



Engineering in Sustainable Human Development

Bernard Amadei

Mortenson Center in Engineering for Developing Communities
University of Colorado, Boulder

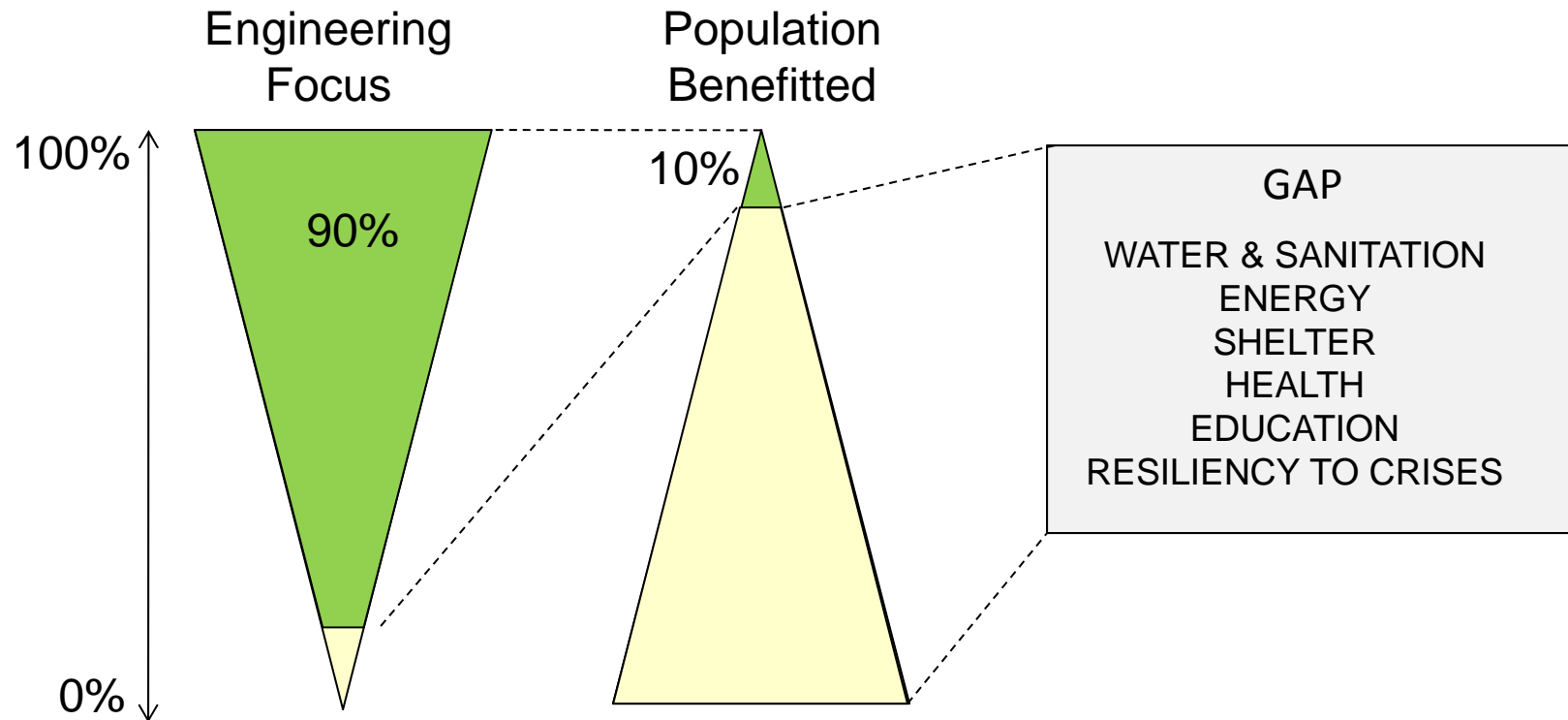


BeyondBorders
IEEE Conference
July 15, 2013



A LARGE GAP REMAINS BETWEEN TODAY'S TECHNOLOGICAL ADVANCES AND THE NEEDS OF THE WORLD'S MAJORITY

"The majority of the world's designers focus all their efforts on developing products and services exclusively for the richest 10% of the world's customers. Nothing less than a revolution in design is needed to reach the other 90%." *Dr. Paul Polak, International Development Enterprises*





Doing Well by Doing Good

Market for joint ventures between private and citizen sectors in the low-income world worth:

- \$202 billion in health care,
- \$424 billion in low-cost housing,
- \$553 billion in energy,
- \$36 trillion in agricultural products and food.

