

CANADIAN CIVIL ENGINEER
L'INGÉNIEUR CIVIL CANADIEN

civil



**Civil Engineering and
International Development**
Génie civil et
développement international

SUMMER / ÉTÉ
2011

28.3

CSCE Excellence in Innovation in Civil Engineering Award 2011

The Atrium, Victoria, B.C.



Architect: D'Ambrosio Architecture + Urbanism.

(l-r): Raafat El-Hacha - University of Calgary,
Gamal Ghoneim and Gerry Carson - DIALOG,
Don Zakariasen - Lafarge

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FROM THE EDITORS / MOT DES RÉDACTEURS

LOUISE NEWMAN LOUISE@CSCE.CA

GUEST EDITOR: RON DROSTE PH.D., CHAIR, CSCE INTERNATIONAL AFFAIRS COMMITTEE



In my new position as chair of the CSCE International Affairs Committee and guest editor of this issue I welcome you to its focus on international activities and issues. It is technology compounded with population growth that has not merely changed human lives but changed the world. Thomas Friedman (*The World is Flat and Hot, Flat and Crowded*) notes the world as flat due to advancements in connectivity through technology, and Jared Diamond (*Collapse*) has clearly defined the physical interconnectivity of the world. It's impossible to live in isolation and not participate on the international scene or be affected by actions elsewhere. But yet, when travelling, the absence of Canadian firms working at the international level is noticeable and often commented on by our international contacts.

Canadians are at the forefront of technology in the developed world and obviously have expertise that will greatly benefit developing countries. And developing countries are developing! Infrastructure is a key to any sustainable development which is desperately needed as these countries attempt to advance in decades to levels that were achieved over two centuries in the

developed world. Development problems are exacerbated by burgeoning populations, which is the underlying issue prompting many scientists and great thinkers to advance troubling forecasts.

The articles in this issue give examples of projects that span opportunities for fresh graduates to senior engineers. Engineers Without Borders (EWB) puts the idealism of youth to useful purpose. The Kumbo article compliments the EWB article with work from experienced personnel to provide improvement, at the most basic level, in the lives of people in marginal conditions. It's obvious that North American lifestyles are unsustainable on a world scale but a more dramatic illustration of the sensitivity of the environment to much less extravagant lifestyles is illustrated by the Shiyang article. The situation is a perfect illustration of tradition trumping sustainability. As well, the role of the International Affairs Committee of CSCE is explained in another article. Its fundamental role is to serve the membership on international matters. Have a read and provide your feedback. Will technology only advance consumerism resulting in calamity or actually lead to sustainable solutions? ■



Winner: 2011 APWA Project of the Year

Sudbury South End Sewage Rock Tunnel

R.V. Anderson Associates Limited (RVA) wins Project of the Year Award from the American Public Works Association. The \$31 M Sudbury South End Sewer Tunnel project involved design and construction services for a 6.5 km long rock tunnel sewer system, blasted through bedrock more than 25 metres below the surface. RVA's innovative approach allowed the City of Greater Sudbury to expand capacity and eliminate several pumping stations, realizing significant savings over the next 60 years.



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Dans mes nouvelles fonctions de président du comité des affaires internationales de la SCGC et de rédacteur invité de ce numéro, je vous présente cette livraison qui traite des activités et des dossiers internationaux. La technologie et la croissance démographique ont bouleversé la vie des humains et changé le monde. Thomas Friedman (auteur de *The World is Flat and Hot, Flat and Crowded*) considère que le monde est plat suite aux progrès de la connectivité attribuables à la technologie, et Jared Diamond (*Collapse*) a donné une définition claire de l'interconnectivité physique du monde. Il est maintenant impossible de vivre isolé, sans participer sur la scène internationale ou sans être affecté par ce qui se passe ailleurs. Pourtant, lorsque nous voyons, l'absence d'entreprises canadiennes travaillant au niveau international saute aux yeux et est souvent soulignée par nos amis des autres pays.

Les Canadiens sont à la fine pointe de la technologie dans la partie développée du monde. De toute évidence, nous avons des compétences susceptibles d'aider les pays en voie de développement. Les pays en voie de développement se développent! Les infrastructures sont le fondement de ce développement durable qui est si nécessaire pour ces pays qui tentent de franchir en quelques décennies une évolution que le monde développé a vécu pendant des siècles. Les problèmes de développement sont exacerbés par la croissance des populations, qui est un problème sous-jacent qui incite nombre d'hommes de science et de grands penseurs à énoncer des prévisions troublantes.

Les articles de ce numéro présentent des exemples de projets qui offrent des occasions aux ingénieurs jeunes et vieux. Ingénieurs sans frontières oriente l'idéalisme des jeunes vers des choses utiles.

L'article sur Kumbo complète l'article sur Ingénieurs sans frontières en signalant le travail de gens expérimentés pour améliorer, au niveau le plus élémentaire, la vie de personnes vivant dans des conditions marginales. Il est évident que le style de vie nord américain est insoutenable au niveau mondial. Toutefois, l'article sur Shiyang illustre le fait que l'environnement est aussi sensible à des modes de vie beaucoup moins extravagant. Cette situation illustre parfaitement comment les traditions nuisent à la durabilité. Un autre article traite du rôle du comité des affaires internationales de la SCGC. Son rôle fondamental consiste à servir les membres en matière d'affaires internationales. Lisez le tout et faites vos commentaires. La technologie servira-t-elle à faire augmenter la consommation et les risques de calamités, ou à créer des solutions durables? ■



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Hospital Chimney - Canada

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As the new President of the CSCE, my first daunting task was drafting my inaugural speech to members at the Annual General Meeting. The content of that speech expressed my opinions on the state of the Society and set the direction that I hope we will successfully travel during the next twelve months. Once that was out of the way my next task became writing this, my first article for Canadian Civil Engineer.

In a time line a little longer than a single generation, the world has experienced a paradigm shift in transportation. For a number of our grandfathers, air travel was the fanciful pursuit of a couple of bicycle mechanics in North Carolina in the early 1900's. To our fathers, air travel was a mode of transportation reserved for a select group of society with the means to indulge in this emerging form of travel. We now take it for granted; jumping on an airplane has become an everyday opportunity to move around the country and globally.

In regards to sustainability, we must move quickly to make a similar paradigm shift in the implementation of sustainability principles into our work. Where air travel has taken a generation to become everyday, implementing sustainability in our projects must become everyday with Civil Engineers now.

“As Civil Engineers, we are the caretakers of the environment and managers of the infrastructure that allows for a comfortable, healthy, safe lifestyle for most people on our planet.”

We are seeing this new mindset in some of today's projects. Old buildings are being repurposed. New buildings are being designed and constructed for future repurposing. New highways are being constructed to not only meet current needs but expandable for future needs with minimal throw-away.

As Civil Engineers, we are the caretakers of the environment and managers of the infrastructure that allows for a comfortable, healthy, safe lifestyle for most people on our planet. In order for society to continue to experience this, we must expand our role in incorporating sustainability principles into our projects. Within our own individual time lines, we must undergo a paradigm shift in our processes and design methods. We must position our profession as one that seeks to design and implement sustainable infrastructure.

At the Society's AGM in Winnipeg, in 2010, a new vision statement for CSCE was announced: *Leader in Sustainable Infrastructure*. Going forward from that announcement, CSCE has worked towards

re-profiling itself. We have been preparing a new business plan, *Vision 2020*, directly focused on taking a leadership role not only within the Civil Engineering community but within the cities and towns that we live and work in.

In 1993, CSCE first published Guidelines for Civil Engineering Practice, Our Commitment to a Sustainable Future. These guidelines work within our profession to encourage Civil Engineers to develop and promote a sustainability ethic. *Vision 2020* will be used to reinforce within and promote outside of our profession, that Civil Engineers are not only seeking sustainable solutions to repair our aging infrastructure but will advocate the implementation of sustainable alternatives for infrastructure improvements and expansion. The stakeholders in our projects must be made aware of the alternatives and the benefits.

Vision 2020 will be a living document for the metamorphosis of the CSCE into the voice for Civil Engineers and sustainable infrastructure. ■



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A titre de nouveau président de la SCGC, ma première tâche délicate consistait à rédiger le discours inaugural présenté aux membres réunis en assemblée générale annuelle. Ce discours exprimait mes opinions sur l'état de la SCGC et précisait l'orientation que j'espère imprimer à l'organisme au cours des 12 prochains mois. Une fois cette étape franchie, l'autre tâche était de rédiger ce premier article pour L'ICC.

En un peu plus d'une génération, le monde a vécu un changement de paradigme en matière de transport. Pour nombre de nos grands-parents, le voyage en avion n'était que le rêve de quelques mécaniciens de vélos de la Caroline du Nord, au début du 20^e siècle. Pour nos pères, le transport par avion était l'apanage d'un petit groupe de personnes capables de se payer cette nouveauté. Depuis, c'est devenu un acquis. Prendre l'avion est devenu un geste quotidien pour aller n'importe où sur terre.

En matière de durabilité, nous devons réaliser rapidement un changement de paradigme pour la mise en œuvre des principes de durabilité dans nos œuvres. Un peu comme le transport aérien qui est devenu une réalité quotidienne en une génération, la mise en œuvre de la durabilité dans nos œuvres doit devenir une réalité quotidienne dès maintenant, pour tous les ingénieurs civils.

« À titre d'ingénieurs civils, nous sommes les gardiens de l'environnement et les gestionnaires des infrastructures qui assurent le confort et la santé de la plupart des habitants de la planète. »

Certains projets contemporains témoignent déjà de cette nouvelle préoccupation. D'anciens édifices sont transformés. De nouveaux édifices sont conçus et construits en fonction de transformations à venir. De nouvelles autoroutes sont construites de façon à combler les besoins existants et à être adaptées aux besoins futurs moyennant un minimum de perte.

À titre d'ingénieurs civils, nous sommes les gardiens de l'environnement et les gestionnaires des infrastructures qui assurent le confort et la santé de la plupart des habitants de la planète. Pour que notre société continue de vivre ainsi, nous devons développer notre rôle en intégrant les principes de durabilité à nos œuvres. À l'intérieur de notre cadre, nous devons effectuer un changement de paradigme dans nos façons de procéder et dans nos méthodes de conception. Nous devons faire en sorte que notre profession soit en mesure de concevoir et de réaliser des infrastructures durables.

