Engineering Institutions & Safer Construction

The link between them: an overview of evidence

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Executive Summary

The objective of this report is to identify the evidence, and apparent gaps in evidence, to link professionalised engineering institutions with safer construction. The report has a particular interest in Nepal and has used the example of the UK professional engineering institutions framework as a reference.

The report sets out the terminology, roles and the key organisations in Nepal, the UK and international in the engineering profession. The selection of key organisations was based on their relevance to improved construction and safer buildings.

Before discussing how professional organisations and trade unions support improvements in health and safety, the report makes the case that the engineering and construction sector is a complex eco-system that is highly inter-connected. This calls for systemic approaches such as the promotion of a health and safety culture – rather than, say, just strengthening regulations. Professional engineering institutions and trade unions are shown to be instrumental in promoting a systemic cultural shift towards improved health and safety – they achieve this by promoting this culture to their members and by informing standards. Contributors also made some important points on the current context in Nepal.

A gap was identified in any hard evidence to show whether improved professional organisations result in improved construction. Instead, the views of leading figures in UK engineering and construction and historical experience were taken as sufficient evidence for the purpose of this report. Finally, examples from DFID's work in Bangladesh and Tanzania highlights the broad acceptance of this relationship.

SECTION 1

Introduction

1.1 Purpose

The objective of this report is to identify the evidence, and apparent gaps in evidence, to link professionalised engineering institutions with safer construction. Evidence specific (or with relevance) to Nepal, or from the region, would be preferred, especially drawn from other Lower Income Countries or those with seismic risk. The key questions are:

- Who are the key professional organisations, and trade union groups, engaged in safer buildings, and what are their roles?
- How do professional organisations and unions support improved construction standards and safer buildings, in Nepal and globally?
- What evidence is there to show whether improved professional organisations result in improved construction?

Both the safety and resilience of the final building, and health and safety during the construction process, will be considered with the emphasis on improving the resilience of buildings in Nepal towards earthquakes and other natural hazards.

1.2 Rationale

This report uses the UK engineering/construction eco-system as the basis for comparison to the eco-system in Nepal in order to help explain key organisations, roles and capacity gaps. The rationale for this is that the UK is home to the oldest professional engineering institutions in the world, and therefore serves as a highly developed example (though, as the report shows, there are some important structural differences). Also, many national and global standards are based on the work of UK professional engineering organisations and trade unions. Note that initial research was also conducted on Bangladesh, India and New Zealand before the decision was made to focus on the example of the UK.

The relative level of development of the UK and Nepal, and their institutions, should be kept in mind. The level of development and political context of a country can mean that, even if the country appears to have the required institutions and legal frameworks, they may not always be able to function as intended. The purpose of this report is not to assess the strength of Nepal's institutions, but where such evidence has been contributed on particular organisations and processes it has been included in the report.

The report considers historical experience from the UK to be sufficient as evidence. Evidence in terms of statistics and data is very difficult to find – indeed, it is highly likely that such data does not exist (which is reasonable given the complexity of the engineering and construction sectors). For example, attempts were made to study construction fatalities (as an indicator of construction safety) over time and relate this to trades unions and professional institutions – but this proved to be very difficult and highly sensitive to other factors. The approach taken has been affirmed by contributors to the report. As the report

will show, two contributors stated that evidence may not exist simply because the link between improved professional organisations and improved construction is self-evident (see 2.3.1).

Role descriptions of specific organisations are too lengthy to include, so the roles have been summarised into different categories and links to the organisations' websites provided instead.

1.3 Methodology

1.3.1 Interviews

Contributions to the report were made through telephone interviews and/or written contributions in response to requests from the author. The full list of contributors is included in the bibliography, and they include leading figures in the UK engineering profession as well as engineers experienced with Nepal's construction sector frameworks. In each interview, suggestions for key organisations, relevant evidence and reports/papers were discussed.

1.3.2 Literature Review

The full list of journals, reports and books used in this report is included in the Bibliography. A wide range of other sources were also reviewed, from which this list was developed. No material was found that directly related to the purpose of this report.

1.3.3 Data sources

Data on construction fatalities was examined, since it is widely used as a proxy for the standards of safety in the construction sector (though comparisons between countries must take a wide variety of other factors into account, and under-reporting is a major problem in developing countries). Data on injuries and health issues arising from the construction sector was not readily available from developing countries. The UK's Health & Safety Executive publishes these data for the UK. Euro-Stat publishes these data from most European countries (though not always on a disaggregated basis). No source of these data was found in Nepal, but some data collected by NGOs in Bangladesh and India was found. Overall, no data was found that directly related to the purpose of this report.

SECTION 2

Findings

2.1 The key organisations

2.1.1 Overview of terminology

- **Accreditation** means "*the accreditation educational courses or programmes (such as of university engineering degrees), the attributes of the graduates from the programmes and the peer assessment of the equivalence of those programmes internationally*".[1]

- **Education** refers to the academic formation of engineers and technicians, usually at universities or technical colleges that should be accredited.

- **Competence** refers to the professional experience of engineers and technicians, usually assessed and sometimes certified by a national PEI that should be accredited.

- **Mobility** refers to the ability of engineers and technicians to study and work in different countries or jurisdictions e.g.: to have trained in the UK and then to practice in Australia. This is made possible by the mutual recognition between countries or jurisdictions of the education and competence of an engineer. This mutual recognition is usually based on an agreed standard or other demonstration of substantial equivalence – and agreed either through bi-lateral or multi-lateral accords (such as the 'Washington Accords' for professional engineers). In order to enter into such accords, the professional accreditation systems of one country must have confidence that the professional accreditation systems in the other country are similar – i.e.: that the engineers have learned similar knowledge and skills, that they developed similar competence in practice and that the professional recognition and accreditation systems are similarly rigorous. Without mobility, engineers and engineering companies are far less able to work internationally – which limits professional development, job opportunities and economic and human development.

- **Government regulation** "*is usually administered by government employees and may be apply to all engineers or to engineers in certain employment categories. Controlling boards may include members from the profession. Complaints and discipline may be administered independently or by government*"[2].

- **Co-regulation** "*involves government and the profession in a partnership. Government is responsible for legislation, which is administered by the profession. Complaints and discipline may be provided independently. If legislation only covers part of engineering activity the profession will have complaints and disciplinary procedures for its members involved in the remaining activities. These procedures may be acceptable to government for the regulated activities*"[3].

1 (World Federation of Engineering Organisations, 2011) Page 5
2 (World Federation of Engineering Organisations, 2011) Page 12
3 (World Federation of Engineering Organisations, 2011) Page 12

- **Self-regulation** "*also has government legislation but individual engineers or companies are themselves responsible for compliance, which is policed separately*"[4].

- **A professional engineer** means an individual who is educated, trained and experienced in the competent practice of engineering, and who can be held to account for the effects of their work.

