



Forced Displacement & Engineering Education:

**DEVELOPING THE CURRICULUM FOR A COURSE
ON A GLOBAL CRISIS**

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Why?

Growing urgency of issue and scale of global displacement

Forcibly displaced communities face unique health risks due to housing conditions, structural barriers, social factors

Challenges faced by communities are complex and require a holistic understanding of the process/drivers of displacement

Humanitarian agencies working in at-risk communities, are often in need of not just cash and medical supplies, but also require trained professionals who are comfortable with technology/can guide innovation, training

Demand for engineers capable of channeling their skills towards working to alleviate these challenges continues to grow, but supply remains limited due to limited training opportunities to engage with these issues

Despite a growing need for engineers to engage with these challenges, little has been done to incorporate these topics into engineering curricula

What's Missing? Landscape of curriculum

Generally limited to **design-based courses**

Often focus on a **select few issues**, like those related to water, sanitation, and hygiene using **siloe approaches**

Detailed analyses of current technological solutions and especially their **limitations/potential harmful impacts** in contexts of forced displacement remain poorly discussed and understood

Do not always provide students with the background to design interventions that are **culturally appropriate and rights-respecting**

Existing frameworks also tend to consider only **narrow definitions of displacement** - might exclude IDPs, stateless communities, people living in conditions beyond typical refugee camps

Limited attention is paid to the **causes** of forced displacement or the impact of **protracted displacement**

Focus on challenges after a destination is reached - fail to treat **displacement as a process**

2023 & 2024 Workshops

- Aiming to fill this gap, we (the Center on Forced Displacement (CFD) at BU), in partnership with the Committee on Human Rights (CHR) of the U.S. National Academy of Sciences, National Academy of Engineering, and National Academy of Medicine), hosted a workshop to explore the creation of a course, on March 9-10, 2023
- Gathered experts in the fields of engineering, demography, human rights, innovation, migration, forced displacement, and pedagogy
- Follow-up workshop held in May 2024 which examined lessons learned during these pilot courses and explored opportunities for scaling up project



Pilot Course at BU (now BE 478): Engineering Approaches to Refugee Health

- Piloted a course at BU as biomedical engineering upper-level elective in Spring 2024 (now a permanent offering in ENG curriculum)
- Aims to allow students to develop a holistic understanding of health of forcibly displaced persons, understand drivers of displacement, develop knowledge of mathematical models to evaluate health risks, critically analyze existing technological solutions from a technical and ethical lens, and design interventions to improve health of these communities

Develop holistic understanding of forced displacement	Readings that provide historical, social, ethnographic and ethical context and interviews with those with lived experience. Strong focus on writing
Explore computational tools and technological interventions for health	Develop understanding of mathematical/computational models, technologies and system interventions. Technical and ethical critique/analysis.
Intervention Design Project	Simulate the design of rigorous, context-appropriate and ethically-grounded interventions through group work that focuses on a particular global challenge.

Takeaways & Lessons Learned

Instructors

- Importance of shifting mindsets in courses like these, trying to ensure we're all speaking in the same terms and with shared conceptual understandings Being comfortable learning alongside students
- Complexity of effectively incorporating lived experience for students and the different forms it can take as well as the unique value it brings
- Feeling of having a community in the process of piloting the course was one of its biggest strengths - people of different expertise working on the same things that you can lean on, get support from
- Presenting reality of situations must be balanced with hope – often a difficult balance to strike

Students

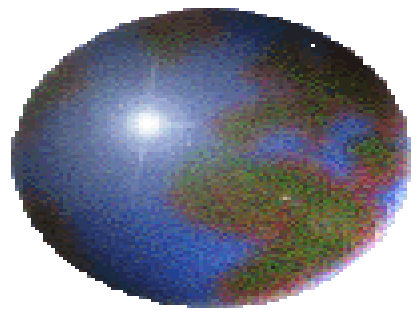
- Never a one-size-fits-all solution
- First course that actively integrated ethical concepts as more than an afterthought
- Importance of working across disciplines, broadened their thinking
- Students enjoy and gain transferable skills, but feel like they will lose an ability to continue to engage with the issue in the long-term or are not aware of opportunities to do so

