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ICID Newsletter

Managing water for sustainable agriculture

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IN THIS ISSUE

International Commission on Irrigation and Drainage (ICID) was established in 1950 as a scientific, technical and voluntary not-for-profit non-governmental international organization. The Newsletter is published quarterly by ICID Central Office, New Delhi, India

Editor : **Dr. S A Kulkarni, Director I**

ICID WatSave Awards 2006

National Committees have still a golden opportunity to grab the sponsorship of the ICID WatSave Awards 2006. Kindly indicate your interest to Secretary General, ICID, if your National Committee is desirous to have the privilege of supporting WatSave Awards 2006.

Nominations are invited for ICID WatSave Awards 2006 from all those professionals/ teams who are engaged in water savings/ conservation in agriculture. Details of the awards are available at http://www.icid.org/awards.html#watsave.

Last date for the receipt of the nominations is **31st May, 2006.**

Message from the President

In the last Newsletter Dr Kulkarni, as editor made a very good start with upgrading this quarterly publication. In order to take this further we need feedback from our readers, and I have asked Vice President Hon Larry Stephens to set up a small editorial advisory panel under the Committee on Public Relations and Publications (C-PR&P). If you would be interested in being part of this, please approach your National Committee to nominate you to the C-PR&P. We would especially welcome young professionals and those with knowledge of publishing.

Speaking of young professionals, which in ICID is anyone under 40 years, the Council agreed in Beijing to welcome additional members to work bodies, putting aside the usual practice of having only one member from a country, providing that the second member was a young professional.

The important thing about membership of our work bodies is participation. If you cannot actually attend all the meetings in person, it is possible to contribute by e-mail, which at a minimum could be your comments on the agenda. Sending a representative does not count, as we find such representatives rarely participate. Of course, we would like to see as many as possible of our work body members present at our annual meetings, and we hope that you find this technically rewarding.

In order to improve the meetings of our work bodies at the next Council meeting in Kuala Lumpur in September 2006, we are introducing several changes. First, we are encouraging more work bodies to provide a platform for interesting presentations, and in essence turn the meeting into a workshop. The best performing work bodies like the Working Group on History of Irrigation, Drainage and Flood Control (WG-HIST) have been doing this for years, and attract many to attend who are not members. We would like to encourage this.

Second, Mr Sharma, our Secretary has taken on board ideas, particularly from our Strategy Theme Leaders to allocate meetings to rooms by theme so there are no clashes between meetings in the same theme, and hopefully make it easier for all participants to locate the appropriate rooms.

Where separate workshops are called for, and there are several planned for Kuala Lumpur, these will take place on the Thursday-Friday to ensure these do not clash with the technical work body meetings/ workshops, and especially the meeting of the Permanent Committee on Technical Activities (PCTA), which is the central work body for considering strategic and over-arching issues. All the chairpersons of the work bodies coming under PCTA are members of this committee (and should attend), but we are looking for more PCTA members to be nominated by National Committees.

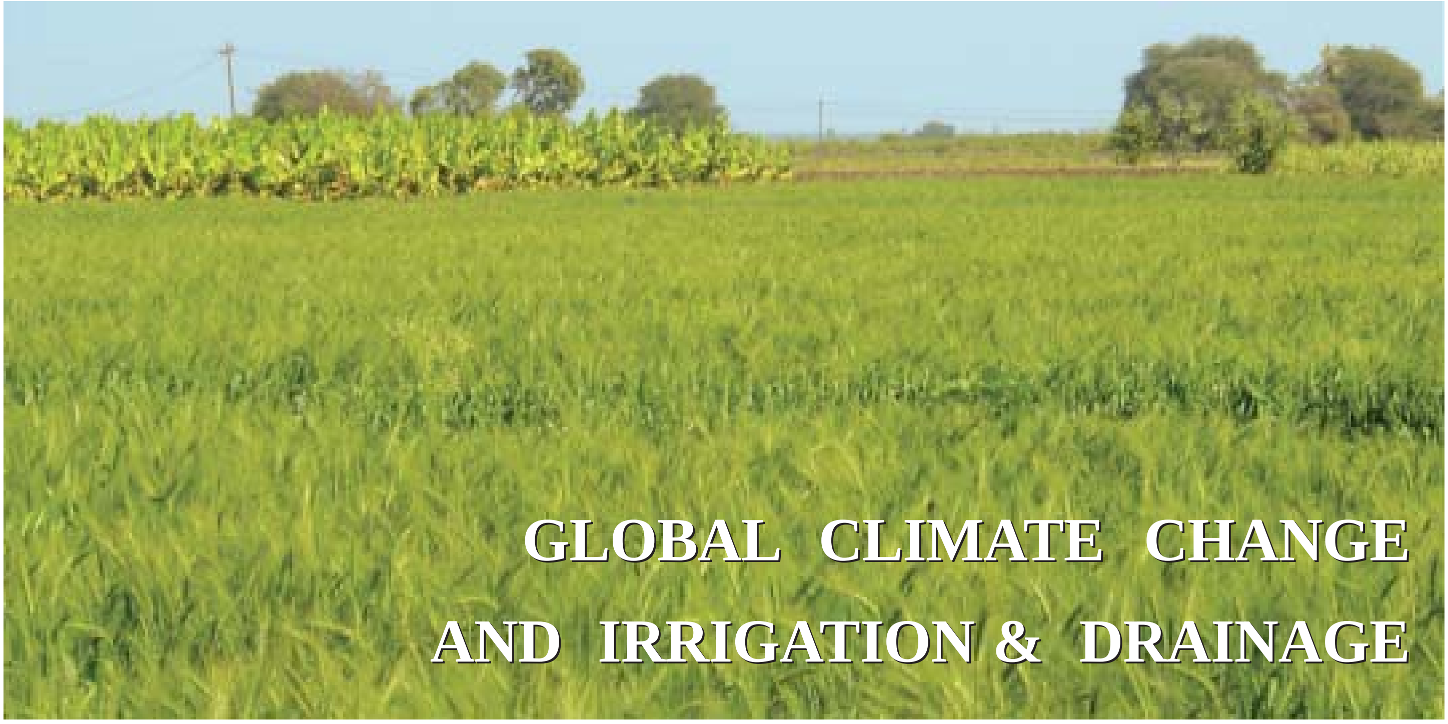
Finally, all these changes are to be achieved during the compressed time period of six days, Sunday to Friday, with the Council meeting on Thursday and the Closing Ceremony on the Friday. If you are thinking of coming to Kuala Lumpur for the 3rd Asian Regional Conference, 7th International Micro Irrigation Congress or one of the separate workshops, why not come early and attend, some of the work body meetings/workshops that will precede these?

Several work bodies are expected to complete their activities in Kuala Lumpur, or next year in Sacramento, and it is a good time to be involved in considering what new work bodies should be created, and proposing new objectives for those work bodies that Council is going to be asked to continue. Also, we have the first meeting in Kuala Lumpur of a new work body on Global Climate Change and Irrigation (WG-CLIMATE).

