Chinese American Water Resources Association

Newsletter

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CAWRA NEWS

Report on the 4th Conference for Science and Technology Exchange on Water Resources Across the Taiwan Strait

By Dr. Samuel Lin

The 4th Conference for Science and Technology Exchange on Water Resources Across the Taiwan Strait was held in Taipei during December 21-26, 1998. The opening and technical sessions were held during the first two days; field trips were organized during December 23-25; and a general discussion session was held on the final day, December 26. The total number of registered participants was 193, among them 30 were from the Chinese Mainland, and about ten were from the United States (mostly CAWRA members).

The three keynote talks were "Taiwan's Water Resources Management, Past and Future," by Hsieh Ruei-Lin, Former Director of Taiwan Provincial Bureau of Water Resources; "The Great 1998 Yangzi River Floods," by Gao Zhi-Zang, Deputy Director of the Research Institute of Hydropower and Water Resources, Beijing; and "Modernization of Hydrologic-Data Collection – A Prerequisite to Mitigating Flood Disasters," by Chao-Lin Chiu, Professor, University of Pittsburgh.

The main topics of the technical papers were watershed management, hydropower generation and mitigation of natural disasters. Seventy-four papers were included in the conference proceedings. To provide ample time for discussion, these papers were summarized and presented in six sessions by nine general reporters. Overall the conference and tour were informative, productive, and successful.

The final session on December 26 was organized for the members of the Organizing Committee and the Technical Committee to review the Conference and to initiate planning for the next Conference. Quite a few subjects and perspectives were proposed and discussed to promote future conferences and cooperation between scientists, engineers, and managers from Taiwan, the Mainland, and the CAWRA. The attendees voted to accept one of the three alternative proposals made by Mr. Gao Zhi-zang, to have the 5th Conference for Science and Technology Exchange Across the Taiwan Strait organized in Chengdu by the Sichuan Union University in October, 1999. An alternative date suggested was June 2000. If held in October 1999, the Conference may precede the International Conference on Dam Safety and Monitoring, Wuhan, October 19-22, 1999.

The Fifth Conference for Science and Technology Exchange on Water Resources Across the Taiwan Strait will be held at Chengdu, China on October 24-26, 1999. The conference site will be the world famous irrigation works, Dujian Yen City. Three themes are selected for the conference.

1. Planning, Construction, and Management of Water Resources Engineering. (Including Reservoirs, Dikes and Levees, and Irrigation Works)
2. Water Environment Protection and Pollution Abatement (Including Rivers, Lakes, and Estuaries)
3. Development and Utilization of Hydropower Resources (including Cascade Power Plants and Pump Storage Power Plants)

Papers submitted shall be in Chinese, but for overseas authors English will be accepted. The length of the paper is limited to 6 to 12 pages. Those papers submitted in English shall include a title and detailed summary in Chinese. The paper submitted shall be one printed copy and a disk containing a MSWord 7.0 file. The paper can be submitted through mail, e-mail or fax to the following address:

Mr. Wang Lianxiang
Office of International Corporation
China Institute of Water Resources and Hydropower Research
20 West Chegongzhuang Road 100044
Beijing, China
Fax 86-10-68412316
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The registration fee is US$150.00, and the Lake Cui Yue Hotel provides three types of accommodations and fees.

Ao Lin Gong (Standard Room)	420 Renmingbi per day
De Yue Lo (Standard Room)	210 Renmingbi per day
Cui Hua Lo (Three person Room)	180 Renmingbi per day

After the Conference, three tour routes of 6 – 7 days with expenses ranging from US$850 to US$1,000 will be organized, depending on the number of interested participants.

Following U.S. members are serving on the Organizing or Technical Committees for this Conference.

U.S. CAWRA members serving in the Organizing Committee:
S-T. Su, *Vice Chairman* H. W. Shen, *Advisor*
Members: Frank Tsai Tsong C. Wei David Soong

U.S. CAWRA members serving in the Technical Committee:
Chao-Lin Chiu, *Vice Chairman* Ben C. Yen, *Advisor*
Members: Shou-shan Fan Samuel Lin C.-K. Lo

The CAWRA has organized two sessions in the 1999 ASCE Water Resources Engineering Conference in Seattle.

The organizers of the 1999 ASCE Water Resources Engineering Conference, August 8-11, 1999, have accepted Dr. Steve Melching's proposal to include two special sessions on Chinese Water Resources. Dr. Melching and Dr. Soong subsequently selected 10 papers that were received in response to the call for papers (see Newsletters 11 and 12) in the two sessions. Presenters in the two sessions are coming from mainland, Taiwan, and the U.S. The following is the list of presentations included in the two sessions.

Session I. Water Resources

1. *Flow Structure of Tanshui River and Its Potential Application in Discharge Measurements under Tidal Effect* by Chao-Lin Chiu and Yen-Chang Chen
2. *Experiment and Modeling Studies on Irrigation Return Flow in the Rice Paddy Field* by Ray-Shyan Wu, Kuei-Miao Lin, and Chuan-Pin Chien.
3. *Linear Programming Applied in the Conjunctive Use of Multiple Water Resources for an Irrigation System* by Chuan-Pin Chien, Wen-Tsun Fang, and Ray-Shyan Wu
4. *Modification of Rule Curves for Optimal Operation of Tseng-Wen Reservoir in Southern Taiwan* by Jan-Tai Kuo and Cheng-Seng Huang
5. *Experimental Study on Preventing the Flood of 1% Frequency in the Huaihe River* by Chen Xian-Pu, Xi Ru-Ze, Liang Bin, Shao Dong-Chao, Duan Hong-Dong, and Chen Biao

Session II. River Systems

1. *Similarities of the 1993 Mississippi Flood and 1998 Yangtze River Flood* by B.C. Yen, T.W. Soong, and C.S. Melching
2. *Sea-Water Desalination as an Alternative Source of Water Supply in Taiwan* by Shiang-Kueen Hsu and Wen-Sen Chu
3. *A Preliminary Study of the Effects of Three Gorge Project on the Pollution Mixing Zones Along Yangtze Riverside near Chongqing* by Zhang, Zhuang & Ai, Li
4. *The Project of River Remoulding of Chengdu City in China* by Wenqian Zhao, Xiaozhang Lei, and Kefen Li
5. *Flow Cessation in the Yellow River and Its Impacts* by Zhang Qishun and Hu ChunHong

Note: Professor Zhang Qishun is ill and may not present his paper no.5 in Session II. If you are interested in presenting a paper on related topic at this session please contact Dr. Soong at (217) 333 1495.

CAWRA Committee Development and Progress

PUBLIC RELATIONS COMMITTEE

Frank Y. Tsai was appointed as Chairman of the Public Relations Committee in April 1999. The Committee is under the Division of Publications and Public Relations. He intends to increase publicity through news media and to make direct contact with other related organizations or publications on both sides of the Taiwan Strait. Also, the Committee will assist the Publications Committee to establish and maintain the CAWRA web site. To find out more about the Committee, to join the Committee, and/or to provide comments, please contact Frank Y. Tsai, 522 S. Larrimore St., Arlington, VA 22204-1067 or e-mail: fyt55@yahoo.com.

PLAN OF PUBLIC RELATION COMMITTEE
GOALS:

1. Goal #1 - Improving service to members of the CAWRA
2. Goal #2 - Fostering and holding Chinese-American Conferences on Water Resources R&D on both sides of the Taiwan Strait
3. Goal #3 - Establishing partnership with water resources organizations and other water related Chinese-American professional societies and similar organizations on both sides of the Taiwan Strait
4. Goal #8 - Encouraging and upgrading Cross-Strait contact and cooperation
5. Goal #11 - Establishing the CAWRA WWW and increasing publicity through news media in English and Chinese

Notes from your Secretary

Throughout the past years, we have lost contact with some of our members. If any of you know their new address, please contact them or provide their new address to me. The list of names of missing members according to our records is:

Dr. Chen Yung Hai, Chen Engineering Technology, Ft. Collins, CO.
Dr. Hong H. Mo, KCI Technologies, Inc., Manassas, VA
Dr. Kam James T., MK-Environmental Services, San Francisco, CA
Dr. Li Ruh-Ming, Newport Beach, CA
Dr. Ling Chi-Hai, US Geological Survey, Mountain View, CA
Mr. Thai Ming-Chang, Middletown, PA
Dr. Wang James C., Nolte and Associates, San Jose, CA
Mr. Yin Stephen C., Argonne National Laboratory, Argonne, IL
Dr. Zhao Dihua, El Corrito, CA
Mr. Zheng Ke-Qiang, University of Mississippi, University, MS.
Mr. Zhou Donghuo, University of Mississippi, University, MS.