2.1.2 Overview of roles

Type	Role
Learned societies	A membership organisation that furthers the development of knowledge in a particular area of expertise, and promotes the sharing of that knowledge between its members. Key activities typically include journals, events, awards and public or policy engagements.
Professional Engineering Associations	Membership groups of engineers and professional engineers, and that act as learned societies for engineers. Associations usually play no role in professional regulation, though a minimum level of education is usually required for membership (and leading members may be asked to assist in any accreditation and regulation activities in a country). Providing professional development is a key activity.
Professional Engineering Institutions	Professional Engineering Institutions are generally national professional associations and learned societies for engineers. They assess their members' education and competence, granting them 'chartered engineer' status and providing for professional development. In some countries these institutions regulate the engineering profession, but in others the regulation is managed by a separate accreditation body.
Engineering Accreditation Bodies	Engineering accreditation bodies accredit organisations that educate engineers (such as universities) and that assess engineers (such as professional institutions) in a country. Accreditation can be a function of a professional institution but it is common for accreditation bodies to be independent entities. They may be referred to as 'councils'.
Trade Unions	Membership associations that protect and develop the rights of people working in particular trades and professions, usually at the national level. Many construction trade unions are formal advisors to construction health and safety policy-making entities, and also provide their members with practice advice and training on health and safety – in addition to making them aware of their rights.
Trade Union Federations	Membership groups for trade unions, usually at the national and international levels. National federations play an important role in governmental policy making and advocacy.
Trade Associations	Groups of businesses in particular trades, such as engineering consultants (who design and plan) and contractors (who build and maintain). These are often powerful lobbying groups, and can inform and promote industry standards and codes.
Construction Industry Bodies	Any independent organisation or public body that plays a role in the construction sector, usually to achieve certain policy goals. Examples include organisations that promote international trade, lobby government, improve health and safety, research and evaluate new building codes, deliver public engagement activities to children or women, represent the client perspective or to recognise success through awards.

[4] (World Federation of Engineering Organisations, 2011) Page 12

Type	Role
Chambers of Commerce	Geographically based groups of businesses that promote and protect the interests of the business community. Committees on particular topics, such as construction, bring together similar businesses in a local area. Local chambers are usually members of regional or national federations.
Non-Governmental Organisations	Usually taken to mean charitable or not-for-profit organisations dedicated to a particular mission or set of objectives. Many deliver services and support directly to people in the construction sector, and they can also advocate for improvements. In countries with weak institutions, NGOs can be vitally important actors (which often raises questions of the dependence of a country on NGOs and can sometimes cause tensions between the NGOs and the national bodies that are supposed to be performing the role – until there is a specific regulatory agreement reached).

Table 1 Overview of roles of different types of organisation in engineering and construction

2.1.3 Key organisations

Nepal	UK	International
Professional Engineering Institutions or Associations		
Nepal Engineers Association (NEA) - link Structural Engineers Association of Nepal (SEANep) - link Society of Nepalese Architects (SONA) - link	Institution of Civil Engineers (ICE) - link Institution of Structural Engineers (IStructE) - link Royal Institution of British Architects (RIBA) - Chartered Institution of Building (CIOB) - link	World Federation of Engineering Organisations (WFEO) – link Federation of Engineering Institutions of Asia and the Pacific (FEIAP) – link Asian Federation of Engineering Organisations (AFEO) – link Federation of Engineering Institutions of South and Central Asia (FEISCA) - link
Engineering Accreditation Bodies		
Nepal Engineering Council (NEC) - link	Engineering Council – link	International Engineering Alliance (IEA) – link
Trade Union Federation		
Nepal Trade Union Congress (NTUC) – link General Federation of Nepalese Trade Unions (GEFONT) – link Democratic Confederation of Nepalese Trade Unions (DECONT) – link	Trade Union Congress (TUC) - link	International Trade Union Confederation (ITUC) – link World Federation of Trade Unions (WFTU) – link Building and Wood Workers International – link
Trade Union		
Nepal Building and Construction Workers Union – a NTUC affiliate Construction and Allied Workers Union of Nepal (CAWUN) – a GEFONT affiliate – link Central Union of Painters, Plumbers, Electro and Construction Workers (CUPPEC) – a DECONT affiliate – link	Union of Construction, Allied Trades and Technicians (UCATT) - link Unite - link Prospect - link	

Nepal	UK	International
Governmental Ministries, Departments and Agencies		
Ministry of Urban Development (MOUD) - link Department of Urban Development and Building Construction (DUDPC) - link Building Code Implementation Program in Municipalities of Nepal (BCIPN) - link	Health & Safety Executive (HSE) Construction Industry Advisory Committee (ConIAC) - link Health & Safety Executive Construction (Design and Management) Regulations (CDM) - link	International Labour Organisation in Nepal - link World Trade Organisation (WTO) in Nepal - link International Labour Organisation (ILO) in Nepal Occupational Safety and Health Development in Nepal (SHIELD) - link
Chambers of Commerce		
Federation of Nepalese Chambers of Commerce & Industry (FNCCI) - link	British Chambers of Commerce - link	South Asian Association for Regional Co-operation (SAARC) Chamber of Commerce & Industry - link
Trade Associations		
Society of Consulting Architectural & Engineering Firms (SCAEF) – link Federation of Contractors' Associations of Nepal (FCAN) - link [5 Regional Contractor Associations & 75 District Contractor Associations – all affiliated with FCAN] Nepal Land and Housing Development Association (NLHDA) – link	Association of Consulting Engineers (ACE) – link Build UK - link Civil Engineering Contractors Association (CECA) - link	International Federation of Consulting Engineers (FIDIC) – link Confederation of International Contractors' Associations (CICA) - link International Federation of Asian and Western Pacific Contractors' Associations (IFAWPCA) - link
Construction Industry Bodies		
Construction Business Development & Implementation Committee (CBDIC) - link Construction Business Development Council (CBDC) - link Construction Industry Training Centre - link Council for Technical Education and Vocational Training (CTEVT) - link	Construction Industry Council (CIC) - link British Board of Agreement (BBA) - link Confederation of Construction Specialists (CCS) - link Construction Industry Training Board (CITB) - link Construction Skills Certification Scheme (CSCS) - link Constructing Excellence-link	South Asian Association for Regional Co-operation (SAARC) Chamber of Commerce & Industry Construction Industry Council (SCCI-CIC) - link
Non-Governmental Organisations		
Nepal Society for Earthquake Technology (NSET) - link Build Change Nepal - link Friedrich Ebert Stiftung (FES) Nepal Trade Union research activities - link, link RedR UK/India Nepal training programme – link Engineers Without Borders USA Engineering Service Corps Nepal office - link	Construction Youth Trust (CYT) - link	Global Infrastructure Anti-Corruption Centre (GIACC) - link Engineers Against Poverty (EAP) - link

Table 2 Organisations in Nepal, the UK and internationally relevant to this report

Note: the above list is not intended to be exhaustive as there are many, many organisations or groups in Nepal, the UK and internationally that cater to particular specialisations or issues. This is however a reasonably full picture of the key organisations that are relevant to the purpose of this report. Other organisations that have been identified during this research are included in the annex.

2.2 How key organisations support improved construction

2.2.1 A complex eco-system

In order to understand how professional organisations and trade unions support improved construction standards and safer buildings, it is important to first recognise that they are part of a complex eco-system.

"*Service delivery takes place in an institutional environment meaning that institutions of many types have ongoing statutory, legal, funding, governance, auditing and other responsibilities… Each entity has to have specific mandates and specified responsibilities and will have to rely on a network and support systems as well as having appropriate governance structures… In many environments there is a serious lack of integration or aligning of effort. This often leads to confusion or even conflict and ultimate waste of valuable resources. If one or more of these institutions is not fully able to carry out its responsibilities, service delivery will inevitably be hampered*"[5].

Put another way, the inter-connections between key organisations means that change is systemic. This applies to failures as well, and so the cause of any failure can be unclear or may not be easily attributed to any one actor. For example, the Royal Commission set up to investigate the collapse of the CTV Building in New Zealand during the Christchurch Earthquake of February 2011 made recommendations relating to technology, communications, building codes, inspections, the outputs of the Institution of Professional Engineers New Zealand, post-graduate continuing education, course curricula and professional registration requirements[6].