Lors de l'assemblée générale de Winnipeg, en 2010, un nouvel énoncé de principe a été proclamé par la SCGC : « *leader en matière d'infrastructures durables* ». À partir de cet

instant, la SCGC a entrepris de se redéfinir. Nous avons élaboré un nouveau plan d'affaires, *Vision 2020*, directement centré sur un rôle de leader au sein de la profession et au sein des cités et villes où nous vivons et travaillons.

En 1993, la SCGC a publié pour la première fois les Principes généraux pour la pratique du génie civil, qui est notre engagement pour un avenir durable. Pour notre profession, ces principes généraux incitent les ingénieurs civils à élaborer et à promouvoir une éthique de la durabilité. *Vision 2020* servira à étayer, à l'intérieur comme à l'extérieur de la profession, le fait que l'ingénieur civil ne se contentera pas uniquement de chercher des solutions durables pour réparer nos infrastructures vieillissantes, mais plaidera aussi pour la mise en œuvre d'alternatives durables pour améliorer et développer nos infrastructures. Nos partenaires doivent être conscients des alternatives et des avantages qu'ils offrent.

Vision 2020 sera un document vivant pour assurer la métamorphose de la SCGC et en faire la voix de la profession et des infrastructures durables. ■

SAVE THE DATE!
JUNE 6-9 JUIN 2012

CONFERENCE CONGRES **2012 EDMONTON**

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2012 CSCE Annual General Meeting and Conference
12th International Environmental Specialty Conference
3rd International Structural Specialty Conference
9th International Transportation Specialty Conference
1st International Conference on Sustaining Public Infrastructure

Assemblée générale annuelle et congrès SCGC 2012
12^{ème} Conférence internationale spécialisée sur l'environnement
3^{ème} Conférence internationale spécialisée sur les structures
9^{ème} Conférence internationale spécialisée sur les transports
1^{ère} Conférence internationale sur les infrastructures durables

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CSCE ANNUAL CONFERENCE / OTTAWA 2011 / CONGRÈS ANNUEL SCGC WINNERS STUDENT AWARDS—GAGNANTS PRIX ÉTUDIANTS

UNDERGRADUATE STUDENT POSTER COMPETITION / AFFICHES DES ÉTUDIANTS DE PREMIER CYCLE

1st Place / 1^{ère} place

Roanne Kelln, Christopher Kathol—University of Saskatchewan
*Mechanistic Evaluation of Warm Mix Asphalt
Surfacing for C.S.35–14*

2nd Place / 2^e place

David Salem, Athir Nader, Mudasser Noor, Mohammed Zaidi,
Alexander Nott, Ramy Hamza—University of Ottawa
Ottawa Multi-Sport Olympic City

3rd Place / 3^e place

Maryam Kolahdoozan, Peter Filev, Fredi Petritaj—Ryerson
University
*Development of Sustainable Unshrinkable Fill
Using Alternative Aggregate Sources*

GRADUATE STUDENT COMPETITION / PRÉSENTATIONS DES ÉTUDIANTS DE 2^E OU 3^E CYCLE

20th Hydrotechnical Conference

Seth Logan—University of Ottawa
*"Morphological and Numerical Modeling of a Highly Dynamic Tidal
Inlet at Shippagan Gully, New Brunswick"*

3rd International/9th Construction Specialty Conference

Bijan Ahmadi—University of Toronto
"Work Zone Throughput Models for Southern Ontario"

2nd International Engineering Mechanics and Materials Specialty Conference

Zaid Al-Sadoon—University of Ottawa
"Seismic Retrofitting of Non-Ductile Reinforced Concrete Moment Resisting Frame Structures"

2011 General Conference

Todd Carroll—University of Texas at Austin
"Passenger Rail Applicability: Opportunities and Challenges in Texas"

2011 HYDROTECHNICAL AWARD

The CSCE Hydrotechnical Division is pleased to announce the winner of the 2011 Hydrotechnical Award for the best masters thesis in Canada related to water engineering and water management. The award is sponsored by Golder Associates Ltd. The 2011 winner is Michael Johann Neil Wagner of the University of Alberta, Department of Renewable Resources, for his thesis entitled: "Hydrologic Risk Assessment Framework for Alberta's Green Zone" under the supervision of Dr. Uldis Silins, Ph.D., RPF



CSCE PRESIDENT'S AWARD FOR BEST STUDENT CHAPTER 2010–2011 / LE PRIX DU PRÉSIDENT SCGC POUR LE MEILLEUR CHAPITRE ÉTUDIANT 2010–2011

British Columbia Institute of Technology



CSCE National Honours and Awards Call For Nominations

Nominations are invited at any time for the awards listed below; those nominations received by November 15, 2011 will be considered for 2012 awards to be presented at the CSCE Annual Conference in Edmonton, AB in June 2012. Please submit nominations, clearly stating the award for which the nomination is made, by e-mail to louise@csce.ca, or mail to: Ms. Louise Newman, The Canadian Society for Civil Engineering, 4877 Sherbrooke St. W., Montreal, QC H3Z 1G9.

A.B. SANDERSON AWARD

Recognizes outstanding contributions by a civil engineer to the development and practice of structural engineering in Canada.

ALBERT E. BERRY MEDAL

Recognizes significant contributions by a civil engineer to the field of environmental engineering in Canada.

CAMILLE A. DAGENAIS AWARD

Recognizes outstanding contributions by a civil engineer to the development and practice of hydrotechnical engineering in Canada.

E. WHITMAN WRIGHT AWARD

Recognizes significant contributions by a civil engineer to the development of computer applications in civil engineering in Canada.

EXCELLENCE IN INNOVATION IN CIVIL ENGINEERING AWARD (deadline for nominations is Dec. 15, 2011).

Recognizes excellence in innovation in civil engineering by an individual or a group of individuals practicing civil engineering in Canada, or a Canadian engineering firm, or a Canadian research organization.

HORST LEIPHOLZ MEDAL

Recognizes outstanding contributions by a civil engineer to engineering mechanics research and/or practice in Canada.

JAMES A. VANCE AWARD

Recognizes a CSCE member whose dedicated service, other than as President, has furthered the advancement of the CSCE and who has completed or recently completed service in one or more sequential positions at the National level.

SANDFORD FLEMING AWARD

Recognizes outstanding contributions by a civil engineer to transportation engineering research and/or practice in Canada.

WALTER SHANLY AWARD

Recognizes outstanding contributions by a civil engineer to the development and practice of construction engineering in Canada.

W. GORDON PLEWES AWARD

Recognizes particularly noteworthy contributions by an individual to the study and understanding of the history of civil engineering in Canada, or civil engineering achievements by Canadian engineers elsewhere. Normally, the recipient will be an individual, not necessarily an engineer, but in special circumstances the award can be given to an organization.

Appel—Distinctions Honorifiques Nationales SCGC

Les membres sont invités à soumettre en tout temps, des candidatures pour les prix ci-dessous; les candidatures soumises d'ici le 15 novembre 2011 seront considérées pour les prix 2012 qui seront décernés au congrès annuel de la SCGC à Edmonton, AB en juin 2012. Veuillez soumettre les candidatures, en précisant le titre du prix, par courriel à louise@csce.ca, ou en vous adressant à : M^{me} Louise Newman, La Société canadienne de génie civil, 4877 rue Sherbrooke ouest, Montréal, QC H3Z 1G9.

LE PRIX A.B. SANDERSON

Est décerné aux ingénieurs civils qui se sont signalés par leur contribution exceptionnelle au développement et à la pratique du génie des structures au Canada.

LA MÉDAILLE ALBERT BERRY

Est décernée à un ingénieur civil qui s'est distingué par son importante contribution au génie de l'environnement au Canada.

LE PRIX CAMILLE A. DAGENAIS

Est décerné aux ingénieurs civils qui se sont signalés par leur contribution exceptionnelle au développement et à la pratique de l'hydrotechnique au Canada.

LE PRIX E. WHITMAN WRIGHT

Est décerné à un ingénieur civil qui s'est distingué par son importante contribution au développement des applications de l'informatique au génie civil au Canada.

LE PRIX D'EXCELLENCE EN INNOVATION DANS LE DOMAINE DU GÉNIE CIVIL (date limite est le 15 déc. 2011.)

Souligne l'excellence dans le domaine du génie civil dont a fait preuve une personne ou un groupe de personnes pratiquant le génie civil au Canada, ou une société canadienne d'ingénierie ou un organisme canadien de recherche.

LA MÉDAILLE HORST LEIPHOLZ

Est décernée à un ingénieur civil qui s'est distingué par son importante contribution à la recherche et/ou à la pratique de la mécanique appliquée au Canada.

LE PRIX JAMES A. VANCE

Est décerné à un membre de la SCGC dont le dévouement a favorisé l'avancement de la Société et qui termine, ou achève, récemment un mandat au sein de la Société, sauf comme président.

LE PRIX SANDFORD FLEMING

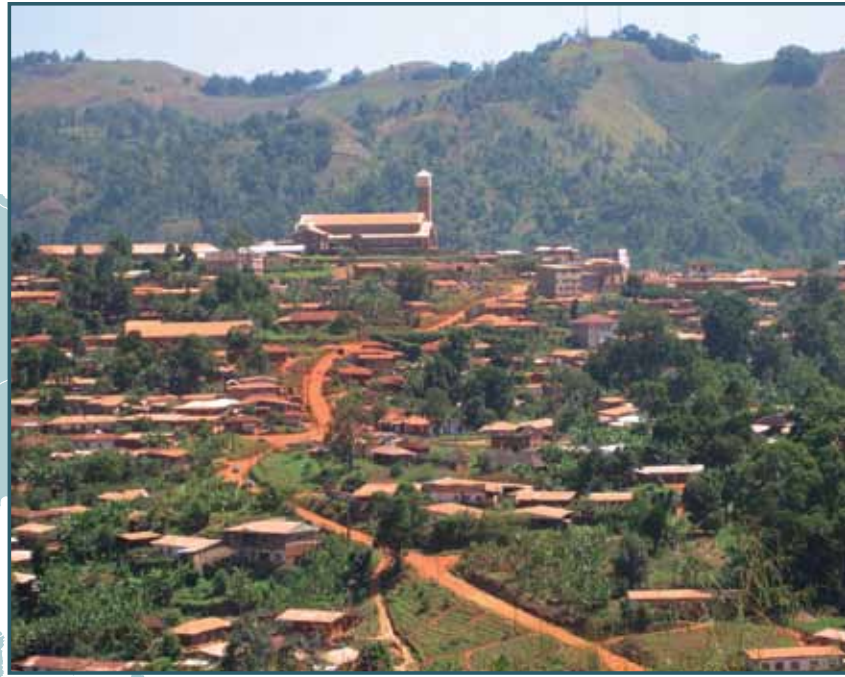
Est décerné à un ingénieur civil qui s'est distingué par son importante contribution à la recherche et/ou à la pratique du génie du transport au Canada.

