World Federation of Engineering Organisations

The Committee on Engineering and the Environment

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Engineers cannot remain silent or complacent when it comes to environmental sustainability.

Engineers and Engineering Must Remain Active in Drive for a Sustainable World

By Darrel Danyluk, P.Eng.
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Too often, engineers remain content to undertake their duties within the realm of technology, without the need for fanfare and acclaim. As a result, engineering and its contributions to global sustainability are largely ignored by the media and fly below the radar of public awareness.

In this newsletter we provide a glimpse of the role engineering plays in sustainability initiatives. We provide perspectives from various industries and from several countries, and also highlight our federation's leadership role in developing a Model Code of Practice for engineers worldwide and by participating at the United Nations deliberations. These articles provide a snapshot of engineering perspectives and opinions on the commitments required to ensure that sustainability has meaning at local, regional, national and global levels.

In line with the 1987 Bruntland Commission's definition, the proposed **WFEO Model Code of Practice for Sustainable Development and Environmental Stewardship** defines sustainability as..... "Ability to meet the needs of the present without compromising the ability of future generations to meet their own needs, through a balanced application of integrated planning and the contribution of environmental, social and economic decision-making processes."

Meeting the needs of a consumer society requires that engineers conceive, design, construct, operate and maintain the critical and support infrastructures required. But in providing energy, transport, clean water, agricultural and raw materials, and manufactured goods and the built environment for shelter, health and educational facilities amongst others, these actions must be done in a sustainable manner. This requires that each element of an engineer's contribution consider not only the economic expenditures, but the social and environmental costs and impacts as well.

A key element to achieving success is the recognition that a collaborative approach is required as we seek to determine feasible and sustainable engineering options for society's needs – particularly for its consumption patterns and practices. By joining with social and natural scientists, engineers can collectively develop an understanding of the inter-relationships between scientific knowledge, engineering options and the impacts on the society and the environment. Understanding these impacts is important in determining the best feasible and sustainable engineering option to meet the need. Without collaboration, sustainability will be elusive, difficult and challenging. Engineering leadership at the project level can provide answers to the sustainability challenge. By instilling the principles of sustainability within a project's scope, and insisting upon a triple bottom line assessment and decision-making process – where economic, social and environmental outcomes are seriously considered – we will deliver feasible and sustainable results. Applying this approach on the many projects worldwide will allow us to journey toward a sustainable world.

The engineers' role is clear – take leadership.

WFEO Model Code of Practice for Sustainable Development and Environmental Stewardship

By David Lapp, FEC, P.Eng.

David Lapp is Secretary, WFEO Committee on Engineering and the Environment.

Introduction

Engineers are not only concerned with developing projects that are sustainable, but also with a wide variety of environmental management responsibilities impacting society and the environment. The long-term societal and economic health depends on a healthy environment.

The WFEO Model Code of Practice for Sustainable Development and Environmental Stewardship defines and explains ten principles that guide engineering practice in the wider context of sustainable development (SD) and environmental stewardship (ES). It will support engineers in their professional practice, in dealings with other professionals and guide professional engineering organizations.

SD and ES Explained

Many professional groups, including engineering organizations, have developed specific, though often discipline-centred, SD definitions. Often such definitions fail to distinguish between discretionary wants and essential needs.

The 1987 Brundtland Commission provided perhaps the broadest and most widely accepted SD definition in stating: “Sustainable development is development that meets the social, economic, and environmental needs of the present without compromising the ability of future generations to meet their needs.”

The commission focused on the essential needs of the world's poor, which deserve overriding priority. It also considered “limitations” the state of technology and social organization

impose on the environment's ability to meet present and future needs.

Stewardship means taking care of something not belonging to you. Environmental Stewardship is more difficult to define. Often stewardship has been addressed narrowly as protecting an endangered species or preserving a threatened eco-system. The Model Code states:

“Environmental Stewardship is the prudent use of the finite resources in nature to produce the greatest benefit while maintaining a healthy environment for the foreseeable future.”

