The role of the professional engineer in the 21st century

Sustainability; Innovation; Flexibility

Aoife M. Foley and Paul Leahy
Dept. of Civil & Environmental Engineering
University College Cork

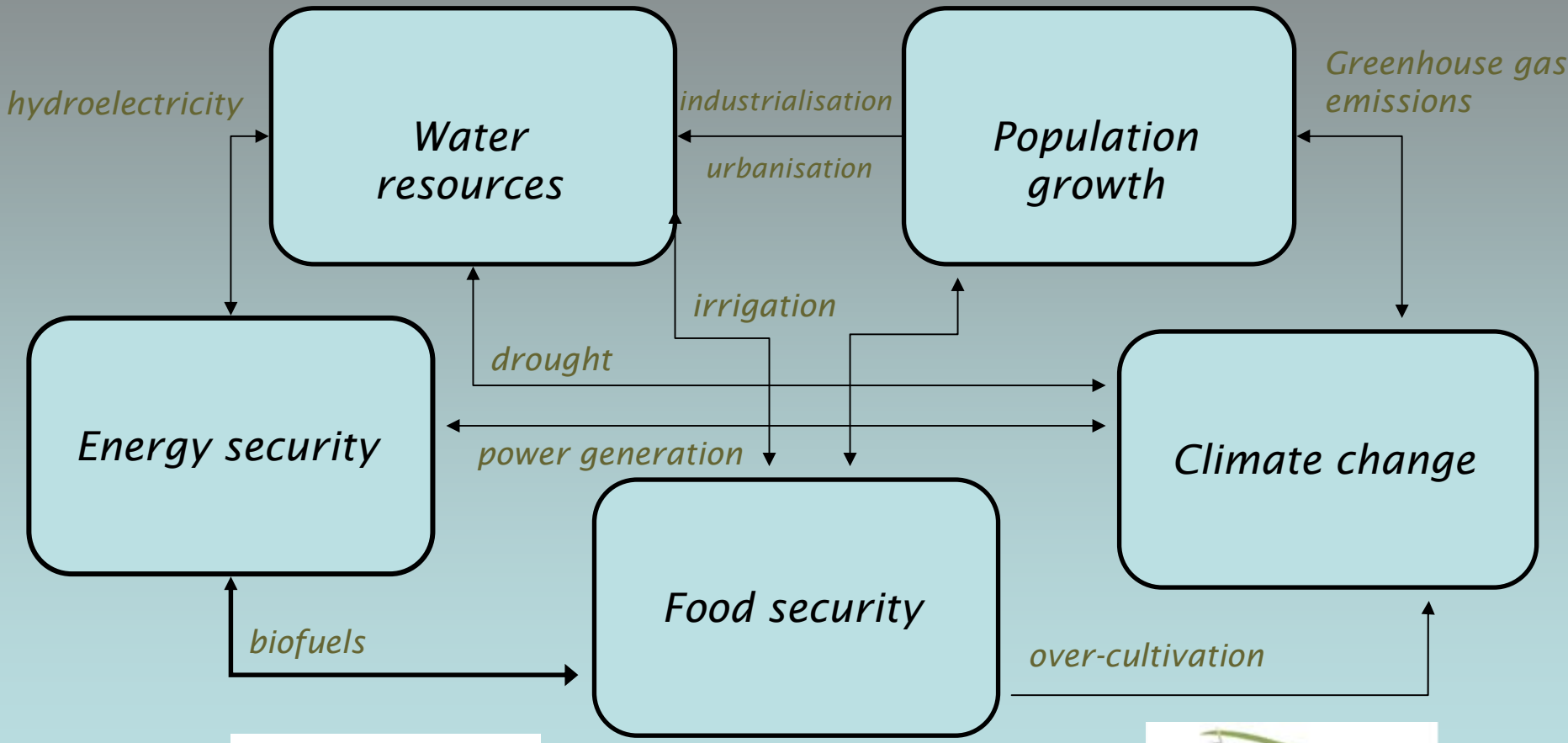
3rd International Symposium on Engineering Education, Cork, July 2010

