

**Inputs provided by: World Federation of Engineering Organizations – Committee on Engineering and the Environment**

**1. General description of mandates and objective(s) of your organization / associated network with institutional structure**

The World Federation of Engineering Organizations (WFEO) is an international, non-governmental organization representing the engineering profession worldwide. It serves society and is recognized as a respectable and valuable source of advice and guidance on the policies, interests and concerns that relate to engineering and technology.

Founded in 1968 by a group of regional engineering organizations, under the auspices of the United Nations Educational, Scientific and Cultural Organizations (UNESCO) in Paris, the World Federation of Engineering Organizations (WFEO) brings together national engineering organizations from over 90 nations and represents some 20 million engineers from around the world. It is the sole body representing the engineering profession of all kinds and disciplines at the world level.

WFEO has ten standing committees that deal with specific subject areas such as environment, energy, capacity-building, anti-corruption, disaster risk management, women and youth. Each standing committee is hosted and chaired by a Member Country of the Federation. The Standing Committee on Engineering and the Environment is hosted by Engineers Canada.

The Standing Committee on Engineering and the Environment (CEE) enables WFEO and the global engineering profession to support the achievement of the UN Millennium Development Goals through the development, application, promotion and communication of environmentally sustainable engineering practices and technologies, the adaptation of infrastructures to the impacts of a changing climate, clean technologies and engineering practices to mitigate climate change; providing engineering perspectives on the agricultural supply chain to United Nations agencies and commissions, developing and promoting good engineering practices to achieve sustainability in mining and preparation of guidelines for engineers on responsible environmental stewardship and sustainable practices.

The CEE represents the World Federation of Engineering Organizations in the UNFCCC Nairobi Work Program on Impacts, Vulnerabilities and Adaptation to Climate Change and at meetings of the UNFCCC. It has registered an Action Pledge with NWP entitled "Adaptation of Sustainable Civil Infrastructure to Climate Change Impacts". The objectives in this pledge are as follows:

1. To develop and implement engineering tools, policies and practices for risk assessment and adaptation of existing and new civil infrastructure to climate change.
2. To build knowledge, experience and appropriate techniques to enhance the technical capacity of engineers to adapt civil infrastructure to climate change, particularly within developing and least developed countries.

Adaptation of civil infrastructure to avoid or minimize loss or damage requires methods to assess the risks of extreme weather events now and in the future as well as the creeping effects of changing climate. It also involves developing in-country expertise and experience of engineers as well as other professionals and practitioners engaged in the planning, design, construction, management, operation and maintenance of

infrastructure.

Assessment of climate risks includes the analysis of historical climate information to develop a current profile of mean and extreme climate parameters. These contribute to the understanding of current climate risks. Future profiles of climate parameters relevant to civil infrastructure require the use of climate projection methods, including climate models as appropriate. This is an evolving area so part of the scope of work under these two objectives includes engagement with climate scientists i.e. those engaged in methods of climate projection and climate professionals who have expertise to interpret the results for engineers.

The PIEVC Engineering Protocol has been proven to provide a reliable and replicable risk profile at a screening level across a wide variety of infrastructure types. Its use has proven cost-effective by providing insight into the highest risks that require attention in the short to medium term. The documented results provide a record of due diligence by engineers and decision-makers that backs up decisions around infrastructure adaptation to changing climate.

## **2. Relevant operational framework(s)**

Engineers Canada is the national federation of the constituent associations that regulate the practice of engineering in Canada. It has worked closely with the Canadian Federal government, particularly Natural Resources Canada and Environment Canada to develop and implement an infrastructure engineering vulnerability assessment tool known as the PIEVC Engineering Protocol. It is used to assess the risks of loss and damage, as well as other types of impacts, from extreme current and future climate.

The Canadian Federal Government has been a partner and funder of Engineers Canada for the application of this protocol in Canada as well as other countries. International applications are facilitated through Engineers Canada membership in WFEO and its role as host and chair of the Committee on Engineering and the Environment. Engineers Canada has performed the role of program development and administration on behalf of the WFEO-CEE.

The CEE works with its fellow national engineering organizations that are members of the World Federation of Engineering Organizations. Together we organize and implement infrastructure climate risk assessment work on a project basis. The scope normally includes risk assessment, development of adaptation actions or recommendations and presentations to government policy and decision-makers. This includes the development of in-country institutional and individual capacity for subsequent assessments. This cooperation is facilitated through a partnership agreement that is co-signed by Engineers Canada and the national member of the World Federation of Engineering Organizations.

The national organization partner in the country provides the interface with the national government of the country to select the infrastructure to be assessed. The focus is on public infrastructure owned and normally operated by governments, usually at the national level. Engagement of the relevant national agencies responsible for the ownership and regulation of infrastructure are engaged as well as the national meteorological organization. These groups support the execution of the risk assessment by providing information and data on the infrastructure, providing climate data and information as well as participate in the risk assessment process in accordance with the Protocol.