Our organization has established four Divisions. The Director of each Division is:

Dr. Samuel Lin for the Division of Publications and Public Affairs,
Dr. David Kao for the Division of Technology,
Dr. S. T. Su for the Division of Corporations, and
Dr. Chin Y. Kuo for the Division of Finance.

The Division of Publications and Public Affairs also formed two committees: one is the Recruiting Committee with Dr. Yuan Cheng serving as the Chairman, and the other is Awards Committee, Dr. Shou-Shan Fan chairs the committee.

GENERAL NEWS

According to a senior official, the summer floods of 1998 have caused the death of more than 3,656 people. Economic losses exceeded $30 billion, with more than 5.6 million houses destroyed and nearly 64 million acres of land inundated. Niu Maosheng, vice director of the country's flood control bureau, stated that the flood had affected more than 230 million people – a fifth of the mainland's population, the worst hit provinces were Jiangxi, Hunan, and Hubei, which lie along the Yangtze River in the Central Region, Xinjiang in the northwest and Heilongjiang and Inner Mongolia in the northeast. The flooding, which lasted for more than two months in some areas, was the worst in 44 years on the Yangtze River and in decades in the Northeast. (Cited from the U.S. Water News, Nov. 1998).

More than 50 factories along the Yangtze River will be shut by the government in an effort to boost environmental protection around the world's largest dam. Already more than 150 paper mills and tanneries have been closed in hopes of stopping pollution around the Three Gorges Dam site, according to the Xinhua News Agency. Government leaders are determined to see the $24.6 billion dam succeed, despite criticism by environmentalists and human rights groups that it is too costly and too intrusive for forcing the relocation of a million people. (China Daily).

ENGINEERING COMPANY ACTIVITIES IN THE GEOGRAPHICAL REGION OF CHINA

(Numerous companies from the U.S. and other countries are actively engaged in water-resources and environmental projects in the geographical region of China. The project information given here was obtained from the World Wide Web sites of the companies involved. The Editor encourages all members to share information regarding projects their company or agency may be doing in the geographical region of China by contributing news items to the Newsletter).

Black and Veatch (B&V)

January 1996 News--The recent merger of Binnie and Partners (a major firm in Hong Kong) with B&V, forming Binnie Black & Veatch (BBV), has already paid off with several overseas contract awards. A project in the field of water resources involves design and construction supervision services worth more than $25 million on the expansion of Tai Po, Hong Kong's largest water treatment and distribution facility. The project is expected to be operational by late 1999. This project will pump water from mainland China through a new 7.5-mi (12 km) long, 13-ft (4-m) diameter tunnel to a new reservoir. Ultimate capacity of the expanded treatment plant will be 320 million gallons per day (mgd) [1.2 million m^3/day].

April 1996 News--B&V involved in the Chongqing water pollution control project created to reduce pollution effects on the reservoir behind the Three Gorges Dam. B&V involved in the

Hubei Province Urban Environmental Project for 4 Chinese cities, including major wastewater and solid waste facilities.

July 1996 News--In March, the Shanghai Municipal Sewerage Company awarded BBV a construction management contract for the Second Shanghai Sewerage Project, recipient of one of the largest World Bank loans ever made for an environmental project. A second contract to provide financial advice was awarded to a joint venture of BBV and the UK water utility company, Thames Water. Construction will begin late this year and end in 1999. The project is designed to collect, convey, provide primary treatment for and dispose of an average wastewater flow of 1.7 million m^3/day (450 mgd) with ultimate capacity by 2020 of 5 million m^3/day (1,320 mgd).

Third Quarter 1997 News--HONG KONG DRAINAGE PLANS: BBV has been awarded contracts with a total value of $5.5 million for two Drainage Master Plans by the Drainage Services Department of the Hong Kong Government. Innovative study techniques, such as differential global positioning systems, asset inventory and management systems, SPIDA and MIKE11 interface modeling tools, and real-time flow monitoring, helped win the contracts. The objectives of the master plans, scheduled for completion in September 1998, are to relieve severe frequent flooding in Hong Kong's New Territories and to provide drainage infrastructure for much-needed new development areas.

WORLD BANK CHINA PROJECT: BBV has been selected by the Yunnan Environment Project Office to provide institutional development, financial management, construction supervision and operations, and management consulting services of water and wastewater facilities in Kunming, all part of the more than $300 million Yunnan clean-up project partially funded by the World Bank (see CAWRA Newsletter Vol. VI, no. 11, p. 10). Kunming is the capital of rapidly growing Yunnan Province (population 38 million) in southwestern China and is located beside Lake Dianchi, a popular tourist destination. The lake not only provides most of the city's drinking water, but also accepts a significant portion of its wastewater, which only receives primary treatment. BBV's project is expected to be completed in 4 years.

Camp Dresser & McKee Inc. (CDM)

Chao Lake Water-Quality Study--In the east central part of China, 300 miles west of Shanghai, lies Chao Lake, one of China's five largest freshwater lakes. Located in Anhui Province, the lake serves Hefei, the capital of Anhui Province (population 1.1 million), and Chaohu City (population 170,000). Both cities rely on Chao Lake as a vital resource, but recent developments have damaged the lake. To restore the lake's water quality, and to improve the health and economic prospects for the area, The Asian Development Bank (ADB) retained CDM to conduct a feasibility study and to prepare a possible loan project for the construction of municipal wastewater treatment facilities.

The area's main source of potable water, Chao Lake is also an economic and recreational resource, used for commercial fishing, barge transportation, and as a source for irrigation. In recent years, the rapid development of industrial and urban areas, coupled with changes in agricultural practices, have caused damage to the lake. Although pretreatment or final treatment of industrial wastewater has controlled pollution by heavy metals, toxic or hazardous substances, the lake has become overloaded with nutrients. These nutrients are derived from municipal and industrial wastewater, from soil erosion, and from excessive application of chemical fertilizers on agricultural land.

The study was managed by CDM's Hong Kong office in conjunction with the Anhui Provincial Government and the Anhui Province Environmental Monitoring Center. CDM's largest bank-funded study in China to date, it was also the ADB's first municipal wastewater study in China.

"The broad scope of the project included a planning and engineering study of the two cities' sewerage and treatment systems, and an evaluation of the project's environmental and socio-economic impacts," said Max Clark, CDM's project leader. A financial analysis was done to determine the tariff structure and pollution charges required to achieve cost recovery and financial sustainability.

A social assessment study was conducted, and included a household survey--the first of its kind in Anhui Province--aimed at identifying needs, preferences, and willingness to pay for system improvements.

The study team identified the basis for planning environmental control systems in the two cities, potential municipal wastewater projects, and recommendations for an implementation program. Hefei's improvements include the expansion of its wastewater treatment facility from 150,000 m^3/day (40 mgd) to 300,000 m^3/day (80 mgd), and integration of the facility with the city's 94 km (58 mi) of sewers and four pump stations. For Chaohu City, the study team evaluated 81 km (50 mi) of sewers, five pump stations, and a 30,000 m^3/day (8 mgd) wastewater treatment plant.

Subject to ADB appraisal and approval of a loan agreement, the implementation program will start in 1996. Residents of Chaohu City and Hefei can look forward to sustainable environmental improvements and protection of their vital water resources.