LE PRIX WALTER SHANLY

Est décerné à un ingénieur civil qui s'est distingué par son importante contribution au développement et/ou à la pratique du génie de la construction au Canada.

LE PRIX W. GORDON PLEWES

Est décerné à une personne, pas nécessairement un ingénieur, qui s'est distinguée par sa contribution à l'étude de l'histoire du génie civil au Canada ou de l'histoire des réalisations canadiennes en matière de génie civil à travers le monde. Dans les circonstances exceptionnelles, le prix peut être décerné à une organisation.



Richard Denham P.Eng., FCSCE

The Kumbo Water System— Improvement Project an Update to March 2011

The winter 09–10 issue of Canadian Civil Engineer featured an article entitled “*CANADA MAINTAINS LINK TO CAMEROON THROUGH THE CSCE*”. The article outlined a development project being undertaken by CSCE. The project commenced in October, 2009 and will be completed in October 2011. This update describes some of the profound changes that have resulted from the efforts of seven diversely skilled, hugely enthusiastic and committed Canadian Volunteers and the Board, Management and workers of the Kumbo Water Authority (KWA) in rural Northwest Cameroon.

THE CANADIAN TEAM

Vincent Suffoletta—Supervisor of Supply, Waterworks Division, City of Guelph.

Jim Harnum—Director Water Treatment and Supply, Toronto Water.

Jennifer Kirkham—Management Consultant.

Scott Farnham—Director, Records Management Services, Spacesaver Solutions Inc.

Patricia Moore—Manager/Director, Government of Canada.

Donna Denham—Community Development and Gender Specialist.

Richard Denham—Water Systems and Development Specialist (Project manager).

These professionals took time off, or were granted leave, from their full-time careers to volunteer their time and expertise to the project. Expenses were covered; however, no fees or remuneration were paid. Each assignment had clear objectives and included the expectation that all work undertaken reinforced and built upon the tools and learning generated in previous assignments. There were no lectures or formal presentations. Some workshops were used in the training of the women farmers. All work was practical in nature, resulting in definable and visible changes and was done using a consistent set of values and code of ethics that reflected the exact kind of work environment the project was striving to create. Each new volunteer was prepared by the volunteers who had been in Kumbo previously. VOIP and email facilitated regular communication between Canada and Kumbo and allowed all Canadian team members to support and coach each other and our partners in the KWA. Building the capacity of the Canadian Team to constantly follow-up and reinforce changed attitudes and the correct use of the new systems, tools and skills introduced over the two years has ensured a level of sustainable change not often achieved in such short term development projects.

THE CONTEXT

The “community” reclaimed the water system from the State authority in 1991. The takeover did not allow for training of personnel or transfer of skills. For the past twenty years, the management of the KWA has struggled with all aspects of running the Authority. No spare parts, no tools, the death (from AIDS) of the only employee able to input data to produce bills, legal conflict with farmers in the catchment area, lack of sufficient income to pay staff or the monthly utility bills, no manager (the last one was fired for fraud) and 17 completely demoralized employees were just some of the obvious problems.

The project had three major thrusts: reclaiming and protecting the catchment area; purchase of tools, parts, and essential equipment; and operations planning and maintenance.

SUCCESSFUL, SUSTAINABLE CHANGES

Revenue Generation

Each customer served by the water system (public tapstand, business, household) has a water meter. These 3,500 plus meters are read and each customer is billed on a monthly basis. Meter readings and recording systems (back of envelopes) were not well organized. Workers had virtually no computer skills. Incorrect readings and errors in key-punching were common. As a result, if customers received bills, they had no confidence that their bills were correct; therefore, many never bothered to pay, sometimes for years.

The meter reading exercise was reorganized using school exercise books and pens and a system that allowed the meter readers to follow a systematic route each month. There is no numbering of houses and streets are more like wandering paths. This was not conducive to computerization, but a computer program was in place and a few staff had developed basic computer literacy skills.

A filing system based on individual client accounts was established and an entire program aimed at changing the “meter reading department” to a “Client Service Department” was undertaken with a multiplicity of actions designed to increase the likelihood of water bills being correct, being issued and distributed on time, and of customers paying their bills each month.

To have bills paid regularly, notices were sent to each customer indicating that they

had three weeks to pay the bill. If payment was not received on the due date, then a warning was sent stipulating that the customer had three days to pay the bill and, if it was not paid, service would be disconnected and a reconnection charge applied. As expected, customers initially paid little attention to these conditions; however, after a number of customers, targeting large users first, were disconnected, word spread that the KWA was serious about bill collection, and over the following year revenues increased by 125%.

Refusing to pay for water is a common problem in all developing countries. People believe that water is given by God and thus it is free. So, the culturally sensitive strategy we used was to agree that water is free but collecting, distributing, and treating water, and fixing leaks costs a lot of money. This message along with a program of educating the public on how the KWA system works, including open houses at the plant and the catchment area, helped to ensure that a further 25% increase in revenues realized to date this year.

Maintenance and Repairs

For years, Valentine, the man in charge of operations kept the system running through the inventive use of various car parts and spare tires. Canadian maintenance people loved working with Valentine, “he could fix anything” (Figure 1).

We assumed that many of the required parts would have to be shipped into



FIGURE 1: Valentine with new Generator set.



FIGURE 2: Repairing watermain.

Cameroon from Europe. By mid-project, however, it was determined that most of the equipment required was available in Cameroon, or, in neighbouring Nigeria. Many of the tools were found in the market at the regional centre, Bamenda, or in Douala, the commercial capital of Cameroon.

In Canada, when we require materials, parts or spares, we go to the internet to find suppliers. This is not yet a workable option in Cameroon, so it became a matter of demonstrating how to seek materials through networking with people in the business, or spending hours combing the markets and shops. A cut-off saw was available in Douala; however, the saw and blades were much more expensive than in Europe. Pipes, valves and meters were considerably less expensive when sourced in West Africa. Success in material management lies in the fact that managers in the KWA now know how to plan and budget for materials, and how to find and purchase tools. Once delivered, they now have a system for storing and controlling inventory. Proper use of each tool, and health and safety equipment and practices, have been introduced into the daily operations (Figure 2).

With tools, materials and training provided by this project, leaks in water supply pipes that have bubbled and dripped for twenty years have been repaired. Meters that have not worked for years were replaced and a ten year plan for further replacement of meters was put in the budget. Budgeting being a further innovation that Management is beginning to use.

Catchment Area Improvements

In the original construction in 1970, a catchment area of approximately 2,008 hectares was established to provide water to the Town of Kumbo. Three intakes, a small gravity sand-filtration treatment plant and a storage reservoir were constructed.

Over the last forty years, little attention was paid to the catchment area. Farmers and graziers moved in and began cultivating the soil and breeding cattle and goats. Eucalyptus trees were planted as a source of firewood and construction material.

This intrusive activity resulted in the twenty-two original springs that produced water being reduced to only fourteen. The available runoff was reduced significantly, and heavily laden with silt and chemicals from the fertilizers in common usage. The KWA neglected the encroachment on the water sources for years. Attempts to remove farmers from the land through a costly five year lawsuit brought against the farmers had failed. Tensions were very high between the farmers who were mostly women involved in subsistence farming, and KWA.

One of the first actions taken as part of this project was to convince the KWA to drop the appeal lawsuit and undertake a constructive process with the farmers designed to restore the catchment area through pro-

tection of the water sources, use of improved farming techniques, and changes in cropping. The first meetings between the farmers and KWA were filled with suspicion and animosity.

We committed to support the women farmers in the practice of conservation farming and train them in income generating activities to improve family livelihoods. A demonstration farm, complete with storage barns and crop drying facilities was the classroom. Training in improved cropping techniques, organic farming techniques, food processing, post-harvest loss reduction, and seed production took place (Figures 3 & 4).

The result of this work with the women has been quite amazing. We initially focused on the introduction of organic farming with sixty women in the watershed. These women have experienced such success that a number of women from the region including Kumbo town, have started similar farms. Increased production, (one lady now has a yield of four bags of potatoes from her land where she previously produced one), better tasting food and decreased diarrhoea among children were documented results after the first growing season. The women report increased economic benefit from having better quality crops preserved through improved storage techniques.



FIGURE 3: Lemnyang demonstration plot.



FIGURE 4: Lemnyang women at storage/meeting building.



FIGURE 5: Women's Leadership training.



FIGURE 6: Kituum women with new push-push carts and tools.



FIGURE 7: Catchment sign.

Word of the success of the Women Organic Farmers Group (their chosen name) has spread like wildfire. The demand for training and inclusion in this initiative is endless. To facilitate women helping women, the Canadians have mentored 20 natural leaders in problem solving and facilitation skills, participatory leadership so that they now are repeating the process of demonstration farms and associated training with other women (Figure 5).

Hoes, cutlasses, watering cans and sprayers, and small (push-push) carts for moving the produce were provided to the women's group. Members raise money from charging a small fee for renting the tools so that they can assist in facilitating the start-up of new women's groups. There are 150 women involved now and we expect that number to increase significantly in the near future (Figure 6).

In addition to the work with the women, the water sources were fenced to protect them from intrusion by animals and the removal of eucalyptus trees, which are huge water users, has commenced (Figure 7).