The engineering profession plays a significant role in economic development and in protecting the environment. It is ideally situated to play a significant role in SD and ES. For engineers to be relevant to current and future generations and provide guidance and leadership to society, a more proactive approach to sustainability, as outlined in the table below, is required.

The Interpretive Guide

The Interpretive Guide serves as an accompanying document to the WFEO Model Code of Practice for Sustainable Development and Environmental Stewardship. It provides further amplification and explanation to engineers and national engineering organizations on interpretation and implementation of the ten principles.

Next Steps

The Model Code and Interpretive Guide will be published in the autumn of 2013 and posted on the WFEO website (www.wfeo.net). In 2014 and 2015, in partnership with other standing committees, and national and international members, WFEO-CEE will undertake efforts to increase awareness and facilitate engagement of the principles by engineers.

WFEO Model Code of Practice for Sustainable Development and Environmental Stewardship “Think Global and Act Local”

The Model Code consists of ten principles that speak to individual engineers:

1. Maintain and continuously improve awareness and understanding of environmental stewardship, sustainability principles and issues related to your field of practice.
2. Use expertise of others in the areas where your own knowledge is not adequate to address environmental and sustainability issues.
3. Incorporate global, regional and local societal values applicable to your work, including local and community concerns, quality of life and other social concerns related to environmental impact along with traditional and cultural values.
4. Implement sustainability outcomes at the earliest possible stage employing applicable standards and criteria related to sustainability and the environment.
5. Assess the costs and benefits of environmental protection, eco-system components, and sustainability in evaluating the economic viability of the work, with proper consideration of climate change and extreme events.

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6. Integrate environmental stewardship and sustainability planning into the life-cycle planning and management of activities that impact the environment, and implement efficient, sustainable solutions.

7. Seek innovations that achieve a balance between environmental, social and economic factors while contributing to healthy surroundings in both the built and natural environment.

8. Develop locally appropriate engagement processes for stakeholders, both external and internal, to solicit their input in an open and transparent manner, and respond to all concerns – economic, social and environmental in a timely fashion in ways that are consistent with the scope of your assignment. Disclose information necessary to protect public safety to the appropriate authorities.

9. Ensure that projects comply with regulatory and legal requirements and endeavour to exceed or better them by the application of best available, economically viable technologies and procedures.

10. Where there are threats of serious or irreversible damage but a lack of scientific certainty, implement risk mitigation measures in time to minimize environmental degradation.

International Conference on Sustainable Development in the Mining Industry

By John Hayden

John Hayden is Deputy Executive Director Public Affairs & Government Relations with the Society for Mining, Metallurgy and Exploration Inc.

The Task Group on Sustainability and Mining attained a major milestone by holding a panel discussion and a technical session at the International Conference on Sustainable Development in the Mining Industry (SDIMI 2013), meeting (June 30-July 3, 2013) on Milos, Greece.

More than 180 attendees from 30 countries heard over 100 professional papers on topics covering various areas of mining and sustainable development. The SDIMI conference was held under the auspices of the Society for Mining, Metallurgy and Exploration Inc., the Society for Mining Professors and the Greek Mining Association.

CEE's Sustainability and Mining Task Group Chair, Dr. Nikhil Trivedi, moderated a session that covered the activities of the mining and sustainability task group. The session included presentations by four task group members, from Canada, China, Finland and the U.S.A. Topics included methodology to integrate SD performance in the mine design and planning process; examples of reuse, re-purposing and the recycling of minerals to improve resource efficiency in mining; environmentally sound engineering technologies and practices in mining; and a framework of a toolbox for risk management in the minerals sector.

WFEO and CEE were represented by Darrel Danyluk, Vice President of WFEO and Chair of the Standing Committee on Engineering and the Environment (CEE). He participated in a panel discussion on Alternative Perspectives in Mining and Sustainability, which included presentations on mining industry initiatives in SD, capacity building and sustainability in the engineering disciplines and engineering education and sustainability in curricula.

