

Sustainable Engineering workshop reports

Sustainable Capacity Building (Workshop 1)

Presentation Points

John Ritchie

The basis for the workshop was that sustainability requires commitment from governments, FIDIC, Member Associations and firms. Sustainable project delivery requires a business that strengthens the capacities at all levels, and that also make the necessary actions to create awareness among governments of the role of the consulting engineer.

The long-term benefits of capacity building (CB) must be recognised to make the necessary allocations. Proper CB will improve project delivery and efficiency of staff, as well as improve the working conditions for the industry when its role is acknowledged by the rest of the society.

The importance of knowledge transfer from senior to younger staff was pointed out by the YP and supported by the workshop participants. Yet there seem to be a certain distance between what is said and what is actually being implemented.

Globalisation puts more emphasis on the industry to develop new skills and so called all-rounders that can deal with sustainability and marketing issues as well as technical, and that can adapt to cultural differences as the CE industry enters into new marketplaces.

Peter Boswell

FIDIC's MA Benchmarking survey has identified the capacity Index on national levels for several countries. BM can measure the deficiencies on National Industry Sector according to indicators like financial, client relations, business processing, and learning & growth. This is also planned to be implemented on company level.

The Capacity index can be used to identify countries where CB is more required.

Liu

To improve the overall conditions for the CE industry in a specific country, approaches must be made towards the government.

The government is the CE industry's biggest client and it is crucial that it understands the value of sustainable engineering. At the workshop it was pointed out examples from countries where local consultants are practically non existent due to government failing to recognise the role of the CE industry in the society. Lack of acknowledgement of engineering and low remuneration keeps young people from studying to become engineers. This was referred to as the "Professional Poverty Trap".

Building capacities requires policy design, a sound institutional framework and organisational structures, and individual demand for change. If a country lacks policy on professionals, these will either change activity or leave the country.

The representative from the Chinese CE industry (Madam Jin Ke) made a presentation on the Chinese government plans to support the CE industry through certification systems and ownership reforms. It will certainly be very interesting to follow the development as the industry in China grows.

Summary

Recommendations for further capacity building.

- FIDIC must train the MAs to make appropriate steps towards the government. How to inform the governments on crucial issues related to the growth and development of CE. The MAs must represent the best interest of the industry when it comes to policies and regulations, and they must be trained to ensure a common comprehension of Business Integrity and Quality Assurance among their member firms. Through the MA's and also business associations the industry can gain the trust of the government.
- Marketing and Branding of the CE industry will improve the society's understanding of our importance and our role in the general development of society. We cannot continue to believe that this will appear by itself. We live in a society where people constantly are fed with information through a verity of channels. The CE industry has not marketed itself properly in the past and it is now time to provide people outside of our circle with information regarding our activity. This may also make it more evident to governments that support is necessary and it will increase the attractiveness of the consulting industry which is very important when it comes to recruitment.
- YP are eager to work internationally. We are flexible and eager to learn and also to show our capabilities. The profit margin of the CE industry often limits the opportunity for a firm to include young professionals on project teams abroad. Firms would not dare to do so already in a bidding process and they are afraid of the consequences from changing staff afterwards. Clients, Multinational development banks donors and in many cases the industry itself should recognise the capabilities of young people (sometimes this also concerns people with 5-10 years of experience). Until then FIDIC should consider the possibility of sponsorships to support inclusion of YP's on projects. Otherwise the industry may not be capable of dealing with the issues generated from globalisations in the future.
- Sponsorship of YP's are also recommended for training and for instance participation in the YPMTP. Some MA's have also taken action to encourage YP by sponsoring participation on the FIDIC conference and participation in the YPMTP. Such initiatives should certainly be considered by others.
- Most improvements involve initial costs, but as YPs with 30 – 40 years ahead of us in the industry we are interested in the development of the industry. However we have a lot to learn and we certainly would like to have the opportunity to do so. We would also like to be proud of our industry and experience interest and recognition from society. Increased attractiveness does not appear by itself and it requires that we make the necessary steps to inform governments, potential clients and potential employees, and society in general. The best marketing comes from good and sustainable project implementation, and that requires capacity and knowledge. We cannot put enough emphasis on the long-term benefits from the initial short-term costs.