CH2M Hill

1997 Annual Report

Singapore Deep Tunnel Sewerage System--When the Singapore Ministry of the Environment requested design changes to this $6.8 billion project, CH2M Hill showed them the results from literally every angle overnight. CH2M/PB, a joint venture of CH2M Hill and Parsons Brinkerhoff, is providing initial planning for the advanced treatment system of deep wastewater transport tunnels, compact and covered treatment plants, and ocean outfalls that will meet Singapore's needs for the next century. CH2M Hill's versatile 3-D design capabilities and global computer network were used to link the firm's Singapore and Corvallis, Oregon, offices to provide round-the-clock engineering for this complex project.

Pa-Li Wastewater Treatment Plant--The Taipei Sanitary Bureau entrusted the startup and operation of Asia's largest wastewater treatment plant to CH2M Hill's facility operations and maintenance arm, Operations Management International, Inc. (OMI). Teamed with Taiwan's Super Max Engineering Enterprise Co., Ltd., OMI will manage the startup and initial operation of the 343 mgd (1.3 million m^3/day) Pa-Li Wastewater Treatment Plant. Once the planned 10-year buildout to 871 mgd (3.3 million m^3/day) is completed, the plant will be one of the largest privately operated plants in the world.

1996 Annual Report

In this annual report, CH2M Hill activities in the geographical region of China were briefly summarized as follows.

Taipei/Taiwan--Planning, design, and construction supervision of several wastewater treatment plants.
Singapore--Contract operations of an industrial wastewater treatment plant; Lead consultant for $3 billion upgrade of Singapore's wastewater system.
Changchun, China--Technical and construction support for a $250 million World Bank funded water supply project.

Danish Hydraulic Institute (DHI)

Flood Forecasting for the Middle Yangtze River (1995-97)--DHI is transferring the MIKE11 FF flood-forecasting modeling technology to the Changjiang Water Resources Commission. As part of the project, a pilot and demonstration model is being established for the hydraulically complicated middle Yangtze River where flood peaks reach 100,000 m^3/s (3.5 million cfs). The modeling area is around 600,000 km^2 (230,000 mi^2) and includes some of the most economically important parts of China.

The Yangtze Valley has a population of more than 300 million of which the majority lives in flood-threatened areas within or downstream of the project area. The Changjiang Water Resources Commission has a long tradition for flood forecasting. DHI is improving the traditional methods by introducing modern modeling technology in the commission. In cooperation with the Danish Meteorological Institute, DHI's well-proven MIKE11 FF model is being coupled with the advanced numerical meteorological model HIRLAM to be used for quantitative precipitation forecasting.

Tanshui Harbor Project, Taiwan (1997-98)--The Port Authorities of Keelung Harbor have initiated the construction of the Tanshui Harbor at the northwest coast of Taiwan, approximately 1 km (0.6 mi) southwest of the mouth of the Tanshui River. When finalized the harbor will have an overall length of 5.5 km (3.4 mi) and extend 3 km (1.9 mi) into the sea in front of the present coastline.

This new harbor has a major impact on the sediment balance. The sediment transported to the coast by the river used to supply sand to the coast southwest of the river mouth. This supply is now caught northeast of the new main breakwater, which is under construction. The area northeast of the harbor, which used to suffer from weak erosion, has now turned into a deposition area. The coastal stretch southwest of the new harbor now has severe erosion. The yearly erosion immediately south of the harbor is estimated at 500,000 m^3/yr (650,000 cubic yards/yr) which is unacceptable as the highway runs very close to the coastline.

In the present study, schemes for the protection of the downdrift coast have been developed. This study, which was made using MIKE21, involved comprehensive modeling of currents, waves, and sediment transport over a large area subject to both extreme conditions (typhoons) and more normal conditions. Furthermore, LITPACK was used for the assessment of equilibrium orientation of the coastline. The modeling work was undertaken in the Institute of Harbor and Marine Technology office in Taiwan as part of the transfer of the numerical models and the training.

Harza Engineering Company

Tianhuangping Pumped-Storage Project--The 1,800-MW Tianhuangping Pumped-Storage Project is the first pumped-storage power station to be integrated into the East China Power Grid. Located in Zhejiang Province, approximately 175 km (109 mi) northwest of Shanghai, the project will increase peak generating capacity, improve reliability, and raise the economic operating level of the whole grid.

Harza engineers advised the client on the location and layout of the tunnels and manifolds, interpretation of rock testing data, and design of grouting and drainage systems. Harza also applied state-of-the-art technology including concrete-lined inclined shafts, reinforced concrete trifurication without steel lining, and bituminous lining of the reservoir.

The fully lined upper reservoir was created by excavating and impounding a natural depression. A 72-m (237-ft) high rockfill dam with bituminous concrete facing was constructed on a tributary of Daxi Creek at the south end of the depression. The lower reservoir was formed by constructing a 95-m (312-ft) high rockfill dam with reinforced concrete facing on Daxi Creek.

Separate intakes are provided for two power tunnels, each 7 m (23 ft) in diameter and approximately 900 m (2,952 ft) in length, including 700 m (2,296 ft) of inclined shafts. Reinforced concrete-lined manifolds trifuricate the tunnels into six penstocks, 3.2 m (10.5 ft) in diameter, which are steel lined 200 m (656 ft) upstream of the underground powerhouse. Six 300-MW pump-turbines/motor-generators operate under an available head of 570 m (1,870 ft) and will produce an annual energy output of 3,100 GWh.

The scope of services provided by Harza Engineering includes:

1) Review of design on civil engineering aspects and construction scheduling.
2) Technology transfer in concrete-lined trifurcate manifolds.
3) Assist in preparation of tender documents and analysis of international bids.
4) Advise on construction management, methodology, and quality control; advise with Austrian partners on bituminous lining for the upper reservoir, and advise with Norwegian partners on excavation and lining of inclined shafts.
5) Assist in the design document preparation for the international competitive bidding for the upper reservoir bituminous concrete lining.
6) Advise on domestic bidding for the tunnel, manifold, and penstock system.

U.S. ENVIRONMENTAL PROTECTION AGENCY ACTIVITIES IN THE GEOGRAPHICAL REGION OF CHINA

(The following information was obtained from the U.S. Environmental Protection Agency, Office of International Activities World Wide Web site http://www.epa.gov/oia)

U.S. Environmental Protection Agency Greater China Program

The EPA and China have been involved since the early 1980's in cooperative projects for environmental research and management. EPA has been working with the Chinese government

in developing and implementing Clean Technologies in the industrial and manufacturing sectors; in presenting Pollution Prevention and Environmental Education Programs; in pursuing a commitment by the Chinese to phase out lead in gasoline; and in treating the causes of air and water pollution. There is frequent contact between EPA and Chinese state/provincial environmental staff at the working level.

EPA's involvement with China in environmental protection efforts has four major focus areas: (1) responding to requests from central and local governments for guidance on environmental policies, laws, and regulations for topics such as hazardous waste, energy efficient lighting standards, and water-quality criteria; (2) providing technical assistance and support for development of public information and public education programs; (3) forming partnerships for cooperative training and research; and (4) exploring mechanisms for financing environmental improvements and for developing potential markets for U.S. suppliers of environmental technologies.

In carrying out this program, EPA works closely with other agencies of the U.S. Government such as the U.S. Department of Commerce, the U.S. Department of Energy, and with a range of academic and non-governmental organizations. Technical cooperation with China on environmental research, environmental program management, or capacity building, is supported by EPA through: (1) the Environmental Protocol, signed under the Science and Technology Agreement between the two countries; (2) the U.S.-Taiwan Agreement in the Field of Environmental Protection; or (3) grants, Interagency Agreements, or other support mechanisms (including the U.S. Technology for International Environmental Solutions (TIES) Program) of the EPA and other agencies of the U.S. Government.

EPA's China Program reflects the several aspects of EPA's mission for international cooperation: research that advances domestic environmental protection activities in China and the U.S.; cooperation that addresses critical global environmental issues; and partnerships in projects that enhance prospects for U.S. private sector participation in China's environmental protection efforts.