I am particularly keen to ensure that those who have contributed significantly to work bodies that are completing their activities, join new work bodies, so that we do not lose their participation. If anyone is concerned about this or any other matter to do with work body participation, please feel free to contact me.

I am looking forward to meeting as many of you as possible at the 4th World Water Forum in Mexico City in March. Thanks to the efforts of several different groups, co-ordinated by President Honoraire Aly Shady and Central Office, ICID will be making a significant contribution to this event. Most notably, ICID is co-beacon with IWMI in "Water Management for Food and the Environment" and with WMO in "Risk Management." There will be several sessions with ICID participation under these themes on 20-21 March, and ICID's Asian Regional Working Group (ASRWG) is holding a joint session with INWEPF on "Sustainable Paddy Water Use" on 20 March. Also, ICID is joining with IWRA on "The Role of Infrastructure" under the "Water for Growth and Development" theme, on 17 March. We hope to give you a report on these events in the next Newsletter.

Peter Lee,
President, ICID



GLOBAL CLIMATE CHANGE AND IRRIGATION & DRAINAGE

Rising global temperatures set in motion a series of other events that will be unevenly distributed across the globe. Of particular interest to irrigation and drainage professionals are those which affect precipitation, soil moisture status, river hydrology, droughts, flooding and agricultural crop growth. In order to play a role in ongoing discussions of GCC effects related to irrigation, drainage, and flood control, ICID in 2005 created a Working Group on Global Climate Change and Irrigation (WG-CLIMATE). Vice President ***Mark Svendsen*** *(USA), interim Chairman of the Group presents a thought provoking overview of these implications.*

The average global temperature has increased by about 0.5 degrees Celsius over the past 100 years in a continuing trend toward a warmer planet. Figure on page 3 shows the rise in global temperatures since around 1900. Convincing evidence shows that this is the highest average global temperature in the past 600 years and evidence from tree rings and glacial ice cores suggests that the increase is unique during the last 10,000 years.

The heating resulting from climate change is not uniform. Temperature increases in the North American arctic have been as high as 5 degrees Celsius, and land surface temperatures have generally increased more than the global average because of the oceans' buffering effect.

In addition, because winds and ocean currents redistribute the earth's heat energy and water vapor, temperature changes vary among regions. The strongest effects occur at mid and high latitudes in the northern hemisphere. Winter and spring temperatures are rising more rapidly than summer temperatures and nighttimes temperatures are increasing more rapidly than daytime ones.

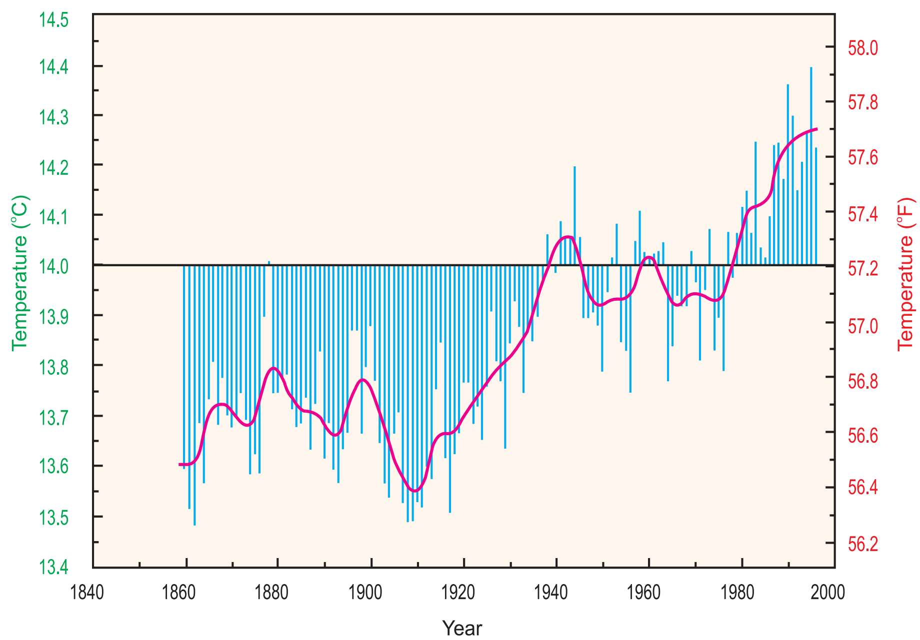
This warming is closely associated with rising levels of CO_2 in the atmosphere, which have increased by about 30% over the past 200 years. Increases in CO_2 levels are, is turn, associated with human activities, principally the burning of fossil fuels; coal, oil, and natural gas; and deforestation – the famous "greenhouse effect." The greenhouse effect is the result of atmospheric gasses – principally CO_2, methane, nitrous oxide, and water vapor – that trap solar energy under the mantle of the earth's atmosphere.

If it weren't for a naturally-occurring greenhouse effect, the earth's temperature would be about 34 degrees Celsius lower that it is – well below the freezing point. However, in the absence of human activity, the naturally produced greenhouse gases are almost exactly balanced by other natural processes which form "carbon sinks" and sequester the greenhouse gasses – principally as biomass or dissolved in seawater. The problem comes when human activity increases the production of these gasses while sequestration processes remain static. The result is increased concentrations of these gasses in the atmosphere and increased retention of incoming solar radiation, i.e. rising global temperatures.

The burning of fossil fuels accounts for 80 to 85 percent of human-caused CO_2 emissions, while land use changes account for 15 to 20 percent.

Projected Consequences of Climate Change to 2100

- Global temperature rises by a further 1.0 to 3.5 degrees Celsius.
- Incidence of infectious diseases increases, with malaria and other vector-borne diseases spreading into temperate regions.
- Number of people affected by coastal flooding doubles from 46 million to 92 million (more if future population increases are figured in).
- Market-oriented production of rainfed food grains shifts to higher latitudes.
- Agricultural pests and diseases spread and prevalence increases.
- Sea level rises by an additional 50 centimetres or more.
- Continental glaciers retreat and many disappear.



Measured global surface temperatures relative to the 1961-1990 average

The reports of the Inter-Governmental Panel on Climate Change[1] (IPCC) allow little doubt as to the cause and effect relationship between human-induced increases in atmospheric CO_2 and the rise in global temperatures. And the persistence of CO_2 in the atmosphere means that even if anthropogenic CO_2 emissions were to cease tomorrow, global temperatures would continue to rise for centuries.