In the complex eco-system of engineering and construction, the question of how key organisations support safer standards and buildings can be answered by a systemic cultural shift towards improved health and safety: "*We fundamentally believe you don't get better health and safety by filling in a form showing that you meet regulations, rather it is a cultural change" –* Jon Prichard, Engineering Council, 21/10/15.

In countries where governance is weaker, the context is usually even more complex – and less clear.

Capacity building of key organisations in this complex eco-system must necessarily embrace this complexity. In an attempt to simplify this process, the Capacity Building Committee of the World Federation of Engineering Organisations has identified six 'pillars' of capacity building needed to improve infrastructure in a country, including individual and institutional capacity. See Box 1.

5 (World Federation of Engineering Organisations, 2010) Page 44
6 (Canterbury Earthquakes Royal Commission, 2012) Pages 6-18

Box 1 Capacity for engineering infrastructure delivery – extract on individual & institutional[7]

"There are six essential pillars which must always be in place and in balance if a society is to have sufficient and stable technical and decision-making capacity for engineering infrastructure delivery to be appropriate, effective and sustainable: individual, institutional, technical, decision-making, finance/funding and resources/equipment/tools/supplies.

- Individual: it is vital that the needs of the individual are met. In the case of the engineering practitioner, this would imply that his/her needs are fulfilled in terms of a career with sufficient status, standing and rewards and support for developing and maintaining professional competence.
- Institutional – there must be appropriate educational, professional, technical and statutory institutions in place at a variety of levels including:
  - professional bodies which support and develop the individual;
  - education providers up to and beyond tertiary level which provide education and training;
  - research and development providers which resolve technical issues; and
  - statutory bodies which develop, establish, provide, monitor and enforce professional, technical and industry standards;
  - institutions must be both public and private sector, including stable, viable and responsible businesses, commercial enterprises and financial institutions that can support the provision, operation and maintenance of infrastructure and other services"

2.2.2 Professional Engineering Institutions

"The value that a Professional Engineering Institution adds is in introducing ethical conduct and professional behaviours into its membership – or else be struck off! The institution must be able to enforce this so that being on a register means something." – Jon Prichard, Engineering Council UK, 21/10/15.

"*Engineering institutions are 'Learned Societies' promoting good practice, professional standards and providing guidance for the design and construction of buildings and infrastructure... They determine professional standards and have a hand in the content of undergraduate and post-graduate training, and arrange Continuing Professional Development.*" – Simon Longbottom, Health & Safety Executive, 21/10/15.

"*Safety regulations are set out in legislation, and professional institutions ensure that people are competent and meet the legislation.*" – Dr. Alan Walker, Royal Academy of Engineering, 21/10/15.

"*Last month, we produced a report called 'Understanding the Value of Professionals and Professional Bodies'[8]. It draws on MPs and the UK public's perceptions, and shows that professional bodies provide value in five areas: productivity, social mobility, international development, policy formation and governance & ethical standards. There is the important point to make that the structure of high level professional education and qualifications that [depends on] professional bodies has developed with little, if any, taxpayers' money… the professional bodies provide, through their qualifications, a consistent yet ever-improving benchmark.*" – David Hawkes, Chartered Institution of Building, 22/10/15.

7 (World Federation of Engineering Organisations, 2010) Page 16
8 (Chartered Institute of Building, 2015)

Professional engineering institutions support improved construction standards and safer buildings by:

- promoting a professional culture, and;
- helping to establish standards of practice.

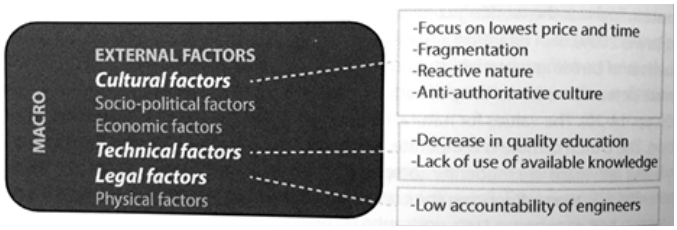
Professional engineering institutions have helped to establish a systemic cultural shift towards improved health and safety in the engineering and construction sectors. The Institution of Civil Engineers has recently published a new book called 'Practical Guide to Using the Construction Design & Management Regulations 2015'[9]. The book's subtitle is 'Teamwork not Paperwork' and the book states that "*It was never intended for risk management to become a paperwork exercise, and the Health & Safety Executive took every opportunity to explain this to the construction industry*"[10].

Professional and learned bodies in the sector are identified as one of the most important components of an 'outer context' or enabling environment needed to establish a safety culture[11]:

"*Professional bodies, whether representing those engaged fully in health and safety at work or those whose work involves considerable health and safety responsibilities, are increasingly seeking to influence safety management in organisations through the practice of their members… [setting] up registration schemes to ensure that members who are engaged in health and safety work establish and develop their competence.*"[12]

Further, the poor performance of Professional Engineering Institutions is seen as a threat to the safety of structures – since their work touches on both these technical and legal factors:

Figure 1 Observed main threats for structural safety on macro level[13]



In order to help engender a safety culture, the form of regulation of the professional engineers is also a factor[14]. "*In the spectrum of types of regulation, the UK profession sits in the middle as a self-regulated profession, rather than as a government-led statutory-regulated profession. The Engineering Council firmly believes that self-regulation is more productive – as it offers a carrot rather than stick - when compared to imposing standards. Independence of assessment is key. It supports an accountability culture to emerge.*" – Jon Prichard, Engineering Council UK, 21/10/15.

Helping to establish standards of practice can perhaps be more easily understood as contributing to improved construction and safer buildings. How Professional Engineering Institutions contribute is, however, less clear as it is different for each kind of technology or

9 (MacArthur, 2015)
10 (MacArthur, 2015) Page 24.
11 (Waring, 1996) Page 26.
12 (Waring, 1996) Page 30.
13 (Terwel., 2014) Page 94 and the figure summarises Pages 83 to 93.
14 (The UK Inter-Professional Group, 2002), (Engineering Council, 2009) & (Engineering Council, 2012)

process. As learned societies, engineering institutions are always consulted on new building regulations and construction regulations that are adopted by government. This is facilitated through participation in key committees, such as the Construction Industry Advisory Committee (ConIAC) of the Health and Safety Executive (this will be described in the next section). But historically, the contribution of professional engineering institutions is very clear, and is briefly described in Box 2.

Box 2 A Brief History of the development of standards in engineering and construction[15]

The Institution of Civil Engineers (ICE) was formed in 1818 and was the world's first professional body. It secured a Royal Charter in 1828 giving it the status of a formal institution for the civil engineering profession.

In the late 19th Century, the ICE began to set up an engineering standards committee. The committee was established in 1901 with the purpose of standardising iron and steel sections. At the time, there were many different sections – as a result of the committee the number was reduced from 175 to 113 sections.

Then common standards for other products (such as tram rails) were developed. Codifying standards in this way resulted in significant improvements in quality, reliability and inter-operability – and hence safer infrastructure. The committee then started codifying engineering practices (such as designing wings or making concrete).

Meanwhile, in 1903, the need to indicate to buyers that goods were 'up to standard' led to the creation and registration of the British Standard Mark (to become known later as the Kitemark).

Standardisation became very important during World War 1, and then spread around the world during the 1920s. The Engineering Standards Committee became the British Engineering Standards Association in 1918, and was granted a Royal Charter in 1929. A supplemental Charter was granted in 1931 changing the name, finally, to The British Standards Institution.