U.S. Environmental Protection Agency-China National Environmental Protection Agency (NEPA) Environmental Protocol

The Governments of the U.S. and China signed an Agreement on Cooperation in Science and Technology on January 31, 1979, in which the two countries agreed to work together to promote scientific and technical cooperation. Under the umbrella of this broad agreement, separate protocols have been signed in a variety of fields between individual agencies of the U.S. Government and their Chinese counterparts. The EPA and China's NEPA manage one of these, which was signed on February 5, 1980.

The EPA-NEPA Environmental Protocol pledges cooperation between the environmental ministries of the U.S. and China working on problems of pollution of the air, water, soil, and marine environment; on the environmental effects on human health; on ecological systems; and on the urban environment. Other categories which are included in the protocol are preservation of nature, environmental legislation, environmental management, and environmental economics. Specific areas of cooperation that are defined under the EPA-NEPA Environmental Protocol include:

Exchange of scientists, scholars, specialists, and students;
Exchange of scientific, scholarly, and technological information and documentation;
Joint planning and implementation of programs and projects;
Joint research, development and testing, and exchange of research (results and experience); and
Organization of joint courses, conferences, and symposia

The following paragraphs summarize the projects related to water resources that have been completed and those that are still active under Annex 3 (Environmental Processes and Effects) to the EPA-NEPA Environmental Protocol.

SOIL AND GROUND WATER POLLUTION STUDY

Focus--Technical cooperation on studies of the transformation mechanisms and control of ground water contaminated by land treatment of municipal and industrial wastewater. Journal articles in the December 1990, issue of Water Environment and Technology, and Bilateral Wastewater Treatment Research by China and the USEPA, published by Water Science and Technology.

Partners--EPA Office of Research and Development/National Risk Management Research Laboratory (Ada, Oklahoma) and Beijing Municipal Research Institute.

INTERNATIONAL SYMPOSIUM ON CLIMATE-BIOSPHERE INTERACTIONS

Focus--A diverse group of climatologists, modelers, biologists, physicists, and chemists met to discuss ongoing research at a conference: "Biogenic Emissions and Environmental Effects of Climate Change" (May 7-10, 1991).

Partners--EPA-Office of Research and Development/National Health and Environmental Effects Research Laboratory (Athens, Georgia).

WATER QUALITY PROJECTIONS FOR CHINA'S BOSTEN LAKE

Focus--Technical cooperation to develop water-quality models for long-term projections of the effects of competing water uses on a major source of water in the western desert of China. Hydrologic modeling initiated a five-year study of effects of global climate change on hydrology and vegetation in China's Xinjiang Province using record extrapolated back several hundred years.

Partners--EPA-Office of Research and Development/National Health and Environmental Effects Research Laboratory (Athens, Georgia) and Xinjiang Province Institute of Environmental Protection in Urumchi.

CHEMICAL TRANSFORMATION PROCESSES-METAL INTERACTIONS AT ORGANIC MATTER SURFACES

Focus--Technical Cooperation in the development of models to predict distribution of heavy metals on organic matter surfaces and in pore water, and to predict metal speciation in both phases. Research results have been presented at several scientific conferences.

Partners--EPA-Office of Research and Development/National Exposure Research Laboratory (Athens, Georgia) and Chinese Research Academy of Environmental Sciences.

MODELING CHEMICAL TRANSFORMATION PROCESSES AND METALS POLLUTION IN CHINA'S POYANG LAKE

Focus--Technical cooperation in investigations of the dynamics of pollutant transport and biogeochemistry. Modeling of geochemical processes in freshwater sediments.

Partners--EPA-Office of Research and Development/National Exposure Research Laboratory (Athens, Georgia) and Chinese Research Center for Eco-Environmental Studies.

WATER QUALITY STUDY OF CHINA'S ZHEJIANG HARBOR

Focus--Technical cooperation in the development of water-quality models for tide gates, and simulation of waste-load-reduction effects on water quality. Development of management tools to achieve water-quality goals in an important Chinese seaport and historic tourist area negatively impacted by navigation and industry.

Partners--EPA-Office of Research and Development/National Exposure Research Laboratory (Athens, Georgia) and Nanjing Institute of Environmental Sciences.

EFFECTS OF GLOBAL CLIMATE CHANGE ON LARGE LAKE SYSTEMS

Focus--Technical cooperation as part of a global project: "Factors Influencing Terrestrial Organic Matter and Trace Gas Dynamics in Temperate Forest, Wetland, and Agricultural Soils." Field and laboratory studies of organic matter transformations, ecosystem productivity, and effects of climate variations on organic matter cycling.

Partners--EPA-Office of Research and Development/National Exposure Research Laboratory (Athens, Georgia) and Xinjiang Province Institute of Environmental Protection in Urumchi.

JOINT BIOMONITORING OF TOXIC DISCHARGES, NANJING RIVER

Focus--Technical cooperation with Chinese regulatory agencies in evaluation of toxicity of aquatic discharges. Development of toxicity identification techniques with benefit to U.S. regulators in implementing effluent toxicity limits.

Partners--EPA-Office of Research and Development/National Health and Environmental Effects Research Laboratory (Duluth, Minnesota), University of Minnesota-Duluth; NEPA, Nanjing City Environmental Protection Bureau, Nanjing University.

US/Taiwan Bilateral Agreement in the Field of Environmental Protection

The agreement between the U.S. Environmental Protection Agency (EPA) and the American Institute in Taiwan (AIT) for technical cooperation in the field of environmental protection was signed in 1993. AIT is an office established by the State Department under the Taiwan Relations Act of 1979. The AIT manages this agreement, among several agreements in other fields, with the Taipei Economic and Cultural Representative Office (TECRO). The Environmental Protection Administration in Taipei works closely with the TECRO on this agreement.

Under the agreement, USEPA and AIT develop a new work plan every two years. The work plan describes the responsibility of each party and the projects to be implemented in the two-year timeframe. The parties hold an annual planning and review meeting each year to assess the effectiveness of the program and to lay the groundwork for upcoming future projects.

The type of projects implemented under this agreement is related to environmental information and technology exchange. Some past and on-going projects can be grouped into the following categories:

Non-Point and Source Pollution (air and water)
Risk Assessment
Emergency Response
Hazardous Waste Management
Environmental Information Management
Hazardous Chemical Analysis
Energy-Conservation Strategy
Pollution Prevention and Cleaner Production
Global Climate Change

As the agreement heads into its third phase, future projects will focus on the broader issues of importance not only to Taiwan, but also to other Asia Pacific Economic Cooperation members and the Greater Region of China. EPA also encourages Taiwan to develop partnerships with the private sector to encourage voluntary, community-based system regulations.

Grants, Interagency Agreements, or Other Support Mechanisms

MEMBRANE DRINKING WATER TREATMENT

Focus--Technical cooperation with China to demonstrate cost-effective technologies for the control of toxic chemicals and pathogenic organisms in drinking water in China.

Partners--EPE-Office of International Activities; U.S. Department of Agriculture; Shandong Province Water Resources Management Office; Zibo City, Shandong Province; China Ministry of Geology and Mineral Resources; China Institute of Hydrology.

TECHNOLOGY SEED GRANT TO NATIONAL ASSOCIATION OF STATE DEVELOPMENT AGENCIES (NASDA)

Focus--Technical cooperation with China to transfer U.S. environmental technologies to areas of critical need in China. NASDA provides assistance to state development agencies which fund demonstrations of U.S. environmental technologies in China. Among the technologies are: Venturi Scrubber Technology for Fine Particulate Control, CAF System Industrial Wastewater Treatment, Bioremediation Wastewater Treatment for Capital Steel, Wastewater and Energy Improvements for Juxian Pulp and Paper Mill, Mobile Industrial Wastewater Treatment Demonstration Unit.