UCC School of Engineering

Presentation outline

- *Major challenges facing society*
- *How engineers can deliver solutions*
- *Public perceptions of profession, science and technology*
- *Current policy and education aspects in Ireland*
- *Engineering education : generalisation or specialisation?*

Some major challenges of the 21st century



Challenge: energy security

- Short term (0-40 years):
  - Energy efficiency
  - Demand side management
  - Modal shifts (electrification of transport)
  - Renewables
  - Carbon capture & storage
  - Nuclear fission
- Long term (40+ years)
  - Nuclear fusion

Challenge: climate change

- *Mitigation*
  - *Low emission technologies; renewables; energy efficiency*
  - *Carbon sequestration*
  - *Geo-engineering?*
- *Adaptation*
  - *Infrastructural upgrades*
  - *Flood and coastal protection*
  - *Early warning systems*

Case: offshore wind farm development

- Project finance
- Resource assessment
- Planning & environmental impact
- Geotechnics
- Substation design
- Grid connection
- Coastal and marine engineering
- Structural design
- Operations, maintenance and control
- Turbine innovations

Arklow Bank, Ireland, 2003.

Public perception of the engineering profession

- *Public perception is critical because*
  - *it affects supply of new entrants*
  - *and the environment in which engineers work*

Media and public perception

- Media coverage of "terrorist engineers"
- Many prominent climate change sceptics are engineers
- Engineers need to communicate successes to raise public profile

Title: *There's something about engineers....* By: Gambetta, Diego, New Scientist, 02624079, 6/13/2009, Vol. 202, Issue 2712
Database: *UK/EIRE Reference Centre*

There's something about engineers...

Section: Opinion
Essay
Predicting who will become a terrorist is a tough job, but we're beginning to get good clues from what people study

WHO becomes a terrorist? An MI5 report leaked to London newspaper The Guardian in August 2008 concluded that there is no easy way to identify those who become involved in terrorism in the UK because there is "no single pathway to violent extremism" and that "it is not possible to draw up a typical profile of the 'British terrorist' as most are 'demographically unremarkable'".

Climate stability: an inconvenient proof

Proceedings of ICE
Civil Engineering 160 May 2007
Pages 66–72 Paper 14806

About Me
ClimateWatcher
Civil Engineer in the general construction industry.

