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Dams and Reservoirs, Societies and Environment in the 21st Century

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Preface

These volumes contain the Proceedings of the International Symposium on Dams in Societies of the 21st Century, held in Barcelona (Spain) on 18th June, 2006, as part of the 22nd ICOLD International Congress. The proceedings comprise 203 papers, from 50 countries, together with General Reports from Symposium sessions. Together, this constitutes an in-depth analysis of the potential role to be played by dams and reservoirs in water development, and management challenges in the 21st Century. The papers are presented under the following headings:

1. Role of dams and reservoirs
2. Benefits of dams
3. Dam Engineering and analysis of alternatives
4. Social and environmental aspects

Water is an essential resource for life and the environment. During the second half of the twentieth century, an increase in the world's population and the economic and social progress of the developed countries, has put serious pressures on water. Numerous countries across the planet are now affected by a water crisis. Statistics emphasise the urgency of the situation:

- 18% of the world population do not have access to safe drinking water
- 40% of the world population lack access to adequate sanitation
- 50% of the world population is subject to water stress, and by 2025 it is estimated that the figure will be 65%

There is increasing stress on water ecosystems as the natural environment continues to be impacted. The incidence and extent of flooding has increased, and water can be seen in many situations as a hazard rather than a resource.

Over the last years, numerous international organizations have promoted a variety of initiatives and proposals, with a view to mitigating the water problem. The United Nations has designated the period between 2005 and 2015 as the International Decade for Action: *Water for Life*. During this period, the focus will be on undertaking real and effective measures, in an effort to meet the Millennium's targets: including reducing by half the population that is currently completely lacking in the essential water supply and sanitation services.

The renewable water resources in the world, which emanate from the hydrological cycle, are constitute approximately 40,000 km^3/year. However, these resources are distributed extremely irregularly, not only in time but also geographically and only about 9,000 km^3/year are available as natural accessible resources. Over the past 5000 years, more than 50,000 large dams have been constructed and these large dams and reservoirs regulate some 3,500 km^3 per year. This represents 30% of the world's available water resources which reaches the end users after having been regulated by dams and reservoirs. The water that is stored and regulated by dams and reservoirs produces irreplaceable water resources and brings benefits to water supply, irrigation, hydropower, flood mitigation, river navigation, recreation, tourism and the environment. Of the world's arable land,17% is irrigated in this manner, producing 40% of the total world crop. Reservoirs regulate around 40% of the water for irrigation, which supports 15% of the total food production. Furthermore, hydropower, which is a clean and environmentally-friendly source of energy, yields 20% of the world's generated electricity supply, while 20% of the world's reservoirs account for a reduction in the major socio-economic impact of flooding. The data mentioned here illustrates the extent to which dams and reservoirs contribute to the availability of water resources, and to the economic and social development of many countries.

All studies, research work and surveys indicate that the stock of dams, and the reservoir volume per capita, is closely linked to a country's stage of socio-economic development (Gross National Income per capita and Human Development Index). Developed countries have an ample stock of dams and reservoirs, and in general terms, the greater the stock in volume of reservoirs is, the greater its contribution to development will be. However, experience has shown us that dams and reservoirs can, in some cases, have other major social and environmental impacts, so it is necessary to consider them within the framework of Integrated Water Resource Management and sustainable development. All feasible alternatives should be considered as part of this holistic approach.