World Federation of Engineering Organisations

The Committee on Engineering and the Environment

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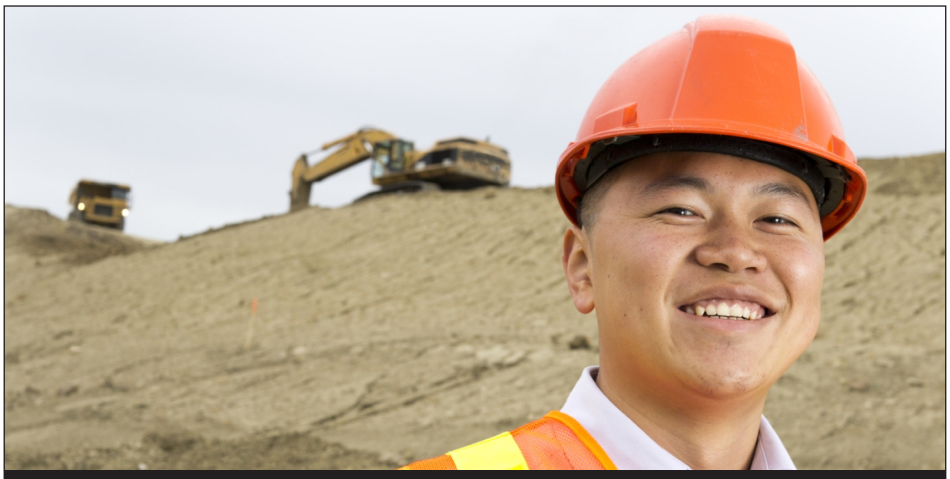
Mining offers an interesting model in terms of sustainability

Sustainability and Industry With a Special Focus on Mining



Expect the newly formed WFEO-CEE Task Group on Sustainability and Mining to offer significant input as the mining industry continues to work toward greater sustainability.

By Darrel Danyluk, P.Eng.
FEC, FCAE, FEIC, FCSCE

Darrel Danyluk chairs the WFEO Standing Committee on Engineering and the Environment (CEE).

The year 2011 marked the beginning of a new era for the WFEO Standing Technical Committee on Engineering and the Environment (CEE) and the opportunity for Engineers Canada to host this committee for a second and final term, and for me personally to have the pleasure of again serving as CEE Chair. As always, we welcome your views, input, comments and participation relative to topics raised in the newsletter.

Term two spans 2011–2015 and the Strategic Plan, which outlines our objectives, goals and deliverables for each of our six focus areas, is in place. This plan is available on the CEE portion of the WFEO website (www.wfeo.net/environment). Our focus areas cover: Adaptation to Climate Change, Mitigation to Climate Change, Sustainability in Industry with a Mining Focus, Engineering and Agriculture, Infrastructure in Developing Countries, and the completion of the Sustainability Guidelines for Engineers.

This newsletter focuses on the upcoming work of the Task Group on Sustainability and Mining. This Task Group is led by the United States, which, through its WFEO member, the American Association of Engineering Societies (AAES), has confirmed Dr. Nikhil Trivedi as Task Group Chair and leader of the initiative.

Sustainability in Mining

This topic was the focus of discussions at the UN Commission and Sustainable Development (CSD) meetings in March of 2011. CEE intervened at the CSD meetings on this topic. Excerpts of this intervention follow:

"The Scientific and Technological Community (WFEO is a co-leader of this major group with ICSU) includes the world's innovators who are the key to the technological solutions needed to address the real and current threats to sustainability.

"Chair, mining offers an interesting model in terms of sustainability. It is a wealth-generator, an employer, a supplier of basic and fundamental infrastructures that provide opportunity for economic and social growth. Its impact on the environment throughout its life-cycle can be long-lasting and its legacy can cause serious concern.