Partners--EPA-Office of International Activities, NASDA

POLLUTION PREVENTION AND CONTROL IN CHINA'S HUAIHE RIVER BASIN

Focus--Technical cooperation with China to utilize U.S. environmental pollution control technology and management approaches in solving severe water pollution problems in a watershed that has been identified as a priority at the top levels of the Chinese government. Technology workshops have been held in China's Anhui Province. Follow-up actions include courses on wastewater treatment and pollution prevention in cooperation with Anhui Province.

Partners--EPA-Office of International Affairs, Maryland-China Business Council, U.S. Environmental Training Institute, Air and Waste Management Association, Anhui Province Environmental Protection Bureau, The World Bank.

ECOLOGICAL MONITORING NETWORK AND AIR/WATER MONITORING

Focus--Technical cooperation with China in the implementation of two World Bank funded projects: (1) development of a national ecological monitoring network, and (2) improvement of air and water monitoring technologies in China. Study tours of Chinese delegations at U.S. academic institutions.

Partners--EPA-Office of Research and Development, China NEPA, The World Bank.

DEVELOPMENT OF WATER QUALITY AND HYDRAULIC MODELS FOR THE WATERS BORDERING HONG KONG

As a result of the rapid growth in population and economic activity, the quality of the waters bordering Hong Kong has come under serious threat over the last decades. At the same time, spending on infrastructural developments undertaken by the Government of the Hong Kong Special Administrative Region (HKSAR) has increased significantly and it has become necessary to ensure that the authorities are well advised on the hydraulic and water-quality effects of these developments. This requires development of the most appropriate numerical models.

In December 1996, the Civil Engineering Department (CED) of the HKSAR Government commissioned WL/Delft Hydraulics to undertake the "Upgrading of the Water Quality and Hydraulic Mathematical Models" project. A new three-dimensional (3D) modeling suite was installed at the CED and the Environmental Protection Department (EPD), replacing an existing modeling system, which dated from the mid 1980s. A dedicated hydrodynamic and water-quality model for the Hong Kong coastal waters was set up, calibrated, and verified. The project was completed in March 1998.

BACKGROUND AND OBJECTIVES

Starting from the early 1980s, the HKSAR Government has been using hydrodynamic and mathematical water-quality models to assess the effects of infrastructural developments, land reclamation, and pollution-control schemes on water quality. In 1996, HKSAR decided to upgrade its mathematical models to improve the Government's capabilities. The primary aim of the new 3D models is to serve as the main tool for the assessment of the water-quality effects of future sewage schemes and engineering developments, planned in the waters bordering Hong Kong.

HYDROLOGICAL AND WATER-QUALITY CONDITIONS

Hong Kong's climate is dominated by a northeast monsoon in the dry winter season and a southwest monsoon throughout the wet summer. As a result, the direction of the residual offshore current, which is about 0.2 m/s (0.65 ft/s), is seasonally determined.

Since the prevailing current direction has a strong effect on the pattern of dispersion of the freshwater discharge released by the Pearl River, the water quality in the Pearl River estuary and coastal waters of Hong Kong demonstrates a strong seasonal variation. During the dry season, there is little discharge and stratification occurs. However, during the wet season, about 80 percent of the Pearl River's annual discharge flows into the estuary. High runoff rates cause considerable vertical and lateral salinity gradients.

The turbidity connected to the high concentrations of nutrients and sediment in the Pearl River runoff inhibits the growth of phytoplankton and has an important bearing on the eutrophication processes in the estuary and further offshore.

MODEL SUITE

The Delft3D software suite was applied. The functional utility supplied to the HKSAR Government included the modules: Delft3D-FLOW, Delft3D-WAVE, Delft3D-WAQ (including far-field water quality, sediment transport, and ecological processes), Delft3D-SED (for cohesive and noncohesive sediment), and Delft3D-PART (representing mid-field water quality by particle tracking). In addition, a series of dedicated functional utilities, such as software for grid generation, tidal analysis, and plume modeling were supplied.

The Delft3D modules are embedded in a user-friendly, task-oriented Graphical User Interface with flexible input and presentation facilities, providing supple definition of projects and scenarios, while safeguarding the integrity between input and computational results. Associated post-processing includes facilities for presentation of 3D features, time series, contour, and vector plots.

HYDRODYNAMIC MODEL

In order to resolve the vertical density and hence flow stratification resulting from the large volume of Pearl River runoff, the Delft3D package was applied in the full 3D mode. The hydrodynamic model divides the water column into 10 equal layers using sigma transformation.

Since the hydrography and water quality of the waters bordering Hong Kong are significantly affected by the river runoff, the model boundaries have to extend far enough to cover all the Pearl River outlets, which span a coastal stretch of 110 km. In the seaward direction, the model boundary must contain the Pearl River freshwater plume, which spreads northeasterly during the wet season.

By contrast, to simulate the flow in the main channels in Hong Kong sufficiently accurately and to allow future assessment of the effect of land reclamation projects, the model grid size has to be reasonably fine.

In compliance with these demands, a boundary-fitted, curvilinear grid was designed, covering an area of about 250 km by 200 km (155 mi by 125 mi) with grid sizes of about 7.5 km (4.66 mi) at the model ocean boundaries and 70 m (230 ft) within Victoria Harbor.

WATER-QUALITY MODEL

The water-quality model accommodates the simulation of 20 state variables, including salinity, dissolved oxygen, biochemical oxygen demand, suspended solids, 2 algae species, nutrients, and coliform bacteria. Detritus components in addition to sediment may be subjected to transport, sedimentation, erosion, and burial in the seabed layers.

The water-quality model was set up to simulate a full year's period. Since the dominant effect is by residual rather than by intratidal transport, only tides in the wet and dry season representative for the averaged residual daily flow, are simulated, thereby considerably reducing the required computer power.

Little is known of the water quality in the Pearl River tributaries. Estimates were derived from measured concentrations at nearby monitoring stations run by the EPD and from the results of the Deep Bay Study.

CALIBRATION AND VERIFICATION DATA

The hydrodynamics model was calibrated and verified using three different data sets collected in field surveys done in the context of previous modeling attempts. The field survey data did not include sufficient season-dependent, spatial water-quality information for model calibration and verification. Thus, data obtained from monthly measurements routinely compiled by the EPD for many years were used.

Follow-Up Projects

Based on the models developed under the project, WL/Delft Hydraulics work in Hong Kong is likely to expand. Some projects recently completed or currently in progress include:

Thermal Plume Dispersion (Cooling Water Disposal) Study for Lamma Island (1997)

Environmental Impact Assessment for dredging and disposal of dredged material in an area of Kellet Bank for reprovisioning of six government mooring buoys (1997-98)

Update on cumulative effects of over 50 land reclamation projects (1997-98)--A new model of the waters bordering Hong Kong will be set up within the scope of this project, to examine the integrated effects of infrastructural interventions such as land reclamation, crossings, bridges, navigation channels, waste-water disposal, and port developments of flow, water quality, sedimentation, and the environment. The new model is based on the Delft3D software and will be verified using extended new Field Surveys. The model can be used to simulate current situations and future scenarios. The project is funded by the EPD.

EFFECTS ON WATER QUALITY OF ROAD CONNECTIONS OF HONG KONG WITH ITS HINTERLAND (1998)

Stonecutters Island Sewage Outfall

Deep Bay Study--A study to determine the optimal management of Deep Bay, which is situated along the Pearl River between HKSAR and China. This study formulates optionsfor how the environment can best be managed.

CONCLUSIONS

On the basis of this project, a major improvement has been achieved in knowledge and understanding of the physics of the waters bordering Hong Kong. A new 3D, state of the art, hydrodynamic and water-quality model was implemented and verified successfully. Gaps were identified in the existing data sets and recommendations for additional data collection were made. The model is now used as a general tool to assess the impacts of possible developments in the Hong Kong coastal area.