In addition to its direct effects, rising global temperatures set in motion a series of other events that will be unevenly distributed across the globe. Of particular interest to irrigation and drainage professionals are those which affect precipitation, soil moisture status, river hydrology, droughts, flooding and agricultural crop growth. Some of these are a) Changes in precipitation patterns, b) Increased storage losses, c) Reduced storage of precipitation as snow, d) Increased crop water demands, and e) Rising sea levels. These consequences of GCC suggest some important and interesting questions for irrigation and drainage professionals such as:

- How can reservoir operations be modified to account for higher storage losses, more extreme events, and other expected changes?
- How will higher temperatures, increased CO_2 concentrations, and reduced soil moisture levels combine to affect crop yields and crop water requirements?
- What is the scope for stabilizing rainfed yields through supplemental irrigation in areas where precipitation declines and becomes more variable?
- What is the likely impact of particular shifts in precipitation patterns on groundwater recharge and availability?
- How can new and remodelled infrastructure help to adapt irrigation systems to the disruptions caused by GCC?
- What are policy and institutional requirements for management strategies that cope successfully with GCC-induced changes?

These and other questions are ones that can be addressed by a newly-formed ICID Working Group. Full text of the article can be viewed at <http://www.icid.org/nletter/mark_nl2006_1.pdf>.

[1] An Inter-Governmental scientific panel of more than 2,000 scientists, established in 1988 by the United Nations Environmental Program (UNEP) and the World Meteorological Organization (WMO).

Climate Change in South Africa

According to South Africa's *National Climate Change Response Strategy*, global climate change is a threat to sustainable development, especially in developing countries. The year 2005 was the warmest year on record in South Africa, and this is bad news for a country which already has a high-risk hydro-climatic environment, with low rainfall-to-runoff conversion and a high inter-annual variability of climate. The country anticipates that it may even face the need to re-negotiate its international water agreements with its neighbours, with whom it shares 70% of its water resources.

The Water Wheel, Jan/Feb 2006

ICID Working Group on Global Climate Change and Irrigation (WG-CLIMATE)

In its meeting in Beijing in September 2005, the 56th IEC accepted the recommendation of the Permanent Committee on Technical Activities (PCTA) to establish a Working Group on Global Climate Change and Irrigation (WG-CLIMATE). Vice President Mark Svendsen (USA) was named as interim Chairman of the working group. To date eight National Committees (Egypt, India, Italy, Japan, The Netherlands, the Philippines, South Africa, and the United States) have nominated representatives to the WG, and three international organizations (IFPRI, IWMI, and the WMO) have named observers to participate. The purpose of the WG is to:

1. Raise awareness and stimulate discussion among National Committees, policy makers, and the general public on the implications of GCC for irrigation, drainage, and flood control,
2. Share and collect experience with GCC and its water-related implications, and
3. Position ICID to play a role in ongoing discussions of GCC effects related to irrigation, drainage, and flood control.

The work of the WG will center around annual seminars where information on GCC and its implications will be shared and discussed. These will take place during the annual IEC meetings and their associated conferences – Kuala Lumpur in 2006, Sacramento in 2007, and Lahore in 2008. Seminars will be open to all interested participants. Outputs from the WG will include a website, on which all contributed papers will be posted, together with links to the extensive set of resource materials available on other sites.

GULHATI MEMORIAL LECTURES: LOOKING BACK OVER FIFTEEN YEARS

The Gulhati Memorial Lecture, named from the "Father" and First Secretary General of ICID is the most important keynote speech of ICID Congresses since 1981. The Fourth Lecture entitled "Irrigation at Crossroads" was delivered by late Mr.W.R. Rangeley at the ICID Congress in Rio de Janeiro in Brazil in 1990. Mr. Rangeley with a remarkable visionary perspective addressed the question of food supply situation and considered how the trends in agricultural production and demands might affect the strategies for irrigation and drainage. Mr. A.Clemmens was honored to present the ninth Gulhati Lecture at the 19th ICID Congress in Beijing. His Lecture addresses the limited but critical issue of the poor performance of irrigation systems and highlights some lessons learned during the last two decades. ***Herve Plusquellec****, Former World Bank Irrigation Adviser takes stock of these two Gulhati lectures together, which are of great interest for ICID member countries and international research and donor organizations.*

The Vision of the 1990s

A likely food crisis by the turn of the century :

Mr. Rangeley anticipated that the developing world would be facing major regional food supply problems about the turn of the century unless a new and accelerating pattern of growth in agriculture coupled with a significant decrease in demographic growth and combined with a modest increase in income arose. The risk of a food crisis projected by Mr.Rangeley was averted. The main reason is likely the explosive development of groundwater that took place during the last two decades. The magnitude of development of aquifers could not be anticipated at that time. Over-exploitation of groundwater is observed in many regions with the well-known ill consequences of declining quality of groundwater, mining of water resources, increasing abstraction costs severely affecting the poorest users. Exploitation of groundwater has now reached and even exceeded its limits in many areas.

Option for future growth :

Mr. Rangeley warned about the risks of renovating old out-moded concepts that will fail again to meet the original objectives and suggested that some modernization and innovation to achieve higher standards of performance-both hydraulic and agricultural - are a necessary part of rehabilitation in almost all cases. He concluded that an enormous effort is needed over the next two decades if the necessary measures were to be effective in time to meet demands. A fundamental prerequisite to that effort was research in irrigation and drainage, which in developing countries has been seriously neglected with the result that in many parts of the world agricultural technology has outpaced irrigation and drainage. Mr. Rangeley, as Past President of ICID, proposed the creation of IPTRID and its setting up within the World Bank to close that gap.

The case of Africa :

Mr. Rangeley challenged the accepted wisdom that the right strategy for Africa was to focus on small farmer managed irrigation development with intermediate technology and low capital cost. He observed that even the intensive development with modern technology of the remaining irrigation potential in Sub-Sahara Africa would not be enough to produce the incremental production required in 35 years time.

The Situation Fifteen Years Later

Mr. Clemmens' lecture in Beijing focussed on the large and medium scale irrigation systems which worldwide account for about 60 percent of the irrigated areas but are the ones that present the most severe gap between expected and actual performance.

Improved management and water measurement alone are not the answer :

Mr. Clemmens challenged the school of thought developed in the 1970s and well accepted through the early 2000s that put forth the idea that improved management could solve all problems. International efforts in the water sector have been focused on the revision of national water policies and water resources management strategies and the promotion of integrated water resources with the development of river basin organizations. In the irrigation sub-sector, the focus has been on the reform of irrigation management institutions, mainly through participatory irrigation management (PIM) and irrigation management transfer (IMT), seen as a means to increase cost recovery and reduce government subsidies.

Mr. Clemmens shares the now well accepted opinion that such efforts were marginally successful. He does not believe that improving management alone would significantly improve the productivity of these systems. It may result in small increments, but not in substantial gains. He neither believes that water measurement, another fashion of the 1970s, is the answer. Mr. Clemmens believes that water measurement is a key component of water control, but it is not sufficient for significantly improving productivity by itself.