"We believe that sustainable mining includes:

- environmental and social impact assessments, undertaken in consultation with local communities as part of the planning process, and incorporated into the mine development plan that includes rehabilitation of impacted areas;
- adequate environmental monitoring systems and regular socio-economic studies over the life-cycle of the mining operation;
- respective regulatory frameworks at national and international levels to address corporate social and environmental responsibility and complete accountability;
- more investment in targeted scientific and engineering research and in upgrading education and training;
- the development, transfer and application of environmentally friendly technologies, including those technologies that reduce water and energy consumption and impact;

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Mining, Engineering and Sustainability

By Deborah J. Shields, PhD

Dr. Deborah J. Shields is an Affiliated Faculty Member at Colorado State University, a Visiting Professor at Politecnico di Torino, and is a principal with Shields Consulting llc. The author can be contacted at dshields@colostate.edu and Deborah.Shields@polito.it

> *"Reducing the water footprints of mining and minerals processing is a high mine-management priority."*

Minerals, metals and materials are essential to every sector of every nation's economy and will play a determining role in the feasibility of the emerging technologies that sustainability will require. Nonetheless, initial discussions about the role of natural resources in sustainability tended to focus on the need to sustain ecosystems and maintain biodiversity. Clearly, mineral resources are not sustainable in the same way as these resources because they are non-renewable, and as a result, many people view mining as either inconsistent with sustainability (once extracted, the resource is "gone"), an anathema (primarily a source of pollutants and environmental degradation) or of secondary importance (merely a source of virgin materials for which recycled materials or renewable resources can be substituted).

Mineral Resources Are Important for Wealth Creation

In reality, sustainable development involves managing resources in a way that is conducive to long-term wealth creation and the maintenance of capital (natural, social, human, economic and physical). This perspective extends naturally to mineral resources, which are themselves a form of endowed, natural capital and are an important source of wealth creation. As a result, the discussion about minerals in sustainability now focuses on replacing depleted mineral capital with other forms of capital, environmental protection, fair and just distribution of risks and benefits, and ensuring that the contribution of a mine is net positive over the life of the project, from exploration through post-closure. While no single ore deposit or mine is sustainable, mining (primary production) has an important role to play in sustainable development, as a source of essential raw materials, and as an engine of economic development. However, the ability of the minerals and metals industry to make positive contributions to society, and to set the stage that will empower sustainable communities, increasingly depends on its willingness to more universally adopt sustainable mining practices and the capacity of governments to ensure that local, regional and national benefits of responsible resource development are fully realized.

Searching for Sustainable Mining Practices

Over the past decade, as a result of numerous transparent multi-stakeholder dialogues, and through international and collaborative interdisciplinary research projects, the industry has generated a considerable amount of guidance on how mining practices must evolve for the sector to responsibly fulfill its role in society's transition to sustainability. However, these practices, collectively referred to by the industry as sustainable mining practices, are not yet widely embraced, and the degree to which they are implemented varies across political jurisdictions, sub-sectors of the industry, and even within enterprises (private, public and state-owned). During 2010 and 2011, the United Nations Commission on Sustainable Development (CSD 18 & 19) examined the progress the minerals industry has made in implementing sustainable development principles and sustainable mining practices, and negotiated a statement on mining, which included recommendations for increased capacity building within the minerals sector, technology transfer, sharing best practices, and risk management, as well as social and governance issues.

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Task Group on Sustainability and Mining Will Work Under WFEO-CEE Umbrella

By Nikhil Trivedi, PhD

Dr. Nikhil Trivedi is Senior Partner with IDEKIN International and resides in Easton, Pennsylvania, U.S.A. He chairs the WFEO-CEE Task Group on Sustainability and Mining.

The Society for Mining, Metallurgy and Exploration (SME) is an international professional society of mining engineers, metallurgists, underground construction professionals, undersea mining professionals, exploration geologists, educators, students and researchers. SME advances the worldwide minerals community through information exchange and professional development. With its main office in Englewood, Colorado, U.S.A., SME has over 14,000 members located in 85 countries, including 51 local sections and 24 student chapters. Of those, 2,750 members, four sections and six student chapters are located outside the U.S. Over the past several years, SME members have been actively engaged in discussions on sustainability and mining at the United Nations Commission on Sustainable Development (UNCSD) and the WFEO level. As a result, SME was recently invited to organize a task group on sustainability and mining under the broad umbrella of WFEO's Committee on Engineering and Environment (CEE). The organization of this task group is still in its infancy, but we are determined to accelerate our activities soon.