So the Institution of Civil Engineers established the British Standards Institute and gifted it its first standards. The standards were for products and practices, and the British Standards Institute retains the national standards for products and practices – and applied the Kitemark to approved products and practices.

The standards for people (professionals) were however retained by the Professional Institutions, and the ICE retained its standards for Professional Civil Engineers.

The BSI organised the first ever Commonwealth Standards Conference in London in 1946, which led to the establishment of the International Organisation for Standardisation (ISO). Many British Standards were adopted by the ISO. In 1975 the Commission of the European Community decided on an action programme to eliminate technical barriers to trade in the construction sector. Within this programme the Commission established a set of harmonised technical rules for the structural design of construction works, culminating in

15 With thanks to Jon Prichard, Engineering Council and the British Standards Group website.

the publication of the first generation of Eurocodes in the mid-80s. All 58 Eurocodes have links to the BSI.

In this way, the work of the ICE as a Professional Engineering Institution led to global improvements in quality, health, safety, productivity and inter-operability – particularly within the building and construction sector.

2.2.3 Trade Unions

"*In 2000, over 130 workers were killed on construction sites. The then Deputy Prime Minister, John Prescott, challenged the industry to make significant improvements (or else…. !). Clients demanded better performance. Attitudes changed. Contractors were held to account by shareholders. Corporate and individual prosecutions were made. But, also, the construction industry collaborated, and created the Construction Skills Certification Scheme*[16]*, Constructing Better Health, the Strategic Forum for Construction, the Considerate Constructor Scheme, Constructing Excellence and the Construction Industry Leadership Council. It collaborated to support the Health and Safety Executive – the UK is well-regulated and they have annual workplans for construction site inspections. The Trade Unions were there in all of these initiatives to represent the workers – indeed, the Construction Skills Certification Scheme (which makes sure that workers have the required skills) is owned 50-50 between the industry and the unions. In 2013/14, there were 34 fatalities in the construction industry. The problem now is smaller and self-employed construction contractors – 24 of the 34 fatalities, 70%, took place on small construction sites. We are also now able to focus on Occupational Health.*" – Gren Tipper, Construction Clients Group, 21/10/15.

"The Institution of Civil Engineers (ICE) has worked closely with Trade Unions through the Health & Safety Executive and their Construction Industry Advisory Committee (ConIAC). The ICE sits alongside Trade Unions in undertaking reviews of the effectiveness of legislation (specifically CDM 2007), then collaboratively with the Trade Unions in developing industry guidance across all stakeholders in the delivery of projects which are safe to construct, use and maintain, without adverse health effects. Through the Construction Industry Council, the ICE is represented on ConIAC, where we collaborate with TUs (cannot recall the level of TU representation, but it is high). ConIAC work has included support of things such as Health initiatives, Worker Involvement toolkit etc. We have worked with CITB in several areas, CITB is the Trade level body, and has a high proportion of TU representation." – David Lambert, Institution of Civil Engineers, 22/10/15.

"*Trade unions were instrumental in introducing the 'Health and Safety At Work' act in the UK"* – Jon Prichard, Engineering Council, 21/10/15.

"*Trade unions have had a hugely important role in improving health and safety in the construction industry. I started my career working on building sides in 1979 and back then there was no Personal Protective Equipment issued – hard hats and steel toed boots. There were no checks on driving licences either, yet we were allowed to drive large diggers and trucks on site. It just wouldn't happen today – the culture has completely changed. The unions became so influential in trying to drive this change this that union members were often blacklisted by construction contractors*" – Petter Matthews, Engineers Against Poverty, 22/10/15.

16 Note that the UK's construction sector health and safety regime has recently been called into question. The BBC's Newsnight programme uncovered serious cases of fraud taking place in the issuing of the Construction Skills Certification Scheme cards, as broadcast on 21st October 2015.

Trade Unions support improved construction standards and safer buildings by:

- promoting a safety culture through information and awareness raising to members, and;
- representing the interests of construction workers in policy and construction standards.

Trade Unions are powerful political actors in many countries, and can apply pressure at the highest levels of government to drive change that benefits their members. Health and safety in construction and of buildings is, however, one area where there is political consensus – or at least is uncontroversial – in an era where safety makes good business sense. Controversies can arise that can stress the relationship between trade unions and construction contractors – either on individual cases or wider policy issues – but this can conceivably benefit health and safety performance.

Note that the UK's political context is relatively stable and there is a single national trade union federation that can engage with government.

2.2.4 Notes on Nepal

Contributors Paul Jaquin and Liva Shrestha noted some key points on the Nepal Engineering Association's and Trade Unions' support improved construction and safer buildings in Nepal:

- Around 50% of buildings in Nepal are built directly by the owners of the building, though they may seek advice from local builders. This is a much higher proportion of owner-builders than you would find in a developed country, and it creates significant regulatory challenges in terms of achieving safer buildings. Most of the buildings are small residences.

- A government regulation model is used for professional engineers in Nepal. Professional Engineers must register with the Nepal Engineering Council in order to practice. The list of Nepal's professional engineers is available on its website. The Nepal Engineering Council is funded by the Department of Urban Development and Building Construction.

- In general terms, government regulation can have a negative impact on a country's professional engineering associations – since professional registration is handled by the government, there is often little incentive for engineers to also join a professional engineering institution. This is especially true if the association is seen as being weak, which causes a viscous circle of decreasing capacity in the association. Professional engineers, if they can afford it, may choose to join the international arms of foreign engineering institutions (such as the Institution of Engineers India or the Institution of Civil Engineers) in order to gain access to their learned society resources. The extent to which this issue affects Nepal is difficult to assess.

- Paying the annual membership fee after having completed an engineering degree is sufficient to join the Nepal Engineering Association as a full member. There is no additional exam or peer-review process required at present, which makes it very difficult for the Nepal Engineering Association to work towards becoming an institution or accredited to international standards.

- The Nepal Engineering Association does not currently have a regular programme of Continuing Professional Development. It does however host training courses which

are delivered by NGOs or funded by aid donors; they do not run their own training. Recent speakers have come from New Zealand Aid and the United Nations Development Programme etc.

- Training and Continuing Professional Development in the building and construction sector is mainly done through the Nepal Society for Earthquake Technology (NSET) – an NGO which receives funds from international donors such as USAID. The training is often very practical, and aimed at masons who work as petty contractors. The success of NSET in this area causes friction between it and the Nepal Engineering Association, as well as the Government of Nepal – because the NGO is doing what they do and they find it difficult to compete against NSET's resources (NSET has 70 staff whereas the Nepal Engineering Association has about 4 staff). Co-operation agreements on specific areas do exist, but friction remains.

- The responsibility for health and safety during construction lies with contractor. However, in practice, the attention paid to health and safety depends greatly on having a well-informed client. Unfortunately, neither the contractor nor the client usually show any concern for the workers on site and are often far more concerned about corruption (such as stealing cement).

- Trade unions do play a role, but are generally not very powerful (contributors to this report with experience of Nepal had not encountered any trade unions on site). Their role is severely weakened by big construction contractors who hire cheap, non-union labour from India and Bangladesh. Indeed, such recruitment practices make health and safety risks worse since temporary migrant labour are more willing to work both day and night as they have no family in Nepal to go home to.

- Most smaller jobs are done by 'petty contractors' (informal, not registered) who face serious issues in relation to health and safety because there is "no direct contract between the real employer and employee"[17].
- The health and safety regime differs depending on the levels of labourer that are employed; skilled labourers have more protection than unskilled labourers (for example, there is a requirement for contractors using skilled labourers to have insurance for accidental death).

