



Global Engineering for a Small Planet: A Vision of Success

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- ➡ More consuming
- ➡ More crowded
- ➡ More connected
- ➡ Less diverse

..and are more likely to experience conflict at different scales (village, city, megacity) because of limited resources, human condition, and geopolitical issues.



“Do today’s engineering graduates and engineers have the skills and tools to address the global problems that our planet and humans are facing today, or will be facing within the next 20 years?”

Peace/Conflict, Climate Change, Poverty Reduction, Water, Energy, Shelter, Communication, Etc.

How can *all* humans have fulfilling lives, meet their basic needs, and live with dignity and at peace?



- ✦ How do we educate a global community?
- ✦ How do we feed a global community?
- ✦ How do we power a global community?
- ✦ How do we safely hydrate a global community?
- ✦ How do we communicate and connect in a global community?
- ✦ How do we integrate Science, Technology, and Engineering (STE) in political, social, and economic decisions?
- ✦ How do we create a peaceful global community?



- ✦ "Today, technology has an unprecedented opportunity to exercise leadership in showing how technology can offer the means for creating a better world, out of the ashes of collapsing or obsolete political and economic systems." (Bugliarello 1991)
- ✦ "A world divided by wealth and poverty, health and sickness, food and hunger, cannot long remain a stable place for civilization to thrive." (NAE 2008)



Developing a New Generation of Engineers for the 21st Century

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



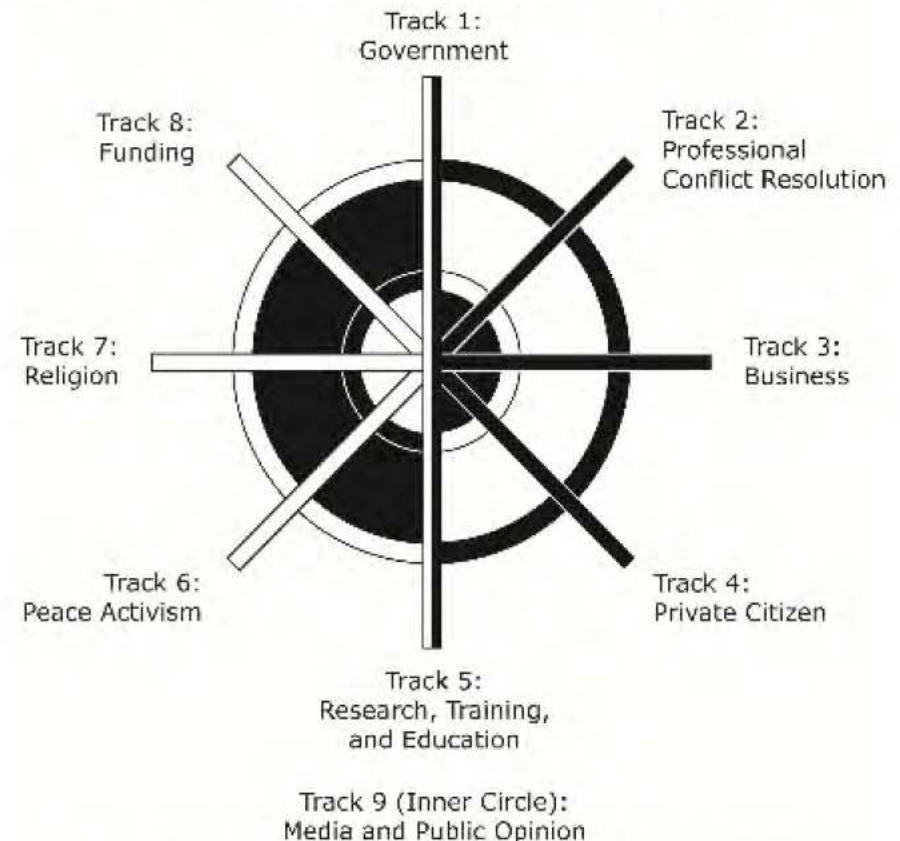


Peace Engineering

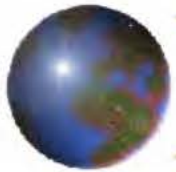
Track 10

- As a new track to “multi-track” diplomacy
- Engineering and peace making through STE.** This refers to the community that provides the science and technology to understand the interaction of people and their environment prior to, during, and after conflict

