The Standing Committee on Engineering Capacity Building's guidebook and compendium initiative

Daniel Clinton[1], Kevin Wall[2], Michael Sanio[3], Dawie Botha[4], Andrew Cleland[5], Dawit Negussey[6], and Sheryl Lewis[7]

[1] *World Federation of Engineering Organisations: chairperson of Committee on Engineering Capacity Building*
[2] *Council for Scientific and Industrial Research, South Africa*
[3] *American Society of Civil Engineers (ASCE)*
[4] *formerly South African Institution of Civil Engineering*
[5] *Institute of Professional Engineers of New Zealand*
[6] *Syracuse University/ASCE*
[7] *United States Army Corps of Engineers/ASCE*

Abstract: The Standing Committee on Engineering Capacity Building of the World Federation of Engineering Organisations (WFEO) in October 2010 launched the first edition of a guidebook setting out its understanding of the challenges and complexities facing the engineering community regarding capacity and sustainability issues. The guidebook suggests approaches to the building of human resources and capability, and presents a collection of philosophies, programmes, initiatives and good practices collated from the experiences of a range of engineering organisations and engineering professionals.

A resource additional to the guidebook, and complementing it, will be a compendium of programmes, projects, and initiatives. Contributions will be promoted and encouraged -- for this purpose, the compendium, currently in the course of preparation, will be in the form of an electronic database hosted on the WFEO website.

The purpose of the guidebook and compendium is to provide a source of reference to institutions and communities and to those involved at any level in working to build:
• engineering capacity and
• sustainability of nations at large where this concerns infrastructure, services and basic needs.

Keywords: Infrastructure, capacity building, engineering, guidebook, sustainability

Background

The World Federation of Engineering Organizations (WFEO) co-operates with national and other international professional institutions in developing and applying engineering to the

benefit of humanity. One means of accomplishing this goal is the formulating of advice and collation of experience, prepared independently of any commercial bias, which would be of assistance to others, such as governments and international agencies.

A case in point is the collaboration, with UNESCO, on capacity building in the engineering environment.

Both UNESCO and WFEO are of the view that given the strong relation between, on the one hand, creation of a critical mass of educated and skilled engineering and science graduates and, on the other, economic and social development, stronger efforts should be made to develop and build these capacities in developing countries. However they are also of the view that the decline in recognition of the role of engineering in many developed countries necessitates that a similar approach should be followed in all countries.

At the World Summit for Sustainable Development in Johannesburg in 2002, WFEO hosted an event at which challenges around capacity building were discussed. At this event, the Africa Engineers Protocol concept of sustainable engineering as a prerequisite for sustainability, and the elements that are the foundation of sustainability, were introduced to WFEO. Subsequently, at the WFEO General Assembly in Tunis in 2003, and with the support of UNESCO, WFEO created a Standing Committee on Engineering Capacity Building (CECB).

Since that time, the CECB's understanding of the challenges and complexities that face the engineering community regarding capacity and sustainability issues has grown immeasurably. CECB recognizes the need to identify, assemble, share and (if feasible) promote the production of material that could facilitate and assist with capacity building. CECB also recognizes the integration of effort that is required to undertake successful capacity building. It has been decided that the most suitable way to do this would be through the production of a guidebook for capacity building in the engineering environment and an associated compendium of programmes and initiatives.

Introduction

This guidebook [1] was prepared, over a period of two years, by a multinational team drawn from the CECB membership. The chairman was American, and three other Americans were among the authors. All of these Americans have had (and in some cases are still having) extensive foreign experience of building capacity. Another American on the team is from Ethiopia, a country with which he still has close professional and academic ties. The New Zealand member of the team brings extensive experience of capacity building in the South Pacific. Finally the two South African members of the team are also very experienced in capacity building.

These authors drew upon other colleagues and upon their networks of international contacts among professionals active in capacity building in the engineering environment.

To further emphasise the international mix: the headquarters of WFEO is in Paris, France.

The guidebook was launched at the WFEO World Engineers' Week in Buenos Aires in October 2010.

The guidebook sets out suggested approaches to the building of human resources and capability within nations that will assist the sustainable achievement of national development objectives and the millennium development goals. This capability would not only be in respect of engineering – although the guidebook's emphasis is on engineering.