Case Study 1 A practising Nepal structural engineer: Liva Shrestha

Liva Shrestha is a practising structural engineer in Nepal with a Masters in Structural Engineering from Tribhuvan University in Kathmandu. Liva has a private practice and also works with the Nepal office of an international NGO called Build Change.

Liva is required to be registered with the National Engineering Council in order to practice.

Liva decided to also become a member of the National Engineering Association, by paying her fee after she graduated (no entry exams or reviews were required).

In order to get approval for a new structure, Liva submits her designs to the municipal government of the district where the structure will be built. The processes she follows are outlined below[18]:

17 (Chapagain, 2000) Pages 11-12

18 For another look at this process, see 'Dealing with Construction Permits in Nepal' published by the World Bank Group's 'Doing Business' website here.

- For small residential buildings, the architectural and structural drawings are submitted to the municipality using a form in order to gain planning permission. No formal review of the designs is done. Temporary approval is granted for construction up to the plinth level. When construction reaches that stage, someone from municipality comes and checks that you are following the planning permit and designs. They then issue a full certificate so that construction can be completed.

- For larger apartment buildings and public buildings like hospitals the process is more stringent with extra steps. Architectural drawings and structural reports are prepared and submitted to the municipality. A formal presentation to jury panels that have architectural and structural expertise must be made. If a panel has any reservations about the design they can ask for a revision. If they are happy with the design, they might make some recommendations. Site inspections then take place – usually at least one inspection during construction.

Liva regularly experiences a number of issues and challenges with this process:

- The lack of qualified people in the municipalities (mainly outside the Kathmandu Valley).

- The system is expensive to operate and so only operates in rich municipalities.

- The building code compliance process is currently being rolled out to additional municipalities outside the Kathmandu Valley. However, the serious lack of staffing means that in practice engineers simply inform the municipality rather than seek approval.

- There is virtually no system to ensure that building codes are followed during construction.

- There is virtually no system to check whether construction meets the required quality.

- Site inspections are a window for low-level corruption.

- Site inspectors are not always qualified to do inspections, even though a high level of skill is not necessarily required.

- In Kathmandu, where site inspectors are usually qualified, the motivation of the inspectors is more of a concern.

2.3 Professional organisations and improved construction

2.3.1 Evidence on professional engineering institutions

"*I would like to think that there is a link between professional institutions and improved construction – though I can't think of any particular evidence for this. My view is that the existence and strength of a professional engineering institution will be very influential in improving construction.*" – Peter Hansford, Chief Construction Advisor to the UK Government, 20/10/15.

"*The Institution of Civil Engineers and the Institution of Structural Engineers have both been in existence for many years and so may not have considered the evidence base for their existence… but the rationale for their being is clear.*" – Simon Longbottom, Health & Safety Executive, 21/10/15.

"*It not easy to find evidence on this. The link is broadly accepted as self-evident so there will be little evidence available*." – Petter Matthews, Engineers Against Poverty, 22/10/15.

There is a gap in evidence (in terms of data, statistics and trends) to demonstrate any link between the improvement in professional engineering institutions and improvement in construction. Two of the contributors to this report stated (above) that the link is widely accepted.

Attempts to identify links between construction fatalities and even building collapses (inside and outside seismic zones) and the strength of Professional Engineering Institutions have not been fruitful. It is conceivably possible, but not within the limited time available to research this report. The main barrier is lack of reliable historical data on the causes of fatalities and collapses, the fact that many countries do not report these data (severely limiting comparisons between countries at different levels of development) and a lack of disaggregated data.

The only readily available evidence is the experience of history. The previous section demonstrated some of this by looking at the roles that Professional Engineering Institutions play and have played in the improved construction and safer buildings. To build on this, and to demonstrate that DFID has itself accepted the 'self-evident' link before, the next section outlines a series of DFID-funded projects.

2.3.2 Case studies from DFID's work in other countries

DFID and its predecessor have invested in the improvement of engineering professional bodies in other countries in the past. Three case studies are outlined below. In the case of Tanzania, the project had the specific goal of improving construction safety. The evidence used to support the bids for each of these case studies was, as with this report, likely based on international comparison and historical experience – again, because the link was accepted as self-evident there was little evidence required.

Case Study 2 ODA: Strengthening the Institution of Engineers Bangladesh. 1993-1998[19]

In 1993, the UK Government's Overseas Development Administration (ODA) (the precursor to the Department for International Development) agreed to support the Institution of Engineers Bangladesh (IEB) to enhance its role as a professional body. The ODA identified the Institution of Civil Engineers (ICE) as the lead partner to support IEB. The goal of the project was improved professional standards in the engineering profession in Bangladesh. This was to be achieved by enhancing the effectiveness of IEB, including its capacity to provide training for Continuing Professional Development.

Following the project, Bangladesh achieved provisional status in the Washington Accords for the mobility of professional engineers. Training facilities were improved, a new membership database was established, the library was restocked and Continuing Professional Development activities were greatly expanded. An attempt was made to train construction workers.[20]

19 (Institution of Civil Engineers, 2002)

20 For the purposes of this report, an attempt was made to relate the development of Institution of Engineers in Bangladesh to data on construction sector fatalities. However, no data could be found from

Case Study 3 DFID: Strengthening Professional Engineering Associations Project. 2001-2002[21]

In 2001, the Institution of Civil Engineers (ICE) entered into a contract with the Department for International Development (DFID) to undertake a project designed to strengthen the indigenous engineering professions in a number of developing countries. The countries involved in the study were: Bangladesh, India, Malawi, Mozambique, Pakistan, Tanzania, Uganda & Nepal. Kenya was added to the list of countries at a later date. Entitled 'Strengthening Professional Engineering Associations Project' (SPEAP), phase one of the project was to complete scoping studies to recommend what could, and should, be done to assist the development of the engineering professions in each country. The ICE presented the over-arching Consolidating Report, together with the eight individual country reports, to DFID in April 2002.[22]

Subsequent major restructuring within DFID significantly altered the way in which programmes and individual projects were funded. The decision concerning DFID's willingness to fund the follow-up work was to be made at an individual country level. No follow-up projects were confirmed.

Case Study 4 DFID: Strengthening Workers' Rights in Construction in Tanzania. 2007-2012[23]

The Department of International Development's Civil Society Challenge Fund funded Engineers Against Poverty for a 5-year project to support Institution of Engineers Tanzania (IET). The goal was to help the Government of Tanzania to implement health and safety regulations, including by operationalising the regulators, delivering training in health and safety (which was accredited by the Institute of Occupational Safety and Health) and by raising awareness amongst contractors, consultants, clients and workers. The project was run in partnership with Tanzania's Occupational Safety and Health Authority (OSHA). The project also worked closely with trade unions.

The project was successful in using a training of trainers approach – ultimately reaching hundreds of trainees – and in providing support advice to OSHA and its newly trained health and safety officers.

The corruption that affects construction safety and safer buildings in Tanzania affected this project also. IET was chosen as the lead partner because OSHA suffered from corruption at a high level, and so the professional institution provided a more effective platform. Also, newly trained health and safety officers had difficult relationships with the trade unions because they did not want to embrace the existing corrupt practices. The project had identified that new officers would be highly vulnerable to corruption, so it worked with OSHA and tailored training content to address this challenge.