The theme of the SDIMI conference was the development, monitoring and assessment of SD criteria for mineral operations. Major conference take-away points were:

1. At present, the focus of public perception is placed on the environmental and social consequences of mining. Growing environmental and social concerns, supply-chain procurement standards, as well as public pressure and regulatory measures will profoundly shape the global mineral business. To cope with these challenges, the minerals community must integrate SD practices and stakeholder participation into engineering design, technical considerations, business strategies, public education, academic curriculum and business performance goals.

2. There is a pressing need to better manage the mining resource, to increase the transfer of knowledge, and to support capacity building in private firms, government and civil society. This will require a harmonization of engineering policies, government legislation and regulation, academic education and industry best practices within the realm of SD.

Sustainable Development Goals After Rio+20

By Jorge Spitalnik

Jorge Spitalnik is Chair of the WFEO-UN Relations Committee.

One of the main outcomes of the Rio+20 Conference (held in Rio de Janeiro, Brazil, June 20-22, 2012) was the agreement by member states to launch a process to develop a set of Sustainable Development Goals (SDGs) built upon the Millennium Development Goals (MDGs) and converging with a post-2015 development agenda.

RIO+20
United Nations Conference on Sustainable Development

Open Working Group

An inter-governmental Open Working Group (OWG) was created with the assignment to submit a report to the 68th session of the UN General Assembly containing a proposal for sustainable development goals for appropriate action.

Aiming at the preparation of its report, OWG has scheduled to discuss, from March 2013 to February 2014, the following matters: *Poverty eradication; Food security and nutrition, sustainable agriculture, desertification, land degradation and drought; Water and sanitation; Employment and decent work for all, social protection, youth, education and culture; Health, population dynamics; Sustained and inclusive economic growth, macroeconomic policy questions (including international trade, international financial system and external debt sustainability), infrastructure development and industrialization; Energy; Means of implementation (science and technology, knowledge-sharing and capacity building); Global partnership for achieving sustainable development; Needs of countries in special situations, African countries, Least Developed Countries, Landlocked Developing Countries, Small Island Developing States as well as specific challenges facing the middle-income countries; Human rights, the right to development, global governance; Sustainable cities and human settlements, sustainable transport; Sustainable consumption and production (including chemicals and waste); Climate change and disaster risk reduction; Oceans and seas, forests, biodiversity; Promoting equality, including social equity, gender equality and women's empowerment; Conflict prevention, post-conflict peace-building and the promotion of durable peace, rule of law and governance.*

SDGs Need Universal Character

OWG has already recognized that SDGs must have a universal character in order to speak not only to developing countries but also to developed countries, and that there is a need for all to achieve sustainable patterns of consumption and production with developed countries taking a leading role. As for the scope of the SDGs, OWG recently stated that the MDGs did not recognize the many dimensions of poverty, which go beyond monetary income, and that the gap the SDGs are meant to address is the integration of the three dimensions of sustainable development, and implementation of integrated solutions. Initially, OWG characterized three possible types of goals to be dealt with: human development related goals with little environmental impact associated with their attainment (e.g., education); human development related goals with important environmental dimensions (e.g., water, food, energy), and goals related to common management of global resources.

Unprecedented Opportunity For Engineers

Civil society is taking part in the OWG discussions through its major groups and other relevant stakeholders. The Major Group of Scientific and Technological Communities (STC), where WFEO is representing engineering viewpoints and positions, is one of the actors in this process. The WFEO-United Nations Relations Committee (WURC) is the WFEO interface with the UN system and provides engineering advice, review and information that contribute to the definition and achievement of SDGs and other outcomes from Rio+20. The WFEO Standing Committee on Engineering and the Environment Committee is actively involved in WURC undertakings and particularly in this process. Regarding science and engineering, OWG has expressed that it will reach out to the scientific community to provide technical inputs on how to set appropriate goals and especially how to handle targets and indicators.