MEMBER FORUM

Comments on Afforestation in China

Contribution by Professor George Leung <gleung@umassd.edu>

Recently floods in China made the headlines. As a consequence of public outcry for environmental protection, the Chinese government is going to institute regulations to protect the environment. However, some of the policies cause me great distress, like forbidding the logging of trees. It is easy enough to forbid tree logging by decree and enforce it with increased police surveillance, but who is going to take care of the people whose livelihood is based on tree logging? It is simply too cruel to destroy their livelihood in the name of environmental protection! Instead, the government should promote tree planting, and better still implement new policies to make planting new forests economically beneficial. Thus, it becomes a natural process for the environment to improve itself without relying on the enforcement of discriminative laws.

In my approach to improve the Yellow River, I try to emphasize the introduction of reclamation programs for the loess plateau, which can survive in a market economy without relying on intervention by the government. I hope the Chinese officials will quickly abandon their "planned" approach (or "command" approach) to all development programs, and start thinking in terms of economical methods that are selfsustaining.

Largely because of this type of economic consideration, I can only find ways to improve the Yellow River basin but not the Yangtze River basin. This is because water has a higher value for the Yellow River basin due to its shortage, and therefore, is properly utilized. Water plays a key role in the region's development. On the other hand, water is so plentiful in the Yangtze River basin, I haven't found a way to stimulate the farmers to retain it and utilize it (to reduce flood peaks downstream at the same time). Can anyone suggest a solution for controlling floods in the Yangtze River basin?

After giving some thoughts to the question of how to encourage afforestation, I came up with the following half-baked ideas, which I shall share with you anyway.

Currently, China is promoting a new land policy by allowing certain "wasteland" to be auctioned to local farmers with 50- to 100-year user rights. Wasteland refers to land not previously designated as farmland in the past attempts at land reform. People generally speak of five types of wasteland, such as waste hill slope, waste hilltop, waste gully, waste sandy land, and waste floodplain. Waste hilltops are good for tree planting.

The next question is how to induce the farmers to use the wasteland to plant trees. Since tree planting is a long-term investment, it is difficult to see why farmers would want to devote much capital or labor to such an uncertain venture. Before trees are fully grown, they do not possess any cash value, though they have the potential to be of value. I think if a "loan credit" is given to a piece of auctioned hilltop together with the forest planted by the farmer, and thus allowing the farmer to borrow a certain sum of money at the normal interest rate from the Agricultural Bank, that alone will provide enough incentive for the farmers to plant trees.

Presently farmers have no credit rating, because they possess nothing that can be used as collateral for loans. They are trapped in a state with little hope of improving their lots, degenerating into a passive mental framework just waiting for relief. A source of loans is crucial to the rural economy.

Last summer I interviewed a farmer outside Yan'an in the poor hilly region. This farmer took a loan from a private source to buy a small tractor, which cost 16,000 yuan, and he borrowed 7,000 yuan to complete the purchase. The interest he paid was 3% per month, amounting to 36% per year. I was shocked when I heard it. Wasn't that usury? Its ugly head was looming above the horizon once again! This transaction shows how desperate the farmers are in seeking capital to invest in order to improve themselves. The tractor was actually not intended for cultivation but to do odd jobs in transportation, and the farmer was expecting to bring in 5,000 yuan of revenue each year, of which he paid 3000 to 4,000 yuan for fuel and repair. More importantly, the farmer's son was already 20 years old, and he needed to find his son a better life than his own, which was being tied down to a low productive land.

According to this plan, a forest of young trees will be assigned a certain loan credit, and five years later, as the trees grow, the credit rating is improved and can earn the farmer higher loan credits with which he can borrow a little more. By keeping the process active, the farmer is motivated to take good care of the forest. In this way the government is not directly subsidizing afforestation, and does not require a budget to maintain it. Also, the bank is giving normal loans to the farmers as it would do to merchants. The bank can of course repossess the hilltop and the forest, if the farmer forfeits in loan payment, as it would do to housing mortgages.

Regrettably, a well-functioning loan system is not yet in place in China, but that is one area China must improve on, if it is to be successful in a market economy. I have been thinking hard to find ways to implement a rural financial system (in my own wishful thinking way). The World Bank projects in Shanxi-Shaanxi are useful as demonstrations on how the system would work, and I am hoping to devote some time to these projects next Spring when I'll be taking a half-year sabbatical leave from my university. I also am trying to learn about the Taiwan rural recovery experience in the 50's, seeing just how it worked. A friend introduced me to Mr. Wang You-Tsao of Taiwan's Rural Development Foundation, whom I met several times, and who had been very sympathetic to China's rural development. I still need to get him involved.

I am very optimistic about the future rural development in the middle Yellow River basin, especially in the northern Shaanxi area, where the government is spending huge sums in exploiting the area's natural gas reserve. With a large imported labor force, there is a great demand for farm produce. The farmers should do well there. Successful development in this region can serve as example for others to follow. Not being a big shot, I can only approach it at a snail's pace, but optimism sustains me.

MEMBERS' SPOTLIGHT

Dr. George Leung has accepted an invitation to participate in an Appraisal Mission for the Second Loess Plateau Watershed Rehabilitation Project starting January 10. Dr. Leung shall be beginning a half-year sabbatical leave from his university and work on the Loess Plateau project. By being stationed in the region on the local level, he hopes to learn more about the rural economy there, and find ways to nurture sustainable growth in a market-oriented economy.

The First Sino – U.S. Joint Workshop on Sediment Transport and Sediment Induced Disasters

A U.S. – China Joint Workshop on Sediment was held March 15 - 22, 1999, in China. The workshop was supported jointly by the National Science Foundation (NSF) of the U.S. and the Natural Science Foundation of China (NSFC), with the intention to strengthen information exchange and cooperation on research on emerging hydro-environmental problems. The NSFC has established a national key research project, *Study on Mechanisms of River Sedimentation, Disasters, and Control Strategies* in China, and is interested in establishing a bilateral cooperation program with the U.S. on sediment transport and sediment-induced disasters. A joint workshop was considered as an effective approach for scientists and engineers from both countries to exchange knowledge and experience, to explore research and educational needs, and to initiate future collaborations. The program included a three-day workshop meeting in Beijing March 15 - 17, and a five-day site visit along the Middle Reach of the Yellow River in the Loess Plateau March 18 - 22. Twelve U.S. and approximately 50 Chinese scientists/engineers/managers participated in the workshop meeting and thirty-seven workshop members including all the U.S. participants took part in the field study trip.

The U.S. team came from diverse disciplines and mixed degrees of experience including five sediment hydrologists, five sediment hydraulicians, one sediment ecologist, and one geomophlogist. The workshop format was specifically designed to allow more time for discussion than for presentation. More than half of the time in each session was given for open discussion which was led by one Chinese and one U.S. participant that constituted the co-chairs of each session. Through the extensive in-depth discussions among the participants in the workshop, Chinese excellence was confirmed in reservoir operation in conjunction with sediment sluicing, in developing transport mechanics for hyper-concentrated flows, in their skills on extensive laboratory model testing, and in applying laboratory experiments to large-scale prototype problems in various environments. Through historical development, Chinese scientists and engineers have accumulated broad prospects on the effectiveness and weakness of man-made measures in countering sediment-related disasters. U.S. scientists and engineers, on the other hand, are leading in laboratory instrumentation and in numerical model development; either in

building process modules or in system applications. The U.S. also pays more attention to environmental issues.

The field study trip took place in the eastern part of the Loess Plateau through which the middle reach of the Yellow River flows. The Yellow River is known for sediment-related issues. This region is the major sediment source for the Yellow River as well as the origin of Chinese civilization.