A report entitled 'Promoting Construction Health and Safety through Procurement: a briefing note for developing countries' was published by Engineers Against Poverty and the Institution of Civil Engineers as a follow-up to this project.[24]

before 2000 in the International Labour Organisation and civil society organisation data sources, meaning that any change made could not be analysed.

21 (Institution of Civil Engineers, 2005)

22 Copies of the scoping studies that were submitted to DFID have yet to be found by the author.

23 (Engineers Against Poverty, 2012)

24 (Engineers Against Poverty & Institution of Civil Engineers, 2009)

End of project reports and an independent evaluation were submitted to DFID (CSCF Project 406) but to date there has been no long-term impact assessment to assess how the work of the IET on this project has affected construction in Tanzania.

SECTION 3

Conclusion

This report addressed three questions, and the findings can be summarised as:

- Who are the key professional organisations, and trade union groups, engaged in safer buildings, and what are their roles?

  25 Nepali, 22 British and 18 international organisations were listed, categorised by their roles. The roles and the terminology used to explain their roles was also set out. Links to the websites of each of these organisations were also listed.

- How do professional organisations and unions support improved construction standards and safer buildings, in Nepal and globally?

  Professional organisations and trade unions were shown to exist within the complex eco-system around engineering and construction. Professional organisations in engineering (particularly Professional Engineering Institutions) that are able to hold their members to account are critical in establishing a systemic cultural shift towards health and safety in engineering and construction by: promoting a professional culture, and; helping to establish standards of practice. Trade Unions use influence in the political sphere to drive change that benefits their members and, in health and safety, they work to: promote a safety culture through information and awareness raising to members, and; represent the interests of construction workers in policy and construction standards. This was evidenced by contributions from sector leaders and historical experience. Finally, some notes on the Nepal context – including contrasts and challenges – were shared.

- What evidence is there to show whether improved professional organisations result in improved construction?

  The report found a gap in evidence for this link, but also that the link is broadly accepted as being self-evident at the highest levels in the UK. Attempts at using data and statistics to identify this link were not fruitful because of lack of data and the complexity of the sector, so the historical experience given in response to the previous question is likely to be the best kind of evidence available. Examples from DFID's history showed that it has in the past invested in improving professional engineering organisations in order to improve construction.

The report has highlighted a number of themes and issues. Though there are important differences between Nepal and the UK experience, whilst conducting this research the author has some broad conclusions on the changes that may need to take place in Nepal. These are:

- Significant investment in recruiting and training site inspectors and local government engineers, who would be supported through technical committees made up of professional engineers.
- Establishing a stronger consensus between contractors and trade unions on health and safety.

- Continuing Professional Development to be delivered by the Nepal Association of Engineers.
- A move towards the self-regulation of engineering professionals, where the Nepal Engineering Council accredits universities to issue engineering degrees and the Nepal Engineers Association to issue chartered status.

"*The earthquakes earlier this year have really caught everyone's attention, and there is an opportunity to reform and develop institutions and establish a new working culture of safe building. Now is the right time to invest in construction safety in Nepal.*" – Paul Jaquin, New Zealand Aid, 20/10/15.

SECTION 5

Contributors

Contributors

Interviews were held with:

- Peter Hansford, Chief Construction Advisor, UK Government.
- Jon Prichard, Chief Executive, Engineering Council UK.
- Gren Tipper, Director, Construction Clients Group (on behalf of Construction Excellence Health and Safety Task Group).
- Petter Matthews, Executive Director, Engineers Against Poverty.
- Dr. Alan Walker, Head of Policy, Royal Academy of Engineering.
- Dr. Paul Jaquin, Senior Structural Engineer at Land Development and Exploration New Zealand and chair of Earth Buildings UK. Deployed to Nepal as a specialist trainer and structural assessor by New Zealand Aid.
- Liva Shrestha, Structural Engineer at Build Change Nepal and in private practice.
- Parikshit Kadariya, Senior Divisional Engineer, Building Code Section, Department of Urban Development and Building Construction, Government of Nepal.

Written contributions were submitted by:

- Simon Longbottom, Head of Construction Policy and Sector, Health & Safety Executive.
- David Hawkes, Project Co-ordinator, Chartered Institute of Building.
- David Lambert, Senior Safety Health and Environment Manager, Kier Construction & committee member and former Chairman of the Institution of Civil Engineers Health and Safety Panel.

No interviews could be held with representatives of key organisations in Nepal due to the public holidays on 20th, 21st & 22nd October (when the research was conducted). Unsuccessful attempts were made to reach GEFONT, NUTC, CAWUN and CUPPEC, and also the ILO Nepal office regarding their SHIELD programme. UK trade union construction sector specialists at UCATT and Unite were asked to contribute, but were unavailable.

Extensive use was also made of the library facilities at the Institution of Civil Engineers.

SECTION 6

Bibliography

References

Canterbury Earthquakes Royal Commission. (2012, November). *Final Report: Volume 5. Summart and Recommendations in Volumes 5-7.* Retrieved from http://canterbury.royalcommission.govt.nz/: http://canterbury.royalcommission.govt.nz/vwluResources/Final-Report-Vol-5-Pt-1/$file/Vol_5_Pt1-Page1-34.pdf

Chapagain, D. P. (2000). Contract Labour in Nepal - International Labour Organisation Seminar. (pp. 11-12). Kathmandu: BISCONS Development and Management Consultants.

Chartered Institute of Building. (2015). *Understanding the Value of Professionals and Professional Bodies.* Retrieved from www.ciob.org/policy: http://www.ciob.org/media-centre/news/professional-bodies-add-huge-value-society

Engineering Council. (2009, October). Board Paper: Engineering Council Guideance on Individual Profession Titles. London.

Engineering Council. (2012, November 29). Board Paper: Self-regulation - what does it mean? London.

Engineers Against Poverty & Institution of Civil Engineers. (2009). *Promoting Construction Health and Safety through Procurement: A briefing note for developing countries.* Retrieved from Engineers Against Poverty: http://www.engineersagainstpoverty.org/publications

Engineers Against Poverty. (2012). *Strengthening Workers Rights in the Construction Industry in Tanzania.* London: Engineers Against Poverty.

Institution of Civil Engineers. (2002). *Strengthening Professional Engineering Associations Project - DFID reference AG2700.* London: ICE.

Institution of Civil Engineers. (2005). *SPEAP Briefing.* London: ICE.

MacArthur, T. P. (2015). *Practical Guide to Using the CDM Regulations 2015.* London: Institution of Civil Engineers.

Terwel., K. C. (2014). *Structural Safety – Study into critical factors in the design and construction process.* Rotterdam: Ipskamp Drukkers B.V.

The UK Inter-Professional Group. (2002). Professional Regulation - A Position Statement. London.

Waring, A. (1996). *Safety Management Systems.* London: Chapman & Hall.

World Federation of Engineering Organisations. (2010). *Guidebook for Capacity Building in the Engineering Environment.* Retrieved from http://www.wfeo.org/stc_capacity_building_reports/: http://www.wfeo.org/wp-content/uploads/stc-capacity_building/WFEO_Capacity_Building_Guidebook_final.pdf

World Federation of Engineering Organisations. (2011, December). *Mobility of Engineering Professionals.* Retrieved from http://www.wfeo.org/mobility/: http://www.wfeo.org/wp-content/uploads/stc-education/MobInfPupdateVDec.2011.pdf

Further Reading

Casteneda, O. (1984). *Engineer and Life-Safety Responsibility Overseas*. Specifying Engineer, v52, n3, p58-61. ISSN: 01645242.

