



World Federation  
of Engineering  
Organisations

# The Committee on Engineering and the Environment

**October 2010**

*“The United Nations has established the Millennium Development Goals.”*

**By Darrel Danyluk, P.Eng.,  
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*Darrel Danyluk chairs the WFEO Standing Committee on Engineering and the Environment (CEE).*

Every day, in every country around the world, societies function. They are supported by physical, social and economic infrastructures that vary from the extremely sophisticated to the very rudimentary. Regardless of the infrastructure's complexity, these three infrastructure groupings are inter-related and all are evolving.

Standards of Living and Quality of Life reflect this inter-relationship and define the respective societies. Each of these infrastructure groupings requires resources and also impacts the environment at the local, regional, national and global levels. All three infrastructure categories must account for their impacts and work towards sustainability.

The United Nations has established the Millennium Development Goals (MDGs), which strive to address many issues that afflict humanity. To meet those ends, the UN Commission on Sustainable Development (CSD) develops policy statements on sustainability across seven thematic groupings such as mining, transport, chemicals, and waste

## It's Time to Think About the Future



Infrastructure projects vary in their technical sophistication. Here, women work on a United Nations supported project to rebuild a road in Timor-Leste (UN Photo/Martine Perret)

management, Africa, agriculture, drought, desert-ification and rural development. Each grouping is considered in two-year cycles and revisited every 14 years. A parallel and related commission, the United Nation Framework Commission on Climate Change (UNFCCC), since 1992, has raised the alarm about the catastrophic effects of a warming planet, and is calling on governments to mitigate CO<sup>2</sup> emissions and to develop country adaptation plans to address the impacts of a changing climate.

The important role of engineers and engineered physical infrastructures in meeting the MDGs; at CSD, across these thematic groupings; and at the UNFCCC, by addressing the mitigation and adaptation needs, appears obvious to the engineer. If anything, this import-

ance is magnified as policy moves to implementation.

It is less apparent to other societal sectors. This deficiency needs to be addressed by WFEO and its Standing Committees. Our Committee on Engineering and Environment (CEE), in its role as the engineering focal point to the UNFCCC and as a member of the CSD Task Force – led by the Committee on Energy – will enhance our efforts to create this awareness.

As I enter the last year of a first term as Chair of the Standing Committee and complete the initiatives in our Strategic Plan, it's time to think about the future. In October, at our next committee meeting, we will be initiating our planning for the themes for a second term of leadership. CEE welcomes your ideas, your participation and on-going commitment.

# Theme 6: Infrastructure In Developing Countries

By Cdr. Arvind Poothia IN (Ret'd)

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The infrastructure sector covers a wide spectrum of services such as transportation (including roadways, railways, airways and water transportation); power generation, transmission and distribution; telecommunication; port-handling facilities; water supply; sewage disposal; irrigation; medical, educational and other primary services.

Some of these services have a direct impact on the working of a business enterprise, while others are more important from a societal point of view. Infrastructure contributes to economic development by increasing productivity and by providing amenities that enhance the quality of life. Its linkages to the economy are multiple and complex. It affects each of the economic activities – such as production, consumption, distribution, trade, etc. – directly or indirectly through positive and negative externalities. The availability of adequate infrastructure facilities is imperative for the overall economic development of a country. Infrastructure adequacy helps determine success in diversifying production, expanding trade, coping with population growth, reducing poverty and improving environmental conditions.

A good infrastructure in the form of improved transport can increase the productivity of workers through better management of time they spend on non-productive activities. Improvements in water supply and sanitation also can have positive impacts on the health of the workers, thereby increasing their productivity. A better infrastructure in various forms helps the poor by allowing them to earn more through their livelihood, and leads to reduction in poverty and inequality.

A strong correlation exists between per capita GDP and availability of certain services such as telecommunications, power, roads, and access to safe drinking water etc. With the rise in per capita GDP, composition of infrastructure changes significantly. Basic infrastructure such as water and irrigation are more important in less-developed countries whereas power and telecommunication play a vital role in developing countries. As the economy progresses, the share of agricultural infrastructure shrinks and other infrastructure takes its place for speedy development of industrial and service sectors.