What Clients Want (Workshop 2)

Frans Bouterse; Wei Haiyan

Main topics/conclusions

First session

Today, large multinational firms like Shell and Alcan adopted sustainability as one of their most important corporate values. So in everything the company undertakes, the company will not only consider the financial/economical consequences, but just as important the consequences in terms of environment and social/health. "Because it is the right thing to do". And there is a business rationale behind it as well because companies not taking their social responsibility very serious will eventually find difficulties operating their business. It might, for example, be more difficult to obtain loans or investments. Therefore, large multinational companies exposed to the public will not only have to act in a sustainable manner, they also have to be seen doing so.

As result, these companies expect their consultants to include sustainability as a key value in their approach as well. The consultant is expected to adopt life-cycle thinking and integrate sustainability issues both during construction and operation. However, it is acknowledged that it remains difficult for clients to include the sustainability of the proposed development solutions as one of the selection criteria.

One way of ensuring that sustainable solutions could be included in a project is to include the consultant already in an early phase of the project. In case a project is developed by a private consortium (for example DBFOT), the consortium might consider including the consultant in the consortium for the complete concession period by having the consultant providing (a minor) part of the equity. Success fees to the consultant might also be an incentive to provide real sustainable solutions.

Second session

The round table discussion in the afternoon session started with a quick scan among those present to determine where the issue of sustainability presently is in different parts of the world. It was concluded that it is firmly included in law and legislation in most countries in Europe, USA and Canada, New Zealand and Australia. In India and Bangladesh as well as in China a rather large change in thinking has occurred during recent years. Sustainability has now become an issue far more up on the agenda. The importance is recognised, however the implementation is not always there yet.

Lenders for development projects like the EBRD and ADB include sustainability issues in their lending conditions. On top of that, innovative thinking from consultants is highly appreciated. However, it was discussed that when clients choose to use Quality Cost Based Selection (QCBS) instead of Quality Based Selection (QBS), it does not encourage consultants to come forward with alternative, innovative sustainable solutions that might differ somewhat from the Terms of Reference, especially not when these solutions might increase the initial study cost. After all, increasing the scope of work might not result in a technical ranking high enough to compensate the higher cost. The risk of loosing the project therefore becomes too big. The banks acknowledge this risk and they therefore try to encourage their lenders to include sustainability issue in their study requirements. However, it is not easy since many lenders do not see the direct (short term) benefit and tend not to want to pay extra for it. So there is room for innovative ideas, as long as they do not exceed the available budget.

Banks tend to use QBS only when quality is of utmost importance. For more routine-like jobs where there are more consultants available that should be able to do a good job, price will remain an issue. For these jobs, the bank is not necessarily looking for the best consultant in the world but a good one.

However, innovative thinking remains required for real sustainable solutions. Therefore FIDIC is encouraged to keep promoting QBS.

Summary

- According to feedback from participants, it was suggested to allow more time and opportunity to address thoughts during the roundtable discussion. It is therefore suggested that the number of speakers be limited to no more than 2, thus leaving more time, 50-60 minutes, in each session for free discussion. This might lead to more a detailed and thorough discussion and conclusion covering more voices.
- The ideal of sustainable development should be spread worldwide and household so that the behaviour of companies, large and small, local and global, could be under the sight of society and non-profit organizations, like FIDIC, which can share the pressure of engineering consultants and result in a benefit-cycle.

Delivering a Sustainable Project (Workshop 3)

Greg Saretzky

Objectives

- Summary of critical points raised by speakers
- Summary of issues discussed by participants and conclusions drawn from the discussions
- Status of the workshop subject
- Action plan for developing future sustainability tools

Relevant items raised in Keynote presentations

The keynote presentation on 'Delivering a Sustainable Project' covered the issues of how sustainability will be achieved and addressed the need to deliver a sustainable project. A general overview of the Project Sustainability Guidelines (PSG) issued by FIDIC was also reviewed.

The process of achieving sustainable development will be an enormous undertaking as an overwhelming percentage of the world's infrastructure does not currently meet sustainable development standards. The timeframe to reach sustainable solutions will take several decades. The process of moving the concepts of sustainable development forward will depend on several factors such as the individual project owners, industry standards, government policy and the overall consulting industry itself.