To date, financial resources for assessments in countries outside of Canada have been provided by the

Canadian Federal government through the recently ended Fast Start Financing Program of the UNFCCC. Going forward, we are hoping to secure resources in the future through the Adaptation Fund, International Financial Institutions, international development agencies and possibly UNEP or UNDP. These would be set up as institutional programs within the country or region administered in accordance with the requirements of the funding agency or mechanism.

WFEO membership includes over 90 national members which serve as an immediate and accessible network for leading or facilitating infrastructure climate risk and vulnerability assessment with their national governments. This work can include information or data on climate-related loss and damage to infrastructure due to extreme weather events and creeping effects of long-term changes in climate

The mandate of the WFEO-Committee on Disaster Risk Management, another standing committee of the WFEO is to facilitate a paradigm shift from focusing on emergency response and recovery to risk management before disaster occurs, including those from climate. The process is supported by vulnerability monitoring and development of tools such as standards to measure risks and preparedness levels in an integrated approach in order to build capacity to better respond to disasters from climate events and others.

### **3. Focus areas of risk management for loss and damage associated with climate change impacts**

#### **(a) Assessing the risk of loss and damage associated with the adverse effects of climate change, including slow onset impacts;**

Various types of infrastructure that vary in size and complexity have been evaluated across Canada. Potential Loss and Damage is part of the risk assessment process and contributes significantly but not exclusively to risk estimates. There are other factors that contribute so that the risk estimate uses a holistic approach. Types of infrastructures that have been assessed include various types of buildings, roads, bridges and culverts, potable water supply systems, stormwater and wastewater systems, water control systems e.g. dams, electrical distribution systems, airports. There is no restriction on the type of infrastructure that can be assessed for the risk of loss damage and other impacts. Effects of slow onset of climate change through indicators can and have been included in some assessments

The WFEO Committee on Disaster Risk Management has published two guidelines that are relevant to responding to the effects of disasters from natural events, including climate:

1. Water-related disaster risk management
2. Earthquake disaster risk management

#### **(b) Identifying options and designing and implementing country-driven risk management strategies and approaches, including risk reduction, and risk transfer and risk-sharing mechanisms;**

The strategies and approaches that result from this work come from an engineering perspective. These focus on design changes, operations or maintenance changes and so forth as these relate to the infrastructure being assessed. In the longer term a growing database of results from these assessments leads to the review of vulnerabilities to determine if there is a need to adjust design codes and standards to reduce vulnerability.

Lastly many adaptation recommendations focus on “soft” approaches such as changes to operating procedures, training of individuals and changes in local policies and procedures such as procurement.

Recommendations normally include the need for more detailed engineering assessment of risks for medium risk interactions.

**(d) Implementing comprehensive climate risk management approaches, including scaling up and replicating good practices and pilot initiatives;**

Once enough assessments have been undertaken of a particular infrastructure in the country a review of the results to establish patterns of vulnerability is warranted. The aim is to make recommendations for reviews of codes and standards used by engineers in design. Preliminary analysis has been completed in Canada but not internationally. There is not yet a sufficient number of assessments complete to make evidence based recommendations.

**(e) Promoting an enabling environment that would encourage investment and the involvement of relevant stakeholders in climate risk management.**

Engineers Canada and WFEO-CEE are promoting infrastructure climate risk assessment as a key first step towards planning and implementing appropriate and cost-effective adaptation strategies and actions to address climate risks. Target audiences include engineers, other professionals, climate scientists, infrastructure owners, engineering consultants, policy and decision-makers. If the requirement for such work appears in project/funding approval applications and processes as well as part of procurement policy and procedures, this will create the demand and resources will be allocated for this important work. Meanwhile we work to build, capacity amongst engineers and other professionals to assure there is ability to respond competitively when the demand comes.

In addition, the WFEO has another standing committee on capacity-building. It works in partnership with the CEE where capacity-building is a key component. The Capacity-Building Committee has developed a comprehensive document entitled “Guidebook for Capacity Building in the Engineering Environment”. It is available on the WFEO website at [www.wfeo.net/kc\\_publications\\_enewsletters](http://www.wfeo.net/kc_publications_enewsletters) .

#### **4. Geographic coverage**

Worldwide through member organizations in over 90 countries. Focus is on developing and newly developed countries which need infrastructure vulnerability assessment and in-country capacity development. The primary focus outside Canada to date is Latin and South America. External financial resources have been secured for individual projects in Costa Rica and Honduras.

Further expansion in these regions is a priority but dependent on the availability and timing of financial resources. Expansion to other regions of the world will depend on the availability of external financial resources and willing partners. These include the national members of the World Federation of Engineering Organizations who can facilitate and participate in the development of this work in their country or region.

#### **5. Key stakeholders**

Owners and operators of public infrastructure are key stakeholders. In most developing countries these are government agencies and departments.

The national meteorological organization is a key contributor to the climate analysis and projections required to estimate risk. Support of this agency and integration of meteorologists and climate scientists is essential.