Chartered Institute of Building. (2009). *Health and Safety in the Construction Industry*. Available at: http://www.ciob.org/policy/health-and-safety

Coble, R. J. & Haupt, T. C. (1999). *Construction Safety in Developing Countries.* Implementation of Safety and Health on Construction Sites – Proceedings of the Second International Conference of the CIB Working Comission. Published by A. A. Balkema, Rotterdam.

Construction Industry Council. (2011). *Client leadership on health and safety*. Available at: http://cic.org.uk/admin/resources/cicclientsafetyleadership0611.pdf

Department of Trade and Industry. (1998). *Rethinking Construction – the Report of the Construction Task Force ('The Egan Report')*. Available at: http://constructingexcellence.org.uk/resources/rethinking-construction-the-egan-report/

Dev Raj Dahal. (2002, December). *The Current Trade Union Situation in Nepal*. Available at: http://library.fes.de/pdf-files/iez/01962.pdf.

European Agency for Safety and Health at Work. (2012). *Promoting occupational safety and health through the supply chain – literature review.* Available at: https://osha.europa.eu/en/tools-and-publications/publications/literature_reviews/promoting-occupational-safety-and-health-through-the-supply-chain

Friedrich-Ebert-Stiftung (FES) Nepal Office. (2014).*Trade Union Situation in Nepal.* Available at: http://www.newunionism.net/library/national%20data/Nepal%20-%202001.pdf

General Federation of Nepalese Trade Unions. (2011). *Current situation of Occupational Safety and Health in Nepal – a Study Report*. Available at: http://www.gefont.org/uploads/publications/9730_Study_OSH_Nepal.pdf

Health and Safety Executive. (2002, December). *Revitalising Health and Safety in Construction*. Available at: http://www.hse.gov.uk/consult/disdocs/dde20.pdf

Her Majesty's Government. (1994, July). *Constructing the Team ('The Latham Report')*. Available at: http://constructingexcellence.org.uk/resources/constructing-the-team-the-latham-report/

Institution of Occupational Safety and Health. (2014, March). *Promoting a positive culture – a guide to health and safety culture*. Available at: http://www.iosh.co.uk/~/media/Documents/Books and resources/Guidance and tools/Promoting a positive culture.pdf

Koehn, E. J. & Reddy, S. (1999). *Safety and Construction in India.* Implementation of Safety and Health on Construction Sites – Proceedings of the Second International Conference of the CIB Working Comission. Published by A. A. Balkema, Rotterdam.

Royal Academy of Engineering. (2011, December). *Safety in engineered systems – a discussion at the Royal Academy of Engineering.* Available at: http://www.raeng.org.uk/publications/reports/safety-in-engineering-systems

West Yorkshire Lifelong Learning Network. (2010, October). *A guide to Professional Institutions within Construction and the Built Environment Sector*. Available at: http://www.lcb.ac.uk/images/pdf/WYLLN_Brochure.pdf

Annex 1 Key factors influencing engineering capacity building

Box 3 Key factors influencing engineering capacity building[25]

"In practical terms, the following are key factors important to the success of building engineering capacity:

Policy factors:

- Commitment to sustainable development practices to ensure sustainable practices
- Public and private sector participation in engineering practice, professional and related matters
- Development of a pool of knowledgeable and informed decision-makers, clients and users of engineering infrastructure and services, including the general public
- Platforms and mechanisms for engineering professionals who can influence best policy practices at all levels of decision making in government and private sector
- Public awareness programmes in order to enhance the visibility and recognition of the role of the engineering profession in civil society
- Appropriate science and technology policy including the extension of research and development initiatives by government
- Good practice policies relating to both local and foreign involvement in nations

Educational factors:

- Appropriate curricula at schools to prepare and enable learners to enter into the field of engineering with specific reference to mathematics, science and technology
- Outreach and career guidance programmes for all school learners
- Acceptable and appropriate international frameworks to accredit and recognise educational qualifications and professional standards to facilitate reciprocity and equity
- Promotion of appropriate education and training for engineering professionals dealing with the challenges of rural and developmental engineering
- Networking frameworks amongst tertiary educational institutions involved in engineering related education
- Promotion and facilitation of entry to and equality for all demographic and gender groups in the engineering profession

Factors relating to ongoing professional development of engineering practitioners:

- Effective communication channels and facilities for all engineering professionals
- Alliance and integration models for interaction and networking among engineering and other built environment institutions
- Internationally accepted norms in terms of conduct, integrity, ethics, engineering standards and care for people and the natural environment
- Continuous learning and professional development opportunities for engineering professionals
- Professional and technical networking opportunities and events
- An events database features annual programmes of events, including those relating
- to continuous professional development, for the purpose of forward planning and co-ordination
- A database of mentors and coaches who can be mobilised for assisting young graduates and even students

[25] (World Federation of Engineering Organisations, 2010) Pages 28-29

- Guideline documents to assist graduates with their candidate phase and to ensure that all the necessary aspects are attended to

Technical support factors:

- Access to technical information and data for all engineering professionals
- Harmonisation of standards, documentation, methods and procedures
- Access to good practice examples as well as case studies regarding engineering practice in terms of desirable and appropriate local and internationally recognized engineering standards, processes, procedures, methods or systems in relation to the delivery processes and the life cycle of products and assets
- Dissemination of and access to relevant published technical papers, articles, editorials, technical journals and magazines for reference purposes
- Utilising procurement as an instrument for development and capacity building

Other factors that can raise the chances of failure include:

- Inappropriate selection of solutions
- Diversion of available funding into complex administration structures or into fees for external consultants, rather than empowerment of the local people
- Lack of continuous and consistent funding that lead to stop-start behaviour, seriously harming progress and even impacting on credibility
- Financial failures and mothballed projects that render the capital used in the development either as wasted or sterile
- Corruption that is not addressed
- Financial stability”

Annex 2 Activities of Professional Engineering Institutions

Box 4 Activities or programme items that professional engineering institutions could and should take responsibility for.[26]

"Basic items:	Membership database
	Membership canvassing
	Constitution, bylaws and regulations
	Strategic planning
	Policy documents
	Continued professional development programmes including courses, seminars, site visits
	Geographical branches
	Technical divisions or institutes
	Magazines, newsletter, technical journal
	Career guidance
	International recognition for educational standards
	International recognition for professional standards
	Best and good practice manuals, technical guidelines and codes of practice
	Code of ethics and code of conduct for members
	Education and training curricula
	Professional remuneration and fees
	Experiential training
	Mentors and mentoring
	Engineering Personnel and human resources
	Image of the profession
	Liaison with government structures at all levels
	Liaison with media
	Capacity building programmes
	Networking with other Built Environment Professions
	Publications including the Institution's Presidential address and the Annual Report
	Website
	Administrative support structure
	Office accommodation
Other items:	Electronic technical paper data base
	Awards for technical excellence
	Awards for members
	Best published paper awards
	Specifications
	Training manuals
	Conditions of contract
	International business and technical networks
	Construction industry development boards
	Legislation

[26] (World Federation of Engineering Organisations, 2010) Pages 48-49

Accreditation of academic institutions Liaison, networking and affiliation locally Liaison, networking and affiliation regionally Liaison, networking and affiliation internationally Bursaries Business support Specialist technical input & working groups Market support Mediation and arbitration Funding and sponsorship initiatives Competitions Annual calendar & activity programme Events data base Meeting facilities Skills development Qualifications framework Research & development Health and safety issues”

Annex 3 Further Research Recommended

Several possible additional avenues for further research were identified during contributor interviews, literature review and the preparation of this report. These are captured below for interest, though it is by no means an exhaustive list of further research into the topic.