Next Steps: Flexibility & Sustainability

- Consortium model
- Bringing new institutions and partnerships
- Exploring areas beyond engineering (data science, microbiology, etc)
- Partnerships with community colleges and institutions outside the US



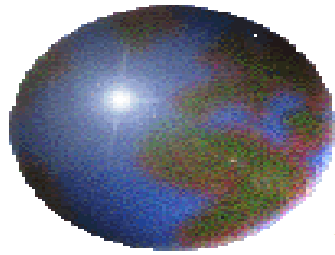
ENGINEERING EDUCATION AND HUMAN RIGHTS



Engineering \longleftrightarrow Society

Bernard Amadei
Emeritus Professor
Dept. of Civil Engineering
The University of Colorado, Boulder, USA

November 18, 2024

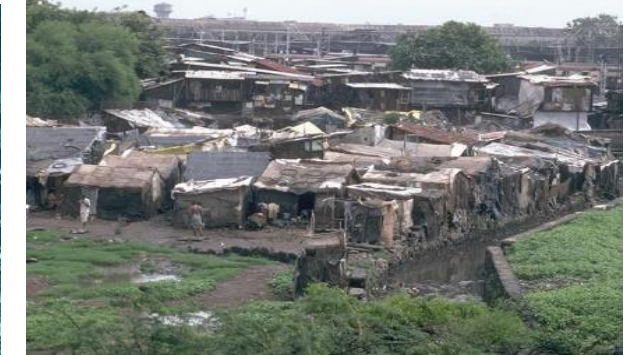


THE UNIVERSAL DECLARATION OF HUMAN RIGHTS

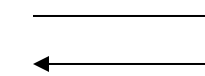
UDHR is a declaration adopted by the United Nations General Assembly on 10 December 1948 at Palais de Chaillot, Paris.



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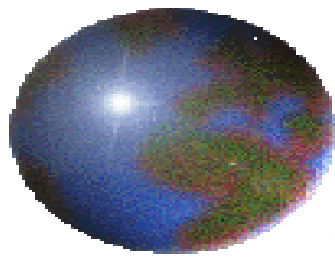


Human Rights



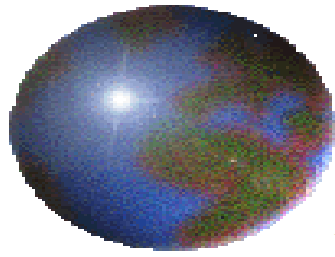
Human Development &
Security





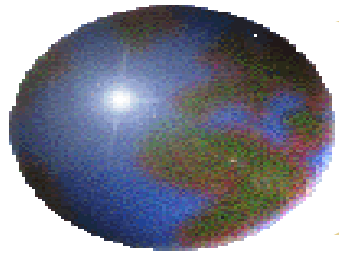
How can ALL humans have fulfilling lives, meet their basic needs, and live with dignity and at peace?





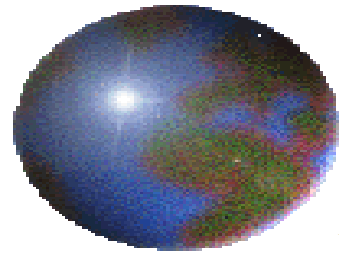
Do today's engineering graduates, educators, and practitioners have the skills and tools to address the global problems that our planet and humans face today or will be facing within the next 20 years and beyond?





Transdisciplinary education

	Field of knowledge 1			Field of knowledge 2			
	Discipline 1.1	Discipline 1.2	Discipline... 1.i	Discipline 2.1	Discipline 2.2	Discipline... 2.i	
Climate Change							
Peace/Conflict							
Emergency							
Refugee Issues							
Indigenous Issues							



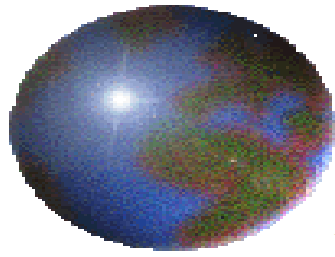
Developing a New Generation of Engineers for the 21st Century

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

A lifelong engineering practice and education based on reflective and adaptive practice, system thinking, and a holistic approach to global problems.