Capacity Building

Our overarching goal is capacity building for mineral producers, and stakeholders, including governmental authorities, non-governmental organizations and the general public.

SME
Society for Mining, Metallurgy & Exploration

We visualize achieving that goal through the promotion and dissemination of information on the application of:

- Environmentally sound engineering practices and technologies in the minerals sector;
- Best practices in social sustainability and the minerals sector – including worker health, safety, reliability and training;
- Best practices in eco-efficient usage of land, water, energy, and mineral resources:
- Engineering solutions to re-using, re-purposing and recycling of minerals; and
- Innovative practices and techniques on risk management in the minerals sector.

Professional Growth and Interaction

We will support professional growth and interaction within the engineering profession through books, articles, symposia, short courses, and/or conferences on minerals and mining in sustainable development, consistent with WFEO principles. Naturally consistent with our theme are the following two initiatives:

- Dissemination of information on the role of minerals and metals in sustainable development, including the role of minerals in improving the quality of life; and
- Promotion of the achievements and capabilities of the mineral community to the general public and specifically to the communities in which minerals companies operate.

Opportunities for Collaboration

We expect to work collaboratively among ourselves and with other task groups within CEE in supporting achievement of the UN Millennium

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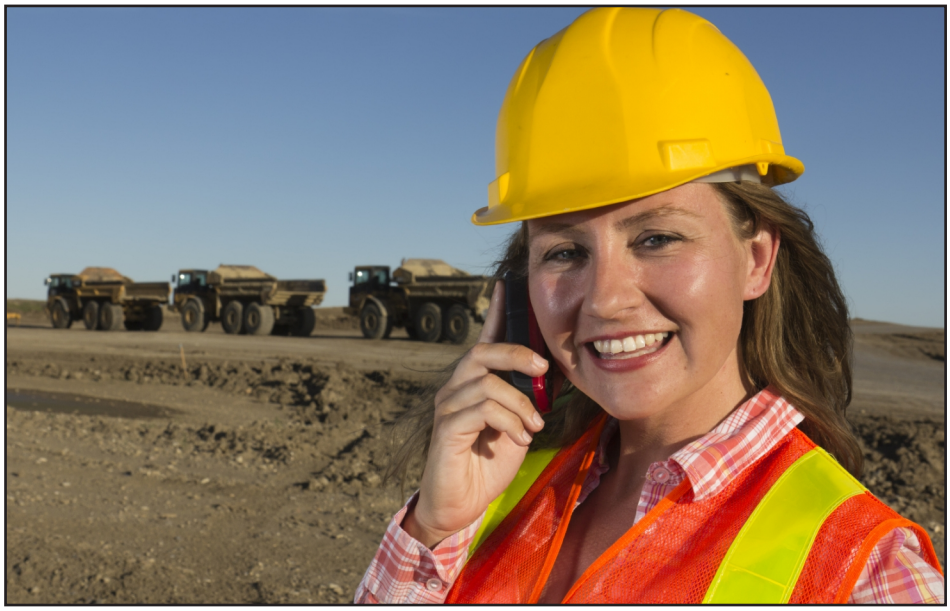

A Roadmap for Implementing Sustainability in Mining Enterprises

By Andrea Ramage

Andrea Ramage is responsible for Sustainability Strategy and Planning with CH2M HILL, Inc and is based in Seattle, Washington, U.S.A.

