



Wicked Problem List*

(*see handout, available on Blackboard)

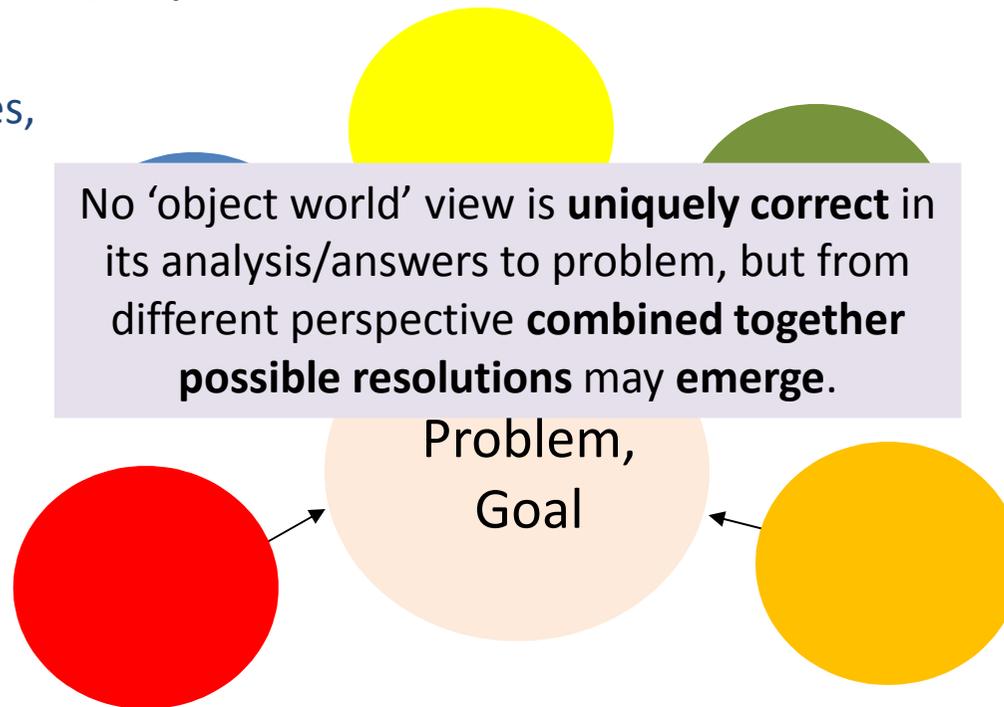
- | | | | |
|-----------|--|-----------|--|
| A. | Energy (Ireland) | P. | Safety; Chemical plant |
| B. | Water (Dublin) | Q. | Safety; Nuclear power |
| C. | Nanotechnology and nano particles | R. | Safety; Road |
| D. | Traffic | S. | Fossil Fuel Natural Resource |
| E. | Sea level/flood protection | | Exploitation |
| F. | Electronics waste | T. | House building standards –thermal |
| G. | Plastics | | (Ireland) |
| H. | Hazardous Waste | U. | Computers and Artificial Intelligence |
| I. | Food Processing | V. | Abandoned industrial waste sites |
| J. | Food Production; Ireland | W. | Resource exploitation under extreme |
| K. | Food Production; Global | | conditions; Safety and environmental issues |
| L. | Atmospheric Carbon; Global | X. | Water quality and treatment |
| M. | Local flooding events (Ireland) | | (Ireland) |
| N. | Atmospheric Carbon; meeting | Y. | Electricity power transmission |
| | Ireland's legal and ethical obligations | | (Ireland) |
| O. | Safety; Car design | Z. | Traffic control |



Different Groups have their own 'Object Worlds'

Different groups relate to a common goal or problem in a different way/with **different perspectives, definitions, understandings** of both the problem and its possible resolutions, depending on their background and position as well as their personal goals, experiences and values.

Users,
Local Communities,
Engineers,
Designers,
Lawyers,
Retailers,
Planners,
Professional
Institutes,
Social Workers,
Trans-national
bodies (EU, etc.)



Politicians,
Local Authorities,
Non Governmental
Agencies (e.g.
Business and Industry
lobby groups,
Environmental
groups, etc),
Patients,
Economists,
Architects,
Farmers, etc., etc..



Problem Solving

“Problem-solving needs not just the recognition and retention of facts but the recognition and retention of difficulties, incongruities, and anomalies.

It does not simply affirm truths but entertains suppositions, rejects the accepted, conceives the possible, elaborates the doubtful or false, questions the familiar, guesses at the imaginable, improvises the unheard-of.”

