ENVIRONMENTAL ENGINEERING PRACTICE IN JAPAN

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(Recommended by the Institution of Engineers, Australia)

1. Introduction

The study tour was undertaken in the latter half of November 1992. The objective was to gain an understanding and appreciation of the application of environmental policy in Japan and particularly the role of the engineering profession. The specific interest areas were as follows:

- Environmental management in large cities particularly related to waste water management
- Environmental research and development generally in Japan
- Japanese involvement in the global environmental scene

The significance of the study tour at this particular time was that it followed the release by the National Committee on Environmental Engineering of the Institution of Engineers, Australia of a publication on Environmental Principles for Engineers, promoting the ideal of ecologically sustainable development. The National Committee's objective is to promote the application of ESD and to facilitate the incorporation of sustainability into all facets of engineering.

The opportunity to examine environmental policy in the Japanese community was therefore very timely.

2. Study Tour

The cities of Tokyo, Yokohama, Nagoya, Osaka and Hiroshima were visited and discussions held with engineers from the municipal governments in Tokyo, Osaka and Yokohama, with senior management of a number of the major construction companies and with senior academics in the Departments of Civil and Urban Engineering at the University of Tokyo.

Mr.Yagi (left, Executive Director of JSCE 1985-92),

The site of the construction of the Nagoya River Estuary Barrage Project to the west of Nagoya was also visited and discussions held with engineers from the River Bureau, Ministry of Construction.

Other discussions were held with research personnel in the National Institute of Environmental Studies and with senior bureaucrats and academics involved in the establishment of the United National Environment Program, Institutional Environmental Technology Centre and its supporting foundations.

In addition a symposium in Tokyo on Environmental Management and Disaster Reduction in Developing Countries was attended and a Global Environmental Expo in Yokohama.

Meetings were also held with Japanese representatives of FEISEAP and WFEO Environment Committees.

A technical paper is in the course of preparation that will more fully describe reflections on Japanese environmentalism. However, in this report a brief review is provided under the headings identified above that will give some insight into these key aspects.

3. Environmental Management in Large Cities

Japan is a country of urban dwellers with some 80% of the total population of 120 million concentrated in urban communities. Tokyo with a population of 14 million is one the world's largest cities. The population of Japan occupies only 20% of Japan's land area with the result that urban densities are some of the highest in the world.

Discussions were held with engineers from the Municipal Government offices in Osaka, Yokohama and Tokyo. Discussions centred around waste water treatment and water pollution control generally although aspects of air pollution and noise control and solid waste management were also covered. Japanese regulatory requirements for pollution control and standards for environmental assessment were also reviewed.

The sewerage provision in the major cities is effectively universal. However, outside of the major cities Japan faces a backlog in providing universal sewerage services with a significant proportion of the population still being served by night soil facilities and with grey water discharge directly to receiving waters. In fact it is stated that for the whole of the country some 85% of the BOD from domestic waste water is discharged directly into public waters.

In the major cities the sewerage systems serve both storm water and domestic sewerage. As a result urban drainage and flooding is a major issue.

There are many common features and similar problems faced by Japanese and Australian authorities in providing urban waste water facilities. The differences are primarily a function of the large population levels and urban densities in Japan. The pressure on land use has resulted in many of the treatment plant facility is common, with the added advantage of also providing odour control.

All solid waste including municipal sludges are incinerated in the large cities with disposal of residues frequently to land reclamation projects along or off the coast.

With distinct dry and wet seasons it is common in the dry season for effluent from the sewage treatment works to provide the total flow in many of the streams and rivers in the major cities. Increasingly effluent polishing is being looked at for treating water to a standard that would be suitable for contact recreation as part of urban beautification.

Effluent reuse in new high rise office buildings of a certain floor area is now mandatory with the provision of dual reticulation systems and on-site treatment of building effluent.