ucc
Coláiste na hOllscoile Corcaigh, Éire
University College Cork, Ireland

UCC School of Engineering

Sustainable Energy Research Group

Interest in science below EU average

DICK AHLSTROM, Science Editor

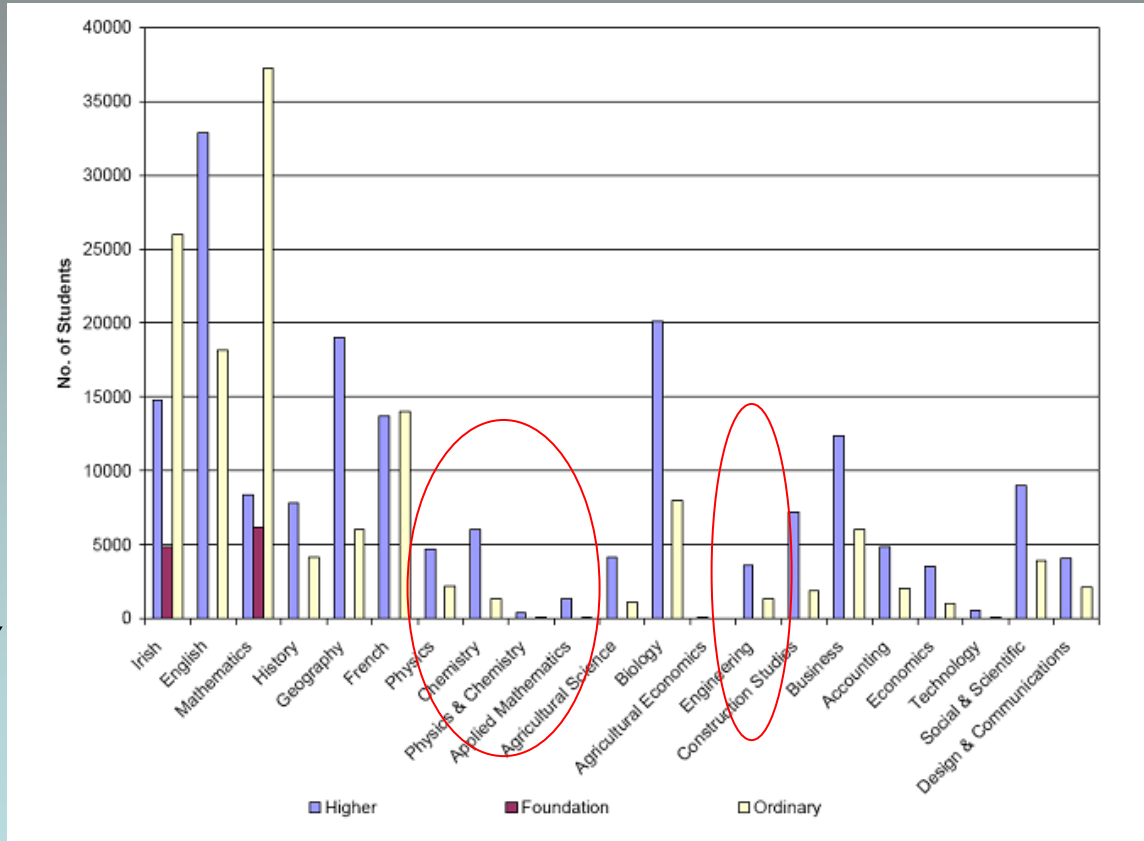
Tue, Jun 22, 2010

WHILE A majority of Irish people believe science can improve our lives, we have a lower level of interest in scientific issues and feel less well informed than other EU states, according to a Eurobarometer survey.

The survey results, released yesterday by the European Commission office in Dublin, show that efforts by Government to enhance public understanding and interest in science have not achieved levels applying in other states.

School leavers and subject choice

- High school students select senior level subjects with a view to career choice and maximising results
- Science, engineering and technology subjects fare poorly



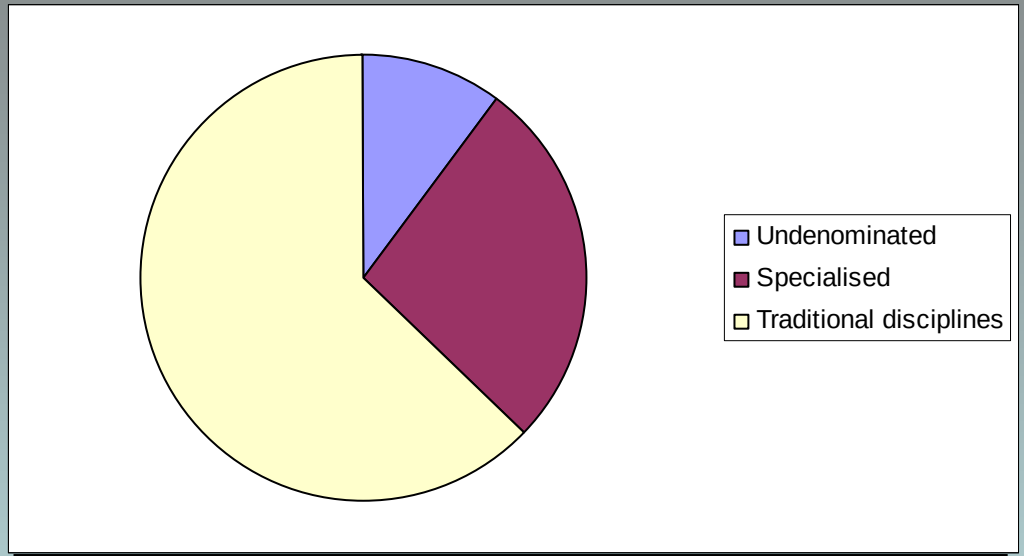
ucc
Coláiste na hOllscoile Corcaigh, Éire
University College Cork, Ireland

UCC School of Engineering

Sustainable Energy Research Group

Engineering degrees: Generalisation or specialisation?