The mining industry recognizes that sustainability issues comprise part of a new business reality, in which traditional business responses no longer fully satisfy the expectations of investors, communities, employees and other stakeholders. Now, companies must develop sustainability programs, at minimum to appease stakeholders and keep pace with peers in the industry; they also have the opportunity to leverage sustainability concepts to drive innovation, establish leadership, and compete more effectively. To help mining companies transition to sustainable business, mining industry organizations can establish basic policy, guidance, best practices, standards, and technical assistance that will help reduce the costs and increase the benefits of sustainability implementation. Good models for such industry level support exist in the building industry, civil engineering and the water/wastewater industries.

However, while the new business reality is clear to most, the appropriate business response can be elusive and sustainability implementation can be challenging. A basic roadmap to implementation, described in this article, helps companies avoid common pitfalls while getting a smart start on their journey toward sustainability.

Part I: Three Implementation Arenas

The first part of the roadmap organizes the bewildering array of sustainability subtopics into three implementation arenas. **Organizational sustainability** consists of policy frameworks, governance, management, culture, leadership, strategy, corporate communications, and various systems to support endorsement and integration of sustainability into the organization. **Operational sustainability** consists of the daily to annual processes and systems that consume natural resources (water, energy, materials), apply human resources, and produce products and wastes. **Project sustainability** consists of planning, design, engineering, and construction activities needed to realize all types of projects, such as mine development, facility expansions, road and bridge improvements, and construction of water and energy infrastructure. Sustainability implementation can begin in any of these arenas, but successful implementation requires action in all three.

Part II: Sustainability at the Mining Enterprise Level

The second part of the roadmap identifies typical implementation challenges and a proven implementation approach.

Implementation Challenges

As for any organizational change effort, typical challenges in implementing sustainability include:

- Overcoming resistance to change, when people are asked to accept and endorse new sustainability goals and programs;
- Effectively linking sustainability goals to strategic goals, while placing them on par with other company goals;
- Integrating sustainability considerations with decision-making processes, including the complex trade-offs amongst sustainability indicators and conventional business indicators; and
- Allowing experimentation to occur, to spur innovation and encourage learning.

Mining must light the way toward sustainable approaches for doing business.

Proven Approach to Implementing Sustainability

In order to address the challenges above, implementing sustainability requires meeting three critical success factors: (1) the benefits must be worth the costs and ultimately support the business, (2) full integration of sustainability into company culture and business processes, and (3) long-term commitment to continuous improvement.

The process for implementing sustainability includes a few basic steps. For each of the three sustainability arenas described in Part I, the steps include:

1. **Vision**: Establish a vision and leadership support. Describe how sustainability is meaningful and relevant to the company to ensure that sustainability efforts will be aligned with business strategy and operating realities.

2. **Strategy and Actions**: Establish a high-level strategy, including goals, objectives and actions to achieve goals.

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A Roadmap for Implementing Sustainability

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Prioritization is essential for achieving results within time and budget constraints.

3. **Indicators and Targets**: Establish performance indicators to evaluate progress, including targets. Identify data sources and business processes for collecting data.

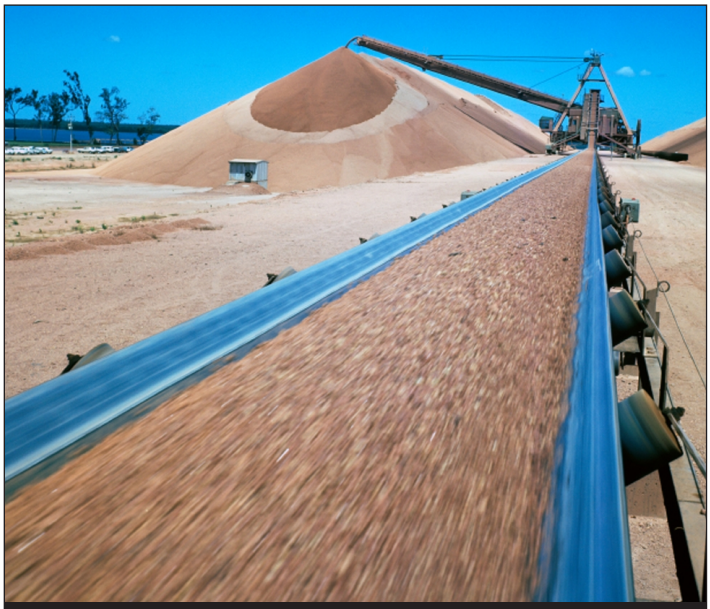
4. **Performance Report and Decision-Making**: Choose the methods, frequency and format for reporting indicators and progress toward targets. Address results in decision-making, and develop tools to support these processes. Appropriately engage stakeholders in decision-making.

