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FROM PHILOSOPHY TO ACTION : ACCOMPLISH HARMONIOUS COEXISTENCE BETWEEN MAN AND FLOOD

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Respected Chair; Ladies and Gentlemen,

The mitigation of losses caused by flood disasters, avoiding human casualties and ensuring sustained, healthy and stable socioeconomic development is a major issue of universal and global concern and thus, a pressing task common to most of the countries in the world. The fact that the ICID congress devotes a full-fledged Question for discussions on flood control indicates the high priority that the international community attaches to flood control and disaster mitigation. On behalf of the Chinese delegation, I would like to extend our warm congratulations on convening of the congress. I would also like to take this opportunity to introduce the Chinese scenario of flood control and disaster mitigation to the Congress alongwith the Chinese understanding of flood disasters and our philosophies and the countermeasures for flood control and disaster mitigation.

- 1. Flood control/disaster mitigation and irrigation/drainage, both being significant issues affecting human existence and development are mutually indispensable and closely interrelated**

Flood disasters are the most serious of the natural disasters in the world. They top all natural disasters in terms of frequency of occurrence, economic

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losses, or human casualties. From a global perspective, the number of floods and resultant economic losses makes up about 1/3 of all natural disasters while the human casualties caused by floods exceed 1/2 of those caused by all natural disasters. In China, Da Yu's Water Training is a household word for more than 4,000 years ago. The mass media currently gives reports about serious flood disasters every year. Almost, all countries in the world face problems related to flood disasters, justifying the need for high attention to floods.

The development of the human society has benefited from agricultural progress in the first place, whereas "Excessive water" and "shortage of water" both exert huge impact on agricultural and social development. Due to natural and social constraints, a country or region tends to be caught both in floods and drought or shortage of water. Such a coexistence with floods and drought makes this task of ours all the more arduous while the issues to be addressed to this effect are all the more complex. We have to exert all our efforts and take practical and effective measures to meet this enormous challenge.

China has an ancient saying "floods are just like ferocious beasts", because the floods in China are often serious disasters that bring along heavy losses. The middle and lower reaches of the seven major rivers in China totaling to an area of about 800,000 km² are exposed to the most serious flood risk to an extent that the GDP of these risk areas remains 70% of the national aggregate. Annual nationwide losses caused by flood disasters amount to nearly 70% of the national GDP. Perennial national losses lie between RMB 80-110 billion. In the 1990s, China faced six years of catastrophic floods in major Chinese river basins. Some localities suffer from Flood disasters every year. Upland disasters such as flash floods, landslides and debri-flows usually cause heavy casualties. On an average, 7 typhoons ravage the coastal China every year, which often brings along storms and heavy losses. In 1931, catastrophic floods hit the Yangtze and Huai River basins, destroying over 8.9 million hectares of arable land and killing 365,000 people.

In recent 55 years, flooding and logging have affected a total land area of 9.3 million hectares and on average annually killed nearly 5,000 people in China. In 1998, the catastrophic disaster along the Yangtze et al resulted in a direct nationwide economic losses of over US\$ 30 billion.

China has another ancient saying "each and every drop of water is as precious as edible oil" in light of drought and water shortage in China. If floods hit the river basins, droughts affect vast expanses of areas. Although, droughts are not as swift and violent as floods, but they are more extensive in scope and time duration. The impacts of droughts take time to cumulate, when people might be too late in realising existence of droughts. The beginning year of Emperor Guangxu's Administration during the Qing Dynasty experienced a devastating drought. Rivers dried up and barren arid land extended several

thousand *li*; 200 million people were affected, taking away more than 1/2 of the then Chinese population. In 1920, 5 provinces in China suffered severe droughts affecting more than 20 million people and killing 500,000. In the recent 55 years, droughts have annually affected over 21 million hectares of farmland on average and caused an average annual loss of over 14 million tons of grain. The severe drought of 2000 victimized over 40 million hectares of crops and forced over 300 county towns or larger cities to arrange water in terms of time and quantitative limits. Some plain areas in East China have witnessed severe excessive extraction from shallow ground water. Embedded depth of groundwater has declined from 3-4 meters several decades ago to around a dozen meters at present. Currently, 60% of the Chinese cities suffer from water shortage with 110 of them in serious shortage of water.

In China, we have another common phrase “flood and logging disasters”, because it is difficult to distinguish these two disaster as they usually accompany and influence each other. Too much and too swift inflow of rivers leads to breaches in embankments, and the consequent disaster. Excessive torrential rainfall exceeding local capacity of drainage leads to logging disasters. Infiltration of large amount of surface floods plus untimely drainage result in rise of groundwater table in some localities, that too leads to logging disasters. In the vast plain areas, the flood waters of a catastrophic floods and logging waters get mixed up into vast expanse of water, hard to tell from each other. The Huai River basin in China is particular in this phenomenon. To some extent, losses caused by logging tend to exceed those caused by the flood disasters.