Drayton and Budinich (2010)

Two Approaches

- Traditional Approach (for the 10%)

Small # of people x large profits = \$\$\$\$

- A Different Approach (for the other 90%)

Large # of people x small profits = \$\$\$\$\$\$



San Pablo, Belize (2001)



Engineers Without Borders - USA

- Partners with disadvantaged communities to improve quality of life
- Implements environmentally and economically sustainable engineering projects
- Develops internationally responsible engineers and engineering students
- Involves 12,000 members, 275 chapters, 400+ projects in 45 countries, 100+ projects completed.





- 0.78 billion lack clean water
- 2.5 billion lack adequate sanitation
- 2.4 billion are at risk with malaria
- 2.0 billion with no access to low cost essential medicines



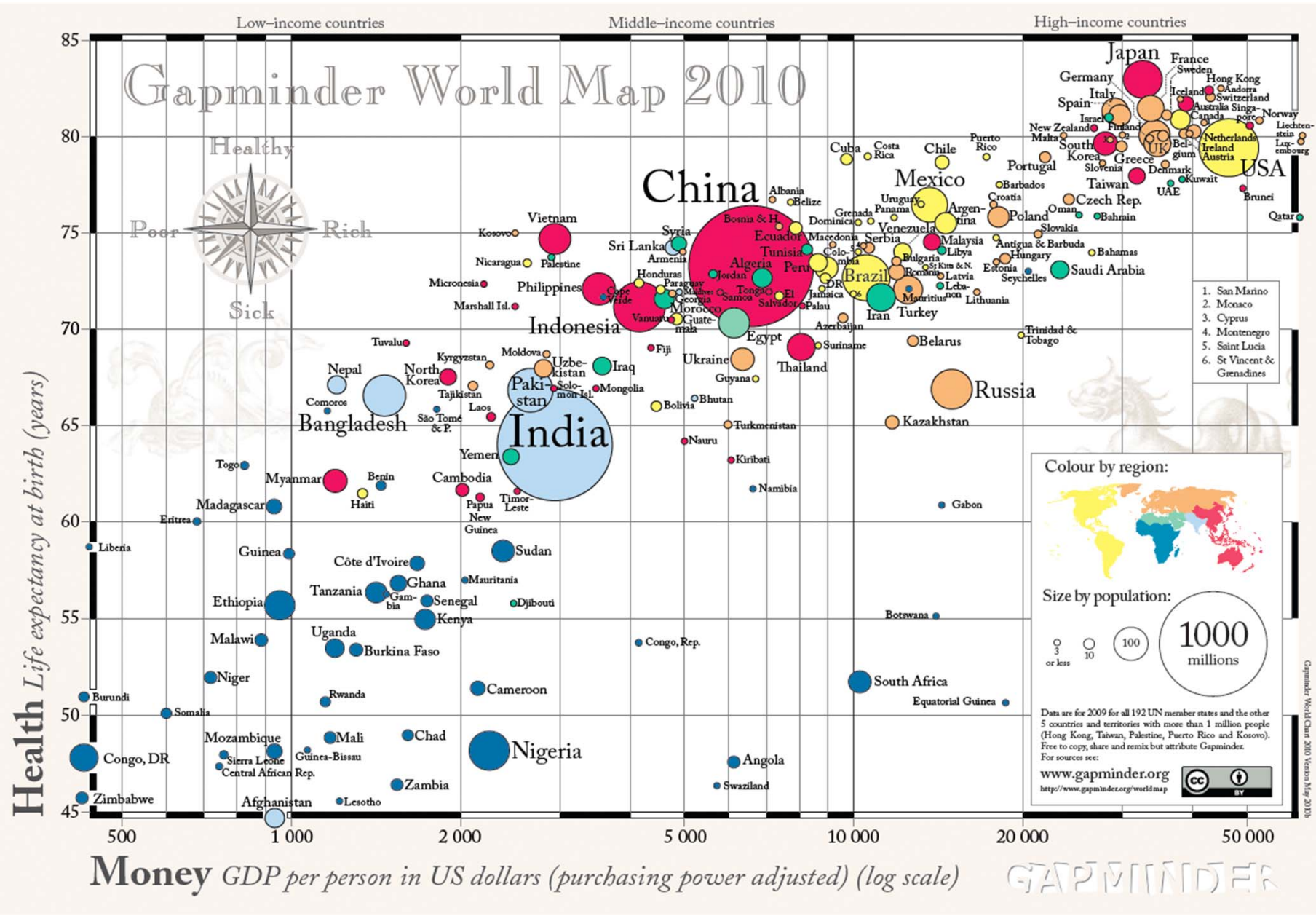
Why Engineering for the Developing World?