Changed farming techniques have reduced the amount of silt and chemicals that reach the water plant. Protection of the sources has contributed to improved availability of water from the catchment area. The year 2011 is the first year in the past decade that water rationing was not required during the dry season.

Gender Equity

The most notable change is the attitude change that now is expressed through open and positive discussion of women's roles and value in the KWA. This societal change is manifest in four women now being employed by the Water Authority, including the first female plumber (Figure 8). Women are now participating in discussions and have the opportunity to vote on decisions. By changing the statutes, KWA now boasts that twenty of forty elected representatives at the KWA General Assembly are women and half of the members of the Management Board are women. For the first time, the Vice-Chair of the Board is a woman (Figures 9 & 10).

SUMMARY

The whole community knows when "the Canadians" are in town. We are stopped often and thanked, or told excitedly how life has changed. There has been a complete change in the attitude and demeanor of the KWA staff.

- Plumbers have been trained in maintenance, and are proud of their work
- The office is well organized due to the presence of a simple and well understood filing system
- The power bill gets paid on time because of increased revenues
- There is peace in the catchment area



FIGURE 8: Delphine, first female plumber.



FIGURE 9: Margaret, first female Vice-Chair.



FIGURE 10: Training new members on General Assembly.

- Training in chlorination led to the development of a unique gravity chlorination system designed by KWA's miracle man, Valentine
- Managers now work as a "team"
- Planning for operations and dealing with major issues
- There is a Strategic Plan in place
- New computers are working, valued and used daily. Managers are able to produce charts, reports and bills.

The project ends October 2011, and will coincide with the celebration of the twentieth year since the inception of KWA. It will be a great party and CSCE will be there. ■



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The Shiyang River Basin: A Case of Water Scarcity

INTRODUCTION

The Shiyang River basin is located in a region commonly referred to as Hexi Corridor in Gansu Province of north-western China. Nowadays, Gansu has some mineral resources that provide major economic benefits to the province, but historically Gansu achieved fame and political importance for being on the silk and tea roads (Avery, 2003). In the Ming dynasty (ca. 400 years ago) the province and watershed had thousands of lakes and water-intensive rice was cultivated. Historic sustainability has been derailed in a dramatic exhibition of the environmental footprint of humanity exceeding the carrying capacity of the

Shiyang basin. In this article, water supply and use in the Shiyang River basin are discussed. This is followed by a discussion of water scarcity as a major global challenge in the 21st century.

The total basin area is approximately 41,600 km² (Kang et al., 2004). Eight major tributary rivers originating in the Qilian mountains flow generally northward onto the southern plain region of Wuwei, and form the Shiyang River that flows north-easterly towards the northern plain region of Minqin (see Figure 1). Minqin is surrounded by two vast deserts, the Badanjilin Desert and the southern part of the Tenggeli Desert.

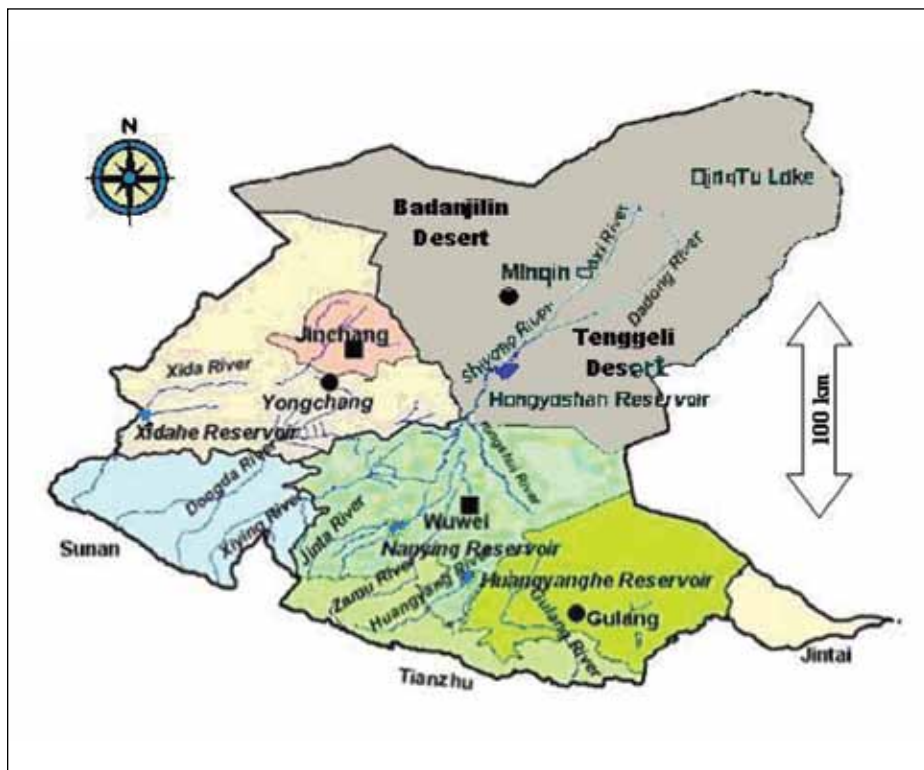


FIGURE 1: Lower Shiyang River Basin (Adapted from: Hermans et al., 2008).

The Shiyang River basin is characteristic of many inland river systems in northwest China, but differs from most river systems in Canada. Most Canadian river systems eventually empty into an ocean, but the Shiyang River terminates in the desert. Runoff in the Shiyang River basin is generated almost entirely in the mountains and is low relative to the water needs of a large population.

SHIYANG WATER RESOURCES

Climatic conditions commonly present in regions of water scarcity, such as the Shiyang River basin, include low and irregular rainfall and high evaporation (see Pereira et al., 2002). The Shiyang River Basin is characterized with low precipitation, and high evaporation potential. The precipitation decreases from approximately 300 to 600 mm in the Qilian mountains to less than 150 mm in the northern plain region, while the evaporation potential increases from 700 to 1,200 mm annually in the mountain region, to between 2,000 and 2,600 mm annually in the northern plain region (Kang et al., 2004).

The basin is surrounded to the south by the northwest to southeast trending Qilian mountain range that rises approximately 2,000 to 5,000 m above sea level. Precipitation and snowmelt from the

mountainous region provide nearly all the available water resources in the basin. The average annual runoff is about $15.8 \times 10^8 \text{ m}^3$ (Kang et al., 2004). Annual runoff can range from 10×10^8 to $20 \times 10^8 \text{ m}^3$. Runoff during July and August accounts for approximately 50% of total annual runoff (Gansu Department of Water Conservation, 2007). The Shiyang River basin can be considered semi-arid to arid, where aridity is defined as a natural permanent imbalance in water availability resulting from low average annual precipitation.

Historically, the flow originating from the Qilian mountain range was carried by the natural river channels to the lower plain region of Minqin, or seeped into groundwater which eventually migrated to the lower plain region of Minqin. This surface water and groundwater supported a large shallow lake and areas of natural oases before the river disappeared into the deserts. The upper and lower plain regions, however, were also fertile agriculture lands. As population and agricultural activities increased, flows in the natural streams became diverted for irrigation of agricultural lands diminishing flow to the lower plain region. With reducing inflow of water, the large shallow lake and natural oases in Minqin began to shrink. To



meet the growing demand of agricultural activities, groundwater resources were over-exploited, which led to a diminishing water table below the root zone of several plants. Surface water and groundwater exploitation changed the ecosystem and led to the spread of deserts.

Today, there are reservoirs on the upper reaches of nearly all natural streams where they come out of the mountains. These reservoirs divert essentially all natural flow through networks of paved irrigation canals. Nearly all the natural river channels have completely dried up or have shrunk significantly. Groundwater over-exploitation has caused substantial decline of the groundwater table; many shallow dug wells have become dry. The groundwater is also becoming saline. The large historical terminal lake and natural oases have all but disappeared.

Water scarcity often is evaluated using a ratio of water availability in a region to the population, and is defined commonly as water availability less than $1,000 \text{ m}^3/\text{person}/\text{y}$ (Pereira et al., 2002). If water availability is less than $500 \text{ m}^3/\text{person}/\text{y}$, water scarcity is considered severe. Estimated average water availability in the entire Shiyang River basin is approximately $700 \text{ m}^3/\text{person}/\text{y}$, but can be as low as $450 \text{ m}^3/\text{person}/\text{y}$ during drier years (Gansu

Department of Water Conservation, 2007). The situation in the lower basin is more severe than in the upper basin.

Approximately 1.4 million residents (67% of the total basin population) are engaged in agriculture; the total agricultural area in the basin amounts to approximately 300,000 hectares (Gansu Department of Water Conservation, 2007). The available land for agriculture is typically divided into small lots leased to families, which constitute the basic operational unit for farming. While this system provides employment and income for a large portion of the population, it also lowers the possibility to implement efficient agricultural operations using more advanced technology.

The reduction of available water for the Minqin County and the lowering of the groundwater table have had serious impacts on desert vegetation (Kang et al., 2004). The vegetation near the deserts, which was supported by the shallow groundwater table, is disappearing. The vegetation kept the advance of the deserts in check. The declining vegetation at the edge of the oasis has led to the loss of natural sand-fixation barriers and opened several sections of the oasis to the encroaching deserts. As sand-fixation is lost, the wind erosion is becoming more intense and the frequency of dust storms is increasing causing severe health and environmental problems.

The desertification process reflects a feedback mechanism between human activity and the environment, resulting from inappropriate land use and human-induced permanent imbalances in water availability that results in damage to soil and vegetation. Agricultural practices not suitable for physical conditions of an area increases desertification risk and eventually reduces the amount of arable land for agricultural development (Sun et al., 2006). Within Minqin County, in the lower reaches of the Shiyang River basin, desertification certainly limits agricultural production by reducing the space available for agricultural development.

The local and central governments of China have become alarmed that, without protection of the natural vegetation, the advancing deserts may possibly swallow up the lower plain region of Minqin. The various levels of governments have come to the realization that unless they can curb the water supply demand, and reverse or at least

prevent further ecological degradation, substantial social and economical consequences in the region may be unavoidable.