The benefits of delivering a sustainable project include decreased costs with respect to design and ongoing operation, reducing project risk and will also be a mechanism for increased innovation. These benefits are in addition to positive effects on environmental and social issues.

The Project Sustainability Management Guidelines (PSMG) issued by FIDIC in 2004 meets globally accepted criteria and raises the bar over conventional design. Most projects meet or exceed conventional guidelines with some projects that are more sustainable such as LEED or SPiRiT, however, they do meet these new benchmarks.

General suggestions were made to modify the Project Sustainability Guidelines (PSMG) such as revising the wording and adding additional indicators. Three potential pathways to sustainability include achieving a reasonable standard of living in undeveloped nations, improving the overall sustainability of existing infrastructure and improving eco-efficiency in developed areas.

Comments of Workshop Chairpersons

The chairperson did an outstanding job on delivering the keynote address and chairing the session.

Presentation Points

Jim Beechinor

The first presentation, entitled 'AMEC Case Examples in Project Sustainability', covered how the corporation is dealing with the concepts of sustainability and implementing them into the company followed by some case examples.

AMEC is a large engineering and construction corporation with global coverage. The company consists of planners, construction managers and technicians as well as designers and incorporates life-of-asset project management. Project lifecycles range from design, to delivery and to support. The company has developed and adopted guidelines on 'Sustainability Guiding Principles' which encompasses the environment, health, ethics and innovation to name a few. The company has developed these guidelines into everyday policies and procedures and has won awards in environmental achievements.

The company has implemented an Innovation Center in order to respond to the growing need for sustainability and the apparent knowledge gap that is present. The purpose of the group is to deliver an added value solution to projects in addition to providing training and development of other group members.

The case studies involved applying the concepts of suitability to projects. The first example including the original project scope of relocating a high pressure gas line in order for further roadway development. The final solution consisted of leaving the pipeline in place by strengthening the geotechnical capacity of an embankment. The solution resulted in a lower risk to the project by not moving the pipeline and significant cost savings with respect to the construction costs as well as shortening the project schedule were recognized. The result was a reduction in disruption, vehicle emissions and energy use.

Another example of project sustainability was a highway reconstruction project where the original scope was to demolish three bridges and subsequent reconstruction of a transportation network. The final solution consisted of restoring two of the bridges and the demolition of another. The demolition material was used for fill within the upgraded transportation network. The roadways also passed through landfill sites which were excavated and mined for usable materials for fill. The resulting end product realized a lower overall risk with respect to the environment as well as significant cost savings in addition to reusing and recycling significant volumes of waste. Additional benefits included a reduction in disruption, vehicle emissions and energy use.

Zhiguo Cai

The second presentation, entitled 'Sustainable Management in China's Hydropower Projects', covered the current status in China's hydropower industry and used the well known Three Gorges Dam project as a case example.

Hydropower development in China currently accounts for approximately 25% of the total exploitable and economical potential hydropower in the country. Developed nations typically utilize approximately 60% of the total exploitable and economical potential hydropower.

China adopted protocols on sustainable development with respect to hydropower in 2004. The protocols promote hydropower development that is in line with the environmental, social and economical concepts of sustainable development.

Some lessons learned in China's development and management of the hydropower industry included factors on construction, planning and innovation. The need to implement a sound construction management system was stressed. Effective overall planning with respect to the river system was also discussed. High quality design and technical management is required on hydropower projects based on the dimensions and impacts of the project. Over 1 million people have been relocated and clearly demonstrates the need for effective planning, management and implementation. The raising of funds from private practice is important on small to medium sized projects where large projects are funded by the government.

The Three Gorges Project is regarded as one of the largest hydropower projects in the world. The drainage area is over 1 million km² with an annual average runoff of 450 billion m³. The capacity of the dam is 18 GW and generates 85 billion kWh. Several engineering management measures and technology was incorporated into the project in order to achieve sustainable management. The primary recommendations included the overall need for planning and incorporating environmental management into hydropower projects.