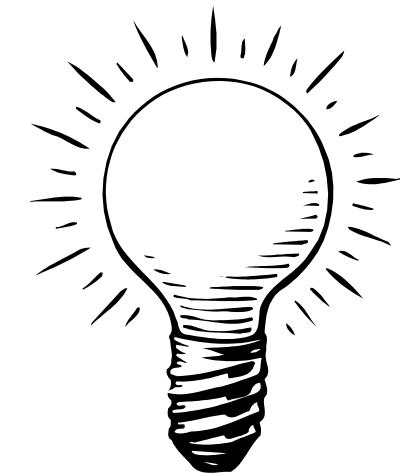
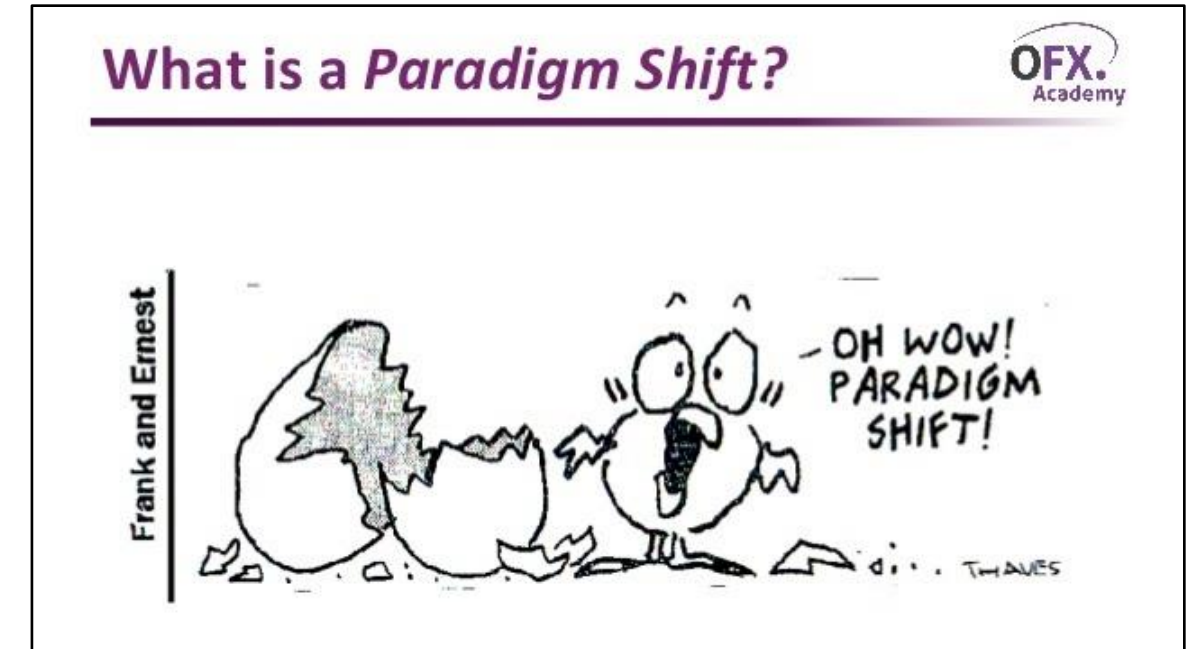
Engineers Without Borders



The significant problems
we face today cannot
be solved at the same
level of thinking we
were at when we
created them.

Albert Einstein

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Human Rights and Engineering Education



Mira Olson, Drexel University
November 18, 2024



Imagine that all engineers worked in support of environmental protection, social justice, human rights and peace....