Agricultural water consumption in the watershed amounts to over 85% of total water use. Therefore, managing water supply demand in the Shiyang River Basin is synonymous with managing agricultural water demand. Water management must maximize economic benefit to the population with the finite resource and focus on diversifying local economy.

A master water resources management plan for Shiyang River Basin was developed by Gansu government (Gansu Department of Water Conservation, 2007). The plan aims to reduce water demand, improve the efficiency of water usage and economical benefit, and reverse the ecological degradation in the watershed in general, and the Minqin region in particular. The master water management plan introduces a number of far-reaching policy initiatives to create a water-saving society, including establishment of a water quota system for irrigation, water transfer to Minqin county, implementation of advanced irrigation technology, reduction of the population in the Minqin, and ecological projects to curb the advancement of the deserts. Even though the Chinese officials have an array of scientific information and an awareness of the problems associated with groundwater over-utilization, the needs of the people of the region also have to be taken into account. Equity and fairness are considerations in water management as are hydrology and water conservation. Severe social-cultural changes cannot be immediate.

The 2002 Water Law, China's key water legislation, provides a comprehensive framework for integrated water management. While this and other national laws set the principles, local governments usually have discretion in their implementation (Liu and Speed, 2009). Water policymakers are increasingly looking to economic tools, such as proper pricing and the elimination or modification of subsidies, to help in the sustainable management of limited water. In China, where water prices have long been heavily subsidized by the government, new efforts are underway to update pricing structures to encourage both improvements in water use efficiency and wastewater treatment.

WATER SCARCITY IN THE DEVELOPING WORLD

Many countries currently experience water shortages; almost one-fifth of the world's population (about 1.2 billion people) live in areas where the water is physically scarce (WHO, 2009). By 2025, the number of countries with severe problems of inadequate water supply will increase dramatically due to increasing populations and changing climatic conditions. It is estimated that 5.3 billion people, two-thirds of the world's population, will suffer from water shortages by 2025 (UN 1997). Water shortage affects the capacity of national governments and water management organizations to provide economic development in a fight against poverty; therefore, water issues are high priority items on many national and international agendas.

The over reliance of an economy based on agriculture significantly aggravates the water scarcity challenges in the developing world. Agriculture consumes large quantities of water. The irrigation water is typically lost to evaporation-transpiration and cannot be recycled. The economic output per unit of water consumption from agriculture often is relatively low compared to other industries. Maximizing economic benefits to the population with a finite resource is an important consideration where water is scarce, but consideration must also be given to the adequacy of food supplies.

Water shortages threaten to reduce global food supply. In the latter half of the 20th century, agricultural scientists and farmers have increased food production through advanced technology and the greater use of fertilizers but there are constraints on the capacity to increase food supply to meet the needs of an increasing global population. Major constraints include a lack of water for irrigation, the loss of agricultural land due to soil erosion and salinization, and the demands on water and land for non-agricultural purposes.

The large and growing populations and search for food and economical opportunities drive the development of marginal lands for agriculture, where access to freshwater resources is difficult and limited. The use of marginal areas for agriculture often results in over-exploitation of land and water resources, which in turn results in precarious living conditions. Therefore, the proportion of poor people, especially among rural populations

in developing countries, is generally higher in areas where water is scarce. The lands in the lower Shiyang River Basin are semi-arid and marginal. The population and agriculture activities in that region are far greater than what can be sustained by the available land and water resources.

The example of the Shiyang River Basin highlights many water management challenges faced by the developing world. The freshwater resources in the world easily accessible in the lakes, rivers, and aquifers are not spatially or temporally distributed to meet the needs of all human populations. While some regions of the world have abundant fresh water resources, other regions suffer severe water shortage. Even in the Shiyang River Basin itself, the water availability distribution is far from uniform, with the upper basin having greater access to freshwater than in the lower basin. The water scarcity challenges in Shiyang River Basin are common to many parts of the world, typically in North Africa, the Middle East, and Central Asia.

CONCLUDING REMARKS

From an historical perspective, the water resources situation in the Hexi corridor has reached a crisis situation. Over centuries, population growth and creeping agricultural expansion and practice have put the region into dire straits resulting in massive loss of arable land that will not be recovered, reduced crop yields, and human suffering (including frequent sand storms). The incremental changes during any generation have been accommodated with typical resilience of the Chinese. An all-encompassing approach to reduce the population with concomitant measures to educate and demonstrate to the remaining populace nearly all conceivable measures to combat the environmental deterioration is being undertaken. Social, capital and cultural costs are high. Without implementation of the measures and coping with necessary changes, nature will not relent and will not forgive.

Much of the world has insufficient freshwater resources to support burgeoning populations, to maintain fragile and stressed ecosystems, and to provide sufficient irrigation water for local food production. The critical situation projected to affect humanity in the 21st century has been called the “water crisis”. In all countries, the resource needs to be protected. In the water-scarce regions of

the world, a shift towards less intensive water use and population migration will be necessary, especially if climate change intensifies the problems of water scarcity.

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A joint 3-year joint project (2007–2010) was carried out by the Chinese Hydraulic Engineering Society (CHES), the Gansu Research Institute for Water Conservancy (GRIWC) and volunteers from the Canadian Society for Civil Engineering (CSCE). The theme of the project was “environmental/ecological assessments and restorations of the Shiyang River basin in the central part of Gansu Province located in the north-west part of China.” Funding was provided by the Chinese Ministry of Science and Technology (MOST) and the Chinese Ministry of Water Resources (MWR).

In the second year of the project, a delegation consisting of three CHES members and three GRIWC members visited Canada in mid November 2009 for project discussions with the CSCE project team members and for collecting project technical information from universities in Ottawa, Toronto and Vancouver and the Department of Agriculture’s Central Experimental Farm in Ottawa.

In the third year of the joint project, CSCE volunteers visited the Shiyang River basin and gained first hand knowledge about the problems. The CSCE volunteers were Dr. Todd Chan, Dr. Jeanne Huang, Dr. Ron Droste, Dr. Bomman Krishnaappan, Brian Burrell and Huixi Xie. After the April 2010 visit to the project site, CSCE team members concentrated their efforts in completing technical papers related to the project. Some of the information in the CSCE papers was incorporated in the final Gansu Project report. The project ended October 31, 2010 and the final project meeting with the Chinese Ministry of Science and Technology, the funding agency, was held successfully on November 25, 2010.



Amanda Whitehead Social Change Fellow
Engineers Without Borders Canada

The Role of Engineers in International Development

The challenges facing the world today are no secret—climate change, the end of oil, poverty—these problems are complex and convoluted, and what’s more, they are each directly linked to the work of engineers. In the auto sector, engineers have been designing machinery and processes for decades. As the implications of climate-change have influenced what we legislate, how we live, and what we drive also changes how and what we engineer.

Engineers Without Borders Canada (EWB) is a Canadian non-profit organization working in international development. EWB believes that engineers have a unique skillset and that the profession

has significant ability to contribute to solving problems of poverty and international development. For the past eight years, EWB has been sending young engineering graduates to Africa to work on these problems.

Over the years, EWB has evolved and become more sophisticated, as years of evaluating our results has refined our understanding of what engineers can contribute to development in Africa. Through this process, we have seen a variety of roles played by engineers in fighting global poverty and building a better world, and on top of that, we have seen the value that engineers can bring when they apply their skills to some of the challenges facing our world today.

"Engineers have the ability to solve complex problems and dig to the root of why certain issues related to poverty persist."

WATER AND SANITATION IN MALAWI

One of the problems engineers have tackled is clean water. Water access is a critical issue in Malawi, where contaminated water is a significant cause of illness. However, as EWB's volunteers soon learned upon working in the water sector in Malawi, the problem is not as simple as a lack of wells.

What the volunteers found is that the locations of water infrastructure such as wells and boreholes are not always well known. Consequently, water points are frequently placed too close to one another, while many communities do not have access to safe water at all.

Further, water technology often has a poor track record of sustainability. When waterpoints break down, many rural communities do not have access to spare parts, nor the necessary training to fix the problem. This, along with poorly placed wells, contributes significantly to low rates of water access in Malawi. This is especially disappointing when often, for just a few dollars and the right spare part, many of these communities could have renewed access to clean water. Instead of investing tens of thousands of dollars to drilling a new well, our engineering graduates are strengthening the systems that plan new water infrastructure and train local hand pump mechanics.

Owen Scott, civil engineering graduate from the University of New Brunswick, and the rest of EWB's team in Malawi, are currently working to implement this solution. Owen works in partnership with WaterAid Malawi. He works directly with 5 Malawian districts where he supports the use of a waterpoint monitoring system—a tool where field staff can track the location and functionality of water points in order to help districts coordinate repairs and improve planning for new wells.

The use of this tool is helping districts to ensure investments in water infrastructure are targeted to where they are most needed—an important step in decreasing

the number of Malawians who lack access to clean water. Over \$80,000 worth of new water infrastructure has now been sited based on data collected through these systems—a clear sign of the impact Owen is having on improving water systems in Malawi.

EVIDENCE BASED DECISION MAKING

Across the continent from Owen and the others in the Water and Sanitation team, another team of EWB volunteers is working in Ghana, where despite living in a very different country, with its own climate, culture, and way of life, they have been able to draw parallels around the problems they are facing.

This team works with the Ghanaian government and in particular, the district offices responsible for infrastructure planning, in an attempt to improve the collection and use of data in each district to make better informed infrastructure decisions. Similar to the Water and Sanitation team in Malawi, this team has found that when sufficient infrastructure data are not available, decisions tend to be made based on political will or other factors such as proximity or the intensity of outcry from a community.

One EWB volunteer, Amir Allana, an engineering student at the University of Toronto, recently spent four months volunteering with this team in Ghana. Upon arriving, he noted that he met countless people who were smart, capable, and hard-working. Yet most of them had very little formal education. After exploring many possibilities, Amir could only conclude that Ghana's educational system was simply falling short, failing to equip the country's people with the knowledge they need to build a better future.

The problem and its solution, he found, were not as obvious as one might surmise—a lack of education in Ghana will not be solved by simply building a new school house. Rather it is a problem that is systemic in nature. Ghana's public services are not prioritized and implemented based on data—such as education and dropout rates—and as a consequence services are not always allocated where they are most needed. While it may seem simple, Amir realized having access to clear data for government planning is simply taken for granted in Canada.