In the provision of water supplies increasing population growth and higher per capita demands as a result of industrial growth has required significant water resource development with the distribution of water from source to consumer being over significant distances. Water conservation measures to reduce per capita demands have been promoted in Japan since the mid 1970's.

4. Environmental Research in Japan

The Environment Agency in Japan appropriates some $2.5 billion annually to national institutes for research into environmental problems. 46 institutes in 12 ministries and agencies are involved in environmental research of some form.

The National Institute for Environmental Studies was established in 1974 and is located in Tsukuba City, some 60 kilometres north-east of Tokyo. Tsukuba houses many of Japanese research institutes being the site of a world expo in the 1970's. The Institute has a staff of some 250 with an annual research budget of some $50 million.

Industry participation in environmental and related research is also significant. The major construction companies (Kajima, Taisei, Shimizu) have major research institutes with annual budgets of some $50 million and staff of many hundreds. Although primarily directed to construction technology many of the projects are environmentally driven – energy conservation, recycling etc.

The large corporations supplying electrical power in Japan also have significant research budget allocations with companies like the Kansai Electric Power Company and The Tokyo Electric Power Company having budgets of up to $100 million annually directed to research into CO_2 fixation, energy conservation etc.

The third sector of environmental research in Japan is the NGO groups and universities. There are numerous centres and foundations, generally promoted by academic groups and supported by both the government and private sector funding. The major universities also have research institutes or departments of environmental or urban engineering directed at both education and research into aspects of environmental engineering. Tokyo University has a Department of Urban Engineering and Kyoto University provides the scientific support to the International Lake Environment Committee Foundation and the Lake Biwa Research Institute.

NEDO (New Energy and Industrial Technology Development Organisation) is the peak research group for technology R & D in Japan. Established in 1980, originally to develop alternative energy sources as a semi-government organization under the Ministry of International Trade and Industry (MITI), it has had its role widened to encompass the development of new industrial technology – new material, biotechnology, manufacturing technology, etc.

Some of the environmental aspects of NEDO's operations include:

- development of renewable energy types: solar, wind, geothermal, etc
- new energy sources
- energy conservation and electricity storage technology
- technology to fix and utilise CO_2
- development of advanced refrigerants, biodegradable plastics, etc.

5. Japan's Role in the Global Environmental Scene

Japan accounts for some 14% of the world's total gross domestic product. As a result there is a strong commitment in Japan to a responsibility to work towards resolving or solving global environmental problems and promoting environmental conservation and particularly providing assistance to the developing countries, many of whom provide the foreign resources on which Japan relies.

All of the research institutes have a component of their research directed at global environmental problems particularly CO_2 reduction, technology transfer generally, etc. There are however specific institutes that have been formed in relatively recent times (see date in brackets) directed at solely the global scene of which a selection are:

- Global, Industrial and Social Progress Research Institute (1988)
- UNEP International Environmental Technology Centre (1992) and supporting foundations, Global Environment Centre Foundation (1992) and International Lake Environment Committee Foundation (1987)
- Research Institute of Innovative Technology for the Earth (1990)
- International Centre for Environmental Technology Transfer (1991)
- KITA Environmental Co-operation Centre

6. Organization

The JSCE Study Tour Grant has been offered to some 5 other countries – US, Canada, UK, Sweden and one other. Australia was the second country to take up the 1992/1993 grant, the inaugural year of the scheme. A Swedish engineer had arrived in Japan in early November to study port and harbour development.

The organization and efficiency of the itinerary, the hospitality of the hosts and the courtesies extended were outstanding and made this study tour of maximum value and enjoyment.

Some 30 people were involved in providing assistance. This included members and staff of JSCE in the organization of the study tour, selected members of JSCE in providing escorts to many of the meetings in Tokyo, Osaka, Nagoya and Yokohama, travel companions and guides on weekends associated with sight – seeing and trips to Japanese historical and cultural sights, and the engineers and their colleagues in the various municipal governments and research centres that so generously gave of their time for discussions.