What are the new modes of
engagement
research
education
design

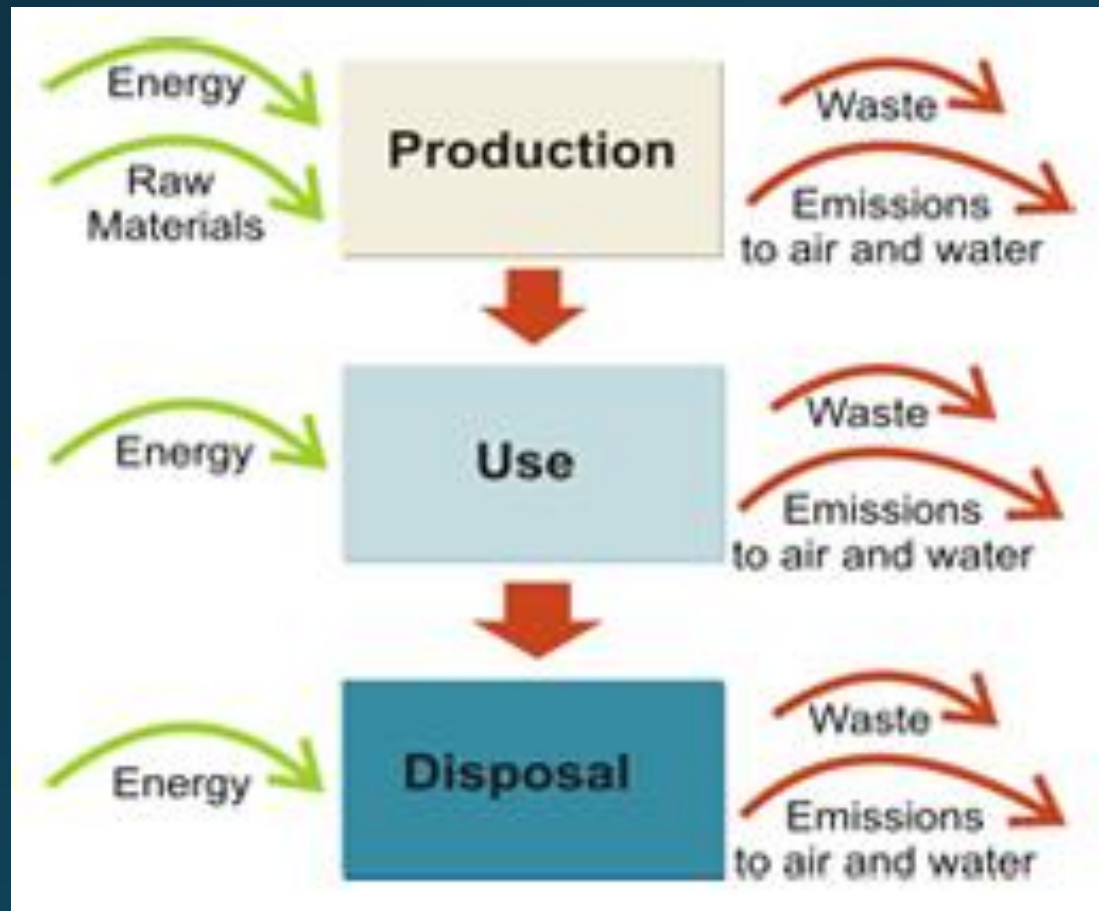
that we need to elevate these values within
the educational environment and the
modern workplace?