The chaos in large-scale irrigation systems **:**

Mr. Clemmens' lecture provided a painstakingly discussion on the inherent chaos that dominates in large and medium scale irrigation systems. He explained why what appears to be minor problems at the top of the distribution system, can end up as extreme differences in delivery - or chaos - at the bottom of the system. Mr. Clemmens emphasized the importance of improving water delivery service to the users. Without a reliable water supply, farmers are at the whim of the chaos that is inherent to large-scale systems. That message is relatively new in international water world, where the focus has been more on water saving rather than increasing agricultural productivity through a more reliable and/or flexible service to users. He concluded by stating that a change in management philosophy is needed and that new technologies for water control are now available that can aid in efforts to significantly improve the productivity of irrigation systems.

Conclusions

The food crisis in the developing countries anticipated by Mr. Rangeley is still likely in front of us. There is much less opportunity now for further development of surface and groundwater resources. New water resources are becoming scarce and expensive to develop. In many regions, the frontiers in developing surface water have been reached and groundwater is over-exploited. Further development is feasible in regions where it is less needed. Mr.Rangeley considered it unwise to prepare future plans for food production in developing countries that relied on progress in biotechnology. The remaining option is to increase the productivity of existing schemes, and especially of the government built and managed large and medium systems.

The strong recommendation of Mr. Rangeley that research in irrigation was of crucial importance and the need for field testing of the results of applied research at pilot scale was eclipsed by the urgent need to address issues in water policies soon after the creation of IPTRID. Improving the operation of large systems was not the focus of international research during the last 15 years. The irrigation modernization agenda of national governments and the international community has been modest during the last two decades. The enormous effort in modernization advocated by Mr. Rangeley did not take shape in the absence of an imminent food crisis. However a prerequisite step, monitoring and benchmarking the performance of irrigation systems, was taken up in a number of countries.

The conclusions of the two speakers could be nicely combined today:

There is a need to do much more to point the way to the right strategies to be adopted (1990). The time is right for the international irrigation and drainage community to step forward and promote positive change in irrigation productivity. Please join this effort (2005). Irrigation is not just about food production. It also concerns developing an industry that lifts people out of poverty. Professionalism is essential.

Photo Courtsey: Herve Plusquellec

The 3rd Asian Regional Conference (ARC) and 7th International Micro Irrigation Congress (7IMIC) are scheduled to be held on the occasion 57th International Executive Council (IEC) meetings of ICID from 10-15 September 2006 at Kuala Lumpur, Malaysia. Besides these, an exhibition on "Irrigation, Drainage & Water 2006" and various pre & post conference technical tours will be organised. For information on preliminary registration form, details of each event, space for exhibition, please contact: MANCID - KL 2006, Ministry of Agriculture and Agro Based Industry, Division of Irrigation and Agricultural Drainage, 4th Floor, Wisma Tani, Menara 4G1, Presint 4, 62624 Putrajaya, Malaysia, Tel: +603-8870 1618/1662, Fax: +603-8888 4855, E-mail: mancid@water.gov.my , azhari@water.gov.my, Website : http://www.icid2006.org, www.icid.org.

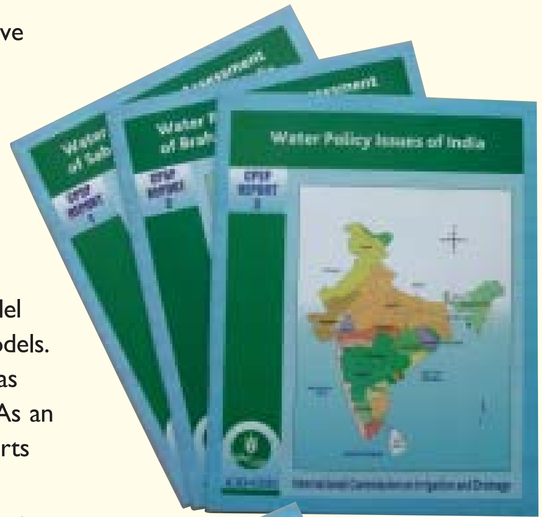
COUNTRY POLICY SUPPORT PROGRAM (CPSP)

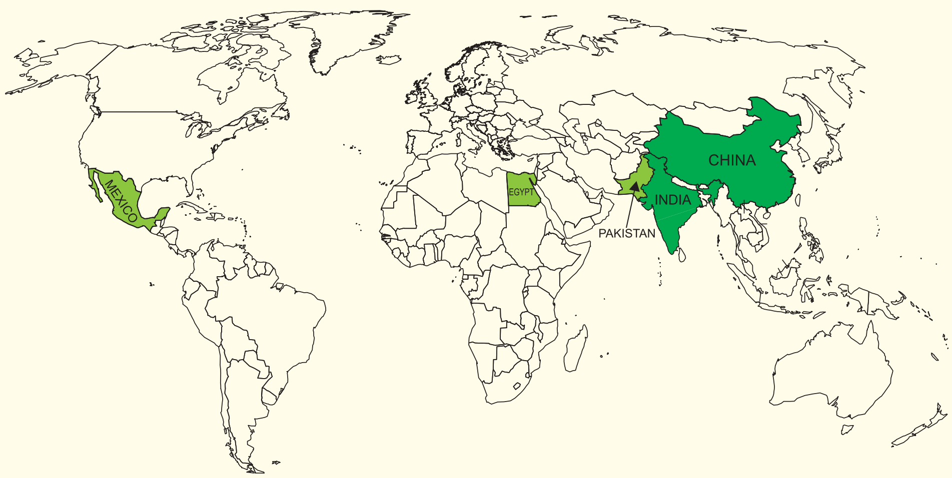
A document on 'Strategy for Implementation of Sector Vision on Water for Food and Rural Development' was brought out by ICID in the year 2000. Subsequently, the Commission also felt the need to mobilize strong international support for strategies and policies in water sector to achieve food security and reduce poverty in developing countries through independent water assessments. In line with this, ICID launched in 2002 a project titled "Country Policy Support Program (CPSP)", with a funding support from the Government of the Netherlands. The CPSP basically aims at assessing and integrating water needs for three sectors viz. food, people and nature, for the present and for the future (2025) with a goal to evolve policy interventions.

Together, China, Egypt, India, Mexico and Pakistan having 43% of the world population and 51% of the world irrigated area were chosen as participating countries. The program was undertaken in co-operation with International Water Management Institute (IWMI), International Food Policy Research Institute (IFPRI), Food and Agriculture Organization (FAO), International Program for Technology and Research in Irrigation and Drainage (IPTRID), and The World Bank.

The approach to achieve the objective comprises: (a) Carrying out assessment of water resource in sample river basins through an integrated, dynamic and holistic model, (b) Holding consultations with the stakeholders at basin and national levels, and (c) Improvement of IWMI/IFPRI's Policy Dialogue Model (PODIUM) and IMPACT-WATER models. The duration of the CPSP phase I was from July 2002 to December 2005. As an outcome of the study, following reports have been brought out:

1) Water Resources Assessment of Sabarmati River Basin
2) Water Resources Assessment of Brahmani River Basin
3) Water Policy Issues of India
4) Water Resources Assessment of Jiaodong Peninsula Basin,
5) Water Resources Assessment of Qiantang River Basin
6) Water Policy Issues of China
7) Water Policy Issues of Egypt
8) Water Policy Issues of Mexico
9) Water Assessment of Nari River Basin and Water Policy Issues of Pakistan
10) PODIUMSIM, and
11) WATERSIM





Participating countries in CPSP

It is hoped that the Governments of participating countries will find study results interesting while shaping or reviewing their policies on Basin Management. Draft reports of various consultations/workshops and the final reports are available for download at

http://www.icid.org/cpsp.html.

