World Health Organization's water quality guideline for arsenic is 10 parts per billion (ppb), and Nepal's is 50ppb
- It's not just a matter of health, it's also a matter of cost
- We tested a total of eight different arsenic removal systems over a period of about three years.
- The *Kanchan*<sup>TM</sup> Arsenic Filter system was invented by an MIT team together with local partners. It won the top prize in the first IDEAS Competition.
- This filter's foundation is vessel of sand, gravel and a standing layer of water, in common with the biosand filter's slow sand filtration technology. This part of the technology removes bacteria and protozoa.
- Our innovation is the addition of iron nails to purify for arsenic as well
- We needed a local source of iron in our community in Nepal
- Iron nails from a local shop worked as well as the iron filings we originally brought from the USA and tested in Nepal.
- We trained local technicians to build these filters, which we call the *Kanchan*<sup>TM</sup> Arsenic Filter.
- We started out with a concrete container, which required concrete molding and manufacturing. Then we switched to a locally available plastic trash can, and finally we got to a small and simple plastic bucket as the container for the system.
- This costs 20 dollars per unit, which is pretty affordable in that area (though we'd really like to be able to get down to 10 dollars)
- We did a study on this water purifier in households over the course of a year, and had very good results
- After we won the IDEAs competition, we next won a World Bank Development Marketplace award
- So far, we've distributed 5,000 filters to about 50,000 people, and this year we'll be distributing 5,000 more
- The government in Nepal and leading non-governmental organizations in Nepal such as Nepal Red Cross and UNICEF agree that this is currently the best water purification technology available for Nepal for addressing the arsenic in drinking water problem.
- This technology is now gaining wider exposure through technology verification testing in Bangladesh and Cambodia