Special thanks should be given to a number of key people:

- Dr. Toshio Fujii, President of JSCE, Professor Hideo Nakamura, Chairman of JSCE Sub Committee No.1 on International Affairs and Dr. Tsutomu Kimura, Chairman of JSCE Sub Committee No.2 on International Affairs for their hospitality and promotion of the study tour.
- Dr. Keizo Baba, who was the key to the success of the tour. His organization and arranging of the itinerary and his support whilst in Japan were outstanding. Thanks also go to his company, Taisei Corporation for their support of him.
- Dr. Shigeyuki Kohno (Shimizu Corporation), Dr. Kenji Aoki (Kajima Corporation), Mr.Hiroyuki Yanagawa (JSCE) and Mr. Naoki Kita (Shimizu Corporation) and their companies.
- Mr. Junichi Yagi, Managing Director of JSCE and his staff for their overall support.

7. Financial

JSCE provided 600,000 yen towards the cost of the study tour of which an amount of 450,000 yen ($5144) was transferred to Australia for travel bookings.

As it turned out it was only possible to make certain bookings from Australia. The difficulty of confirming reservations during what was a peak season in Japan and at the time of a major public holiday meant that only some of the accommodation bookings could be made from Australia and the balance had to be made in Japan. As a consequence the payment of some of the accommodation was necessary by credit card with a consequential loss on the transaction. The tour was organised to coincide with a number of events in Japan, particularly the Glentex Expo in Yokohama. Formal advice of the travel grant was not received until 16 November and departure for Japan was 15 November. This did not allow the opportunity to optimise travel arrangements and travel costs.

Package deals are available through the Japanese airlines which provide both air travel and

accommodation packages. However, it is not known whether such packages were available at the time of the tour. These packages are only available in Australia, as is the JR Rail Pass which offers considerable savings compared to ticket purchase in Japan. On the other hand JSCE has membership arrangements which offer significant savings at the Hotel Edmont in Tokyo. However, it was only possible to take advantage of this for part of the time in Tokyo as vacancies were not available for the initial period in Tokyo. Overall it is felt the 600,000 yen provides the opportunity for approximately 10 days to 2 weeks travel and accommodation in Japan. Travel is relatively cheap throughout Japan using the rail pass, although it does not apply to much of the local travel, including all private systems. The major costs are for accommodation and meals. Hotel prices range from 7,000 yen to over 20,000 yen per night.Daily living expenses were high with travel and meals averaging out at approximately 8,000 yen par day.

This is in addition to the very generous hospitality provided by the engineering company representatives and members of JSCE.

A breakdown amongst the principal items is as follows:

- Airfares, JR Rail Pass, travel insurance (Price Travel, Sydney) 175,000
- Accommodation Tokyo (6 nights) 95,000
- Accommodation in Osaka (2 nights) 28,000
- Accommodation in Nagoya (2 nights) 32,000
- Accommodation in Yokohama (2 nights) 50,000
- Daily expenses at 8,000 per day 112,000
- Miscellaneous (business cards, airport taxes, documents, etc) 120,000

8. Conclusions

The study tour was an outstanding success in terms of the opportunity to view Japanese technology, the interaction possible with Japanese engineers and the furtherance of mutual understanding of the environmental challenges faced by our two countries and in the global arena.

Many important contacts have been established which will be of great value in the future for the National Committee, and through them the Institution.

The tour was organized in an exemplary manner by the JSCE. Difficulties had to be overcome to identify key people to make appointments and to finalise travel and accommodation arrangements. The short notice of my intended visit exacerbated this problem but it must be said there was not one meeting or opportunity that was lost because of inadequate planning.

I am sure for my part that the tour developed closer relations between our professions and I

am indebted both to the JSCE and IEAust for the opportunity. I can whole heartedly support the continuance of the study tour program and indeed encourage the Institution to look for opportunities for further co-operation and collaboration with our Japanese colleagues.