5. **Educate and Communicate**: Educate leaders, managers, staff and stakeholders. Communicate goals and perfomance results.

6. **Evaluate and Course-Correct**: Regularly evaluate the sustainability approach and supporting processes. Modify vision, goals, objectives, initiatives and actions as needed, as well as indicators and targets and business processes.

Part III: Role of Industry Organizations and Engineering Societies

The third part of the roadmap, involving industry organizations, such as the International Council on Mining and Metals (ICMM) and engineering societies, is to facilitate sustainability implementation, thereby reducing the cost of implementation for mining companies. Their role is to compile information, conduct research, provide learning forums, develop standards for sustainability performance indicators and best practices, and provide technical assistance. Another potential role, borrowed from green building and civil engineering industries[1], is to provide sustainability rating systems (for self-assessment or third-party certification) that establish general standards of best practice and allow comparisons to be made between companies (or projects).



Sustainability requires a commitment to move mining enterprises in new directions.

Conclusion

The road map for sustainability implementation has been proven through multiple case studies in manufacturing, municipal utilities, oil and gas, consumer products, and many other industries operating around the world. Among other factors, successful sustainability implementation at the company level requires a long-term commitment by leadership, embedment into the culture of the organization, and deep integration with existing business processes. At the industry level, industry organizations and engineering societies should provide a strong and consistent platform of policy, guidance, best practices, standards and technical assistance in order to facilitate sustainability implementation.

1.The U.S. Green Building Council offers the LEED™ green building rating system. The Institute for Sustainable Infrastructure offers the Envision® rating system for all types of infrastructure projects.

Online Information Sources of Potential Interest to WFEO-CEE Members

Attention is drawn to the following online information sources.

1) Integrated Research of Disaster Risk (IRDR), a program co-sponsored by the International Council for Science, the International Social Science Council, and the United Nations International Strategy for Disaster Reduction, recently posted a report by IRDR's Forensic Investigation of Disasters (FORIN) Working Group. It is available on the IRDR website at http://www.irdrinternational.org/wp-content/uploads/2012/03/FORIN-report.pdf

2) The UNFCCC Secretariat notes that the latest newsletter of the Nairobi Work Programme on impacts, vulnerability and adaptation (NWP), is available at http://unfccc.int/files/adaptation/application/pdf/nwp_eupdate_march_2012.pdf

Mining, Engineering and Sustainability

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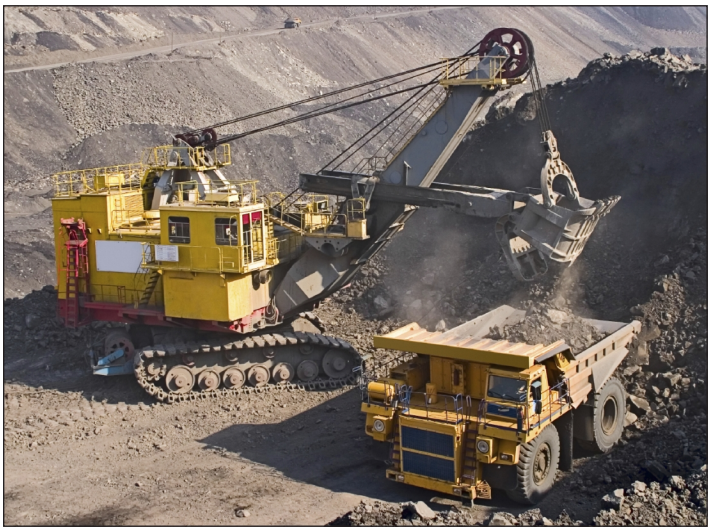
Considering the Entire Mine Life-Cycle