By traveling on mountainous roads on two buses the field team had an excellent opportunity to observe the erosion patterns in the well known Loess Plateau. It is hard to conceive that these vast, bare lands were covered by forests some two thousand years ago. Human disturbances have significantly contributed to the current poverty-stricken consequences. The astonishing land erosion forms, the ultimate headcut, the bank erosion and sedimentation, the terrace fields, the self-sustained agriculture, the local use of sediment; every aspect of the observation presented an eye-opening experience for field trip participants. Besides the Loess Plateau, the field team also visited the Hukou waterfalls, Sanmenxia Reservoir, and Xiaolongdi Dam. Hukou waterfalls are located at a significant contraction on the Yellow River. Because of its geological formation Hukou has withstood the erosive forces of the river flow and formed a control section that has prevented the propagation of bed erosion downstream. At Sanmenxia Reservoir, the field team learned from reservoir director Mr. Lu that about 2/3 of the reservoir was lost due to siltation within the first year after its completion. A significant number of studies has been done at the dam and the learned experiences have been adopted or applied to other reservoirs in China. Currently the dam has been successfully modified for sediment sluicing. With its sluicing structures and designated operational modes, the Sanmenxia Reservoir can essentially maintain a balance between the annual incoming and outgoing sediment loads. Impacts of sediment laden flows on turbine and powerhouse structures were discussed among interested groups. The Xiaolangdi Reservoir is currently under construction. It is the most downstream dam and will control 93 percent of the drainage area of the Yellow River. Besides flood prevention, its sediment sluicing design has considered desirable morphological changes in the Lower Yellow River. The team was fortunate to have the opportunity to observe the whole site and visit a demonstration model, and discussed with site engineers about the future joint operation model of the Sanmenxia and Xiaolangdi Reservoirs.
In addition to their practical field experience, Chinese scientists and engineers have collected a large amount of data for potential studies of the mechanisms of sediment movement. From the workshop it is apparent that in sediment studies, the U.S. now emphasizes on issues and impacts, while China emphasizes on problems and remedies. Potential for future cooperation apparently exists. The first workshop was organized by Dr. ZhaoYin Wang of the International Research and Training Center for Erosion and Sedimentation, China; Dr. David T. Soong of the Illinois State Water Survey; and Professor Ben C. Yen of the University of Illinois at Urbana Champaign. At the concluding session, all participants considered the efforts were worthwhile and strongly recommend the formation of an organizing committee for preparing the second workshop. Professor Panos Diplas of the Virginia Polytechnic Institute is the chair of that committee. We will keep our members informed about progress on and announce the second workshop once it is organized. (Summarized by David Soong).

Following is a partial list of the workshop participants

China (partial list)

ZhaoYin Wang	Chen, Shihui	JiRen Ni		Li Yitian
WenQin Wang	Cao, Shuyou	Hu, Shixiong	Chen Huai	Shao, Xuejun

U.S. (NSF sponsored participants)

Nani G. Bhowmik	Grace S. Brush	Panayiotis Diplas
Misganaw Demissie	Shou-Shan Fan	Marcello Garcia
Brad Hall	Rollin Hotchkiss	Fazle Karim
TaWei Soong	Ellen Wohl	Ben Chie Yen

International Visitors (partial list)

Donald W. Knight	Gary Li	Yeou-Koung Tung
Onyx Wai	Ander Chou	Mohamed Ghidaoui
Hsu, Shaohua Marko	Joseph Lee	

WATER CONSERVANCY AND RELEVANT ENVIRONMENTAL PROBLEMS IN CHINA

(At the Seventh International Symposium on River Sedimentation and the Second International Conference on Environmental Hydraulics in Hong Kong, December 16-18, 1998, YANG Zhenhuai, former Minister of Water Resources of Mainland China gave a keynote address on this subject. In the address, he outlined 10 recommendations for water resources in China. These recommendations are summarized here. This article has been substantially edited to improve from the original translation, and some ideas may have be altered in the process)

1. In future revisions of the Yangtze River Basin Planning and its implementation we must insist on the principle of combination of storing and releasing flood waters with the first consideration given to releasing flood waters. It is suggested that special funds be allocated to the Ministry of Water Resources, the Changjiang Water Resources Commission, and relevant provinces and departments to summarize and evaluate the 1998 flood in the Yangtze River Basin, the Songhuajiang and Nunjiang Basins, and the Yellow River Basin. The study should be conducted by means of simulating the routing process using relevant data and mathematical modeling; for each case in 1998, 1954, 1931, 1935, and 1996 for different types of floods on the Yangtze River. Different flood control measures and different operation schemes should be considered, e.g., with the Three Gorges Project and without it. After the practical investigation is completed, the opinions from various sides may be determined. Particularly, we also should consider exploiting detention devices and flood insurance, building townships for resettlement, working out a rational standard of flood control, and computing the flood stage for different frequencies. A comprehensive report on the 1998 catastrophic flood on the basis of such an assessment will serve as a reference for revising the flood control planning of the Yangtze River and also for the planning for strengthening embankments and flood detention regions and realigning of rivers. In the U.S.A. after the catastrophic flood on the Mississippi River in 1993, they did the same. The Flood Control Law in China has been published in 1998. Urgent tasks include working out rules for compensating the losses of farmers, for operation of existing reservoirs, and for compulsory insurance for flood control. At the same time, special funds should be allocated for reinforcement of dangerous engineering projects. These items are supposed to be finished within 10 years.

2. To complete the Three Gorges Project and the Xiaolangdi Hydroproject on time. The Xiaolangdi Project will be completed in 2001. The Three Gorges Project will complete the closure of the dam in 2003 and will be totally completed in 2009. Looking forward to the

21st century, Chinese people will enter a new historic epoch, it is suggested to make the best use of time to study the problems of river improvement in the lower Yellow River and relevant engineering works in the Jingjiang – Honghu reach of the Yangtze River and the three outlets connecting to Dongting Lake. When the Xiaolangdi and Three Gorges Reservoirs are built, clear water will be released and scouring will take place in the downstream courses, leading to bank collapse. These river courses must be harnessed before 2001 – 2003 to avoid damages. The administration and operation of these two big reservoirs especially the rational and optimizing mode of regulation should be studied in advance.

3. From now on, revision of the Yellow River Basin Planning and the Yangtze River Basin Planning must be strengthened. In the last 20 years, the national economy has developed rapidly, consequently the consumption of water has changed greatly. Important changes include the variation in population and local economy, the variation in ground surface conditions, and also the deepening in the people's understanding of the river basins. Therefore, the planning of each basin urgently needs to change to account for current conditions. This is a great software engineering. It must be done with the participation of many experts and scholars and solicit different opinions from society to draw collective wisdom and to absorb all useful ideas. This item is expected to be done within 2-3 years. Based on the approval of these plans, at the same time, we have to pay more attention to the key projects on the tributaries and main stem of the Yellow River and Yangtze River and the preparatory works of the water transfer from the South to the North. These key projects are: Xiluodu hydropower station on the Jingsha River, Tingzikou on the Jialing River, Jikou and Daliushu on the Yellow River, Nierji and Hadashan on the Songhua River, Longtan and Datengxia on the Pearl River, and Linhuaigong on the Huaihe River, etc.

4. In the remedial measures to cure water pollution, in addition to strengthening the treatment of source pollution induced by a township's enterprises, it is suggested to take as reference the experience obtained by the Administration Bureau of the Thames River in the UK. To protect water quality the river water resources commission must be given broad powers including the power of monitoring water quality and to execute the power of punishment, to unify the planning of water related environmental protection for the whole river basin especially for some cities and regions, and to put into effect the principle of "to prevent in advance." Except for the water pollution control projects on the Huaihe, Haihe, and Liaohe Rivers, we must pay more attention to these projects on the Yellow, Yangtze, and Pearl Rivers, especially upstream of the reservoirs of the Three Gorges and Xiaolangdi Projects.