Israel Scheffler (1991)





Wicked Problem Assignment; Strategy

1. Internalise the problem. **Think** about it. What are the issues?
2. **Research** the problem.
3. **Reflect** on the problem **scope** and **possibilities for action/resolution**
4. In doing so, cast a **critical** eye over the problem, **challenge** accepted conceptions, **question** the familiar, **guess** at the imaginable.
5. **Meet** with your group (armed with 1-2 page synopsis)
6. The group should **engage**, strive to **understand each other's 'object worldviews'** while also striving to **critique, challenge, negotiate, be creative, develop new ideas.**

By this process you should come to recognise that:

- **engineering problem solving** is a **social process.**
- finding and asking the **right questions** (e.g. in discussing and outlining the problem and its many facets) is more important than finding **'definitive solutions'**.

BE



Engineering; Roles and Responsibilities

Engineers **design and operate products, processes, systems, infrastructure and communications.**

This involves the **application of science** through the understanding and use of **applied technical subjects.**

Engineers therefore **SOLVE PROBLEMS.**

BUT, the scope of such problems is rarely merely just technical in nature; there is *always* a wider **CONTEXT.**



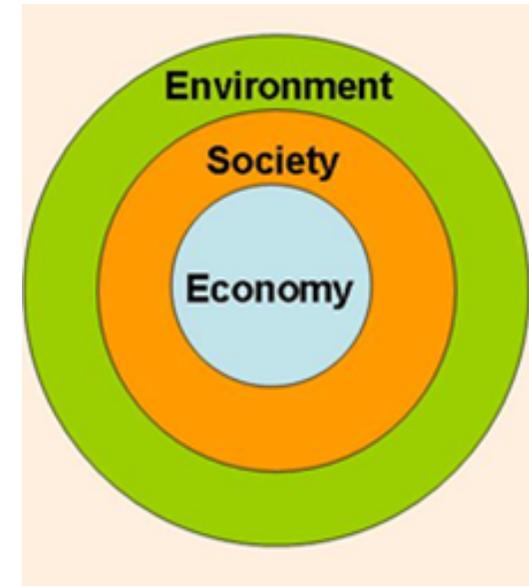


Engineering; Roles and Responsibilities

Virtually all real world problems involve **people** and/or the **natural environment**. They are thus not merely simple nor even complicated but are in fact, **'COMPLEX'**.

Apart from **scientific/technical** aspects, the following considerations impart complexity on the problem;

- **Economic** or financial issues
- **Environmental** or ecological issues
- **Social** or societal issues



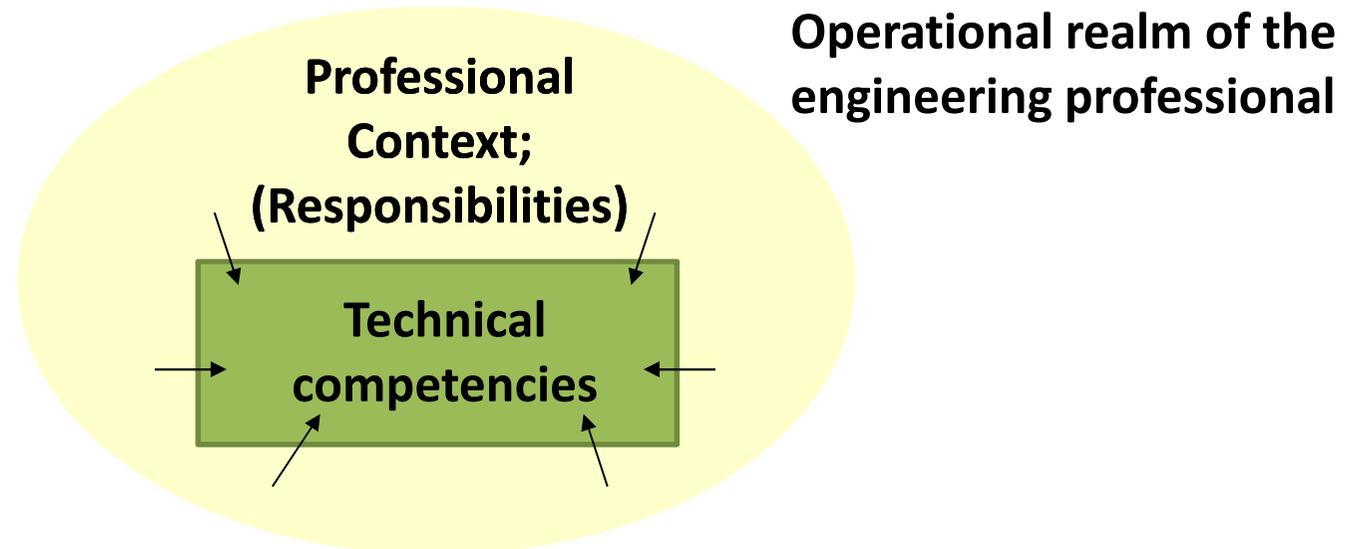
Engineers therefore operate in a **wider context** than the merely **technical/scientific** for **economic** and **financial** gain: they also operate in the realms of the **societal/social** and **environmental/ecological**.