For the countries or regions where the floods and drought or shortage of water coexist, overall consideration of “excessive water” and “water shortage” is an inevitable choice for mitigating losses. In fact, many flood-control works aim at multiple functions, i.e., mixing flood control and disaster mitigation with irrigation or drainage. While intercepting floods to reduce losses in the lower reaches, the reservoirs also increase water for irrigation to some extent. Dikes help prevent overflowing but also tend to increase the burden of draining off the logged areas in the protected locality. On the other hand, concentrated draining out from the protected locality further adds to the burden of flood control along the concerned rivers. The sum of water drained intensively into the mainstream in the Yangtze River basin during the flood season could exceed 4,000 m³/s. This is a significant issue for us to address. As such, it is imperative for us to consider drought fighting while controlling floods and vice versa. We will attach equal importance to flood control and drought combating, and take flood control/disaster mitigation and irrigation/drainage into overall consideration.

2. Understanding of flood disasters

China is a major country in water conservancy. It has practiced water training for several thousand years and has acquired rich experience in flood

control and disaster mitigation, gradually upgrading its understanding about the flood disasters and has developed/improved its water-training philosophies and flood-control strategies.

We understand that flood disasters possess both natural and social attributes. Without harming mankind, a flood will not develop into a disaster and whereby it may only be called flood. Neither will floods grow into disasters without the man and water needs for the land or the human development activities. As such, mitigation of flood disasters requires us to control floods to some extent, and more importantly, to provide way out for floods and a room for flood regulation and storage. For this purpose, we need to discipline and restrain the human behavior, reduce social activities that lead to flood disasters to accomplish harmonious coexistence between man and the flood. With such efforts, we will be able to promote benefits, avoid hazards, and mitigate losses resulting from floods.

We understand that flood disasters are both universal and regional. Flood disasters may take place in all countries and regions with varying natural conditions and socioeconomic status. However, these countries and regions may greatly differ in their specific problems and the countermeasures to address these problems. In any case, all countries and regions embrace the same objective of reducing losses caused by flood disasters.

We understand that flood disasters have a particular regularity, abruptness and event variation. From the perspective of historical flood-disaster series and the whole situation of a specific region, certain regularity might exist in the occurrence and development of flood disasters. Nevertheless, flood disasters tend to be swift and violent. Furthermore, each event of flood disaster usually has its own particular features, is non-repetitive, and requires specific measures that correspond to the real situation.

We understand that floods are basin-specific, that surface water and groundwater are interchangeable and that the upper and lower reaches of a river, left and right banks and mainstreams and tributaries influence each other. Close relationship exists between floods and water quality, and between floods and other components in the process of water development and utilization. Flood control and disaster mitigation requires integrated planning and relevant measures with the river basin as the basic unit. It also requires overall consideration of all related elements at a higher level and in a more extensive scope, i.e., overall consideration of requirements for flood control, drought combating, water quality and the ecology.

We understand that exclusive dependence on flood-control works is insufficient and falls short of the objective of reducing losses and for that we

need to implement flood management to create harmonious coexistence between man and nature. In this regard, we need to rationally define criteria for flood-control works and systems of flood-control works, rationally divide functions of flood-control works and develop scientific flood-control plans, flood-regulation programs and flood-forecasting warning systems. We also need to reform and innovate our management systems and operation mechanisms to gradually establish and improve a flood management system that disciplines human social activities, conducts risk management and regards floods as a resource. With all these efforts, we aim at enhancing our integrated ability of preventing and controlling floods.

We understand that floods are precious fresh-water resources and the control and mitigation must consider utilization-oriented resources of floods. China is a populous country with per capita water only reaching 1/3 of the world average. Due to impact of the monsoon climate, the precipitation in China is uneven in both the spatial and temporal distribution. The precipitation in the flood season constitutes 60-80% of the yearly aggregate. Inter-annual precipitation also changes greatly. An important and realistic issue for China is to make use of flood resources during the flood seasons, enhance flood regulation by upgrading its early-warning capability and address water consumption such as irrigation and power generation in an overall manner while ensuring safety. Many countries in the world are facing similar issues.

We also understand that it is necessary to keep the traditional ways of flood control and emergency response in place. However, flood control and emergency response involve high costs having a major impact on normal production and life. Therefore, we need to study and improve ways and approaches for the control and emergency response in a continuous manner. During the flood control and emergency response along the Yangtze River et al in 1998, over 8 million people were engaged nationwide in the related work at the peak time while the materials mobilized for the purpose were valued over RMB13 billion in total. All related agencies participated in the activity.