5. Construction of many reservoirs reduces the peak flood in rivers and consequently the duration of medium floods is prolonged, which leads to the shrinkage of the lower river channel. Yet owing to climatic factors, attacks by big floods exceeding the standard are inevitable. Therefore, detention regions remain needed. The original depressions, swamps, and lakes along the rivers must be recovered or replaced by compensating storage. Because of regulation in reservoirs and the large amount of water diverted for irrigation, the actual flood in the lower reaches and that emptying into the sea will diminish, and deposition in estuarine areas will extend. As a consequence of the deduction of fresh water, aquatic production and the ecology in near shore areas will be affected. For example, in the Haihe River basin the planned reservoirs have mostly been completed, and the abrupt reduction of river runoff into the sea led to serious deposition in the estuarine delta. These cases can represent impacts of development on the environmental ecology in North China. Except for the Songhuajiang River and some other international rivers, the shortage of water resources is a common phenomenon for all rivers north of the Huaihe River. Particularly for those

rivers in arid regions, the population growth, the development of economy, and the large amount of water used for irrigation lead to the river drying up in the lower reaches, and the environment and ecology turn to desertification. For example, in the downstream reaches of the Tarim River in Xinjiang Uygur Autonomous Region and the Heihe River Basin in Gansu Province and Inner Mongolia Autonomous Region, more than several tens of thousands of hectares of diversiform-left poplar forest died. Owing to the disorder of river flow in the lower reaches, the loss of water transported to the lower reaches is extremely large. The loss will be replaced by artificial canals in the future to preserve rational water supply for the ecological environment. During the flood season the flood will be retained on both banks and diverted for irrigation to make full use of flood water and sediment resources.

For the rivers in South China, especially in the Yangtze River Basin, grass and trees need to be planted on hilly-mountainous regions to conserve soil and water. In plain areas along the river, adequate area of streams and depressions should be preserved, along with the implementation of regulation of the river system and strengthening of the embankment system. Some enclosed dykes should be abandoned to facilitate the passage of floods, to gradually return farmland into the rivers and lakes, and to provide the needed detention for flood mitigation. The height of the embankment system should not be too high to avoid the damage resulting from sudden breaking of the embankment. The existing reservoirs should be fortified, and emergency devices should be built to assure the safety of inhabitants. The standard of flood control should be raised for cities and townships along the rivers. For bank protection, it is recommended to use grass or riprap instead of vertical concrete walls to facilitate the preservation of diversity of aquatic biomass.

In those rivers where the flood stage rapidly rises or the amplitude of variation in stages is significant, the agro-pasture structure should be modified to fit the natural pattern of rising and receding water level. Easily inundated areas can be built as gardens or the parks. If it is necessary to build houses, it is recommended to make the base of the apartment flood proof.

6. To promote water conservation in industry, agriculture, and society. To promote the ideas of saving water and protect water-related environment and water resources. Water price must be regulated gradually. In the irrigation districts, canal systems should be rebuilt for prevention of seepage. To devote major efforts to popularize sprinkler irrigation, drip irrigation, and other new water-saving techniques and to stop overflow irrigation and prevent secondary salinization. Water saving will actually be revolutionary in water conservancy in China, and we have to devote long-term efforts to achieve this goal. Afterwards, reservoirs should be constructed in the upper reaches of rivers where inhabitants are scarce and inundation damage may be reduced to the minimum. In short, the negative aspects of reservoirs should be reduced to the minimum and resettlement should be adopted. Resolution of the problem of resettlement induced by reservoir construction is expected in ten years.

7. The area in North China along the iso-line of 400 mm of precipitation is the region with the weakest ecological environment. At present, agriculture plays a fundamental role here. In the future, the region should be established gradually as an agro-pasture region where the pasture will play the fundamental role. In an arid region, where the rain-fed crops are cultivated, construction of bench terrace fields and other soil conservation measures and construction of cellars and small ponds for storage water should be encouraged. Underground water also should be used to solve the problem of shortage in drinking water for people and cattle.

8. As a consequence of the increase of carbon dioxide as well as other micro gases in the atmosphere and also the green house effect, the weather of the whole earth is becoming warmer, which results in a rise in the ocean water level. In combination with other man-made factors, increased green house warming results in changes in water resources and other environmental variations. Since the 1980s, in South China the frequent floods and waterloggings and in North China the trend of drought have increased. Sensitivity to weather variation is lower in regions where the river system has a great ability to regulate. The Three Gorges Project and the Xiaolongdi Reservoir under construction, accompanied with large-scale water conservancy projects, large scale soil and water conservation, construction of water saving facilities (especially the flood control systems in cities), construction of water supply system and water pollution protection devices, and the improvement of sea embankments, will be producing advantages in the coming 21st century.

9. Water conservancy has significant effects on the ecological environment. While confirming its positive effects, one must seriously summarize lessons and experiences to mitigate and diminish the negative effect of water conservancy and get a non-inferior solution. Even if some defects exist, these defects could be remedied by later generations. It is of vital importance to put water conservancy into a complicated system, to start from the strategy of sustainable development with a scientific background, to strictly obey the natural law and economic law, and to make decisions on the basis of thoughtful consideration. The input data for decisions on water conservancy must be increased by the establishment of monitoring facilities for hydrology, meteorology, water quality, soil erosion, water circulation, etc. Also we should fully make use of the remote sensing techniques, GIS techniques, high information techniques, and establish a series of experimental plots with different sizes for observation.

10. To strengthen the execution of the Water Law, the Soil and Water Conservation Law, the Law of Flood Control, the Law of Environmental Protection, the Law of Forest, the Law of Land Management, and the Law of Grassland. Strictly to execute these laws and to work out the rules to complete the set of laws and the details in practice. It is suggested to revise the Water Law and to work out a Water Resources Saving Law, the Law for Management of Water Resources Commission, the Law for the Yangtze River and the Law for the Yellow River. The execution of relevant policy must be strengthened, and policies which are fit to the market economy must be worked out.

MEMBER PROFILES

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PROFESSIONAL CAREER HIGHLIGHTS: Serves as a safety engineer for dams throughout Virginia; Administrates120 regulated dams in 17 counties and cites
SIGNIFICANT HONORS: AWARDS, PUBLICATIONS:

- Named the Employee of the Year (1998) in the category of Technical Service, Virginia Division of Dam Safety
- Paper "Dams Need $1-Billion Upgrade" published in the Engineering News Record, 8/17/98
- Served as Chairman of fundraising for Combined Virginia Campaign (CVC) and recognized for the DCR CVC new high record of pledged amounts in the newsletter, DCR, 1998
- Awarded for successfully organizing the 1995 Virginia Dam Safety Conference
- Named Outstanding Teaching Fellow at University of Pittsburgh in 1987
- Wrote more than 20 papers published in journals and conference proceedings

Professor *Zhao, Wen-Qian* of the Hydraulic Engineering Department, Sichuan University was suggested for the Member Profile by the CAWRA Chapter in China. Professor Zhao is a member of the CAWRA in China and has participated in the Cross Strait Conferences. Mr. Zhao completed his graduate study in Fluid Mechanics from the Tsing Hua University in Beijing in 1960, at the time there was no degree system. Before his graduation he started teaching at the Chengdu Polytechnic Institute in Chengdu, Sichuan. After becoming a Professor and Director of the Hydraulic Section, Hydraulic Engineering Department, Chengdu University of Science and Technology (CUST), he spent one year (1983-84) at the University of Washington in Seattle as a visiting scholar. Later he achieved the positions of Chairman of the Hydraulic Engineering Department and Director of the National Hydraulic Laboratory of High Speed Flows in 1985 and 1988 respectively, both at the CUST. In 1989 he visited the University of Dundee in Scotland, U.K. for an one-year study.

Now he is a full professor in the Hydraulic Engineering Department of CUST, Dean of Grauduate School of CUST and Sichuan Union University. Professor Zhao has many publications including 3 books. He is a member of the Water Resource Management Committee, IAHR, and a senior member with many technical societies in China.

Members' Publications

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2000. Xth World Water Congress. Melbourne, Australia. Contact: International Water Resources Association, 4535 Faner Hall, MC4516, Southern Illinois University, Carbondale, IL 62901-4516, USA. Tel: 618 453 5138, Fax: 618 453 2671, email: waterint@siu.edu.

July 25-28, 2000. 8th International Symposium on Stochastic Hydraulics. Beijing, China. Contact: Dr. Zhao-Yin Wang, International Research and Training Center on Erosion and Sedimentation, P.O. Box 366, Beijing 100044, China. Tel: 8610 68413372 Fax: 681068411174, email: zywang@sun.ihep.ac.cn

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