Corporate social responsibility and sound governance are essential aspects of sustainable development, whether mineral related or not. However, the correct application of existing and newly developed technologies by skilled and knowledgeable engineers is equally important. For example, the frame of reference for sustainable mining practice has expanded to cover the entire life-cycle of a mine, from exploration to project development, operations, closure and post-closure, but this perspective is not yet widely adopted. In addition, there have been technical improvements over the past decade of which wider implementation is required if societies are to meet their sustainability goals. For example, reducing the water footprints of mining and minerals processing is a high mine-management priority. Wider adoption of sound water-management practices (e.g., increased water treatment and recycling, the use of environmentally benign dust-suppression chemicals to reduce road-watering intensity and frequency, etc.) is needed. Similarly, implementation of measures that result in significant efficiencies and reduction in energy use and carbon emissions need broader adoption. Currently the transport and storage of processing waste products (tailings)



utilize large quantities of water. Technologies are now in practice, but can be improved, which provide for "dry-stacking" of these products. Numerous other examples exist. Another article in this newsletter (page 3) describes a new Task Group within WFEO-CEE on Mining and Sustainable Development that will focus on capacity building, and transfer of technologies and best practices.

Task Group on Sustainability

(continued from page 3)

Development Goals. Moreover, we can think of many opportunities for our task group to cooperate with other standing committees within WFEO, such as Capacity Building, Disaster Risk Management, Education, Innovative Technologies, Energy, Anti-Corruption and Future Leaders.

Our operating principles are simple. We will operate under strict professional and ethical engineering principles. We will honor the unique cultural and social values of the countries of the world where mining and mineral processing occurs. We will endeavor to encourage adoption of engineering guidelines for responsible mining to ensure that the essential flow of minerals continues to keep pace with ever-increasing global demand.

International Participation

We have embarked on an ambitious effort to secure participation from those countries of the world where mining and/or mineral processing are major activities. We have tried to bring balance to our team by specifically seeking skilled engineers from the developing world and the developed world. We have secured participation on our task group from Australia, Brazil, Canada, Chile, China, Finland, Ghana, Greece, India, South Africa, Spain, Turkey, U.S.A. and Zambia.

Our effort to recruit new contributors to the task group will continue as we further refine near-term objectives and goals to support our mission.

Liaisons to the task group are Mr. John Hayden, Ms. Carol Russell, and Dr. Deborah Shields. Dr. Nikhil Trivedi chairs the task group. All are members of SME. We welcome comments, ideas and suggestions from our engineering colleagues.

Please contact John Hayden at hayden@smenet.org or Nikhil Trivedi at nikhiltrivedi@idekin.com. For more information about SME, please visit www.smenet.org.

CEE 2011-2015 Strategic Plan Includes New Themes

By David Lapp, FEC, P.Eng.

David Lapp, is Manager, Professional Practice, with Engineers Canada and Secretary of WFEO-CEE.

During Engineers Canada's first term hosting and chairing the CEE, a four-year Strategic Plan (2008-2011) was implemented, and concluded in September 2011. For the second term, a new plan continues work on three themes from the first plan and embarks on three new ones. All six themes will contribute knowledge and outcomes in support of WFEO's input to the UN Millennium Development Goals (MDGs). The second strategic plan will conclude its work by the time of WFEO's General Assembly in December 2015.