- *Only 8 of 78 honours engineering degree courses on offer in Ireland are undenominated entry.*
- *21 are in specialised areas.*
- *Despite c. 200% increase in the number courses on offer since 1998, this breakdown has remained similar since then.*



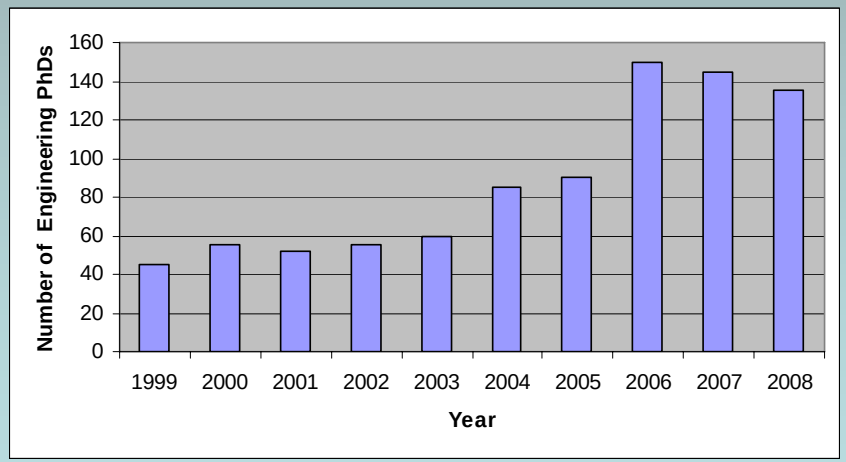
Breakdown of Honours Engineering Degrees (Level 8) on offer to school leavers in Ireland, 2010.

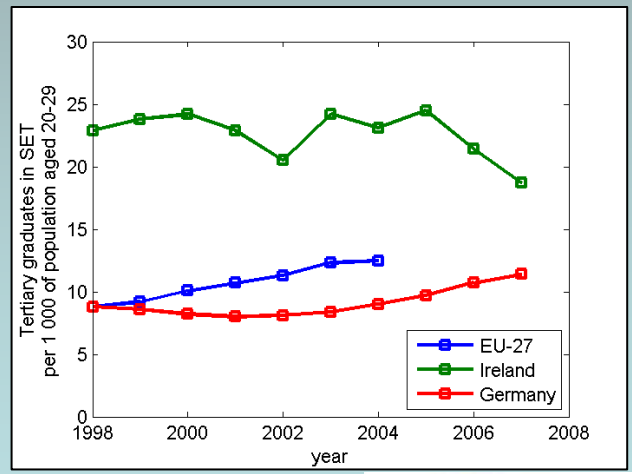
Traditional disciplines: Electrical, Electronic, Process/Chemical, Civil, Mechanical

Specialised: e.g. Biomedical, Sports, Transport Systems

Graduate education

- *Public policy aim in Ireland of increasing number of PhDs*
  - *Problem of perception within industry*
  - *Poor job security for PhD graduates*
    - *45% of PhDs in temporary employment 5 years post-graduation (DE, BE, ES)*
    - *Earnings premiums for graduate degree holders have decreased in Ireland (-4.3%) and many other OECD states in last decade.*





ucc
Coláiste na hOllscoile Corcaigh, Éire
University College Cork, Ireland

UCC School of Engineering

Sustainable Energy Research Group

Meeting future challenges will require career flexibility

- *Career paths have become less linear*
- *Generalists with solid engineering fundamentals will be best equipped to cope with complex, multi-disciplinary challenges*
- *Early specialisation may not equip students with skills they will need*
- *A shift back towards general engineering skills may be needed in engineering education*
- *This may be in conflict with short-term needs of industry*

Educating engineers for the future

- *Large numbers of eligible, interested students not emerging from school system*
- *'PR' failure of engineering profession*
- *Emphasis should be on sustainability, flexibility and fundamental engineering skills at undergraduate level*
- *Some disconnects between* **industry expectation** *and* **academic programmes**; **government targets** *and* **job markets**