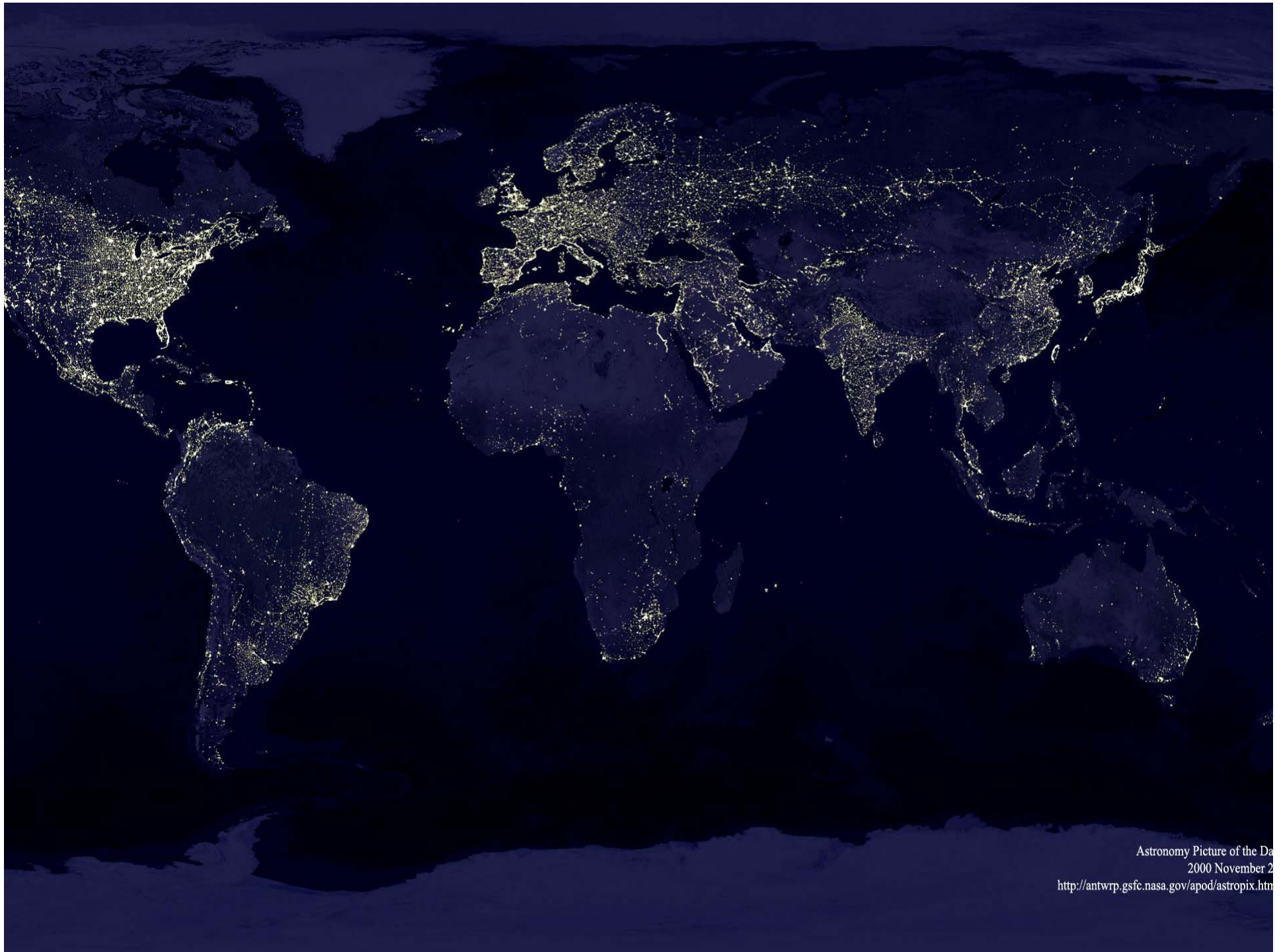
- 1.2 billion lack adequate housing
- 1.6 billion have no access to electricity
- 1.3 billion are illiterate
- 1.8 billion live in conflict zones, in transition, or in situations of permanent instability