Participant discussions

Providing sustainable solutions to undeveloped nations was a topic of discussion and should be considered to motivate people to apply relatively low investments into these areas that will result in large positive impacts. The overall timing and direction of sustainable development will simply take time, however, the overall direction is in the right way - "If you do not know where you are going, than any road will get you there" (Lewis Carroll).

Discussions on sustainability in developing countries was also touched on as it was identified that most workshop discussion were focused on undeveloped nations.

Several, relatively short, discussions centered on several factors all relating to sustainable development and design. The overall need for developing social sciences was stressed. The gap can be bridged by effective teamwork between design engineers and social professionals.

Significant interest was directed towards the Innovation Center that AMEC had created and the participants felt that the concept is a good idea to move sustainability forward.

Perceived high initial costs of sustainable projects were demystified as it was shown that in several situations initial costs were lower based on decreased energy costs and reduction of goods.

The Three Gorges Dam presentation attracted a lot of discussion around the concepts of flood control and relocation of several residents. These issues were addressed by the project through effective planning.

Summary

Status of the workshop subject

The workshop was well received by participants and proved to be a valuable source of information and discussion. Participants were quite interested in how to deliver a sustainable project in addition to learning from case studies.

Suggestions and Agenda for Progress

The overall recommendations for revising the Project Sustainability Guidelines have been recognized and are deemed important. The differences of approach to applying such guidelines to developed and developing nations must also be considered. The creation of Innovation Centers seem to be a logical and effective force to bridge the gap between social and technical disciplines in addition to drawing further attention to the concepts of sustainability.

Globalisation and Sustainability (Workshop 4)

Liu Luobing; Carole Welton Kaagaard

Presentation Points

Globalisation can be defined as the movement of goods and services across borders. This phenomenon is affecting consulting engineering firms throughout the world. Three perspectives on globalisation were presented during the workshop: 1) the perspective of a large engineering consultancy from a developed country that is already international and still expanding; 2) how Indian engineering consulting companies have been able to develop to make the most of the global market; and 3) the African viewpoint and the difficulties posed by globalisation that have yet to be overcome.

Consulting engineering firms in developed countries have already experienced a borderless business climate and will continue to do so in the future. Engineering companies, particularly from developed countries, are expanding particularly into Asia and Latin America driven by the demands of multi-national clients for multi-national services. One way for engineering consultancies to become global is through acquisition of strong local partners in another country. The critical success factors for developing a global firm are finding the right partners with a good, strong local image, and creating one firm with the same core values whilst respecting cultural differences.

Globalisation is inevitably driving companies in North America and Europe to outsource certain services including engineering services. Outsourcing represents an enormous opportunity for companies in developing countries that are able to take advantage of this situation by providing quality services at a reduced cost. India, for example, has managed to establish itself as a centre of knowledge and innovation. It has taken time and hard work to raise the quality of teaching at universities in India, but the benefits are that highly educated, competent engineers are being formed who cost much less than the same engineers in developed countries.

Globalisation is defined by some as global economic institutions such as the World Trade Organisation, the International Monetary Fund and the World Bank, ruling the world together with multi-national corporations. Despite the opportunities for expansion and growth, globalisation has actually increased poverty and reduced growth in many developing countries, particularly in Africa. Multi-nationals are expanding into developing countries to continue their economic growth targets at the expense of local companies. Consequently, the market for engineering consultants in developing countries is dominated by foreign expertise which limits the development of professional skills and capacity building in these developing countries.

FIDIC recognises that to get the maximum benefits of globalisation and create a win-win situation for all parties, something needs to be done to redress this imbalance. The workshop discussions did not lead to the formulation of an action plan but that could not really be expected given the short time available for discussion. FIDIC should continue to address this issue and should set up a task force to generate concrete ideas for action, particularly to increase capacity building in developing countries.

Globalisation is only a cure to alleviating poverty if certain conditions are met such as cancelling Third World debt and allowing free trade to occur from developing to developed countries. Engineering consultants play a role in alleviating poverty through infrastructure projects that are essential to economic growth and development. Increasing importance is being given to investment in infrastructure projects by international institutions like the World Bank.

Just as importantly, consulting engineers need to develop and sustain national engineering capacity in developing countries. National consultants are needed, especially in countries where investment has been limited, as local consultants are in the best position to help design sustainable solutions.