The principles and ideas proposed in the guidebook are not position papers or policies of either UNESCO or WFEO, but represent a collection of philosophies, programmes, initiatives and good practices collated from the experiences of a number of engineering organizations and engineering professionals.

It is envisaged that the guidebook will be utilised as a source of reference to assist the creation of common understanding, the improvement of decision making, the promotion of integrated and multidisciplinary modes of development, and the improved planning and implementation of development programmes and initiatives.

The nature and role of capacity building

A generic definition of capacity building is:
"The building of human, institutional, and infrastructure capacity to help societies develop secure, stable, and sustainable economies, governments, and other institutions through mentoring, training, education, physical projects, the infusion of financial and other resources, and, most importantly, the motivation and inspiration of people to improve their lives." [2]

Engineering professionals could confine their role to being only the planners, designers, constructors, operators and maintainers of infrastructure and services. Being professionally responsible demands however that engineers take a wider role upon themselves. This wider role includes a recognition that engineers need to facilitate and enhance not only their own knowledge, but also the knowledge of others, in order that decisions taken will ensure that engineering infrastructure is sustainable and that it is fit for its purpose -- which is to underpin quality of life and the economic well-being of communities and nations.

It is becoming increasingly evident that, in spite of well developed technical engineering expertise and solutions, the complexities to create and provide even basic infrastructure services are proving to be beyond the capacity of many governments, institutions and communities. There is ample evidence that in many countries – including developed nations – there is a steady loss of informed decision-making capacity where infrastructure and the built environment are concerned.

Across the world, there is insufficient understanding of the need for infrastructure and services, and of how to develop, deliver, operate and care for that infrastructure and services. This demands action from the engineering profession. However efforts to deliver what is right, feasible, appropriate and affordable are often not taken seriously enough, or even ignored. Capacity -- of a variety of institutions and individuals, and in respect of this understanding -- needs to be built.

Success in capacity building will only be achieved through a systematic approach, taking into account all six "pillars" of capacity building. These pillars are:
- Individual – to ensure that the needs of the individual are met.
- Institutional – to ensure there are educational, professional, technical, governance and statutory institutions, systems and support structures in place. The institutions to be both public and private sector, including stable, viable and responsible businesses, commercial enterprises and financial institutions that can support the provision, operation and maintaining of infrastructure and services.
- Technical – to ensure there are technical standards, codes of practice, technical literature and guidance material and so forth to underpin and support ethical and appropriate engineering, technological and procurement practices.
- Decision-making – to ensure decision makers have sufficient information and understanding as well as access to knowledge and skills to enable them to make logical and rational decisions.

- Finance – to ensure that adequate and affordable finance is available to enable sustainable solutions (including adequate revenue streams after external donors have moved on) and that financial practice is at all times responsible.
- Resources, tools and supplies – to ensure that there is access to appropriate, affordable and suitable materials, tools and supplies for the building, operating and maintaining of infrastructure.

One size certainly does not fit all, and in each instance where the building of capacity is deemed to be advisable, the systematic approach introduced above needs also to ascertain to what extent, and in what manner, it is necessary to address all three levels:
- the level of the enabling environment,
- the organisational level, and
- the individual level.

Each capacity building programme or initiative must:
- be preceded by:
    o   identification of stakeholders;
    o   assessment of requirements and identification of priorities for capacity building (that is, priorities in terms of both <u>what</u> capacity to be built, and <u>whose</u> capacity to be built);
    o   identification and mobilisation of agencies that will build the capacity, and mentor and sustain this in the longer term;
- be followed by assessment of the results of capacity building (results not just in terms of capacity built, but to what extent that capacity is leading to the required improvements in terms of outcomes (Note 1)); and feedback, leading to continuous improvement in capacity;
- be iterative (i.e. a first round of capacity building might be of a basic nature only, with each round successively raising the bar).

To reiterate: capacity building:
- must be focused on the purpose of improving capacity -- e.g. on improving service delivery by those in whom capacity is being built -- and not be about building capacity for its own sake, since it is all too often is the case that the need to apply the capacity is lost sight of;
- must address needs according to priority.