Engineering; Roles and Responsibilities

Each of these areas (environmental, social, economic) are **inherently subjective** or **value based**. Engineers thus **cannot practice outside** of a set of **values** (either implicit or explicit) underpinning their work and decisions they make in their practice have **implications** on all these areas.

In addition to the technical competence that Engineers possess there therefore comes a level of **RESPONSIBILITY**..



BE



2. Philosophy of engineering; historical and current philosophies & trends

Engineering has a long tradition going back to ancient times...



Dul DHC Photographic Unit

Newgrange, Co. Meath



Pyramids, Egypt



Roman Aquaduct

BE



Definitions of Engineering:

“The art of directing the great sources of power in nature for the use and convenience of man.”

(Thomas Tredgold, 1828)



“the profession in which a knowledge of the mathematical and natural sciences gained by study, experience and practice is applied with judgment to develop ways to utilise, economically, the materials and forces of nature for the benefit of mankind”

(Engineers’ Council for Prof. Development, 1979)

BE

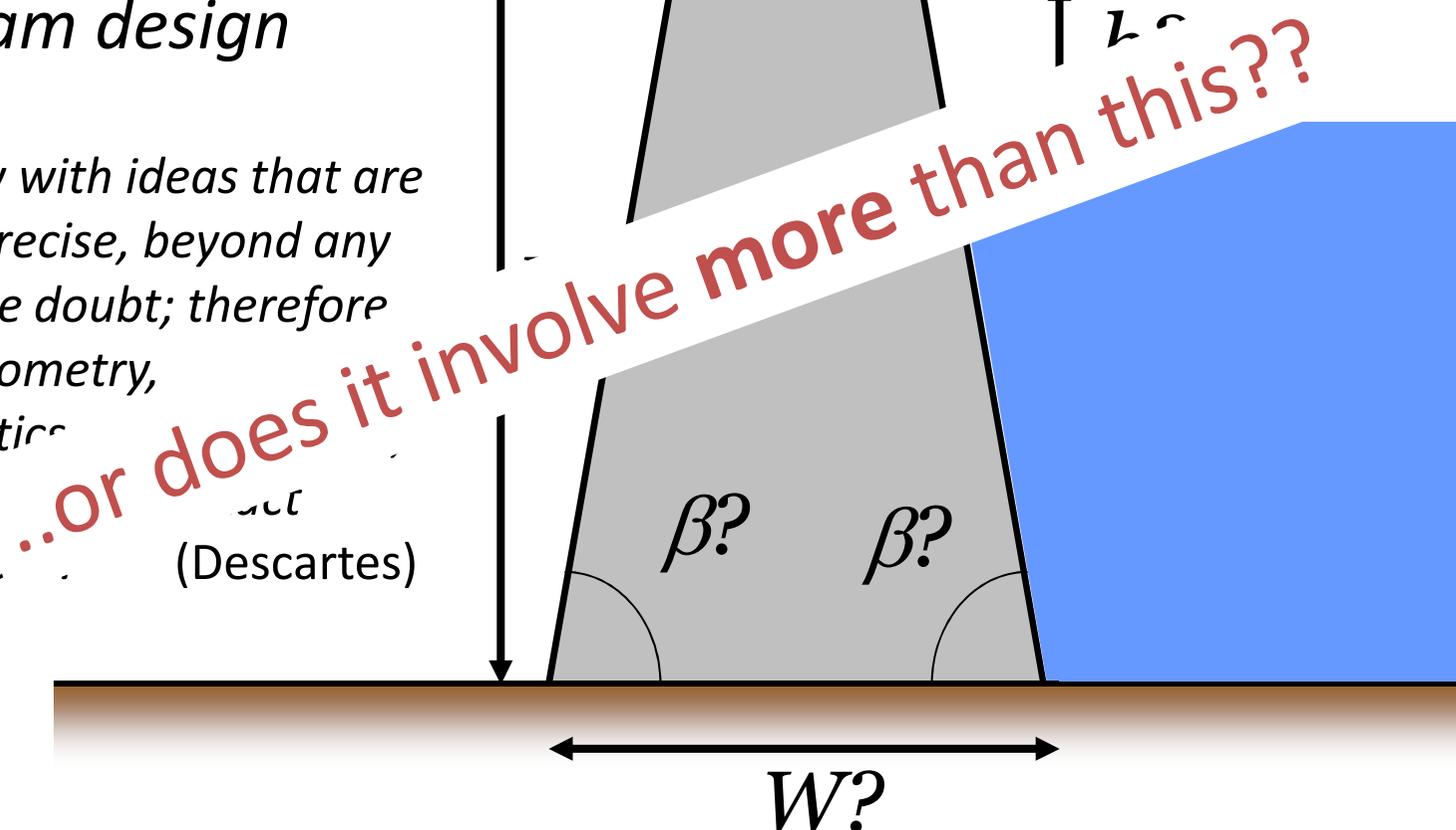


Rational approach:

Engineering involves Solving straightforward Technical Problems through Design..

e.g. Dam design

“Deal only with ideas that are distinct, precise, beyond any reasonable doubt; therefore rely on geometry, mathematics, measurement, observation... (Descartes)”