There needs to be an emphasis on transfer and exchange of knowledge and capacity building when international engineering consultants work on projects in developing countries.

Disaster Mitigation (Workshop 6)

The Disaster Mitigation workshop featured several presentations on a number of issues facing developed and emergent countries. A brief summary of each of the presentations can be found below:

Presentation Points

Integrated approach to Flood Mitigation in the Netherlands

Documented climactic changes have increased the vulnerability of flood-prone areas in the Netherlands. An integrated approach that addresses issues of flood control, allowable development areas, sustainable development of waterfront areas, and environmental management can mitigate the risk of flood damage to the built environment.

Use of PSM (Project Sustainability Management) to Evaluate Large Engineering Projects:

The example of the Nagara River Barrage Project in Japan served as the case study for PSM. Over fifty indicators were evaluated on the case study project. The overall conclusion was that PSM is a useful tool for developed nation projects; the indicators are not always relevant for projects in emerging nations. Disaster risk management is not yet part of PSM, and it should be considered for future incorporation into the system. Further refinement of the system will allow PSM to grow into a relevant, flexible tool for evaluation of engineering works, large and small, in a variety of locations.

Sustainable Reconstruction in Tsunami-Affected Areas

This presentation focused on issues to be considered during the rebuilding of tsunami-damaged coastal areas in India. Reconstruction issues included characteristics of new, sustainable buildings; criteria for proper protection of rebuilt areas; and criteria for effective coastal management criteria to protect vulnerable coastal communities.

Disaster Planning Lessons Learned from Hurricane Katrina

This presentation focused on a number of vulnerabilities that were revealed in the aftermath of Hurricane Katrina in the United States. Disaster planning is sometimes based on faulty engineering assumptions. These incorrect assumptions can have catastrophic results (i.e. flood protection inside the city of New Orleans was based upon flood crests overtopping levees; parts of the levees actually collapsed in the aftermath of Hurricane Katrina, leading to flooding of entire areas of the city with no easy method of recovery). Vigilant maintenance of protective structures and engineering works is critical. Disaster management planning must be integrated at all levels, local, state and federal. Last, and not least, the plans must address the needs of all groups of people, including those who are poor, lack resources to flee threatened areas, or are unable to flee.

Disaster Reduction Planning in China

China has suffered many losses from natural disasters such as earthquakes, floods, typhoons and drought. The natural disasters in China have four major characteristics, i.e., high frequency, multiple type, regional distribution and serious losses. China formulated a National Natural Disaster Reduction Plan (1998-2010) to reduce the risks of these natural disasters. In the presentation, the distinguishing features, main principles and strategy of implementation about the plan were described and the Chinese government's actions on disaster reduction in the past and the future were briefly introduced. The plans are focused on public awareness at all levels, pre-positioned disaster recovery assets and centres of action, and the involvement and research of consultants throughout the country.

Summary

A number of conclusions could be made from the presentations listed above. These conclusions include, but are not limited to, the following ideas.

- Climactic change has been documented in recent years. These changes appear to be responsible for an increasing severity of damage from natural disasters. We must develop appropriate responses to mitigate risk and reduce damage from unforeseen natural events.
- The “disasters” that may affect our built environment may not be limited to natural events. One workshop participant noted that our disaster risk reduction and damage mitigation activities should also include man-made events. Events that could be considered include war, terrorism, and accidental release of hazardous materials.
- Insurers and politicians are playing an increasing role in disaster risk reduction through economic decision-making. For example, insurers may refuse to cover structures built in flood-prone areas. This discourages building in areas that may be subject to damage and encourages more sustainable growth of built environments. Engineers need to begin to engage insurers and politicians in order to have an impact on these activities.
- Measuring the sustainability and long term effectiveness of a project is important. The systems used to measure a project must be flexible and capable of adaptation to a variety of project types, conditions, and locales.
- Inadequate disaster planning can go horribly wrong, with terrible consequences for those unable to escape from a severe natural event. Redundant disaster management plans coupled with investment in protective infrastructure can significantly reduce the risks to vulnerable communities—both pre- and post-disaster.
- Resilient engineering systems should be designed, instead of “brittle” systems. A resilient system may be designed to fail under the most severe conditions, but it should be easily recoverable. Too often, we design brittle systems that cannot be easily fixed once they are overcome.
- China has developed a good model of disaster risk reduction. This system incorporates planning with centralized and regional components; rapid assistance to damaged areas; extensive public awareness programs; and ongoing research.