The themes and the leading countries are:

Theme 1 – Adaptation of Infrastructure to Climate Change – Canada;

Theme 2 – Climate Change Mitigation – United Kingdom;

Theme 3 – Engineering and Agriculture – Tunisia;

Theme 4 – Engineering and Mining – United States;

Theme 5 – Sustainable Infrastructure in Developing Countries – TBC; and

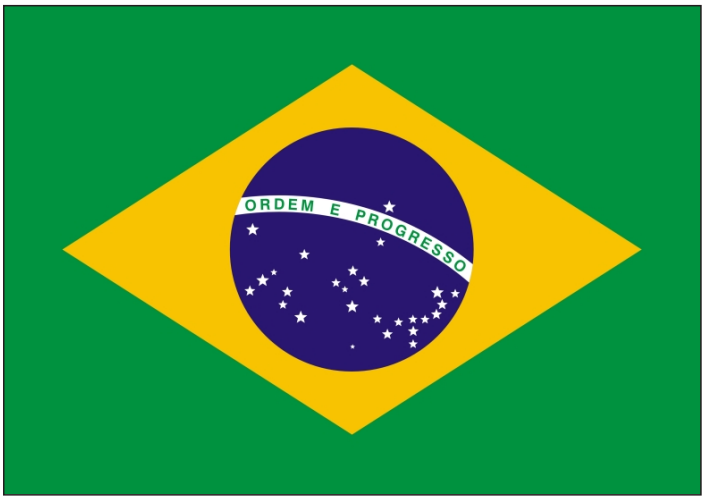
Theme 6 – International Guideline on Sustainable Development and Environmental Stewardship for Engineers – Canada.

Each theme prepares a general workplan, which includes activities and deliverables such as organizing workshops, webinars, preparation of papers and presentations, reviews of documents, attending meetings on behalf of WFEO and the CEE. Each theme working group relies on available resources and volunteers, and is chaired by a Theme Leader from the leading country.

For a copy of the new plan, please contact the WFEO-CEE Secretariat (david.lapp@engineerscanada.ca). WFEO member countries and international organizations are encouraged to nominate individuals to participate and contribute to each of the six themes. To do so, contact the Secretariat at the address noted above.

WFEO-CEE Closely Involved With UN Rio +20

Between June 20 and 22, 2012, the United Nations Commission on Sustainable Development will hold the Rio +20 Summit in Rio de Janeiro, Brazil. Over the past several months, the UN has been working on a Zero Draft Declaration that will communicate outcomes and future actions needed to address sustainable development, alleviate poverty, tackle food security and promote the principles of environmental stewardship in all regions of the world. The WFEO has been working with the International Council for Science (ICSU) as the leading members of the Major Group on Science and Technology to provide mutually agreed input to the Zero Draft to ensure the voice of engineering and science is heard.



This message will be further elevated through events to be held prior to the Summit itself. A five-day Forum on Science Technology and Innovation, the organization of which was led by ICSU with input from WFEO and others, will be held the week prior to the Summit (11–15 June). The Forum will provide a space for interdisciplinary scientific discussions, and dialogue between scientists, engineers, policy-makers and other stakeholders. Key messages and conclusions from the Forum will be reported to the Rio+20 conference to highlight the urgent need for concerted action on sustainable development, and the role that science and engineering should play in this endeavour.

The WFEO-CEE Chair and Secretary, along with several representatives from WFEO-CEE and other WFEO groups will be attending these events and will be preparing reports that will be communicated to the WFEO-CEE and the WFEO community. Further information on Rio + 20 can be accessed through the links provided in the calendar of events or by contacting the WFEO-CEE Secretariat (david.lapp@engineerscanada.ca).

Sustainability and Industry (continued from page 1)

- technical and financial support to developing countries that will strengthen the technical capacities of national institutions regarding the opportunities and challenges of mining, including establishing and managing contracts with international mining companies and organizing participatory processes that includes the local community.

"Chair, the legacies and residual impacts of mining, such as the large physical footprint of a surface mine, should be carefully planned, implemented and monitored to minimize the environmental impacts during mining and to facilitate the return of the land to a sustainable post-mining use."

The CEE Task Group will continue to input the engineering view on mining into the UN process.

UNFCCC Meeting in Bonn

In May of 2012, the United Nations Framework Convention on Climate Change (UNFCCC) meetings will continue in Bonn. The WFEO-CEE delegation has proposed a side event titled: "Climate Vulnerability Assessment: Key Strategies, Lessons Learned, and the Social, Economic, Environmental Costing Component. The Triple Bottom Line!" Meetings are scheduled with national delegations to further the awareness of the engineer's role in adaptation.