## Bandra-Worli Sea Link, Mumbai

India's first and longest open-cable stayed bridge, the Bandra-Worli link, is the first phase of the West Freeway Sea Link (WFSL) project and links the City of Mumbai with its western suburbs. The project is aimed at upgrading the road transportation network of greater Mumbai.

The Bandra-Worli Sea Link has a total length of 4.7km and dual carriageways of four lanes each. The project comprises:

1. Approach road of 540m
2. 54x2 pre-cast segmental approach spans of 50m length
3. Bandra Cable Stay Bridge on 126m-high, single pylon with 500m clear span
4. Bandra Cable Stay Bridge on 54m-high, twin towers with 150m clear span
5. 811m link bridge
6. 16-lane intelligent toll plaza.

At peak times, the project deployed 165 engineers and staff, and 2,800 workers. The project management team had the requisite experience and skill levels for segmental construction and marine-sub-structural works. The project demanded application of state-of-the art technologies of global standards.

**Owner:** Maharashtra State Road Development Corporation  
**Designer/Consultant:** Dar Consultants India Pvt. Ltd.

**Contractors:** Hindustan Construction Company Ltd.  
**Funding:** Maharashtra State Road





# Roads and Bridges Infrastructure

## – A Snapshot of Indian Developments

The following and the projects featured in boxes in this newsletter highlight some recent infrastructure developments in India.

### Size

- India has an extensive road network of 3.3 million km – the second largest in the world
- Roads carry about 70% of the freight and 85% of the passenger traffic
- Highways/expressways constitute about 66,000 km (2% of all roads) and carry 40% of the road traffic
- The Government of India spends about \$4 billion annually on road development
- The Government's ambitious National Highway Development Project (NHDP) is at an advanced stage of implementation. Key sub-projects under the NHDP include the Golden Quadrilateral (GQ), 5,846 km of four-lane highways and the North-South & East-West Corridors (NSEW), 7,300 km of four-lane highways
- Program for four-laning of about 14,000 km of National Highways is underway

### Outlook

- Annual growth projected at 12-15% for passenger traffic, and 15-18% for cargo traffic
- Over \$50-60 billion investment is required over the next five years to improve road infrastructure

### Potential

- Road development is recognized as essential to sustain India's economic growth.
- A large component of highways is to be developed through public-private partnerships.
- Investment opportunities exist in a range of projects being tendered by National Highways Authority of India (NHAI) for implementing the NHDP – contracts are for construction or on a Build-Operate-Transfer (BOT) basis depending on the section being tendered.
- A \$5-billion project plans to lay six-lane roads over 6,500 km of National Highways on the Design Build Finance and Operate (DBFO) basis – for high-traffic stretches of over 40,000 passenger car units (PCUs) per day.



### Grade Separated Interchange at Junction of NH-45-IRR at Kathipara, Chennai

National Highways Authority of India (NHAI), along with the State Government of Tamil Nadu, programmed to develop access to the Golden Quadrilateral Corridor by providing free-flow facilities in highly trafficked areas in Chennai. The Kathipara flyover involves design and construction of a clover-leaf interchange in the heart of Chennai City. The structural portion involves 600m-long, dual 12.0m-wide decks for the main viaduct spans connecting the inner ring road to the Airport. Four loops of approximately 200m length each connect to the main viaduct from Guindy-Poonamallee Road. All the structural spans are resting on aesthetically shaped piers founded on open footings at 3 to 4m depth.

Voided slab superstructure in PSC and RC have been adopted for superstructure.