While he was in Ghana, Amir joined forces with Phillip Dibabe, the Director of Ghana's Education Department in Saboba. Phillip is responsible for administering Saboba's schools—managing staffing, resource allocation, and standardized testing—for thousands of students each year. Phillip recognized that his department was failing to deliver the caliber of education needed for children in Saboba. Together Phillip and Amir set out to identify the gaps in the education department's existing database so they could gather new data, analyze the results, and draw informed conclusions about the state of Saboba's education.

And it worked. For the first time Phillip could identify trends in Saboba's education system. For instance, they found that enrollment in district schools spiked from 2007–2009, but the number of students who passed standardized tests to graduate from elementary school drastically declined from 53% to 34% in the same period.

Once they started to analyze the results, Phillip linked the high failure rate to a lack of preparedness of teachers to equip their students with the ability to succeed on the tests. And the consequence was quite severe—students were unable to graduate to secondary school.

Phillip developed and ran tutorial sessions geared at preparing students for the state exams. He ran a pilot program at Saboba's biggest school, unsure what to expect. The students came in droves, hungry to learn, and excited at the prospect of passing the exams to provide them with the opportunity to advance their education.

This demonstrates the power of improved data-based decision making. Collecting data on education, which perhaps sounds dull or far removed from the problem, can fundamentally change the way services are delivered in Ghana's remote communities.

WHY ENGINEERS?

Why is EWB an organization of engineers? The above examples illustrate how engineers play valuable roles in international development. Engineers have the ability to solve complex problems and dig to the root of why certain issues related to poverty persist. We are well trained to find simple solutions that will be sustainable and make sense for local communities, and what's more, we understand the value in iterating to arrive at a solution, and monitoring those solutions

with the goal of improving them. EWB has seen that engineers recognize the need for failure. Innovation is crucial to progress, and sometimes innovating requires failing. We know that it is often *through that failure*, that a true solution is found.

EMBRACING FAILURE IN DEVELOPMENT

A mistake is made somewhere in rural Tanzania. It is not publicized—a donor may be upset. Two years later, the same mistake is repeated in Ghana; six months later in Mali. And so the story continues as it has for over 60 years.

A district water officer in rural Malawi has a radical new idea to motivate communities to invest in repairs. A mid-level bureaucrat at UK's Department for International Development devises a bold plan to change the reporting requirements for one of their grantees. A project officer at an international NGO writes a memo proposing a pilot project that would target only market-ready farmers. But none of them share or execute their ideas because the failure associated with innovation is not rewarded in development.

By hiding our failures, we are condemning ourselves to repeat them and we are stifling innovation. In doing so, we are condemning ourselves to continue under-performance in the development sector. Conversely, by admitting our failures—publicly sharing them not as shameful acts, but as important lessons—we contribute to a culture in development where failure is recognized as essential to success. Donors—large and small—can better understand and support the work they fund. Institutions and individuals can learn more from each other, and test more innovative approaches—and either avoid what's already been tried or enter into these experiments with eyes more open.

As engineers, we intimately understand the importance of failure to the process of innovation. We've seen countless examples of this in our profession, and know maybe better than anyone that it takes guts to invest in the new and unproven. Take James Dyson, the engineer and industrial designer responsible for the dual cyclone bagless vacuum cleaner. He failed 5,127 times before he got his now top-selling

vacuum functional. And what message has he been sharing? Sometimes if you want to discover something, you need to do things the wrong way. This message, along with many others, is what engineers are bringing to the development table, in an effort to find impactful solutions to the problems of poverty. More and more engineers are showing their adaptability and creativity, and demonstrating how engineering crosses disciplines and fits into the larger picture of social responsibility.

Engineers are combining their formal training in engineering principles, theories, standards and techniques with a strong understanding of cultural differences. By working across the world they are creating widespread change.

Like Owen in Malawi, working with Malawians to improve the system for water-management, and Amir in Saboba, contributing to the increasing collection and use of data in making important infrastructure decision, countless other engineers are seeing the value they can bring to all corners of the world and taking up the responsibility to contribute to positive social change. ■

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A Canadian Society with an International Presence: The Role of the CSCE's International Affairs Committee (IAC)

INTRODUCTION

The International Affairs Committee (IAC) represents and promotes the interests of the CSCE outside of Canada. It arose from informal meetings held by CSCE members with foreign engineering societies, such as the 1981 meeting with the China Civil Engineering Society of Dr. Leslie Jaeger and Dr. Moe Cheung, who were in China attending a structural engineering conference. For over two decades, IAC has been one of the most active and influential CSCE project committees, due greatly to its dedicated chairpersons and volunteer members. The purpose of this article is to review IAC's mandate, operations, past accomplishments, and future direction.

MANDATE

The IAC is the CSCE committee generally mandated to plan and carry-out CSCE's international activities and to undertake its international development projects. It is the CSCE program committee responsible for development, implementation and promotion of agreements of cooperation with foreign and international engineering bodies. IAC assists other components of the CSCE with respect to the hosting and protocol associated with visiting foreign delegates from engineering societies. IAC's mandate, however, excludes the operations of foreign branches of the CSCE (e.g., Hong Kong Branch) and international/foreign conference sponsorship handled directly by Technical Divisions.

COMMITTEE OPERATIONS

The IAC typically consists of 10 to 16 CSCE members-in-good-standing, with the CSCE Executive Director and the Vice-President-International serving as ex-

officio members. The membership term is two years, renewable at the discretion of the committee chair. Due to the long-term nature of many IAC activities, members often serve multiple terms. The committee has a chair, deputy chair, secretary and past chair. In addition, several IAC members have the role of a liaison officer responsible for relations with one or more foreign engineering bodies within a geographic area.

IAC is one of the program committees represented on the CSCE's Programs Coordinating Committee (PCC). In the CSCE's organizational structure, the Chair of IAC reports to the Vice President-Technical Programs.

EXAMPLES OF PAST ACCOMPLISHMENTS

Rural Water Conservation and Management, Kumbo, Cameroon, 2009–11. Led by Rich Denham, this CIDA-funded IAC project has made it possible for a remote town in north-central Cameroon, Africa to effectively manage the supply, storage, conservation and distribution of scarce water resources in the community, and to engage women more extensively and effectively in water management. The impact of this project is enormous, greatly benefitting community health, sanitation and agriculture, and above all, the economic well-being of all citizens in the region.

International Conferences on Waste Engineering and Management: Hong Kong 2008 and Shanghai 2010. These two conferences advanced the understanding and application of sustainable development principles in general, and environmental and waste engineering and management in particular, while raising the profile of the CSCE and Canadian engineering in East Asia.

Todd Chan *rcsce*

IAC Immediate Past Chair, VP—International

Ron Droste *rcsce*

IAC Chair

Kirk Thompson *rcsce*

Immediate Past VP—International

Brian Burrell *rcsce*

VP—Technical Programs

Shiyang River Project, China, 2007–10. CSCE volunteers, led by Dr. Todd Chan, participated with water resource engineers and managers of the Chinese Hydraulic Engineering Society (CHES) and the Gansu Research Institute for Water Conservancy (GRIWC). The project was on environmental/ecological assessments and restoration of the Shiyang River basin in the central part of Gansu Province in the NW region of China. The project was completed on October 31, 2010 and the final project meeting with the Chinese Ministry of Science and Technology, which was the funding agency, was held in November 2010. In the final project report, some of the environmental issues were examined in detail and solutions were proposed to restore the environmental and ecological conditions of the river basin.

Fergana Valley Peace-Building Water Management Project, Kyrgyzstan & Uzbekistan, 2000–02. Mr. Rich Denham led this IAC project in Central Asia financed by CIDA. Its goal was to develop water management supporting structures that would contribute to social and economic development in a region where over 10 million inhabitants composed of 80 various ethnic groups need to work together to peacefully share their water supply. Accomplishments included the building of new water infrastructure systems, establishment of village water committees and pragmatic conflict prevention measures, and training in health and hygiene.

Caribbean Engineering Registration and Accreditation Program, 1995–99. CSCE helped the Jamaica Institution of Engineers (JIE) establish this program, made necessary by an amendment to the Washington Accord enacted in 1997 that prohibits recognition of accreditations done by institutions outside the Caribbean. Until this Program came into effect, all Caribbean graduates had been accredited by the ICE and other engineering institutions in the UK. The JIE chose Canada over the UK, the USA and other nations, as the model upon which to develop their Program, and it has since been expanded to encompass Trinidad and Tobago, and other Caribbean states. Canada was chosen because of its dual approach to a) accreditation and b) regulation and enforcement, successfully practiced in all provinces and territories. CIDA funded out-of-pocket expenses,



amounting to about \$250 thousand. CSCE mustered resources from within the Society and acknowledged experts from across Canada in operational aspects. The JIE lauded CSCE for facilitating implementation of this critically important Program.

Sustainable Development Program, China, 1994–99. During the planning of international activities in the mid-1990s, the IAC, then led by Al Perks, pursued sustainable development in civil engineering as the Society's programming approach. In a CIDA-funded project in China led by Dr. Claude Johnson, the China Civil Engineering Society published in 1999 the definitive 'Sustainable Development Guidelines for Civil Engineering' for implementation. These guidelines are based on Canadian experience in applying sustainable development principles. In the construction of national highways, for example, there had never been any discussion between the Ministry of Transportation and the Ministry for the Environment during the design of new highways. Now there is, and CSCE can take credit for this major accomplishment.

Youth Initiative Program, China and Pakistan, 1990–95. IAC facilitated the exchange of young engineers and students, between Canada and both Pakistan and China. Under the Program, 39 participants came to Canada for training for up to six months and 78 Canadian participants went to China and Pakistan to become familiarized with engineering practices in those countries.