Multi-Track Diplomacy



From Diamond & McDonald, 1996



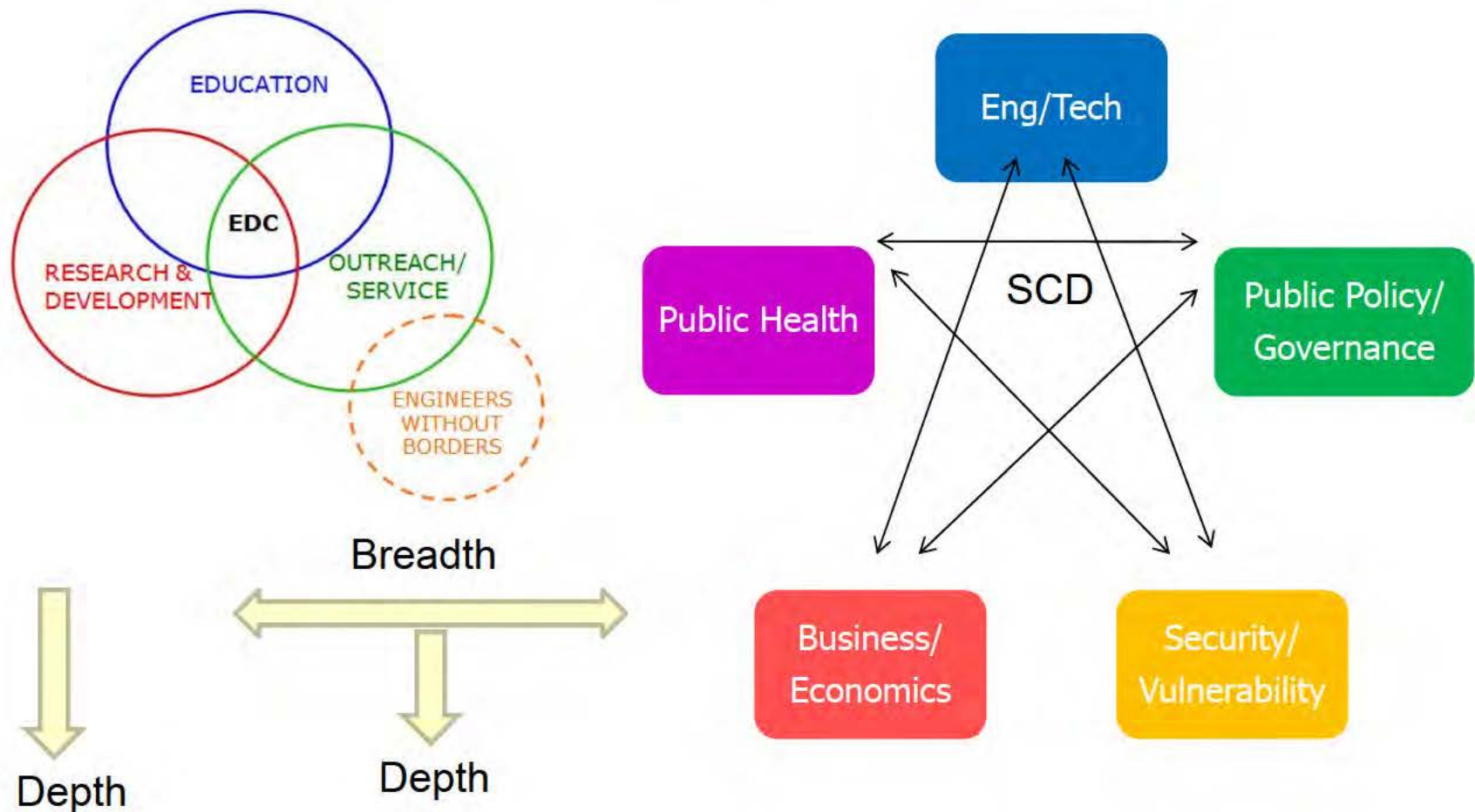
Engineers Without Borders - USA

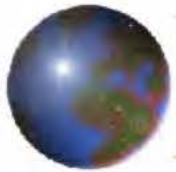
- Partners with disadvantaged communities to improve quality of life
- Implements environmentally and economically sustainable engineering projects
- Develops internationally responsible engineers and engineering students
- Involves 14,000 members, 325 chapters, 400+ projects in 45 countries, 200+ projects completed.





Mortenson Center in Engineering for Developing Communities at the University of Colorado





The 14 NAE Grand Challenges

- ✦ Make solar energy economical
- ✦ Provide energy from fusion
- ✦ Develop carbon sequestration methods
- ✦ Manage the nitrogen cycle
- ✦ Provide access to clean water
- ✦ Restore and improve urban infrastructure
- ✦ Advance health informatics
- ✦ Engineer better medicines
- ✦ Reverse-engineer the brain
- ✦ Prevent nuclear terror
- ✦ Secure cyberspace
- ✦ Enhance virtual reality
- ✦ Advance personalized learning
- ✦ Engineer the tools of scientific discovery





14 Grand Challenges for Engineering (GCE)

	GCE 1 Goal	GCE 2 Goal	GCE 3 Goal	GCE 14 Goal
Climate Change					
Peacemaking					
Wellbeing					
Entrepreneurship					
ICT					



How can Pakistan leverage its existing strength and capacity in STE to address the needs of the 67% (70%) who make less than \$2 a day while at the same time continue to grow a global knowledge based economy?" (STE4D Conference, Islamabad, June 3, 2014).

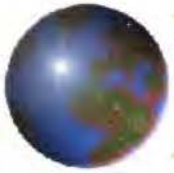


Doing Well by Doing Good

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)



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

Albert Einstein



What is your own grand challenge?