The efficacy of capacity building must be evaluated. Part of the evaluation must be an assessment of cost-effectiveness -- i.e. was the effort and cost of capacity building justified by the improvement in e.g. service delivery? If it was not, then maybe lack of capacity was not the bottleneck, and some other way to improve service delivery should rather have been undertaken. Alternatively, the capacity building needs might have been misunderstood, or the effort might have failed because of its content or inappropriateness, or even because of the way in which it was conducted and by whom.

Part of that assessment prior to deciding where and what capacity must be built, should be identification of the weak links in the service value chain. If the objective is to improve service delivery, say, should priority attention go to some other link or links that is or are weaker, rather than to capacity building?

If capacity building is for the purpose of supporting a project or programme of some sort, e.g. an infrastructure delivery programme, then it goes without saying that the capacity building must be integrated with the programme lifecycle.

The guidebook -- a compilation of advice

The guidebook presents a compilation of advice (Note 2) drawn from the experiences of the international engineering community, clustered under a set of headings which represent an idealised capacity building project:

- Researching needs: How to work with communities and institutions in order to establish their needs.
- Defining and influencing public policy: How to work with governments in participating nations to make the case for increasing resources for capacity building programmes, particularly emphasising the international evidence that building technical capacity has been vital to alleviating poverty, improving quality of life and building prosperity in nations.
- Educating, training and developing skills: How to develop and implement qualifications, ethics and competence standards in participating nations, including building of skills in the educators themselves, and providing suitable teaching resources.
- Participating: How to attract and retrain citizens towards education in engineering, in order to build a demographically representative and local or indigenous technical skills base.
- Building networks and support systems: How to build governance and representative structures and institutions to support all the above.
- Developing technical and business standards: How to develop a framework of standards, together with systems to improve adherence to these standards.
- Executing projects throughout their lifecycle: How to identify, and apply, factors key to taking projects from their initial conceptualisation right through to their successful completion, and subsequent successful operation.
- Obtaining and using external funding: How to apply for, and use, external funding.

The guidebook presents a number of case studies in order to illustrate how capacity can be built in widely varying circumstances -- such as South Pacific island nations with small populations, war-torn nations which have rebuilding needs, or nations rich in natural resources but poor in infrastructure development.

Examples are presented in the guidebook of the capacity that may be needed by communities and institutions, particularly in respect of:

- Skills: Including skills that are technical, financial, and people-oriented.
- Resources: Including finance, training programmes and mentoring processes, and policies (particularly public policies).
- Decision-making mechanisms: Including policies, prioritisation rules and mechanisms, risk analysis and policies, incentives, ethics, standards, and trade-off mechanisms -- but more than these. And recognizing:
    - o   that choices are never absolute, but are invariably between alternatives;
    - o   the importance of identifying that results depend on a chain of factors, and not on one factor -- and recognizing the importance of identifying weak links, and in particular identifying the weakest link and that, once that is addressed, the next weakest link becomes the new priority; and
    - o   the importance of the "80/20 rule" and of first getting the basics right, with the "nice-to-haves" to follow only if resources remain.
- Administration and systems: Including governance, laws and regulations, procurement, monitoring and evaluation, and feedback loops.

The institutions referred to could include:

- Indigenous institutions (i.e. from the nation where the capacity building is taking place), as opposed to foreign; or
- Informal institutions (such as unorganised communities), as opposed to formal; or
- Public sector institutions, including government itself, parastatals, and semi-government agencies and utilities, as opposed to community-based organisations and non-governmental organisations, as, in turn, opposed to the private sector.

Not only would each developmental situation require capacity building specific to that situation, but each institution significant to that situation would require capacity building appropriate to its own needs.

Finally: It is important that the parties involved in capacity building are not referred to as "contributing" or "receiving". For a number of reasons, not least that, in the authors' experience, all parties receive during a capacity building process, and all contribute. The increase in capacity is not a uni-directional phenomenon -- rather, all should be referred to as "participants".