This SDGs activity poses an unprecedented opportunity for the participation and input of engineers to put the profession at the forefront of the contributing partners for achieving and fulfilling feasible programs and measures on sustainable development and climate change that are being implemented by the UN and its agencies.

Sustainability Key New Zealand Goal

By Carol Boyle, PhD

Carol Boyle is Associate Professor of Civil and Environmental Engineering at the University of Auckland and Chair of The Sustainability Society, a Technical Interest Group of the Institution of Professional Engineers New Zealand (IPENZ), the New Zealand National member of WFEO. As a subsidiary body of IPENZ, the Society facilitates learned society activities across the domain of sustainability engineering and science, and is open to non-engineers to participate in its activities. The society is also recognised by New Zealand's lead scientific body, the Royal Society of New Zealand.

The Auckland Plan sets a vision for Auckland (photo above) to be the world's most liveable city by 2040. *Photo by Avi Ceder.*

When it comes to sustainability, New Zealand is blessed. It has abundant sunshine, plenty of rain, good geothermal activity and sits in the “Roaring 40s” – strong westerly winds, blowing between 40 and 50^{0}S latitude.

Electricity production is 75% renewable and the Government has committed to achieving 90% renewable electricity by 2030. With 4.5 million people and a landmass comparable to Japan and the UK, New Zealand is among the few developed countries operating within its ecological footprint. A strong agricultural industry helps feed the global population, while the equally important tourism industry is focused on maintaining important environmental areas.

New Zealand's “100% Pure” slogan is taken seriously and when this is perceived as being at risk, there is public outcry. Consequently, there has been improvement in reducing agricultural discharge to the environment – led by major industries, including Fonterra and supported by municipal councils and consulting engineers. However, concern still exists about poor water quality in many lakes, rivers and streams. New developments, including hydroelectric and irrigation dams, wind power schemes, new mines and transportation projects, are heavily scrutinised by the public, local councils and government. Those not meeting sustainability criteria have been rejected or subjected to considerable public criticism and usually required to meet environmental and social standards. Recent legislative changes reduced the capacity for public input into development proposals and placed a stronger emphasis on economic outcomes. However, strong input from Maori (local indigenous peoples), who are recognised as stewards of the land, has been provided on many projects. This has resulted in innovative engineering approaches, which support the environment, communities and the economy.

Local councils are aware of the needed balance between raising rates and improving existing infrastructure to meet sustainability criteria. The Auckland Plan sets a vision for Auckland to be the world's most liveable city by 2040. Further work on climate change and energy consumption, in collaboration with industry, consulting and local council planners, engineers and Maori, has set significant goals for Auckland, including reducing GHG emissions to 40% of 2000 levels.

Three recent New Zealand disasters refocused engineering effort and activity. Major 2011 and 2012 earthquakes in Christchurch, plus aftershocks, proved the resilience of well-built, modern buildings. It also identified problems with centralised energy and water infrastructure, and liquefaction risks, informing new policies and planning, and new considerations in decentralised infrastructure and greater restrictions on high liquefaction-risk areas. Engineers came under scrutiny for the collapse of one building and this likely will result in strengthened registration requirements for engineers. Earthquake strengthening is being undertaken across New Zealand. Smaller, more recent earthquakes in Wellington also confirmed the value of good building design and construction.

The Pike River mining disaster, in which 29 miners died, led to review of how companies manage risk, health and safety. Good management and good engineering have been identified as priorities as have requirement to assess, mitigate or manage potential risks. The recent international incident with contaminated milk powder produced by Fonterra NZ will further push to position corporate responsibility atop companies' agendas.

It can be argued that some reactions to such disasters simply require improving engineering practice. However, global, future-thinking companies recognise that shifting towards sustainability will assist them in recognising, managing and mitigating future risk, identifying opportunities to develop resilient solutions, and developing innovative and sustainable solutions to engineering issues. Many New Zealand engineers are strongly committed to sustainability and want to understand the issues and risks they will face and how to incorporate sustainable solutions. While it does not face the population pressures of other countries, which force them into sustainability, there is a commitment to sustainability, which will constantly be a driving force in setting pathways for New Zealand's future.