Sustainable Water Supplies (Workshop 8)

Objectives

- Summary of critical points raised by speakers
- Summary of issues discussed by participants and conclusions drawn from the discussions
- Status of the workshop subject
- Action plan for developing future sustainability tools

Relevant items raised in Keynote presentations

Ma Kai: Waste water treatment up by 30,7% (1994-2004) in China. Water taking quotas on their way in China; tax incentives on water saving.

Jin Liquin: Water pollution levels in Asia are 20 times international levels.

John Boyd: 15-35% of water catchments are overused. Incidents of flooding have increased heavily from 1950 to 2000.

Comments of workshop chairpersons

- The challenge from the 3rd World Water Forum (WWF3): cut the number of people, who lack access to clean water supplies and basic sanitation by 50% in 2015.
- The outcome of this workshop will be carried over to the WWF4 in 2006.

Presentation points

Stanley Kawaguchi

- Proposal: FIDIC should actively seek to participate in WWF4.
- WWF4 includes a lot of opportunities for FIDIC (themes and perspectives).
- FIDIC should actively participate in Theme 1 (Water Development) and Perspective 3 (Capacity Building and Social Learning).
- Statement by former FIDIC president Steyn Laubscher: "Adapt or die" must be translated into action.

Tse Yau Shing

- Singapore is an example of sustainable water supplies.
- Singapore is short on water supplies and would like to minimise its import of water from Malaysia.

Shigemichi Hatao

- Natural disasters lead to changes in laws, standards and codes.
- Water supply systems should be built with due consideration of natural disasters.

Yoshihiko Yamashita

- IFNet and GFAS are tools for predicting floods and thereby reduce damages.

Li Yuanyuan

- China has a low and uneven distribution of useable water resources.
- Negative impacts from human activity are abundant.
- 59% of the area (60% of the population) is influenced by stressing of the water supplies.

- 8% of the area is subject to serious flooding, 44% to lighter flooding.
- Development strategies have been worked out (supply, flooding, ecological degradation).
- Huge investments in water supply and flood prevention are needed.

Participant discussions

- Recommendations from WWF3: an action-oriented agenda is needed.
- Historically there has at best been a stale mate in the development, particularly in the developing countries.
- Jorge Padilla and CNEC Mexico are already active in the preparation of WWF4, so the FIDIC EC has decided to participate actively as proposed.
- Mexico City is suggested as a case for WWF4.
- Flood prevention problems in Hungary is also suggested as a case for WWF4.
- FIDIC should arrange a session and have speakers on all themes at the WWF4.
- FIDIC's recommendations should be included in the resulting ministerial recommendations, and FIDIC should be acknowledged as a resource center.

Summary

Status of the workshop subject

Everybody believes that the subject of sustainable water supply is one of the most important aspects in human development. Water is the fundamental matter for human life and social development. The world is facing the problem of shortage of water; billions of people in some developing countries cannot drink clean water. Water is also a reason for conflict. Water creates floods and disasters, lives and properties are damaged. Water can provide reliable clean energy. The speakers have stated the points and ways to water resources management, disaster control and water reclaim. Experiences from their countries and relevant projects were introduced to the participants, and discussions on water issues was made and the issue of World Water Forum was discussed, all believed that FIDIC should attend the WWF4 and give strong recommendations to play an important role.

Suggestions and agenda for progress

- Stanley Kawaguchi / Steyn Laubscher: "Adapt or die".
- Li Yuanyuan: Huge investments are needed in China.
- WWF4 in 2006 in Mexico: FIDIC should actively participate and seek to have speakers in as many themes as possible; FIDIC could even arrange a session. The participation of FIDIC should be aimed at action. Case suggestions: Mexico City (water scarcity) and Hungary (flood prevention). FIDIC should work to have its recommendations included in the final ministerial recommendations.