FUTURE DIRECTION AND OUTLOOK

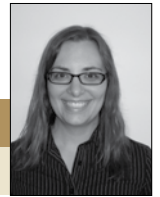
In the future, IAC is expected to continue its "traditional role" of carrying-out joint activities with foreign engineering bodies, involvement with international devel-

opment projects, and arranging technical visits to foreign engineering bodies and receptions for their delegations visiting Canada. In so doing, IAC will strive to provide opportunities for CSCE members to gain international experience especially useful to engineers in employment situations that would otherwise be unlikely to afford such an experience. Also, IAC will continue to support organizational goals such as membership recruitment, formation of foreign branches, and professional development.

Due to advances in electronic communications, greater international mobility, the emergence of trans-border and global environmental problems, and other forces associated with globalization, Canadian engineers must be aware of engineering developments in foreign countries in order to remain competitive and to provide the best services to their employers and clients. It is expected that IAC will become increasingly involved with informing Canadian civil engineers of major foreign civil engineering projects, research and developments in professional practices, while also promoting Canadian civil engineering internationally. Some IAC activities will be done likely in partnership with the international committees of other Canadian engineering organizations.

IAC is attempting also to increase its services to CSCE members in Canada. IAC continues to provide information on IAC activities to CSCE members in CIVIL Canadian Civil Engineer (CCE) and its website. Furthermore, special presentations, updated website information, webinars, and informational publications have been planned for the forthcoming year.

IAC continues to serve the CSCE membership! ■



Welcome to the inaugural Young Professionals' column!

First off, I'm pleased to announce that following the first ever Young Professionals' activities hosted at this year's conference and annual general meeting in Ottawa, the CSCE Board of Directors moved to create a Young Professionals' Committee. The career panel and social night in Byward Market during the conference were well received and we will build on these successes for next year's conference in Edmonton. In fact, there is already a Young Professionals' Coordinator on the conference planning committee! Expect lots of great things in Edmonton in June 2012.

In addition to activities at the annual conference, please look to your local Section for both local and regional events. If you have no idea where your local Section is or how to get in touch with them, let me know and I will make sure they connect with you. Also, if you

have any great ideas for events for Young Professionals that could be hosted by your Section, please share them with me and your Section Executive. We'd love to help you make them happen.

There are a number of other ways you can get involved. You can volunteer to be a Young Professionals' Activity Coordinator for your local Section. We also need to develop a CSCE Young Professionals website where we can all connect and share information. Or if seeing your words in print is more your style, I'll be looking for people to contribute to this column from issue to issue. Even just making time to participate in activities and spreading the word to your colleagues is a great way to show your support.

Thanks to everyone, both young and seasoned professionals, for your support and to those who participated in the events at

the conference in Ottawa. The creation of this Committee is a great step forward for the CSCE and gives us the chance to have an official voice within the Society. We now have the opportunity to shape this group and develop programs and services for all of

“The success of this initiative depends on all of you!”

us from coast to coast and even internationally. The success of this initiative depends on all of you! Please feel free to contact me at yp@csce.ca with your questions, comments, suggestions, and especially if you want to get involved. Make sure to watch this space in upcoming issues of CIVIL for more Young Professional themed news and events. ■

Bienvenue à cette première rubrique des jeunes professionnels!

Premièrement, je vous annonce qu'à la suite de la toute première activité organisée par les jeunes professionnels lors du congrès de cette année et suite à l'assemblée générale annuelle tenue à Ottawa, le c.a. de la SCGC a pris les mesures nécessaires pour créer un comité des jeunes professionnels. Le panel sur les carrières et la soirée au « Byward Market » ont suscité de l'intérêt, et ces succès nous inspireront pour le congrès de l'an prochain, à Edmonton. En fait, il y a déjà un coordonnateur des jeunes professionnels au sein du comité de planification du congrès! On peut donc s'attendre à d'heureuses surprises à Edmonton, en juin 2012.

En plus des activités lors du congrès annuel, il y aura des activités aux niveaux local et régional. Si vous ne savez pas où se trouve votre section locale ou comment la rejoindre, faites-le moi savoir et je verrai à ce qu'ils communiquent avec vous. En outre, si vous voulez suggérer des activités que

votre section pourrait organiser à l'intention des jeunes professionnels, soumettez-les à moi et à l'exécutif de votre section. Nous ferons notre possible pour que vos idées se réalisent.

Vous pouvez participer de bien d'autres façons. Vous pouvez être bénévole pour assurer la coordination des activités des jeunes professionnels de votre section locale. Nous voulons aussi créer un site web pour les jeunes professionnels de la SCGC de façon à pouvoir nous rejoindre et mettre en commun des renseignements. Et si vous aimez écrire, je cherche des jeunes prêts à rédiger des textes pour cette chronique. Le simple fait de participer aux activités et de répandre la bonne nouvelle auprès de vos collègues et amis est une autre façon de manifester votre appui.

Merci à tous, jeunes et moins jeunes, pour votre aide et votre participation aux activités du congrès, à Ottawa. La création

de ce comité est un grand bond en avant pour la SCGC et nous donne une voix établie au sein de cet organisme. Nous avons maintenant l'occasion d'influencer ce groupe et d'élaborer des programmes et des services pour tous, d'un bout à l'autre du pays, et même au niveau international. Le succès de cette initiative dépend de vous!

« Le succès de cette initiative dépend de vous! »

Vous pouvez me rejoindre en tout temps, au yp@csce.ca et me communiquer vos questions, commentaires, suggestions, et surtout votre désir de participer. Surveillez bien cette chronique dans les prochains numéros de L'ICC pour découvrir les nouvelles et les activités intéressantes des jeunes professionnels. ■

Membership Matters

At the SOCIETY'S HONOURS AND AWARDS BANQUET, held in conjunction with the 2011 Annual Conference in Ottawa, the CSCE recognized its members for their career achievements and for the excellence of their technical papers.

Fifteen members were inducted as *Fellows* of the Society: Bala Balakrishnan; Eugenio Ceroni; Evan Kit Yu Chan; Ronald Droste; Patrick Hettiaratchi; Gary Kriviak; Clifford Lam; Sylvain Leblanc; Oscar Pekau; Peter Rasmussen; Khaled Sennah; Jack Sutherland; Kirk Thompson; Rick Tiller and Ernest Yanful.

Hassan Moghimi, a Ph.D. candidate in structural engineering at the University of Alberta received the *Dillon Consulting Scholarship*, which was established in 2006 and is awarded for academic excellence.

The *Excellence in Innovation in Civil Engineering Award*, established in 2008 through the generosity of Canam Canada, was granted to DIALOG™, Lafarge Canada and the University of Calgary for their innovative *Ultra-High Performance Concrete in Architectural Cladding*.

The *Walter Shanly Award*, established in 2000 in honour of Walter Shanly, a very successful railway engineer in Canada in the mid-1800's, recognizes excellence in the development and practice of construction engineering in Canada. The award for 2011 was presented to Aminah Robinson Fayek, Professor in the Department of Civil and Environmental Engineering at the University of Alberta.

The *Sandford Fleming Award* was established in 1999 in honour of Sir Sandford Fleming (1827–1915), Canada's foremost railway surveyor and railway engineer of the 19th century. For his outstanding contributions to the practice of transportation engineering in Canada, the award for 2011 was granted to Andrew Horosko, Special Consultant to the National Academy of Sciences in Washington, DC.

The *Albert E. Berry Medal* for 2011 is granted to Nihar Biswas, a distinguished University Professor of Environmental Engineering at the University of Windsor.

The Medal was established in 1987 in honour of Dr. Albert E. Berry (1894–1984), an outstanding civil engineer who was one of Canada's first environmental pioneers, and is awarded for significant contributions to the field of environmental engineering in Canada.

The recipient of the *E. Whitman Wright Award* for 2011 is Frank Vecchio, Professor of Civil Engineering at the University of Toronto. The Award was established in 1985 and is granted to a civil engineer who has contributed to the advancement of innovation and information technology in civil engineering.

The *Camille A. Dagenais Award* was established in 1981 in honour of Mr. Camille A. Dagenais, Past Chairman of the Board of SNC Group Inc., and President of the CSCE in 1972. For his outstanding contributions to the development and practice of hydrotechnical engineering in Canada, the recipient for 2011 is Barry Adams, Professor of Civil Engineering at the University of Toronto.

Established in 1977, the *A.B. Sanderson Award* recognizes outstanding contributions to the development and practice of structural engineering in Canada. The award for 2011 was granted to Sher Ali Mirza, Professor Emeritus of Civil Engineering at Lakehead University.

The *James A. Vance Award* was established in 1977 and is granted to a civil engineer and CSCE member whose dedicated service has furthered the advancement of the Society. For his outstanding contributions towards the advancement of the Society including as Chair of the Infrastructure Renewal Committee and Co-Chair of the National Round Table for Sustainable Infrastructure, the recipient for 2011 is Reg Andres, Vice President of R.V. Anderson Associates.

In 1972, the *Can-Am Amity Award* was established by the ASCE by the initiative and endowment of James A. Vance. The award gives recognition to those civil engineers who have made outstanding and unusual contribution toward the advancement of professional relationships between the civil engineers of the United States and Canada. The 2011 recipient is Don Hayley, a founding partner of EBA Engineering Consultants Ltd., now a Tetra Tech Company.

Established in 1987 in honour of the late Philip Louis Pratley (1884–1958), the *P.L. Pratley Award* is granted annually for the best paper on bridge engineering. The award for 2010 was presented to Guy Mailhot for his paper entitled "Evaluation of the Ultimate Strength of a Hybrid Steel Bridge Compression Member Reinforced under Load", published in the Proceedings of the 8th International Conference on Short and Medium Span Bridges, Niagara Falls, Canada, 2010.

The *Thomas C. Keefer Medal*, established in 1942, is presented annually for the best paper in areas such as hydrotechnical and environmental engineering. The medal for 2010 is awarded to Michael Isaacson for his paper entitled "Earthquake-induced hydrodynamic forces on reservoir roofs", Canadian Journal of Civil Engineering, Volume 37, No. 8.