We understand that flood control and disaster mitigation is a long-term task that requires us to come out of the conventional mentality of “major training activities in the wake of catastrophic water disasters”. Flooding along rivers is a natural phenomenon that takes place in its own manner. Human society is constantly developing, hence, the appearance of new problem is inevitable. While enhancing our emergency response to disastrous events, we should also proactively promote flood-control and disaster-mitigation measures that are ever alert for “responding to flood risks” and “reducing vulnerability”. “Major training activities in the wake of catastrophic water disasters” claims a high price. For flood control and disaster mitigation, we must ponder, plan and arrange in advance.

3. Philosophies and countermeasures for flood control and disaster mitigation

Different countries in the world have different issues of flood-disaster; the pros and cons of their philosophies and countermeasures for flood control and disaster mitigation also vary. Mutual exchange and learning from each other will no doubt promote common and harmonious development.

By constructing reservoirs and dikes along rivers, rectification and training of river channels, development and utilization of the surface and ground water resources, China has created relatively stable conditions for socioeconomic development. Water conservancy has played an important role in addressing the historical Chinese headache of feeding its huge population. Water conservancy has also provided water for large-scale industrial and urban development that meets over 1/5 of the energy demand through hydro-power development. Nationwide dikes have been rectified in a length of 278,000 km; river channels at all levels have been dredged and trained; 98 major areas have been developed for flood storage and detention amounting to a total storage and detention capacity of 120 billion m³; over 2,000 large and medium-sized pumping stations have been constructed for the control of floods and draining off the waterlogged areas. Over 12 million hectares of farmland is protected by constructing 86,000 reservoirs of all types having a total capacity of 565.8 billion m³. Water storage works have gained a 17% capacity for controlling run-off of rivers. 1.06 million diversion projects have been developed with increased storage capacity of groundwater projects reaching 82.4 billion m³. Current annual water supply in the country totals 645.9 billion m³.

With socioeconomic development and emergence of new issues related to flood control and disaster mitigation, we have enriched our understanding of flood disasters and continuously improved on our philosophy in this respect. Over the recent years, China has explicitly put forward new philosophies such as “transformation from project-based water management to resource-oriented water management”, “attaching equal importance to flood control and drought combating”. “transformation from flood control to flood management” and “harmonious coexistence between man and flood”. Accordingly, some new countermeasures have been adopted, for which large scale effective work has been carried out.

- (1) The transformation of publicize and consolidate the new philosophy of flood control and disaster mitigation” or “transformation from flood control to flood management” complies not only with the Chinese national situation but also with the international trend of development in flood control and disaster mitigation. If the sprouting of an idea and concept needs a process, consolidation and implementation of the idea and concept also takes time. Such a transformation requires extensive

understanding and support of all social classes and the public in general.

- (2) Amend plans for flood control and disaster mitigation along major rivers. Floods are basin specific and as such the philosophies on water training and strategies for flood control and disaster mitigation need to be incorporated into river-basin planning and training. Ever since the catastrophic floods along major rivers including the Yangtze in 1998, China has launched a new round of planning for flood control and disaster mitigation along major rivers to implement the new philosophy of water training and the new concept on flood control and disaster mitigation by adopting river-basin planning to realize the objective of mitigating flood disasters. At present, plans for the major rivers are basically complete. In order to reduce casualties in mountainous and hilly areas, China has developed special plans for prevention and combating flash floods.
- (3) Improve the engineering system of flood control and disaster mitigation to upgrade the ability of preventing and resisting floods. Flood management needs to be supported by an engineering system that complies with relevant standards. Over the recent years, China has greatly increased its input into water conservancy by consolidating risky flood-control works and addressing deficiencies in the flood-control engineering system as per relevant plans. As a result, China has remarkably accelerated the progress in eliminating deficiencies and consolidating the mainstream embankments or other risky flood control works in middle and lower reaches of major rivers, thereby further enhancing flood-control capability of the mainstreams of major rivers and the rivers as a whole. In the future, we shall address the problem of inadequate standards for draining off the waterlogged areas by renovating draining facilities and gradually upgrading standards for draining off farmland.
- (4) Appropriately expand way out for floods and increase room for flood regulation and storage. In recent years, China has relocated residents in over 1,460 polders along the Yangtze River basin for using these polders to increase the capability in regulating and storing flood from rivers and lakes thereby increasing the volume of flood regulation and storage along the rivers by approximately 13 billion m³. At the same time, some flood-release areas between the dikes on the two banks of the mainstream Huai River have been decommissioned while medium and small flood-release passes in the middle reach have been expanded and deepened. These planned efforts of dredging flood-release passes along river channels, at estuaries and by lakes connected with rivers have achieved remarkable results.