In the following section, a brief of the key outcomes of CPSP studies pertaining to India and China are presented.

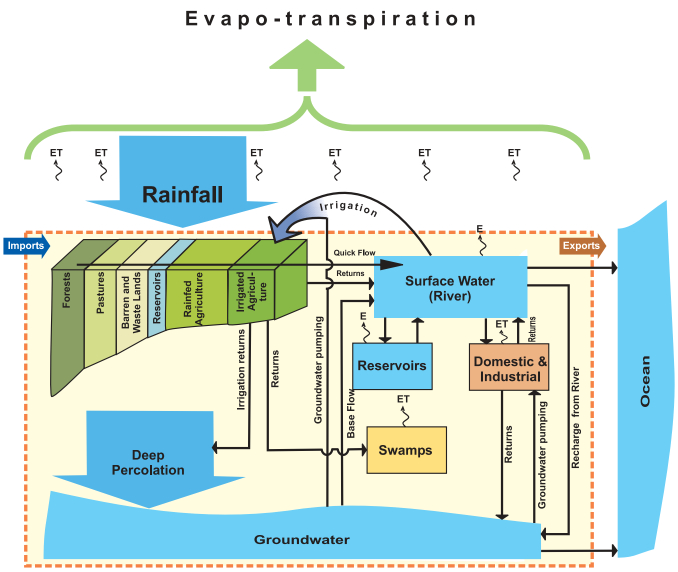
BHIWA Model: A Simple Tool to Understand Basin Water Resources

As a part of CPSP, a Basin Wide Holistic Integrated Water Assessment (BHIWA) model was developed. The model has been conceived mainly to quantify and integrate sectoral water uses. The model is an attempt to help the analysis the dynamics of the water use changes and it is hoped that it will be a useful tool for water policy planners and other professionals interested in projecting the water scenarios at basin level under different policy options / philosophies for use of water and related resources

The development of the model is one of the significant parts of the 'Country Policy Support Program (CPSP)'. The model has been conceived mainly to address the issues of integration of water use under the three sectors namely water for nature, water for people, and water for food. The basic objectives of the model are: (i) To consider the impact of changing land and water use on the resources, (ii) To quantify and integrate sectoral water uses, and (iii) To formulate and analyze scenarios to evaluate various policy options for development and management of water and related land resources.

The model has seven computation modules viz., (1) Actual ET, quick runoff and natural recharge, (2) Irrigation withdrawal, (3) Irrigation returns, (4) Evapo-transpiration (ET) by sector, (5) Domestic and industrial withdrawals, use and returns, (6) River water balance, and (7) Groundwater balance. In addition to these modules, there are worksheets to facilitate data inputs, and generation of aggregated results in the form of tables and charts.

Once the model is calibrated, it enables the user to analyze scenarios of water resource development and management with respect to policy options at river basin scale. The model runs on a monthly time step simulating average hydrological year. The model runs on a simulation mode and does not enable users to



Schematic diagram of BHIWA Model

directly set targets/goals. However, scenarios can be developed in terms of changes in land use, crop areas under rain fed and/or irrigated agriculture, cropping patterns, irrigation efficiencies, imports and exports of water, surface storage, surface and groundwater withdrawals, returns, etc. By simulating past conditions of little or no water use in the basin, the model can also help in setting up minimum reference flows for maintenance and enhancement of river ecology and environment. Comparison of such flows with projected 'future river flows' help in determining indirectly limits on water withdrawals, including decline in groundwater tables to meet environment flow requirements. The model takes into consideration complex interaction between numerous factors and gives overall water balance at basin/ sub basin level.

The model as developed helps a review of scenario impacts (though not a rigorous operation model). One needs additional modules to evaluate socio-economic impacts. The discussions during National Consultations reveal that the model is a useful one for water policy planners and other professionals interested in projecting the water scenarios at basin level under different policy options / philosophies for use of water and related resources.

The BHIWA model was applied in four Indian basins viz. Brahmani, Sabarmati, Tapi and Pennar; two Chinese basins viz. Jiaodong and Qiantang; and Nari basin in Pakistan.

The model initially developed in Excel platform has been later converted to a Visual Basic version. The BHIWA model (both in Excel and VB versions) and a 'User Manual' are available for download at http://www.icid.org/bhiwa_xp.zip.

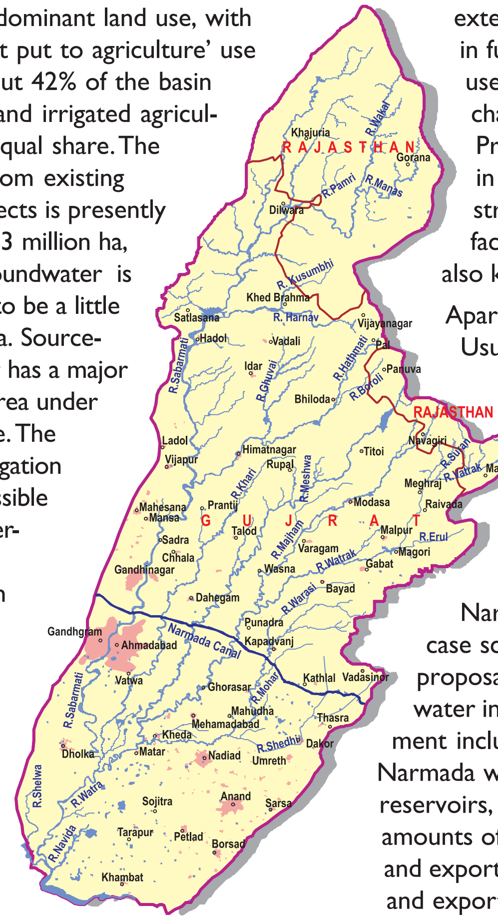
Assessment of Basin Water Resources: Case Studies from India and China

Application of BHIWA model to different basins show interesting and varied findings. In water deficit basins with substantial development such as Sabarmati basin (India) and Jiaodong basin (China) it is found that in order to sustain the present withdrawals and also to meet the future water needs, it will be necessary to import some water from outside the basin, apart from improved management of land and water resources. More details follow.