**Owner:** National Highways Authority of India  
**Contractor:** Somdutt and Simplex (JV)

**Consultants (Design and Supervision):** STUP Consultants P. Ltd.

### Pir Panjal Railway Tunnel, Jammu & Kashmir

The Pir Panjal Rail Tunnel project is part of the ambitious, 345km-long Udhampur Srinagar Baramulla rail link that will provide an alternative and reliable transportation system to Jammu and Kashmir (J&K) by joining the Kashmir Valley with the Indian Railways network. The railway line will strengthen available transport facilities to J&K and provide all-weather means for transport in an area that is snowbound for a significant part of the year. Post-completion, it will be the longest tunnel in India, around 11km long and 8.50m in diameter, passing through the most difficult terrains of Himalaya.

The photograph shows the water-proofing membrane provided along with supports to restrict seepage. The work commenced in June 2004 and is expected to be completed in 2011.

**Owner:** Ircon International Limited

**Designer, Consultant, Geoconsultant:** Rites JV

**Contractors:** Hindustan Construction Company Ltd.

**Funding:** Ircon International Limited



### Rajiv Gandhi International Airport

Constructed on a green-field site, approximately 30 km south of downtown Hyderabad, the new Rajiv Gandhi International Airport is built on an area of 5,400 acres and has the longest runway (4,260m) among Indian airports. The airport can handle 12 million passengers and accommodate the world's largest passenger aircraft, the Airbus A380. The domestic and international cargo-processing and storage facility is designed with a clear height of 14m and total built-up area of 10,070m<sup>2</sup>. The roof has been designed with a seamless steel roofing system extended up to a length of 72m and a width of about 400mm, cut using special rollers.

**Owner:** GMR Group in a public-private partnership which also includes the State Government of Andhra Pradesh, Airports authority of India and Malaysia Airports Holdings Berhad.

**Contractors:** Larsen & Toubro Limited.

**Engineering Consultants:** Engineering Design and Research Centre (EDRC) of ECC Division, Larsen & Toubro Limited.

**Owners Consultants:** STUP Consultants P. Ltd in association with Kowi Consult



## WFEO-CEE and Related Upcoming Events

- Oct. 16, 2010 Buenos Aires, Argentina – WFEO-CEE Face-to-Face Meeting #3
- Oct. 17, 2010, Buenos Aires, Argentina – WFEO Executive Council Meeting
- Sept. 6 or 7, 2011, Geneva, Switzerland – WFEO-CEE International Session on Climate Change – “Addressing Climate Change Impacts – Infrastructure Adaptation and Capacity Building Opportunities” WEC2011 – [www.wfeo.net](http://www.wfeo.net)
- Nov. 29–Dec. 10, 2010, Cancun, Mexico – UN Framework Convention on Climate Change, Conference of the Parties Meeting No. 16 – [www.unfccc.org](http://www.unfccc.org)
- June 6–17, 2011, Bonn, Germany – Bonn Climate Talks – [www.unfccc.org](http://www.unfccc.org)
- Jan. 4–6, 2011, Singapore – 4th ASCE-EWRI International Perspective on Water Resources and the Environment [www.ipwe2011.org](http://www.ipwe2011.org)
- March 31–April 1, 2011, Bangkok, Thailand – International Conference on Agricultural Engineering – [www.kmitl.ac.th](http://www.kmitl.ac.th)
- May 2–15, 2011, New York, U.S.A. – UN Commission on Sustainable Development – Meeting No. 19 [http://www.un.org/esa/dsd/csd/csd\\_index.shtml](http://www.un.org/esa/dsd/csd/csd_index.shtml)
- May 19–21, 2011, Climate Change, Agri-Food, Fisheries and Ecosystems: Reinventing Research, Innovation, and Policy Agendas for Environmentally-and Socially-Balanced Growth", Agadir, Morocco. Abstracts deadline Oct. 31, 2010 – [ICCAFFE2011 Homepage](http://www.icc2011.org)
- May 22–26, 2011, Palm Springs, CA, U.S.A. – 2011 ASCE-EWRI World Environmental and Water Resources Congress – [www.asce.org](http://www.asce.org)
- May 2012, Rio de Janeiro, Brazil – United Nations Conference on Sustainable Development 2012 (Rio +20) [www.uncsd2012.org](http://www.uncsd2012.org)