



Progress Report

WFEO Action Pledge for Nairobi Work Program

Date: December 2, 2013

Name of Organization: World Federation of Engineering Organizations

Date: November 29, 2013

Title of Initiative:

Adaptation of Infrastructure to Climate Change Impacts

Elements of Action Pledge on which progress is reported here:

Element #1: To develop and implement engineering tools, policies and practices for risk assessment and adaptation of existing and new civil infrastructure to climate change.

Element #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

NWP work areas to which the updates are relevant:

Methods and tools, climate change risks and extreme events, adaptation planning and practices

Activities Undertaken and Key Outputs

Action Pledge Element #1: Tools, Policies and Practices

Activity #1: Further Development and Evaluation of the PIEVC Engineering Protocol

The PIEVC Engineering Protocol is a screening-level risk assessment process used to assess the engineering vulnerability and risks to civil infrastructures and the built environment by the impacts of current and future climate. The results are used to develop engineering recommendations for adapting the vulnerable components of the infrastructure to increase their resilience to current and future climate impacts.

The Protocol is a five-step process that is based on the principles of risk assessment. Climate risks are assessed for current and future climate. It requires analysis of historical climate data as well as climate projections. The participation of climate scientists and specialists is critical to the process. It engages many engineering and science disciplines, managers, operations and

maintenance personnel, emergency response, decision-makers and other stakeholders in a structured process to establish levels of risk and impact of various climate parameters on infrastructure hard and soft (e.g. impact on personnel) components.

It has been used to assess existing infrastructures as well as new ones in the planning and design phases.. It can be used to assess any type of infrastructure in any geographic location to a degree of detail and scope that is defined by the user.

The Protocol now has a Triple Bottom Line Decision Support Module –an additional tool that evaluates the economic, social and environmental impacts of adaptation recommendations and options through a multi-factor analysis process. This includes the option of no adaptation i.e. continuing the status quo or no action. The Module is now available for use through a license agreement, similar to the Protocol. It is provided as an additional (and optional) part of the Protocol. It is not available as a separate tool as it is closely integrated with it.

The Protocol is the intellectual property of Engineers Canada, which is a member of the WFEO. It is available for international use through a license agreement. The Protocol and its worksheets are now available in three languages – English, French and Spanish.

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Activity #2: Engineering Vulnerability Assessments of Civil Infrastructures and the Built Environment

Several new case studies of infrastructure engineering vulnerability assessment were completed in 2013 including:

- City of Miramichi Highway Assessment (New Brunswick, Canada)
- Union Water Supply System Assessment (SW Ontario, Canada)
- Trois Rivières Stormwater Management System Assessment (Quebec, Canada)
- Honduras Highway Assessment Project - Honduras

Assessments in progress as of November 2013 include:

- Pearson Airport Stormwater Management System – Toronto, Ontario, Canada
- City of Nelson Stormwater Management System (British Columbia, Canada)
- City of Quebec Estimaerville Stormwater Management System Design (Quebec, Canada)
- British Columbia Ministry of Highways System Assessment (3 segments)

The reports are available at (www.engineerscanada.ca) or by contacting David Lapp, FEC, P.Eng. (david.lapp@engineerscanada.ca). Several more assessments are in the planning stages and once the projects begin, they will be reported in the next period.

Activity #3 – Development of Model Guide on Climate Change Application Principles for Engineers

- Development of a model practice guide on climate change adaptation principles for infrastructure engineers

Action Pledge Element #2: Capacity-Building

Activity #1 – Honduras Highway Bridge Climate Risk Assessment

The objective was to build awareness and capacity among Honduran engineers to undertake vulnerability assessments to assist engineers in improving the resiliency of their infrastructures to climate impacts. One of the trainers was the Project Manager from Costa Rica who presented results from their project in Costa Rica that was previously reported.

- Completed a major assessment and capacity-building project with the Colegio of Ingenieros Civiles de Honduras (CICH)
- Led by Honduran engineers with advice and workshops organized in partnership with Engineers Canada and included work with the country's meteorological service to build the capacity of meteorologists to support climate risk assessment work. Forty (40) engineers and other professionals were engaged and supported the project. Capacity building was through a "learn by doing approach" complemented through coaching and mentoring by Canadian engineers and climate scientists, and the development of university level course materials.
- Assessed climate risks and engineering vulnerabilities of four highway bridges located in different geographic regions and climatic zones in Honduras
- Reviewed Honduras procurement policies, construction practice standards and codes to determine gaps and opportunities to incorporate consideration of climate
- Attached as a separate file is a summary of the project.

Activity #2 – PIEVC Engineering Protocol International Workshops

- Delivered a side event at the UNFCCC Bonn Meetings – June 2013
- Delivered a one-day workshop on the Protocol and its international applications at the World Engineers Summit 2013 in Singapore – September 2013
- Held an on-line short course (four sessions) over a 10 day period (July 9-18). The Honduras Highways project was used as the primary example. The lecturers were located in various places – several locations in Canada, Costa Rica and Honduras.
- Members of the Canadian project team and individuals from Costa Rica and Honduras delivered the lectures and examples. We received 88 registrations from Costa Rica, Honduras, Canada, United States and Germany. Most of them were Costa Rican and Honduran university engineering students.