As superintendent of public works of the Province of Canada, Colonel Sir Casimir Stanislaus Gzowski (1813–1898) was responsible for improving waterways and canals and constructing roads, harbours and bridges. A founder of the CSCE in 1887, he served as president from 1889 to 1891. Established by Sir Casimir, the *Casimir Gzowski Medal* is awarded annually for the best paper on a civil engineering subject in the area of surveying, structural engineering and heavy construction. The 2010 medal was awarded to J. Paul Ditttrich, R. Kerry Rowe, Dennis E. Becker, and K.Y. Lo for their paper "Influence of exsolved gases on slope performance at the Sarnia approach cut to the St. Clair Tunnel", Canadian Geotechnical Journal, Volume 47, No. 9. ■

Question d'appartenance

À l'occasion du banquet des LAURÉATS QUI S'EST DÉROULÉ AU CONGRÈS annuel 2011, la SCGC a rendu hommage à plusieurs de ses membres pour leurs réussites professionnelles ou pour la qualité de leurs communications techniques.

Quinze membres de la SCGC ont été élus au titre de « Fellow ». Il s'agit de : Bala Balakrishnan; Eugenio Ceroni; Evan Kit Yu Chan; Ronald Droste; Patrick Hettiaratchi; Gary Kriviak; Clifford Lam; Sylvain Leblanc; Oscar Pekau; Peter Rasmussen; Khaled Sennah; Jack Sutherland; Kirk Thompson; Rick Tiller et Ernest Yanful.

Pour son excellence académique, la *bourse Dillon Consulting* a été octroyée à Hassan Moghimi, étudiant de troisième cycle à l'Université de l'Alberta.

Le *prix d'excellence en innovation dans le domaine du génie civil*, établi en 2008 grâce à la générosité de Canam Canada, a été décerné cette année à DIALOG™, Lafarge Canada et à l'université de Calgary pour leur innovation *Ultra-High Performance Concrete in Architectural Cladding*.

Créé en 2000 en hommage à Walter Shanly, un éminent ingénieur des chemins de fer au Canada du milieu du 19^e siècle, le *prix Walter Shanly* souligne une contribution exceptionnelle au développement et à la pratique du génie de la construction au Canada. Le prix pour 2011 est décerné à Aminah Robinson Fayek, professeure en génie civil à l'université de l'Alberta.

Créé en 1999 en l'honneur de Sir Sandford Fleming (1827–1915) principal arpenteur et ingénieur des chemins de fer du Canada au 19^e siècle, le *prix Sandford Fleming* souligne une contribution exceptionnelle au développement et à la pratique du génie des transports au Canada. Le prix pour 2011 est décerné à Andrew Horosko, consultant.

La *médaille Albert E. Berry* pour 2011 est décernée à Nihar Biswas, professeur de génie de l'environnement à l'Université de Windsor. Cette médaille a été créée en 1987 en honneur de Albert E. Berry (1894–1984), un grand ingénieur civil qui a été l'un des pionniers de l'environnement au

Canada. Cette médaille est attribuée pour une contribution exceptionnelle au génie de l'environnement au Canada.

Le récipiendaire du *prix E. Whitman Wright* pour 2011 est Frank Vecchio, professeur de génie civil à l'Université de Toronto. Créé en 1985, le prix est décerné à un ingénieur qui a contribué à l'avancement des technologies de l'information dans le domaine du génie civil.

Le *prix Camille A. Dagenais* a été créé en 1981 en hommage à M. Camille A. Dagenais, ancien président du conseil d'administration du Groupe SNC Inc., et président de la SCGC en 1972–1973. Pour sa contribution exceptionnelle au développement et à la pratique du génie hydrotechnique au Canada, le récipiendaire pour 2011 est Barry Adams, professeur de génie civil à l'Université de Toronto.

Créé en 1977, le *prix A.B. Sanderson* rend hommage à l'auteur de contributions exceptionnelles au développement et à la pratique du génie des structures au Canada. Pour 2011, ce prix est décerné à Sher Ali Mirza, professeur émérite en génie civil à l'Université Lakehead.

Créé en 1977, le *prix James A. Vance* est décerné à un ingénieur civil membre de la SCGC qui s'est distingué par son dévouement pour l'avancement de la SCGC. Pour sa contribution exceptionnelle à la SCGC, en particulier comme président du comité sur le renouvellement des infrastructures et co-président de la Table ronde nationale pour les infrastructures durables, le prix James A. Vance pour 2011 est attribué à Reg Andres, vice-président chez R.V. Anderson Associates.

En 1972, le « Can-Am Amity Award » a été créé par l'ASCE grâce à l'initiative et à la générosité de James A. Vance. Ce prix rend hommage aux ingénieurs civils qui ont

apporté une contribution exceptionnelle et originale à l'avancement des relations professionnelles entre les ingénieurs civils du Canada et des États-Unis. La récipiendaire du prix pour 2011 est Don Hayley, associé fondateur de EBA Engineering Consultants Ltd, qui est maintenant une filiale de Terra Tech Company.

Créé en 1987, le *prix P.L. Pratley* est décerné annuellement à l'auteur de la meilleure communication en matière d'ingénierie des ponts. Pour l'année 2010, le prix est décerné à Guy Mailhot pour sa communication « Evaluation of the Ultimate Strength of a Hybrid Steel Bridge Compression Member Reinforced under Load », publiée dans les actes du 8^e congrès international sur les ponts à travée courte et moyenne, à Niagara Falls, au Canada, en 2010.

Créée en 1942, la *médaille Thomas C. Keefer* est décernée annuellement à l'auteur de la meilleure communication dans des domaines tels que l'hydrotechnique et le génie de l'environnement. Pour l'année 2010, la médaille est décernée à Michael Isaacson pour sa communication « Earthquake-induced hydrodynamic forces on reservoir roofs », publiée dans le numéro 8 (volume 37) de la Revue canadienne de génie civil.

Surintendant des travaux publics pour la Province du Canada, le colonel Sir Casimir Stanislaus Gzowski (1813–1898) était responsable de l'amélioration des canaux et de la construction des routes, des ports et des ponts. Fondateur de la SCGC en 1887, il en fut le président de 1889 à 1891. Créée par Sir Casimir, la *médaille Casimir Gzowski* est décernée chaque année à l'auteur de la meilleure communication dans les domaines de l'arpentage, de la construction de charpentes et des grands travaux. Pour 2010, la médaille est décernée à J. Paul Dittrich, R. Kerry Rowe, Dennis E. Becker, et K.Y. Lo pour leur communication « Influence of exsolved gases on slope performance at the Sarnia approach cut to the St. Clair Tunnel », publiée dans le numéro 9 (volume 47) de la Revue canadienne de géotechnique. ■

People to People Citizen Ambassador Programs is organizing a delegation of professionals specializing in the development of safe, sustainable, and resilient infrastructure to travel to India December 4–12, 2011. CSECE members, and anyone involved in civil engineering, are encouraged to apply as a delegate. The delegation leader is Dr. Ghani Razaqpur, a former president of the Canadian Society for Civil Engineering and professor in the Department of Civil Engineering at McMaster University, and we hope for a strong showing of civil engineers. This delegation will seek to increase collaboration with Indian professionals and

organizations on topics of mutual interest in the sustainable engineering arena. This will be combined with cultural activities highlighting the sights and sounds of the country. Delegates will enjoy insider views of the engineering systems in India and experience the culture in ways that most travelers never do, from exploring the Palace of the Winds and the Taj Mahal to observing professional counterparts in their element.

Program details and an application form are available by calling 877.787.2000 ext. 7008 or emailing brenda.winn@peopletopeople.com. A direct link to the planned itinerary can be found online at: www.peopletopeople.com/ghanirazaqpur.



Domestic Venues

ACMBS-VI
Kingston, ON
May 22–25, 2012
<http://www.acmbs2012.ca>

2012 CSECE Annual General Meeting and Conference
Edmonton, AB
June 6–9, 2012
<http://www.csece2012.ca>

15th International Specialty Conference on Cold Regions Engineering
Quebec City
August 19–22, 2012
<http://www.csece.ca/2012/iccre>

International Venues

Third International Workshop on Performance, Protection & Strengthening of Structures under Extreme Loading (PROTECT2011)
Lugano, Switzerland
August 30–September 1, 2011
<http://www.protect2011.supsi.ch/>

International Conference on Drinking Water, Safety, Security and Sustainability
October 9–11, 2011
Hangzhou, China
<http://drinkingwater.zju.edu.cn>

Seismic Protection of Cultural Heritage
October 31–November 1, 2011
Ankara, Turkey
<http://e-imo.imo.org.tr/portal/web/Organizasyon/Default.aspx?id=4>

Coastal Management 2011: Innovative Coastal Zone Management: Sustainable Engineering for a Dynamic Coast
November 15–16, 2011
Belfast, UK
www.ice-coastalmanagement.com

SPOTLIGHT ON MEMBERS / MEMBRES EN VEDETTE



On May 28, 2011, *Sherry Sparks, FEC, MCSECE, P.Eng.*, received the Engineers Canada Award for the Support of Women in the Engineering Profession. Sherry is Director of Building Inspections for the City of Moncton, the first woman to hold this position in New Brunswick. She was the first woman project engineer for Marine Atlantic and the first woman regional engineer for the New Brunswick Department of Supply and

Services. Sherry served as Vice-President of the CSECE's Atlantic Region from 2007–2011. She is also past-president of Engineers and Geoscientists New Brunswick. Her high-profile academic career focuses on one key issue: the advocacy of women's involvement in the engineering profession. She is an inspiration to the next generation of women looking for a rewarding career and a way to improve the lives of their fellow citizens.

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Finite element analysis & design of reinforced, precast ICF & tilt-up concrete walls

sp beam

Analysis, design & investigation of reinforced concrete beams & one-way slab systems

sp column

Design & investigation of rectangular, round & irregularly shaped concrete column sections

sp slab

Analysis, design & investigation of reinforced concrete beams & slab systems

sp mats

Finite element analysis & design of reinforced concrete foundations, combined footings or slabs on grade

StructurePoint's suite of productivity tools are so easy to learn and simple to use that you'll be able to start saving time and money almost immediately. And when you use StructurePoint software, you're also taking advantage of the Portland Cement Association's more than 90 years of experience, expertise, and technical support in concrete design and construction.

Visit StructurePoint.org to download your trial copy of our software products.

For more information on licensing and pricing options please call **847.966.4357** or e-mail info@StructurePoint.org.