Different Challenges

- In the **developed world**, the challenge is to **consume less and more intelligently** and be respectful of natural and human systems.
- In the **developing world**, the challenge is to ensure that proposed economic solutions **address the basic needs of people** and are good to the environment





Astronomy Picture of the Day
2000 November 2
<http://antwrp.gsfc.nasa.gov/apod/astropix.htm>

Voices of the Poor

Poverty is *unnecessary pain*:

- Precarious livelihood
- Isolation
- Physical weakness
- Gender relationship
- Psychological weakness
- Weak state institutions and communities
- Limited assets and high vulnerability



“Offering a dedicated retreat for Harrods smallest VIPs (Very Important Pets), The Pet Spa at Harrods promises a whole menu of animal friendly services including behavioral counseling, full body massages and animal reiki as well as nutritional advice, personal training sessions and grooming...”



THE *P*ET SPA
—  —
AT HARRODS

Creating Secure, Stable, Equitable, Healthy Communities

Have capacity through **resources**
and **knowledge** to:

- Address their own problems
- Sustain themselves
- Cope and adapt to various hazards
- Satisfy their own basic needs
- Demonstrate livelihood security



Engineering for the other 90%

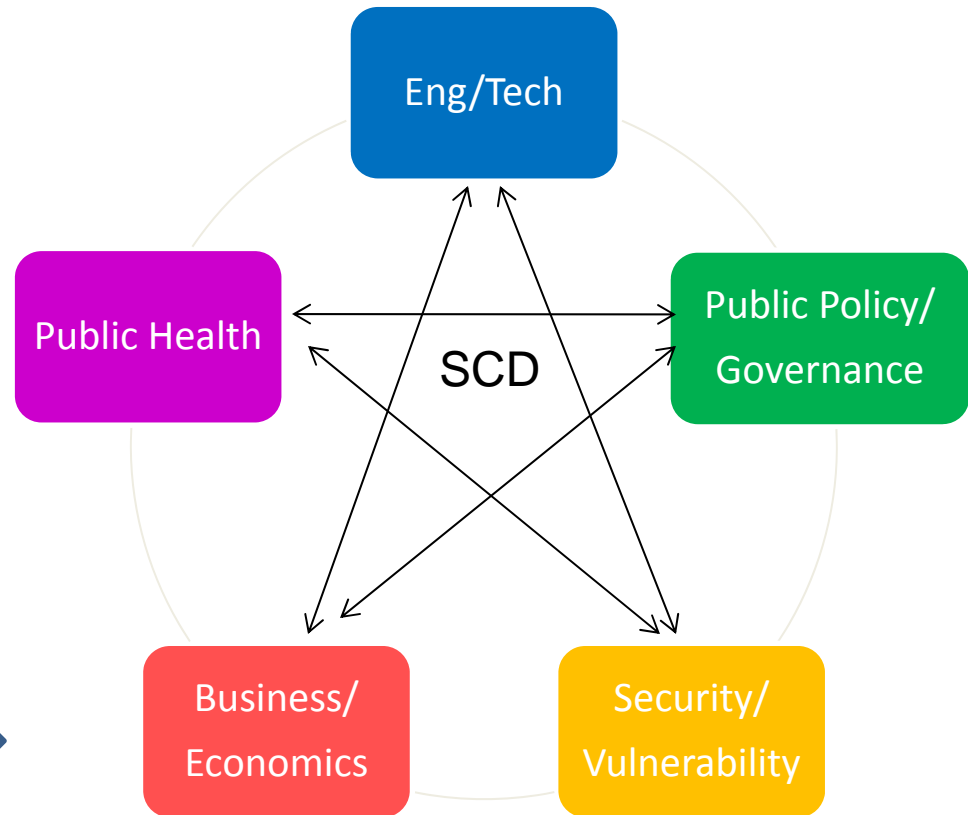
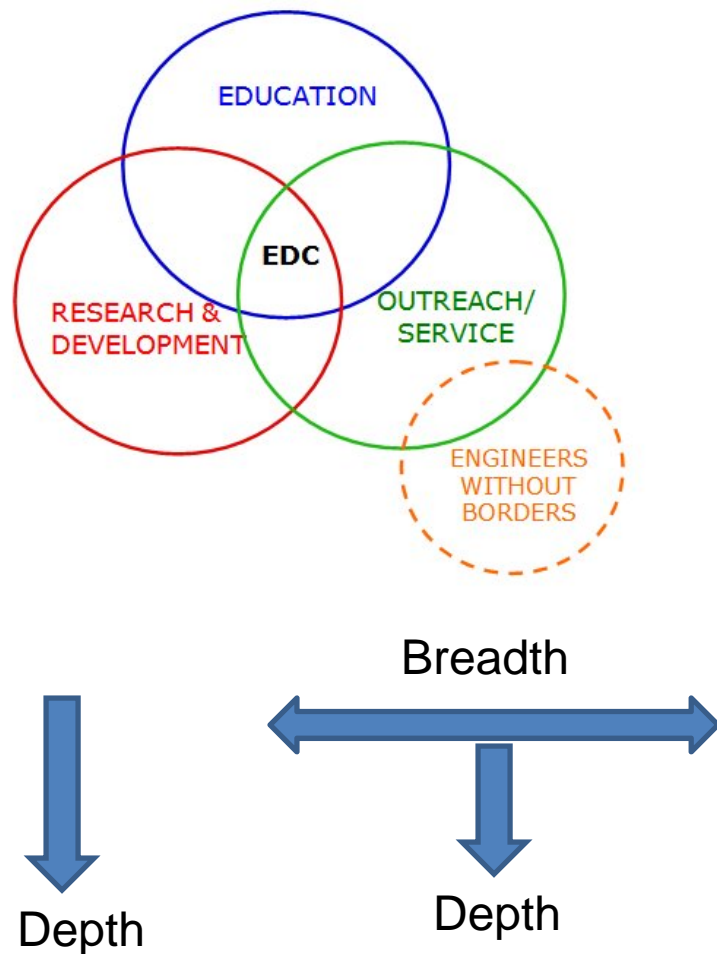
- Delivery of solutions that are **done right** (correct) and **rightly done** (correctly done)
- Solutions with a human face:
“People are the Real Wealth of a Nation”
- Solutions that are appropriate
- Solutions that emphasize **Affordability, Accessibility, Availability.....Sustainability, Scalability.... Reliability**