BE



un-der-stand
understandabl
in-der-stand
of clear thou
human under

19th Century; Industrial Revolution



BE



Engineers Design and Build



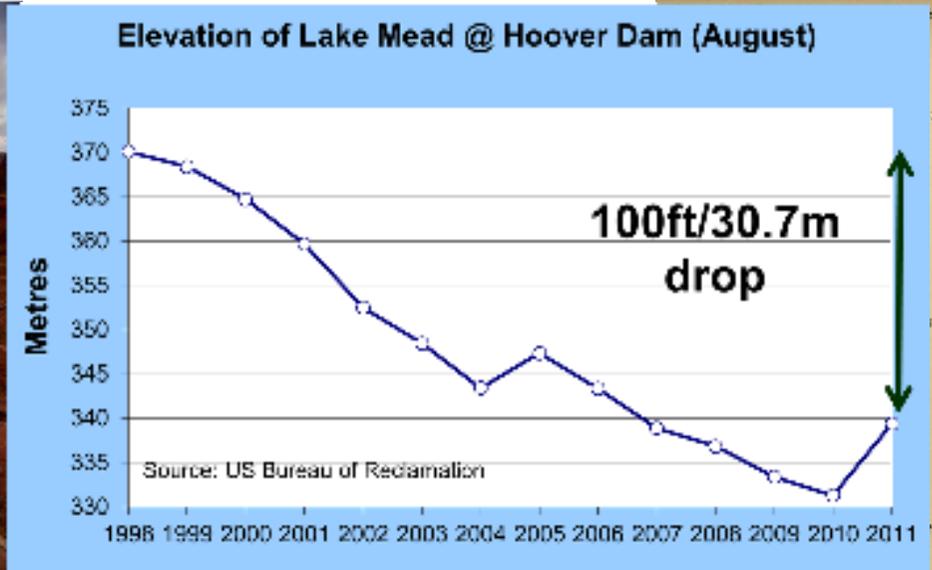
..Resultant Social Change

BE



un-der-stand
understandabl
in-der-stand
of clear thou
human under

Industrial Revolution ...and Beyond



e it”
9, 7

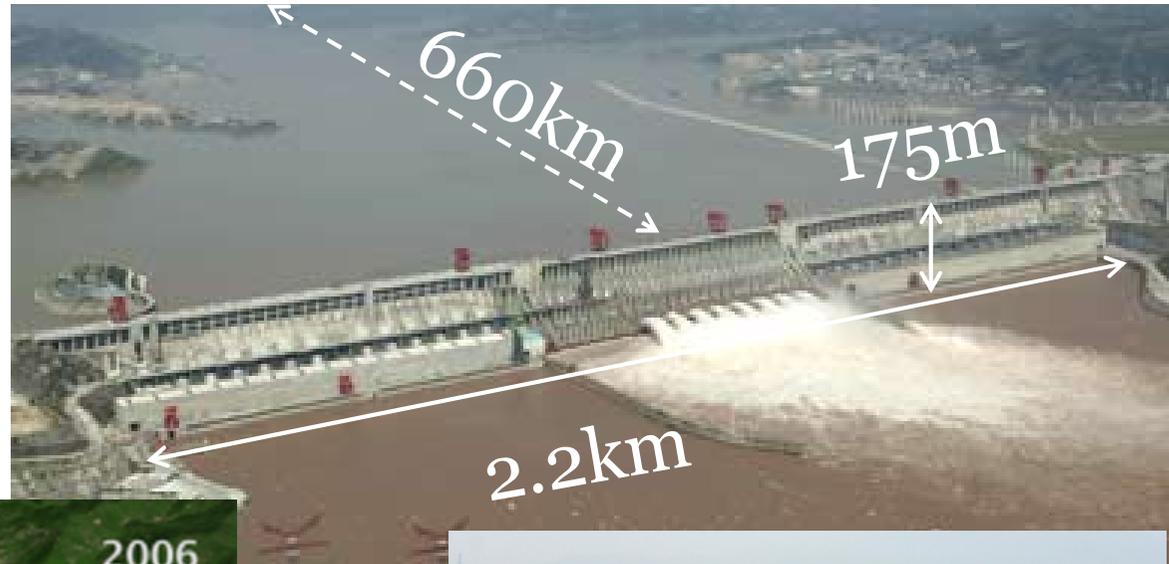
BE



un-der-stand
understandabl
in-der-stand
of clear thou