- One way to generate evidence that meets the purpose of this report would be to fund an impact study of the work DFID funded Engineers Against Poverty and the Institution of Engineers Tanzania to do on construction workers' rights (see Case Study 4). The evaluation that is referenced in this report was conducted at the end of the project. Now, more than three years later, it would be valuable to see what impact the project has had in Tanzania.

- The UK's Construction (Design & Management) regulations are thought to be an example of 'harmony' between the Professional Engineering Institutions and national legislation. The regulations, in theory, mean that liability is effectively placed on the 'competent' engineer over the life of a construction, and the Professional Engineering Institution is responsible for accrediting that engineer. It would be useful to find evidence of how effectively this works in practice, or whether accreditation bodies (such as the Engineering Council) play a more important role.

- Insurance is a factor in the construction sector, but it was not possible to consider it within the scope of this report. Insurance companies may require, and base insurance premiums on, the design engineer and construction project manager to be accredited for a company to receive professional indemnity insurance. The importance of this insurance will likely change with the context: in countries with stronger legal systems, the insurance industry is a hugely influential driver of change. The question would be how insurance could be helpful as a driver of change in improved construction and safer buildings in developing countries.

- Case Study 1 outlines the experience of a Nepali structural engineer working with the authorities to secure planning permission etc. There needs to be consideration of the comparative process that occurs in the UK, since this report relies heavily on comparison to the UK context. It would be instructive to consider whether the UK planning process would be appropriate in Nepal.

- Though this report has shown there isn't necessarily evidence for a link between the strength of professional institutions and safer construction, there may be evidence for the corollary: the presence of a strong, well-respected and functioning set of professional institutions in the construction industry is indicative of an improved construction industry. Attempts were made in the research for this report to compare data between countries on construction safety and safer buildings and the (likely) relative strength of professional institutions – but this was hampered by lack of data and limited time. This work could be developed further.

- The effect of improved professional institutions in construction on the cost of construction would be helpful to understand, particularly for a developing country context where most clients are so sensitive to cost that they build their own buildings. Does an increased cost of delivering professional systems result in increased cost to the client? Is there anything that would link improved construction to lower insurance premiums – for the contractor and the client? Is there anything that would link improved construction to subsidies for retro-fitting, or would link improved construction methods supported by cash transfers as part of disaster response? (For example, cash transfers for household reconstruction after typhoon Haiyan were tied

to improved construction methods but required inspection during construction to enable the release of the next tranche of cash. This could be compared to housebuilding mortgages in the UK where sign-off is needed before next set of funds can be released by the bank.) Would also see a decrease in corrupt practices, which reduces costs? Would contractor costs decrease as workers have more experience, simply because they are healthier and safer and so can work longer? Health and safety in the UK may benefit contractors' bottom lines – but again this relates to the legal context.

- One of the report's contributors, from Chartered Institute of Building has expressed an interest in the outcomes of this report because they are interested in the topic of international recognition for building qualifications. This could be added to the report, alongside the comments on international recognition and mobility for engineering qualifications.

Other organisations

The list below shows additional organisations or groups that were identified whilst researching this report, but were not considered as key to the report's purpose. They are included here for interest.

From Nepal:

- Building Construction Management Committee under Ministry of Physical Planning and Works
- Computer Association of Nepal (CAN)
- Construction Industry Development Board (CIDB)
- Construction Industry Development Implementation Committee (CIDIC) under Ministry of Physical Planning and Works
- Institute of Engineering (IoE) at Tribhuvan University
- Kantipur Engineering College (KEC)
- Kathmandu University (KU)
- Khwopa Engineering College (KEC)
- Nepal Council of Arbitration (NEPCA)
- National Forum for Earthquake Safety (NEFS)
- National Skill Testing Board (NSTB)
- Nepal Bureau of Standards Construction Industry Training Centre (CITC)
- Nepal Engineering College (NEC)
- Nepal Geological Society (NGS)
- Nepal Geotechnical Society (NGS)
- Nepal GIS Society (NGISS)
- Nepal Landslide Society (NLS)
- Nepal National Committee of the International Commission of Irrigation and Drainage (NENICID)
- Nepal Standard Standardisation Committee formed under Nepal Bureau of Standards
- Standard Document & Building Code Sub-Committee for the Construction Enterprise Development Council under the Ministry of Physical Planning and Works
- Road Maintenance Fund under the Ministry of Works and Transport
- Sectoral Skill Committee - Construction (SSCC), British Council
- Society of Hydrologist and Meteorologist (SOHAM)
- Women in Science and Engineering Nepal (WISE)

From the UK:

- Association of Building Engineers (ABE)

- Association of Consultant Approved Inspectors (ACAI)
- Association of Project Management (APM)
- Association for Project Safety
- British Safety Council
- British Standards Institute (BSI)
- Building Control Alliance (BCA)
- Building Regulations Advisory Committee (BRAC)
- Building Research Establishment (BRE)
- British Woodworking Federation (BWF)
- Chartered Association of Building Engineers (CABE)
- Chartered Institute of Plumbing and Heating Engineers (CIPHE)
- Chartered Institution of Civil Engineering Surveyors (CICES)
- Chartered Institution of Highways and Transport (CIHT)
- Chartered Institution of Water and Environmental Management (CIWEM)
- Chartered Quality Institute (CQI)
- Confederation of British Industry (CBI)
- Confederation of Construction Specialists
- Considerate Constructors Scheme
- Constructing Better Health Scheme
- Construction Clients Group (CCG) of Constructing Excellence
- Construction Health Leadership Group
- Construction Industry Computing Association (CICA)
- Construction Industry Council Approved Inspectors Register (CICAIR)
- Construction Industry Research & Information Association (CIRIA)
- ConstructionSkills
- Contractors Health and Safety Assessment Scheme (CHAS)
- Hazards Forum
- Institute of Concrete Technology (ICT)
- Institution of Engineering and Technology (IET)
- Institution of Mechanical Engineers (IMechE)
- Institution of Occupational Safety and Health (IOSH)
- Lift and Escalator Industry Association (LEIA)
- Local Authority Building Control (LABC)
- National Agency for the Recognition and Comparison of International Qualifications (NARIC)
- National Federation of Roofing Contractors (NFRC)
- National Specialist Contractors' Council (NSCC)
- National Security Inspectorate (NSI)
- Quality Fencing Assurance Scheme (QFAS)
- Royal Academy of Engineering (RAEng)
- Safety and Reliability Society (SaRS)
- Society of Construction Arbiters
- The Sustainable Building Association
- The Welding Institute (TWI)
- United Kingdom Accreditation Service (UKAS)
- Women in Building Services Engineering (WIBSE)
- Women in Science and Engineering UK (WISE)

<u>International:</u>

- Asian and Pacific Centre for Transfer of Technology (APCTT)
- Construction Sector Transparency Initiative (CoST)
- European Agency for Safety and Health at Work

- European Federation of National Engineering Associations (FEANI)
- European Network for the Accreditation of Engineering Education (ENAEE)
- International Chamber of Commerce (ICC)
- International Council for Research and Innovation in Building and Construction (CIB)
- International Information Centre for Structural Engineers (IICSE)
- International Organisation for Standardisation (ISO)
- Research Centre for Applied Science and Technology (RECAST)
- Technical Consultancy Development Programme for Asia and the Pacific (TCDPAP)
- World Council of Civil Engineers (WCCE)

Additional information can also be found at www.wfeo.org/organisations or www.britassoc.org.uk.