Developing a New Generation of Global Engineers for the 21st Century

Engineers are called to be **CHANGE-MAKERS**, **peace-makers**, **social entrepreneurs**, and **facilitators of sustainable human development**



Mortenson Center in Engineering for Developing Communities



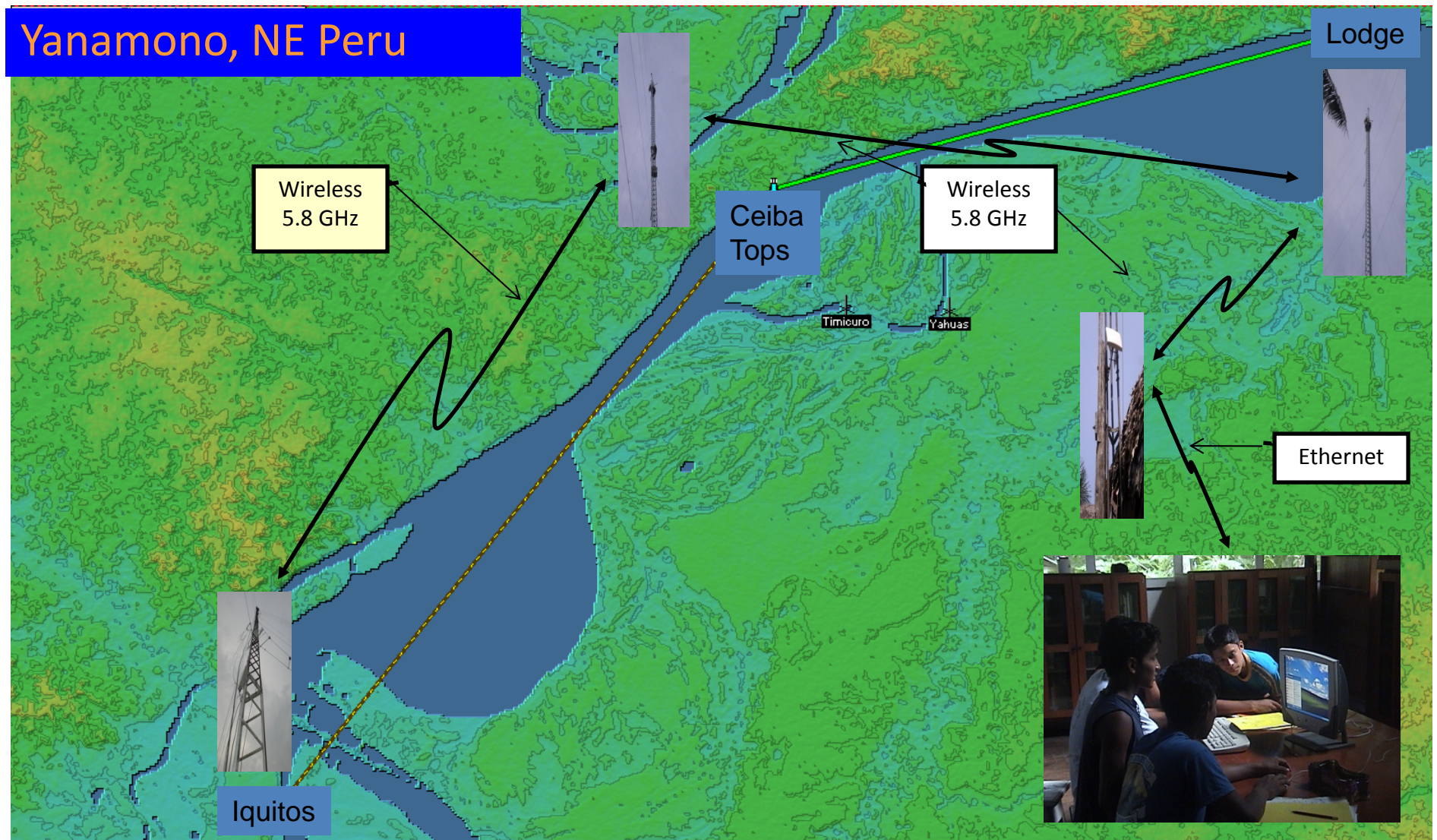
Appropriate & Sustainable Technology

“Find out what people do and help them do it better.” E.F. Schumacher



Adapted from ITDG

TeleMedicine, TeleEducation





Education

Research



Capacity Building



Crow Nation (MT)