A Dynamic and Strategic Perspective on Corporate Social Responsibility in China

By Zhongxue Li, BS, MS, PhD

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Just like sustainability, corporate social responsibility (CSR) has been one of the long-range focuses of global concerns. CSR as a path to sustainable development (SD) has been well recognized all over the world.

CSR Movement

Publicly, the significance of CSR has been highlighted by *The Future We Want*, the outcome document adopted at the United Nations Conference on Sustainable Development (UNCSD or Rio+20) in June, 2012 to support national regulatory and policy frameworks that enable business and industry to advance SD initiatives, taking into account the importance of CSR and to call on the private sector to engage in responsible business practices, such as those promoted by the UN Global Compact.

Privately, the International Council on Mining and Metals (ICMM), among others, has catalyzed environmental and social performance improvement in the mining and metals industry. It brings together 22 giant mining and metals companies and 35 associations to address the core SD and CSR challenges, such as accountability, transparency, effects of carbon-pricing schemes on competitiveness of the industry, climate change revenue recycling schemes, and climate change-related adaptation strategies for the industry.

Civically, a key milestone has been laid by the International Organization for Standardization (ISO) standard of Social Responsibility Guidance (ISO 26000). It indicates a world-wide consensus on CSR issues and its solution among stakeholders, by focusing on the seven principles of accountability, transparency, ethical behavior, respect for stakeholder interests, human rights, rule of law, and international norms of behavior; the seven core subjects of organizational governance, human

rights, labour practices, environment, fair operating practices, consumer issues, and community involvement and development; and seven aspects of CSR guidance.

Academically, the International CSR Conference at Humboldt-Universitat zu Berlin series, as a platform for multi-stakeholder dialogues, since 2004, has been exploring the themes of CSR and sustainability in all their various dimensions, such as new forms of stakeholder governance and legitimacy and effectiveness of global CSR standards; CSR networks and co-operations; responsible supply-chain management; sustainable energies, climate change, and carbon-footprint strategies; and CSR measurement and management models.

CSR Conception

What is CSR all about then? Adam Smith during the 1750s said the unfettered free market does not always perform perfectly and participants must act honestly and justly if the ideals of free market are to be achieved.

A. B. Carroll in the 1990s presented a four-layered CSR pyramid model with economic and legal responsibilities as the base levels and ethical and philanthropic responsibilities as the top levels.

ISO in 2010 defined the social responsibility of an organization in general as its responsibility for impacts of its decisions and activities on society and the environment through transparent and ethical behavior that contributes to SD, takes into account stakeholders expectations, complies with applicable law and is consistent with international norms of behavior, and is integrated into the organization and practiced in its activities within its sphere of influence.

CSR Dynamics With Multi-Dimensions

CSR is universal. It is of dual existence having objectivity as a corporate capability and requiring subjectivity regarding corporate decisions and activities. It can apply to all types of corporations in the public and non-profit sectors as well as in the private sector, whether large or small, and whether operating in developed or developing countries.

CSR is multi-dimensional. CSR issues and extent are dependent upon corporate attributes such as ownership

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and governance, types and sizes, competency and market shares, industrial sectors, and geopolitical and cultural contexts in which corporations operate.

CSR is time dependent. Stakeholder expectations and CSR scope, extent and capacity evolve over time. Corporate behavior with CSR issues changes with the life cycle of corporations and the level of economic and social development.

CSR State-of-the-Art in China

In view of the CSR development in the United States and Europe and combined with Simon Zadek's organizational learning models, a framework for characterizing the dynamics of CSR with economic and social development in China has been built. It includes patterns of CSR issues at the latent, emerging, consolidating, and institutionalized stages, and modes of CSR responses at the defensive, compliance, managerial, strategic, and civil stages with corporate CSR behaviors and motives as shown in **Figure 1**.