Sabarmati Basin, India

Sabarmati river is one of the major west flowing rivers of India. The basin drains an area of 21,565 km^2, of which 17,441 km^2 lies in the state of Gujarat and 4,124 km^2 in Rajasthan. The pseudo-natural mean annual runoff is estimated to be 3,810 million cubic meters corresponding to pre-1960 conditions. Basin's population in 2001 was 11.75 million with a per capita availability of water as 324 cubic meters per annum, which is lowest among the basins of India. As a result of the rapid pace of socio-economic development, the demand for water has experienced a steady increase for irrigation as well as domestic and industrial use.

Agriculture is the dominant land use, with forest and 'land not put to agriculture' use accounting for about 42% of the basin area. The rain-fed and irrigated agriculture have almost equal share. The annual irrigation from existing surface water projects is presently of the order of 0.43 million ha, while that from groundwater is roughly estimated to be a little over 0.70 million ha. Source-wise, ground water has a major share in terms of area under irrigated agriculture. The present level of irrigation has been made possible mainly through inter-basin transfer of surface waters from the adjacent Mahi river. Additional import from Narmada river has further augmented the supply and more imports are proposed by Gujarat State.



Map of Sabarmati river basin

Large Industrial base and urbanization has added to the water demands. There exist 20 State supported industrial estates besides a sizeable number of private industries. There are two thermal power stations and a major fertilizer plant in the basin. There is an ample scope and plans for further industrialization in the basin. The urban population of the basin accounts for about 52 percent of the total as per the 2001 census, which is expected to grow in future and put extra demands for water for domestic use and sanitation. Presently, the basin is beset with problems of overexploitation of groundwater, non-filling of surface water storages, deteriorating of surface and groundwater quality, social in-equity and inter-sectoral conflicts.

The Present (1995) situation was restudied to achieve sustainability in ground water use through additional surface water transport and induced recharge from river. Various future plausible scenarios for 2025 were visualized. These considered to proposed plans, better water and soil management and likely extent and seasonal shifts in future agriculture water use including possible changes in land use. Propensity of the people in the basin to adapt to strategic changes and face compulsions was also kept in view.

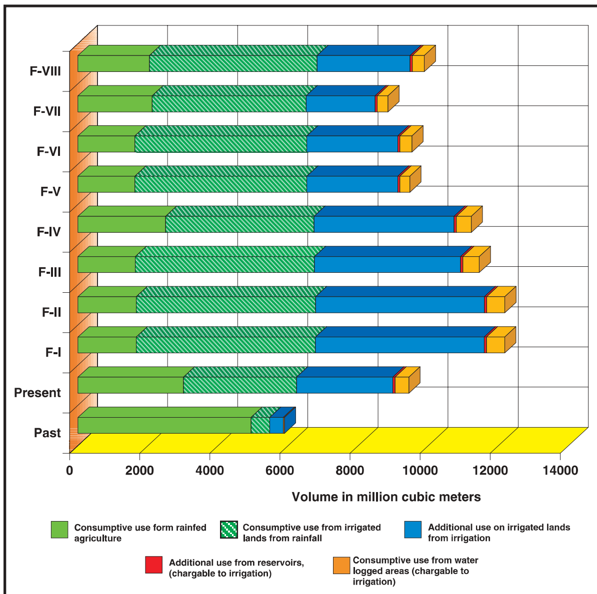
Apart from Business as Usual (B as U) scenario, following alternative future (2025) scenarios were examined:

1) Irrigation expansion, but no Import of water from Narmada basin (worst case scenario), 2) The current proposals of Gujarat Govt. for water infrastructure development including the pumping of Narmada waters in the upper reservoirs, and increase in amounts of in-basin use, imports and exports, 3) Lesser import and export of water, 4) Irrigation expansion and agricultural seasonal shift, 5) Reduction of groundwater use and in the pumping Narmada waters into the reservoirs; (as compared to the future plan of Gujarat), 6) Reduction of groundwater use by lesser irrigation expansion and better management, and 7) Limited agriculture shift and water exports.

The total water input in an average year (rainfall and imports) to the basin under the present (1995) situation amounts to 17,744 million cubic meters. The major outflows from the basins comprise of consumptive use or evapo-transpiration (ET), river flows and exports. The total consumptive use under present (1995) situation is estimated to be 14,796 million cubic meters, comprising about 35% by nature sector (forest, pasture and barren lands), 64% by agriculture sector (rain-fed and irrigated agriculture) and only about 1% by people sector (domestic and industrial).

The "non-beneficial" component of evapo-transpiration works out as about 22% of the total evapo-transpiration. It is seen that out of total consumptive use of irrigated agriculture, almost 50% is met by rainfall and the balance supplemented through irrigation. The major findings of the assessment are:

a) Non-beneficial ET in the nature and agriculture sectors is of the same order as the annual river flow, b) Reduction of non-beneficial ET through appropriate soil and water management can be a potential strategy, c) Import of Narmada water is necessary to sustain the present withdrawals and to meet also the future needs, including that for improvement of low flows to maintain river ecology, d) Quantum of the groundwater use at present is unsustainable. While the situation would improve slightly in future due to possible large addition on account of imports from Narmada, composition of return flow indicates much higher risk of groundwater pollution, and e) There is an urgent need for large-scale artificial recharge to groundwater, or alternatively for a considerable reduction in groundwater and the total use. More description of Sabarmati Basin Assessment is available at http://www.icid.org/cpsp_report1_web.pdf.



Composition of consumptive use in agriculture sector, Sabarmati basin

Jiaodong Peninsula Basin, China

Map of Jiaodong peninsula basin

The Jiaodong Peninsula basin has a total drainage area of 19,182 km^2. The per capita annual water availability in the basin in the year 2000 was 492 cubic meters considering the estimated renewable water resources of the basin as 4,394 million cubic meters per year and 8.93 million as the population of the basin. This water availability is likely to be 454 cubic meters per year per capita in the year 2025 with the projected population of 9.67 million by 2025.

The BHIWA model was calibrated for the present conditions and applied to derive responses to the past and five future scenarios using monthly time set. Apart from Business as Usual Scenario (Future-I), other scenarios examined include:

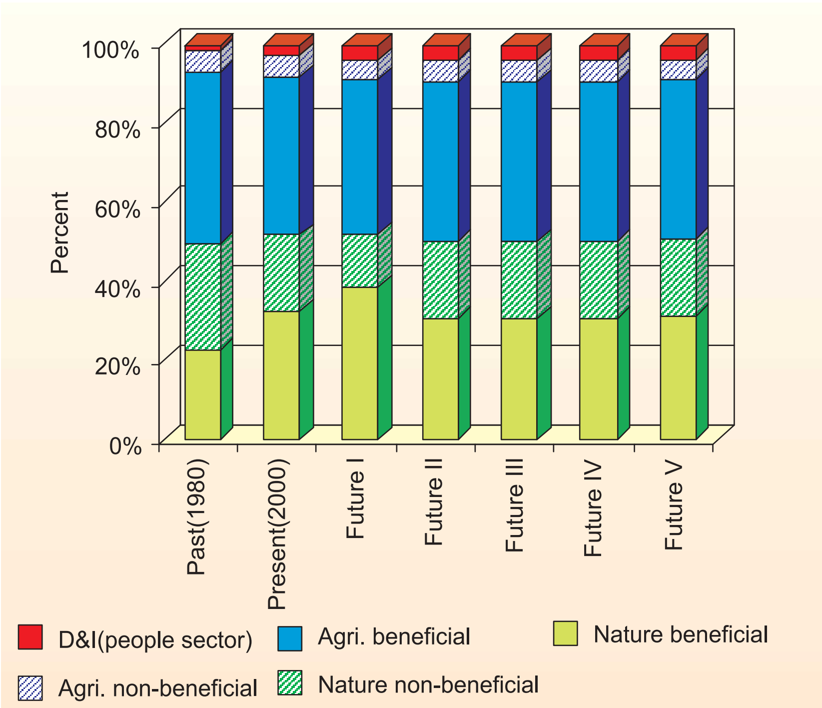
a) Without expansion of forest (Future-II), b) Better system management and reduced groundwater use (Future-III), c) Better system management and reduced groundwater use and adoption of drip irrigation (Future-IV), d) With improved soil and land management, import of more water and reduced groundwater use (Future-V)

The total water input to the basin comprises rainfall and import of water. The rainfall amount in the basin is 13,748 million cubic meters and presently there is no import of water. However, an import of 147 million cubic meters as per B as U, Future- II, III, IV scenarios and about 295 million cubic meters in Future-V scenario may be required. The major output consists of consumptive use and river flows. The total consumptive use (ET) in the year 2000 situation was 11,821 million cubic meters comprising about 52% by nature sector (forest, pasture and barren lands), 46% by agriculture sector (rain fed and irrigated agriculture) and 2% by people sector (Domestic and Industrial).

The major findings of the assessment are: 1) Nature sector consumes major part of the primary water resource (rain water).Nature sector consumption for the past (1980), present (2000) and future (B as U) condition is estimated respectively as 5459, 6114 and 6601 million cubic meters. 2) The increasing consumption in the nature sector (hence marked decrease in river flow in B as U scenario) is mainly on account of the land use shift between barren and forest land. 3) Groundwater flow to rivers has decreased from 570 million cubic meters per year in the past to 230 million cubic meters at present.

In B as U scenario too, contribution from groundwater is likely to decline, 4) For sustainable use, the groundwater withdrawal shall need to be reduced especially in Yantai area, and 5) To meet the additional future water needs, and to limit likely reduction in river flows, it will be necessary to import some water from outside the area, apart from improved management of soil and water resources.

The assessment has helped in testing of various possible land and water use scenarios and possible integration of water supply and demand aspects of nature, food and people sectors. More description of Jiaodong Peninsula and water resources assessment is available at http://www.icid.org/cpsp_report4_web.pdf.



Consumptive use (ET) by nature, agricultural, and domestic & industrial sectors, Jiaodong basin

Water Policy Issues Emerged from CPSP Studies

Water Policy Issues of India

The geographical area of India is 329 Mha of which 180.6 Mha is arable. A total area of 142 Mha is net sown, of which 57 Mha is irrigated. The total drainage area of India is divided into 24 basins. The average annual renewable water resources of the country are assessed as 1953 km^3 under pseudo natural conditions, of which the potentially utilizable water resources is estimated at 1086 km^3, (690 km^3 from surface water and 396 km^3 from groundwater).

The population of the country in 2001 was 1027 million and is projected to increase to 1333 million in 2025. The per capita availability of water in 2001 was 1901 cubic meter per year and will reduce to 1518 cubic meters. The present water withdrawals are 629 km^3 and in 2025 are projected to grow further and are expected to be 843 km^3. The present capacity of storage dams is only about 177 km^3. The ultimate gross irrigation potential has been assessed as 140 Mha of which about 100 Mha has been created so far. Further expansion of irrigation potential will require an increase of about 100 km^3 in the total storage capacity.

A summary of the key policy issues emerged from the detailed assessments and consultations held at basin/ national level is as follows:

- It is essential that *precipitation (or rainfall*), which forms the primary source of all waters on land, *rather than the terrestrial surface and ground water runoff* is to be recognized as the primary and real resource for water assessments.
- There is a need for accounting of *additional water availability due to return flows*; and accounting of water *withdrawals* and *consumptive use* by sectors, separately and collectively towards an integrated and sustainable water management.
- The consumptive use, which results in the *depletion of resource*, needs to be managed through increase in efficiencies across all sectoral uses, and by curtailing specially its "*non-beneficial*" component of evapo-transpiration both from lands under natural use and from lands under agricultural use.
- While local harvesting of rain can to some extent be promoted, its usefulness in water short basins, where the existing reservoirs hardly fill up, is very limited as it impacts *negatively* on the filling of existing storages on the main river and its tributaries.
- In many low rainfall and water short areas, with considerable rural population, integration of land, water and livelihoods is necessary. Irrigation may be a viable option for increasing their income levels, and for alleviating poverty.
- Inter-basin transfer of surface waters from adjacent river basin(s) is an obvious option to meet the *additional needs of* water deficit basins and to restore the groundwater regime and provide for environmental flows in the downstream.
- The high groundwater use, which has developed in many water-short basins, needs to be curtailed as artificial recharge from imported water may be technically and economically unviable, besides threatening water quality and reducing dry season river flows.
- For water short basins, a better water and land management through adoption of sprinkler and micro irrigation techniques etc. would be of some help in demand management.
- The increasing hazards of pollution of surface and ground waters, through higher proportion of return flows, needs to be countered both by adequate treatment of the wastewater being discharged into natural waters, and by encouraging reuse of wastewaters without discharging these in water bodies.
- In some water-rich basins, the groundwater use is not developing beyond that required for meeting domestic demands of the rural areas. In such basins, a balanced, conjunctive use of surface and groundwater sources is essential for avoiding possible hazard of waterlogging.
- The high priority given to the drinking water has to be elaborated by defining the core and non-core demands, and by allocating the better quality and more reliable sources to meet the core demand.
- The development of urban water supply needs to be done along with the development of sewerage and sewage treatment.
- Environmental water requirements need to include both, the terrestrial eco-systems, as also the aquatic ecosystems. While environmental flow requirements (EFR) need to be recognized as valued requirements, acceptable methods (which consider the water regimes required by the different species, as also the tradeoffs, as preferred by the society, between the environmental and other uses), need to be developed.

Water Policy Issues of India are discussed in CPSP Report 3, which can be accessed at http://www.icid.org/cpsp_report3_web.pdf.