The compendium

A resource additional to the guidebook, and complementing it, will be a compendium of programmes, projects, and initiatives. The compendium is however intended to be more than just a resource to be consulted. The intention also is that it will stimulate exchange of ideas, and that the best of these will be captured and added to the compendium. This exchange of ideas will also no doubt identify aspects that need to be covered -- hopefully that will, in turn, stimulate the development of programmes and initiatives that could fill the gaps.

The compendium cannot therefore be a static document, but will need to be updated from time to time. Contributions will be promoted and encouraged. For this purpose, the compendium will have to be in the form of an electronic database, hosted on the WFEO website.

Population of the compendium is, at the time of writing, in its early stages.

Usage of the guidebook and compendium

Who will use the guidebook and compendium, and how would they be used?

To reiterate: the purpose of the guidebook and compendium is to provide a source of reference to institutions and communities and to those involved at any level in working to build:
- engineering capacity and
- sustainability of nations at large where this concerns infrastructure, services and basic needs.

The guidebook could inter alia, and depending on the situation needs, assist with:
- identification of capacity building needs;
- designing of capacity building programmes -- for specific circumstances, or in response to, say, a region-wide need (for example, to serve as a generic template for a country, that it can adapt for its specific needs from time to time);
- resourcing, and then carrying out, capacity building programmes;
- reducing risks of and enhancing trust and credibility with stakeholders, including funding and resource institutions.

The guidebook is in the first instance written for a professional readership of built environment planners and implementers who have the broader understanding of the role that infrastructure and services issues play, and who have the passion, the empathy and compassion to contribute to a better life for all. These readers will most probably be in senior management positions, and include those with strategic responsibilities. They will be people who have the ability, and the authority, to influence others to do what is right.

However the material in the guidebook is also selected for its value to a range of possible participants in capacity building. That is, the guidebook addresses capacity building at many levels, also taking account of the broad pipeline of issues and items in infrastructure service delivery.

The compendium will attempt to address an even wider audience than that for which the guidebook is intended. For example, some of the compendium material is suitable for school learners, rural communities, and/or officials with little if any strategic influence in infrastructure-related institutions.

In conclusion

The guidebook is entirely based on practice. The principles and ideas proposed in the guidebook are not position papers or policies of either UNESCO or WFEO, but represent a collection of philosophies, programmes, initiatives and good practices collated from the experiences of a range of engineering organisations and engineering professionals.

It is trusted that the guidebook, and the compendium to come, will prove a much-used resource, and a valuable contribution to achieving national development objectives and the millennium development goals.

The authors gratefully acknowledge the contributions of a small team of engineering professionals and their colleagues who gave generously of their time, expertise and experience. They also acknowledge the professional organisations that made the services of these individuals available.

References

[1] Committee on Engineering Capacity Building of the World Federation of Engineering Organisations (2010) *Guidebook for capacity building in the engineering environment.* (Members of the committee: Daniel Clinton (WFEO: chairperson of CECB), Andrew Cleland (Institute of Professional Engineers of New Zealand), Kevin Wall (Council for Scientific and Industrial Research, South Africa), Michael Sanio (American Society of Civil Engineers (ASCE)), Dawie Botha (South African Institution of Civil Engineering), Dawit Negussey (Syracuse University/ASCE), Sheryl Lewis (United States Army Corps of Engineers/ASCE) and Paul Day (Patriot Technical Consultants).) First edition -- 2010. WFEO, Paris, France. 110 pages.
http://www.civils.org.za/Publications/tabid/81/Default.aspx

[2] Hatch, Henry (2004). *Presentation* at a workshop sponsored by the Office of the Science and Technology Advisor to the U.S. Secretary of State, March 2004.

Note/s

Note 1: For example, not just that people have through the capacity building programme become more skilled, but that they apply those skills, and that this brings about better results in terms of achieving whatever it is they have been capacitated to do.

Note 2: This advice represents what the authors of the guidebook regard as "good practice", rather than "best practice". If a current situation is much below good practice, the goal should be to raise it to good practice levels -- and not to strive for best practice, which would invariably require unwarranted effort and resources. Many nations, institutions and communities are too often so enthralled at the thought of achieving best practice that they devote disproportionate resources to a minority of projects and programmes, leaving inadequate resources for that which might be more mundane, but which is likely to be important to more citizens. As Voltaire wrote: "the best is the enemy of the good".