Activity #3 – Other Outreach Activities

- Presentations to staff at the German International Development Agency (GIZ) - April 2013

- Presentation at the International Workshop on Disaster Risk Management on South American Integration Infrastructure – Santiago, Chile – September, 2013
- Presentation and panel discussion at IADB Public Private Partnerships and Climate Change Adaptation Workshop – Barbados, November 2013

Potential application/implication for the adaptation community under the NWP

Academics

The PIEVC Engineering Protocol and Triple Bottom Line Module can be applied to research vulnerabilities of all types of infrastructure. It could also be used as a teaching tool for the principles of risk assessment as it relates to infrastructure and climate change impacts.

Practitioners

An available tool with demonstrated applications through completed assessments that are publicly available. These help enable engineers, planners and decision-makers to assess the engineering vulnerabilities and climate risks to help justify adaptation decisions to account for climate change impacts on civil infrastructure in design, operations and maintenance

Enable practitioners to demonstrate due diligence in considering climate change for infrastructure which is needed for insurance and liability concerns

Enable procurers to specify requirements to consider climate change risks in the design or retrofitting of infrastructure using assessment tools that are now available for use.

Policy-makers

Results will lead to recommendations on adjustments or reviews of infrastructure codes, standards and practices within countries or regions.

Results will lead to recommendations and implementation of policies and procedures to conduct climate risk assessment as part of any procurement or operational review of civil infrastructure and the built environment.

Educators

Results of assessments can be used to develop presentations, workshops and course materials in climate change risk assessment as it relates to civil infrastructure. Personnel who worked on these case studies could be invited to serve as guest speakers or even trainers.

Journalists

There is a considerable body of written reports that could be used for articles in technical publications, workshops and at conferences.

Next Steps

Planned Activity #1 – Development of a Knowledge Base of Infrastructure Climate Change Engineering Vulnerabilities

Description:

The results of case studies of individual infrastructures in Canada have now been consolidated into an electronic knowledge base, initially compiled in Microsoft Excel. A second generation of this knowledge base will be migrated to a more robust IT platform to enable more automated compilation of results and analysis of particular climate or infrastructure parameters of interest.

Its first application was to evaluate the need for reviews of infrastructure codes, standards and related instruments in Canada based on component that are highly vulnerable or at high risk from particular climate parameters. This work was completed in September 2012 and will be continued as new case studies and assessments are completed.

If there is interest in the knowledge base framework it could be customized for use internationally or by other countries.

Outputs:

A database on climate change vulnerabilities for various infrastructure categories that can be used for research purposes will be created.

Planned Activity #2 – Additional Engineering Vulnerability Assessments of Civil Infrastructure and the Built Environment

Description:

More assessments will be undertaken for countries and regions outside Canada where funding can be secured. Partnerships will be formed with country-based national engineering organizations through the World Federation of Engineering Organizations network. We will work with the national organizations to approach government departments that are responsible for the country's infrastructure. International Financial Institutions and development agencies will be approached for funding assistance.

The objective is to secure one or more long-term, regionally-based funding program in partnership with financial institutions for infrastructure climate risk assessments and build in-country institutional and practitioner capacity. The capacity-building will be extended to include planning and implementing cost-effective adaptation strategies based on sustainability criteria to reduce climate risks to an acceptable level.

Outputs:

Assessment reports that will be placed on the website www.engineerscanada.ca and www.wfeo.net as they become available. Results will be entered into the vulnerability database.

Planned Activity #3: On-Line Training and Workshop Delivery

Description:

With completion of the Honduras on-line short course at the conclusion of the Honduras project, the capacity now exists to offer such training to other countries and regions of the world. Efforts will be made through the WFEO network to offer such training on a cost-recovery basis.

Workshops and training will be customized to the needs and expertise of the in-country professionals. The scope will be extended to the principles, strategies and methods to implement infrastructure adaptation actions.

Outputs:

A series of successfully delivered workshops and training that increases the capacity of professionals to plan and execute vulnerability and risk assessments of infrastructures and the built environment in their country.

Planned Activity #4 – Knowledge Development and Capacity Building for Infrastructure Vulnerability Assessment in Newly Developed and Developing Countries

Description:

The overall goal is to build the capacity for engineers to lead engineering vulnerability assessments of their civil infrastructure and built environment to the impacts of future climate change. Each country will complete a vulnerability assessment for one of their key infrastructures that can be used as an example for follow-on assessments. Initially projects will be proposed using the model that was successfully executed in Costa Rica and Honduras. However there may be adjustments needed based on local circumstances

These projects will be undertaken on an opportunity basis subject to the availability of funding and qualified personnel.

Outputs:

Training workshops for practitioners will be delivered in the newly developed and developing countries with a particular focus on Latin America and Caribbean nations. The Costa Rica and Honduran case studies will be used as examples of the application of the Protocol in the region. These workshops include a presentation on the local and/or regional climate to improve awareness and knowledge of the impact of current and future climate on infrastructures.

Reports on engineering vulnerability assessments of individual infrastructures will be completed in newly developed and developing countries and executive summaries will be made available through the WFEO website (www.wfeo.net) under the Committee on Engineering and the Environment.

Workshop materials will be developed in English, French and Spanish that could be re-used with some revisions for similar projects in other countries.