- (5) Compensate residents in flood storage and detention areas for losses due to flood-diversion and upgrade operability of real-time flood regulation. Flood storage and detention areas in China are often inhabited by a large population but are usually insufficient in rescue facilities for the inhabitants and protection measures for properties. Often it is hard for the authorities to make a decision on flood diversion due to human casualties and post-disaster recovery. As such, the Chinese government has developed its compensation policy for flood diversion in such areas, i.e., provide corresponding compensation to the inhabitants after flood diversion commensurating with the losses suffered when their major properties and crops are inundated.
- (6) Improve the legal framework, amend flood-control plans and cater to requirements of flood management. According to changing situations and requirements of flood management, China is making efforts to amend the national *Regulations on Flood Control*, and formulate the *Practicing Directions for Administering Flood Storage and Detention Areas*, to promote the establishment of a system for assessing flood impacts, revising programs for flood regulation along major rivers and studying/implementing flood insurance. Floods are a precious fresh-water resource. We cannot just drain it and say “that is that”. From real need of flood control and disaster mitigation, China has already produced a list of key medium-sized reservoirs to this effect, and is considering adjustment of water stages of some large reservoirs during the flood season, so that floods can be used more as a resource while ensuring the safety of reservoirs. China has also launched pilot research programme on utilization of floods as a resource in some river basins and regions. The purpose is to prevent and restrain hazardous human behavior. By resorting to flood management, we shall not only protect mankind from floods but also protect flood from mankind.
- (7) Develop the national command system for flood control and drought combating and improve means for real-time command and regulation of flood control. The new philosophy on flood control and disaster mitigation has placed higher demands on flood regulation along rivers. At the moment, China is constructing the national command system for flood control and drought combating for the purposes of improving existing means for collecting information on water regimes, upgrading methods for transmitting information, enhancing the ability to process and demonstrate information, increase accuracy of flood forecasting and reinforce real-time flood-regulation approaches.
- (8) Take relevant elements into overall consideration/arrangement in the course of flood control and use scientific means to regulate floods. Over the recent years, China has changed the traditional mentality of

pooling all resources to safeguard flood-control works and transmitting flood to the sea as soon as possible along rivers. Rather, China has strengthened real-time consultations at different localities among flood-control command authorities at the national, river-basin and provincial/municipal levels, to timely study and make decisions on important flood-regulation issues, regulate floods in a scientific manner, take into overall consideration regarding flood control and disaster mitigation and water consumption for various purposes such as drought fighting, ecological protection/recovery and production. By doing so, China has not only reduced losses resulting from flood inundation, but also increased utilization of floods as a resource. At present, water regulation is carried out in the Yellow River basin as well as some of the rivers in West, Central and North China for the purpose of using floods as a resource and improving the eco-environment. These efforts have also achieved good results.

Ladies and Gentlemen,

China attaches great importance to international communication and cooperation in water management, flood control and disaster mitigation. Over the recent years, we have established cooperative relationship with over 60 countries in the water sector. We have also concluded agreements with some countries for cooperation in flood management. With support rendered to us by ADB, we are now doing research on Chinese strategy for flood management. Some provinces and regions are also considering pertinent programs and measures in this regard. Furtherance of international communication and cooperation in flood control and disaster mitigation is of great significance for harmonious coexistence between man and the flood. As such, it is imperative for us to discuss and study issues related to flood control and disaster mitigation under the framework of ICID congress on a regular basis.

Flood control and disaster mitigation is an important issue that most countries have to face in their courses of promoting socioeconomic development. Transformation from flood control to flood management has become a trend of international development. Not only, are the developed countries looking towards sustainable development; even the developing countries are exerting great efforts to discuss issues and promote practices in this regard. Mitigation of flood disasters requires long-term arduous efforts. The important thing is that we start to act now, that we reinforce communication, that we cooperate with sincerity and that we make concerted efforts for the ultimate goal of harmony between man and the flood.

Finally, I would like to wish the congress a great success.

Thank You!

Keynote Speaker



Professor Dr. Liu Ning is Engineer-in-Chief in the Ministry of Water Resources of People's Republic of China, has got long working experience on design, on-site construction, management of water resources and hydropower projects. He has headed the design and feasibility studies of the Three Gorges Project, South to North Water Transfer Project and has got abundant experience on water resources management, flood management. He also worked as Engineer-in-Chief of Planning, Design and Management Bureau of South to North Transfer Project and Vice Engineer-in-Chief in Yangtze River Commission.