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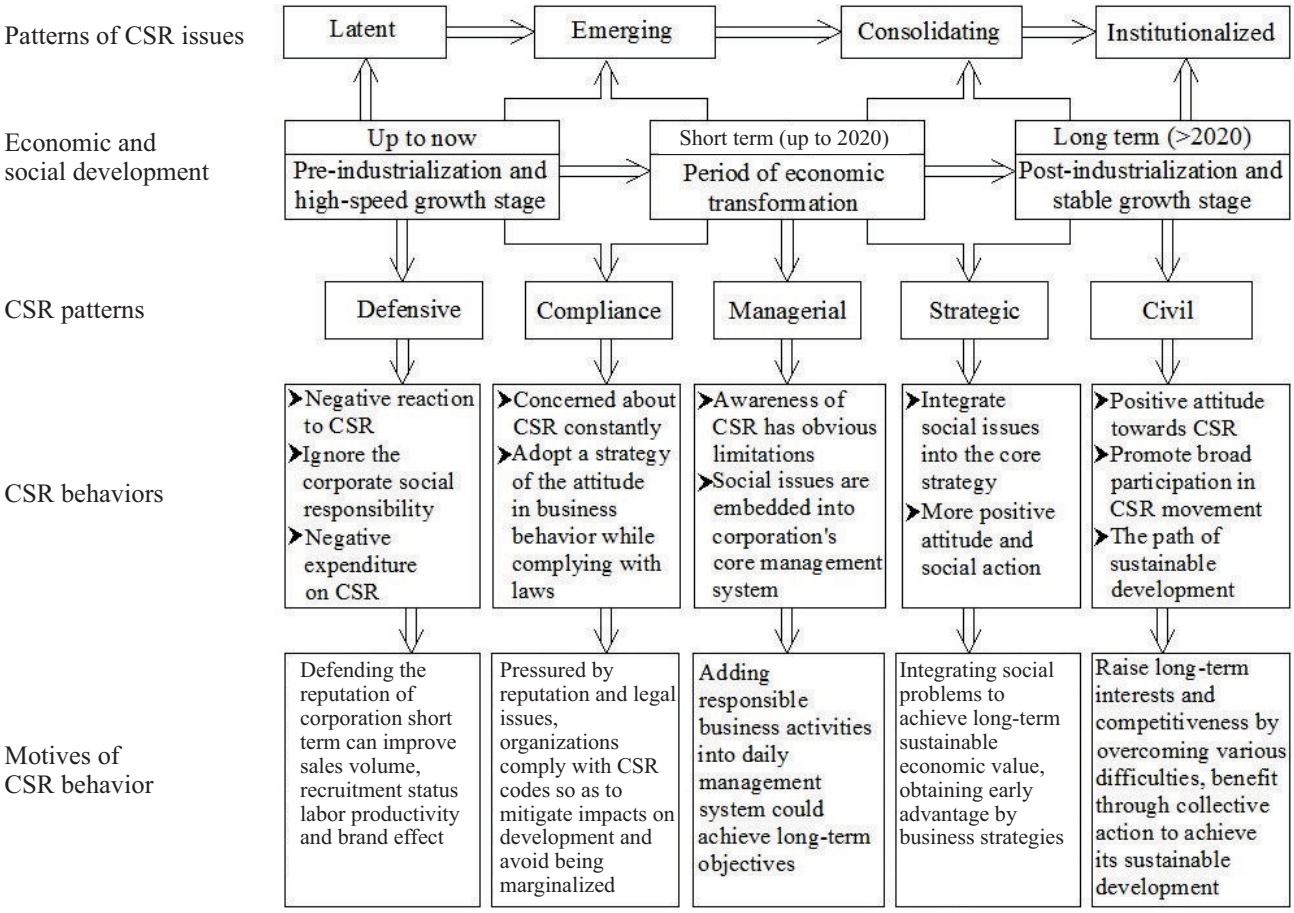
Figure 1 CSR dynamics as economy and society evolves in China