WFEO at Rio +20 in June

In June of 2012, the world will come together in Rio de Janeiro, Brazil. Known as Rio +20, the conference references a timeline since changing climate and sustainability were recognized by the UN membership as important areas for policy discussions. WFEO is a co-leader of the "Scientific and Technological Major Group" and in this capacity has the ability to input into the UN deliberations. Our focus has been on raising the profile of engineers and engineering solutions through our input on action initiatives. Through focused seminars and side events, negotiating session interventions and written input into the Conference Chair's "Zero Draft", WFEO maintains the engineering profile on the global stage. Opportunities are available for WFEO national members, and through them, interested individuals. Our experience to date shows that the relationship between active national members and their respective governments are strengthened by becoming involved. We welcome your interest in these opportunities.

Looking Towards CEE's Future

Lastly, I provide some comments and a perspective on the future of the CEE. The WFEO bylaws limit the term (maximum two, four-year terms) that a member country can host a technical standing committee. We have entered our second term and an inherent requirement will be to identify, engage and transition the CEE to a new host country at the General Assembly scheduled for 2015 in Japan. I invite national members to attend and participate in our face-to-face meeting in Ljubljana, Slovenia, in September, and to consider the hosting of this committee beyond 2015.

WFEO-CEE and Related Upcoming Events

- June 27, 2012 (TBC) WFEO-CEE Teleconference Meeting #5
- Sept. 16, 2012 Ljubljana, Slovenia – WFEO-CEE 2012-2017 Face-to-Face Meeting Meeting #5
- Sept. 17–21, 2012 Ljubljana, Slovenia – WFEO-CEE Session on Green Buildings World Engineering Forum, Sustainable Construction for People

United Nations Framework Convention on Climate Change

- May 14–25, 2012 Bonn, Germany – Bonn Climate Change Conference www.unfccc.org
- Nov. 26–Dec. 7, 2012 Doha, Qatar – Conference of the Parties Meeting No. 18 www.unfccc.org

United Nations Commission on Sustainable Development

- June 11–15, 2012 Rio de Janeiro, Brazil – ICSU-UNESCO-WFEO-ISSC-Brazilian Ministry of Science, Technology and Innovation and Brazilian Academy of Sciences Forum on Science, Technology and Innovation for Sustainable Development www.icsu.org/rio+20/science-and-technology-forum
- June 16, 2012 Rio de Janeiro, Brazil – WFEO Seminar on Sustainable Communities www.wfeo.net
- June 20–22, 2012 Rio de Janeiro, Brazil – Rio +20 – United Nations Conference on Sustainable Development www.uncsd2012.org

Meetings Relating to WFEO-CEE Themes

Themes 1 and 2 – Climate Change Adaptation and Mitigation

- May 27–29, 2013 Montreal, Canada – Engineering Institute of Canada – 3rd Climate Change Technology Conference 2013 www.cctc2013.ca

Theme 3 – Engineering and Agriculture

- July 8–12, 2012 Valencia, Spain – International Commission of Agricultural and Biosystems Engineers – 3rd CIGR International Conference of Agricultural Engineers www.cigr.ageng2012.org

Theme 4 – Sustainability and Mining

- Oct 15–20, 2012 Tongji University, Shanghai, China – Underwater Mining Institute: Marine Minerals: Finding the Right Balance of Sustainable Development and Environmental Protection http://www.smenet.org/page/index.cfm?title=2012_UMI_Attendee_Information
- June 30 – July 3, 2013, Milos, Greece – SDIMI 2013 Sustainable Development in the Minerals Industry http://www.sdimi.org

Theme 6 – Infrastructure in Developing Countries

- May 24–26, 2012 New Delhi, India – American Institute of Engineering and Sustainable Development, International Civil Engineering and Sustainable Infrastructure Conference www.aiesd.org