A look at engineering education

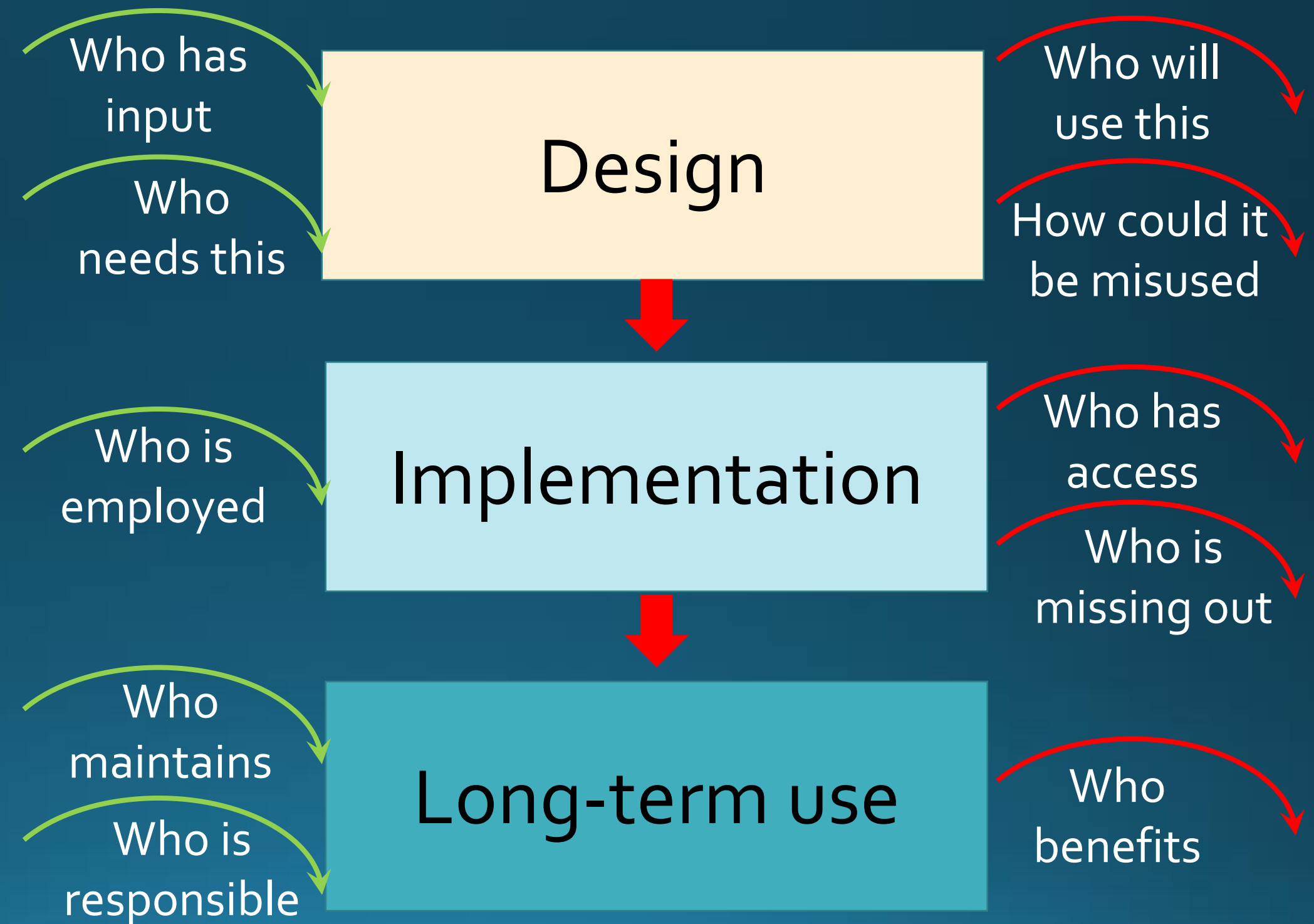
- Engineering Ethics
 - Standalone courses
 - Embedded approaches
 - Multidisciplinary approaches
- Do we effectively **value** human rights in engineering education and design?
- Are engineers **responsible** for / **accountable** to human rights?
- Can human rights **drive** engineering education and design?

Framework for conflict-sensitive engineering design

Framework for LCA-informed design



<https://www.toolkit.bc.ca/tool/life-cycle-analysis>



Examples in UG and Grad Education

Undergraduate

- Co-taught courses
 - Sociologists / STS Scientists
 - Peacebuilders
 - Political Scientists
- Design projects
 - Infrastructure in conflict regions
 - Infrastructure for displaced persons
- Course projects / material
 - Water resources / hydrology
 - General engineering
- Role-play simulations
 - Transboundary water allocation – Jordan River Basin
 - Bridge design

Graduate

- M.S. curriculum in Peace Engineering – core courses:
 - Intro to Peace Engineering
 - Conflict Assessment for Engineers
 - Systems Engineering for Peacebuilding
 - Community-Based Design
 - Peacebuilding Skills
- M.S. curriculum in Humanitarian Engineering (INSA Lyon)
 - Partnered with humanitarian NGO and humanitarian training institute
- NGO- or practitioner- partnered research
 - Disaster preparedness
 - Modeling civilian harm

We define Peace Engineering as the application of systems-level science and engineering principles to support **conditions for peace.**

“a state of human existence characterized by sustainable levels of human development and healthy processes of societal change”

Ricigliano, R., 2012. Making Peace Last. Taylor and Francis.