WFEO-CEE and Related Upcoming Events

- Sept. 9, 2013, Singapore City, Singapore – WFEO-CEE Face-to-Face Meeting #6
- Sept. 13-15, 2013, Singapore City, Singapore – WFEO Executive Council Meeting and General Assembly

United Nations Framework Convention on Climate Change

- Nov. 11-22, 2013, Warsaw, Poland – UNFCCC Conference of the Parties – Meeting #19 (COP-19) www.unfccc.int

Meetings Relating to WFEO-CEE Themes

Themes 1 and 2 – Climate Change Adaptation and Mitigation

- Sept. 11-13, 2013, Singapore City, Singapore – World Engineers Summit 2013 – Innovative and Sustainable Solutions to Climate Change www.wes2013.org

Theme 3 – Engineering and Agriculture

- Nov. 17-18, 2013, Abu Dhabi, United Arab Emirates (UAE) – 2013 International Conference on Sustainable Environment and Agriculture www.icsea.org
- Sept. 16-19, 2014, Beijing, China – 18th World Congress of CIGR – International Commission of Agricultural and Biosystems Engineering www.cigr2014.org

Theme 4 – Engineering and Mining

- Nov 5-8, 2013, Santiago, Chile – 2nd International Conference on Social Responsibility in Mining www.srmining.com
- Feb. 23-26, 2014, Salt Lake City, UT, USA – Society of Mining Engineers (SME) Annual Meeting – "Leadership in Uncertain Times" www.smenet.org
- June 12-13, 2014, Falmouth, United Kingdom – SRCR'14 – Sustainability through Resource Conservation and Recycling '14 www.min-eng.com/srcr14

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CSR Strategies in China

As a developing economy in transition, China is developing national regulatory and policy frameworks to support business and industry for advancing SD initiatives and engaging in responsible business practices for CSR-related risks to be mitigated. **Table 1** shows some strategies that may be adopted by either the public sector for society risk mitigation or the private sector for corporate risk mitigation.

Table 1 CSR Risk Mitigation Strategies in China

Public strategies for society risk mitigation	Political	• Reform institutional mechanisms and follow the leads of best CSR practices • Promote transparency, communication and CSR awareness • Respect for stakeholder interests, rule of law, international norms of behavior and human rights
	Social	• Develop multi-stakeholder, multi-level strategies and initiatives • Enhance partnerships and stakeholder engagement among the public, private and civic sectors • Encourage CSR reporting for transparency and visibility • Disseminate best CSR practices
	Economic	• Promote international exchanges and cooperation • Adopt green supply chain and procurement • Develop CSR initiatives at various levels • Continually improve CSR performance in view of CSR diversity and dynamics
	Technical	• Establish effective R&D systems to advance scientific and intellectual capabilities • Adopt emerging norms, standards and guidelines • Promote risk-related management systems such as ISO 26000, ISO 14000, OHSAS 18000 and SA8000
Capacity building strategies for corporate risk mitigation	Corporate governance	• Review global and regulatory CSR drivers • Develop forward-looking strategies and goals • Design a CSR structure and cross-functional system • Establish CSR policies, practices and procedures • Continually adapt to more advanced CSR stages
	Financing	• Match budget to best framework and commit dedicated budget for CSR initiatives • Do cause marketing • Promote community investment, employee volunteerism, sponsorships, product give-aways and philanthropy
	Technology	• Integrate CSR into business & spheres of influence • Adopt cleaner, healthier, safer, ecologically more efficient processes, products and services • Identify key social, environmental and ethical issues and evaluate their impacts
	Human resources	• Develop effective staffing plan • Raise awareness of and reach consensus on CSR through effective learning /training and communication processes • Respect for human rights and treat employees fairly • Build a CSR culture