human under

Three Gorges Dam, China

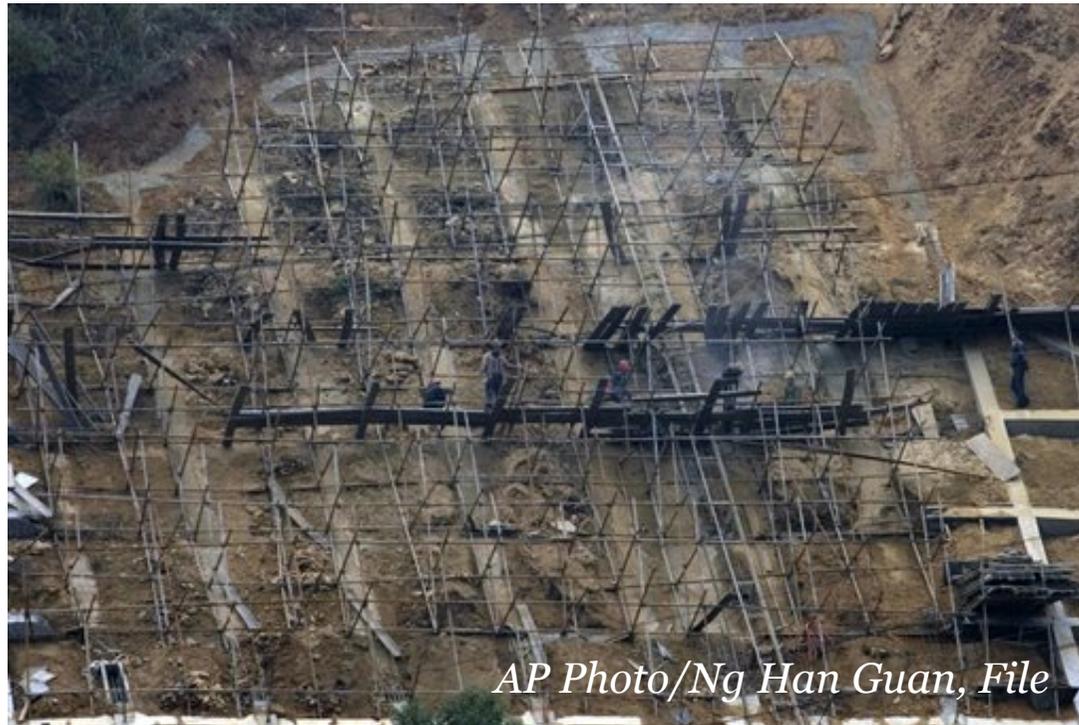
First envisioned: 1919
Approved: 1992
Cost: €30bn
Fully operational: 2011
World's largest power station
(100 TWhr/annum: 20 x Hoover Dam), but...



BE



Three Gorges Dam, China



AP Photo/Ng Han Guan, File

Deforestation, Erosion & Huge Pressure Changes/Soil Stress:
Increased landslide risk –(€20bn extra cost) *(Original cost of dam: €30bn)*
Dam built on seismic fault