The availability and willingness of a national engineering organization is needed to lead the local effort. There must be enough capacity of individual engineers in terms of skill sets and willingness to learn and dedicate themselves to this type of work to make it viable. The national engineering organization serves as the local partner and executing agency managing the interface with the government infrastructure owner.

Other key stakeholders are other government agencies who have some responsibility to deal with climate change as well as other departments of owners of certain types of infrastructure. Exposure to these agencies is key to wider acceptance and implementation of loss and damage risk assessment.

Other key stakeholders include national and international funding bodies that can contribute the resources necessary to undertake the risk assessment and apply its findings towards adapting the infrastructure to reduce loss and damage.

Another key stakeholder is the World Meteorological Organization (WMO). WFEO has a Memorandum of Understanding with WMO that focuses on climate information needs of engineers. The scope includes a listing of climate parameters needed by engineers to support assessment of infrastructure for the risk of loss and damage due to current and future climate.

## **6. Implementation modality / delivery mechanisms**

Please provide information related to the technical, financial and institutional support mechanism

Technical support is provided by the Canadian engineering community that has executed vulnerability assessment in Canada using the Protocol. We also have access to a number of climate professionals in Canada that have contributed in an advisory or technical support capacity to all assessments completed in Canada and internationally.

Engineers Canada licenses the use of the Protocol at no financial cost. Staff maintain the Protocol and provide support and advice in its use. We also facilitate the delivery of programs and occasionally will administer contracts for individual assessments. We engage or forward the names of consultants and consulting companies to the owner who wishes to undertake the assessment. We do not do the detailed consulting work.

Financial support is secured through agreements with governments or owners of the infrastructure to be assessed. They provide the funding to cover the costs of executing the assessment. These costs include the services of a consultant and climate expertise to execute the Protocol and prepare the reports and documentation. The assessment team normally includes a consultant hired to run the assessment process, a climate scientist or firm that provides the climate information, the infrastructure owner staff and some outside advisers that form the project advisory committee. Engineers Canada staff and volunteers provide additional support and advice in the use of the Protocol as well as the design and operation of the infrastructure.

Please provide information related to reporting, if any

The WFEO-CEE has submitted progress reports on its Action Pledge to the NWP for the past several years. See below for information on individual reports and outputs.

### **7. Key activities / outputs to date**

Engineers Canada has completed assessments of nearly 30 infrastructure systems across Canada. Reports and presentations on these assessments are available at [www.engineerscanada.ca/pievc](http://www.engineerscanada.ca/pievc)

Two international assessments have been completed in Costa Rica (Limon sewage treatment plant) and Honduras (four highway bridges). These reports are available by request to the individuals listed in the contacts below. These will be posted on their respective websites soon.

The PIEVC Engineering Protocol is available for one-time or multiple use through a license agreement with Engineers Canada at no financial cost.

Engineers Canada has delivered nearly 30 training workshops across Canada to engineers and other infrastructure professionals. International training workshops on the Protocol have been delivered in Brazil, Costa Rica, Honduras, Guatemala and Panama. These workshops can be delivered locally on a cost recovery basis that would include covering costs of travel for trainers and guest speakers.

Recently an on-line version of a university level short course was delivered to engineering students and professors in Honduras and Costa Rica. An on-line version of the training workshop is also available. Both are delivered on a cost recovery basis. Further information can be obtained through Engineers Canada.

The WFEO-CEE has delivered side events on international applications of the Protocol at the UNFCCC Bonn Climate Talks every year since 2009.

### **8. Any additional information and contact details**

Mr. Darrel Danyluk, FEC, P.Eng.  
Chair, WFEO Committee on Engineering and the Environment  
Vice-President, World Federation of Engineering Organizations  
NWP Focal Point Contact  
Engineers Canada  
Ottawa, Ontario Canada  
Tel: +1-613-232-2474  
[darrel.danyluk@engineerscanada.ca](mailto:darrel.danyluk@engineerscanada.ca)

Ing. Freddy Bolanos Cespedes

Tramite de proyectos, CFIA

San Jose, Costa Rica

Tel: (506) 2202-3900 (4057)

[fbolanos@cfia.cr](mailto:fbolanos@cfia.cr)

[www.cfia.or.cr](http://www.cfia.or.cr)

Ing. Jorge Paz

Vice-President, CICH

San Pedro Sula, Honduras

Tel: (504) 2565-3519

[Jf\\_paz@hotmail.com](mailto:Jf_paz@hotmail.com)

[www.cichorg.org](http://www.cichorg.org)

David Lapp, FEC, P.Eng.

Manager, Professional Practice

Engineers Canada

Ottawa, Ontario, Canada

Tel: +1-613-232-2474

[david.lapp@engineerscanada.ca](mailto:david.lapp@engineerscanada.ca)

[www.engineerscanada.ca/pievc](http://www.engineerscanada.ca/pievc)

Contact for further information on PIEVC Engineering Protocol, training and projects completed