Kabul, July 08





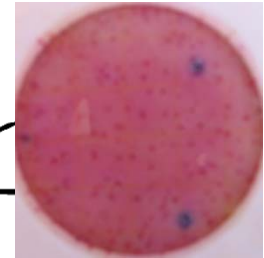
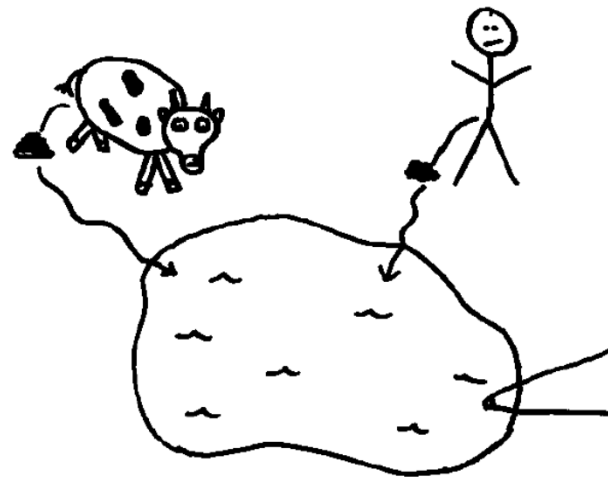
From Waste to Wealth



Bridge Construction



From A. Bang's MS Report April 2009



Namsaling, Nepal



Innovation in Emerging Markets

- **Frugal** or constraint based innovation
- **Disruptive** Innovation (GE)
- Hand held ECG: \$800. Cost: \$1 per patient
- Tata Swach (Clean) water filter: \$22 initial investment (3,000 l, 200 days, a family of



**Affordability, Accessibility, Availability.....
Sustainability, Scalability.... Reliability**



From www.duronenergy.com



<http://wecaresolar.org/solutions/solar-suitcase/>

650 M with disabilities in the world

520 M in developing world

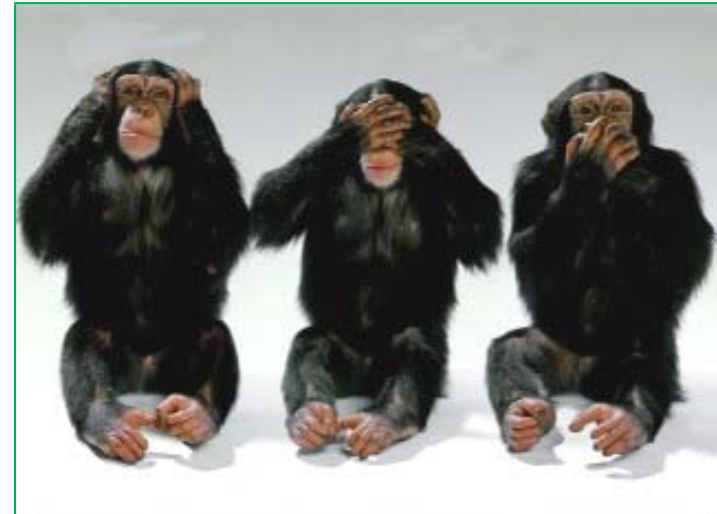
200 M are children

4,000-20,000 amputees in Haiti

Assistive Technology



“The significant problems we face cannot be solved by the same level of thinking that created them.”



Albert Einstein

<http://mcedc.colorado.edu>



Thank You