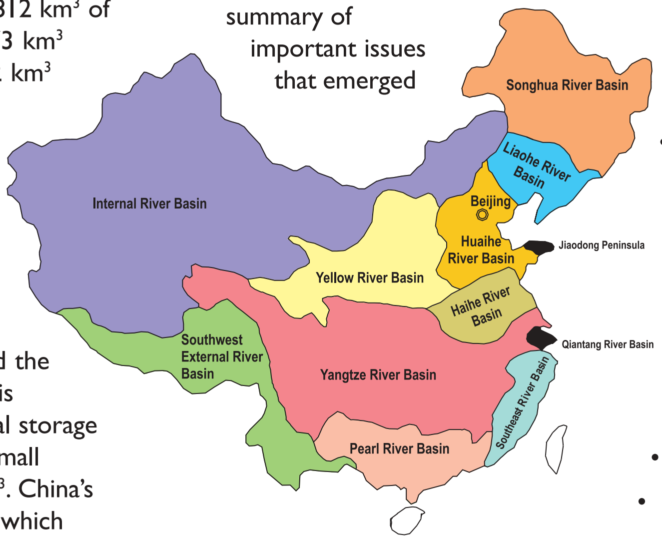
River basins of India

Water Policy Issues of China

China is the third largest country in the world in respect of geographical area (960 Mha). The drainage area of the country is divided into 9 basins. The renewable water resources of the country are 2,812 km^3 of which potential utilizable are 873 km^3 (751 km^3 surface water and 122 km^3 groundwater). China's population was 1,292 million in 2003 and is projected to be 1,600 million in 2025. The per capita availability of water at present is 2,204 cum per year and it will be 1,875 cum per year in 2025. Present water utilization is about 557 km^3 and the projected requirement in 2025 is estimated as 1,138 km^3. The total storage capacity of large, medium and small reservoirs in China is 565.8 km^3. China's total arable land is 130 Mha, of which irrigated area is 55.9 Mha. The country has planned to increase the irrigated area to 60.3 Mha by 2025.

The Water Law of the People's Republic of China (CWL), formulated in 1988 was revised and adopted in August 2002 and made public with effect from October 2002. The CWL provides guidelines for planning, development, utilization and protection of water resources, water bodies and water projects, and efficient utilization of water resources.

Through CPSP study, the detailed assessment and analysis of the two river basins provided a greater insight into the understanding of their water resources.



River Basins of China

Similarly, the modelling has allowed the testing of various possible land and water use scenarios, in regard to their hydrologic implications, and allowed integration of the individual water use sectors. Following is a summary of important issues that emerged during national consultation and may need to be studied further for suitable modifications in the Water Law of China:

- From the perspective of the economic and social development, it would be necessary to change the perception of water resource availability by promoting and improving water resources management.
- Developing harmonious coexistence between man and nature for sustainable development.
- Change in the perception that water is inexhaustible to the recognition that freshwater resources are limited.
- Shifting focus from water development, utilization and management to water allocation, conservation and protection.
- Emphasizing water works management through strengthening non-structural measures and scientific management.
- Matching water supply according to demand.
- Developing pressurized irrigation systems and promoting efficient water use.
- Realizing water as a natural gift, structural measures should be taken up for its optimum utilization.
- Proper Management and monitoring of water quantity and quality in all uses.
- Promoting re-use of poor quality water.
- Integrating water allocation, distribution and management.

The strategy for sustainable use of country's water resources focuses on developing water resources and expanding the capacity of water supply; increasing water use efficiency and saving water; protecting water resources and improving water environment. Measures for sustainable use of water resources include – optimal allocation, effective protection and utilization, appropriate development, scientific management and increased financial input.

Water Policy Issues of China are discussed in CPSP Report 6 and can be accessed at http://www.icid.org/cpsp_report6_web.pdf.

EVOLUTION OF IRRIGATION AND DRAINAGE: THE JOURNAL OF THE ICID

Over the years the Journal of ICID has developed as a prestigious peer-reviewed publication and enables the Commission to accomplish its objectives of publishing original papers on scientific, engineering and socio-economic issues associated with irrigation, drainage and flood management. Prof. dr. ***Bart Schultz****, Chairman, Editorial Board chronicles the evolution of the Journal and apprises its present status.*

Since 1952, ICID has been publishing its own scientific Journal. Initially it was published biannually under the name ICID Bulletin. Over the years continuous improvements have been made to bring the Journal to its present status of internationally recognised scientific journal in irrigation sector.

During early years, papers were published more or less without any review. In 1963 late Secy. Gen. Hon., K.K. Framji, became the designated editor and fulfilled this role until his retirement in 1987. In 1986, Lahore, Pakistan, Council approved recommendations to improve the format of the Bulletin, and the introduction of international editorial standards. Pres. Hon. Marvin Jensen took the initiative to upgrade the Bulletin. He received substantial support of late Vice-Pres. Hon. Tom Anstey. The first issue of the improved Bulletin was published in early 1988 with Pres. Hon. Marvin Jensen as the Interim Editor. At the congress in Rio de Janeiro, Brazil (1990), Dr Wally Nicholaichuk (Canada) was appointed Editor-in-Chief He served until Prof. Janusz Rydzewski (UK) took over in 1995. Initially Marvin and Tom continued as interim Associate Editors until the first Associate Editors were proposed by National Committees and accepted by Council in 1990.

In 1989, Ottawa, Canada, the proposal of Marvin to create an ICID Bulletin Editorial Subcommittee (or Team) comprising the Editor, the Associate Editors, a Central Office representative, and someone from the Permanent Committee on Technical Activities was approved. That team quickly developed into the Editorial Board in 1993, the Hague, the Netherlands. Marvin Jensen served as the first Chairman of the Editorial Board. In 1994 it was decided to change the name of the Journal as ICID Journal.

Janusz Rydzewski substantially improved the review process and the quality of the Journal. In 1994, Pres. Hon. John Hennessy who succeeded Marvin Jensen as Chairman of the Editorial Board, together with Janusz endeavored to promote and improve the Journal. As the inflow of papers increased in 1999, the Journal was published in three issues per year and subsequently as a quarterly Journal in 2000. Through the good offices of Marvin, John, Larry and Janusz, the ICID Journal was selected for coverage in Current Contents/ Agriculture, Biology and Environmental Sciences (CC/AB&ES) and Science Citation Index Expanded (SCIE). The coverage began with Vol.49(1),2000.

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For 2006 Wiley will provide each ICID Office Bearer, work body member and subscriber a membership registration number. Your e-mail address will be your user name and you can choose your own password.

Volume 55.1 of the Journal is published in February 2006 and is available on the website. Click on www.interscience.wiley.com/irrigationanddrainage for direct access to the home page of Irrigation and Drainage at the Wiley site, or at abstract of the concerned paper for a direct link to the abstract of that paper.

It was felt, however, by many members of ICID that in order to improve the quality of services to members, to offer greater opportunities to water and land resource practitioners and professionals, and to promote ICID globally, the Journal would have to be radically improved and to be published by a professional publisher. Therefore in 1997, John and Janusz took the initiative to invite tenders from professional publishers to take care of the publication and dissemination of the Journal under full editorial responsibility of ICID.

After a careful selection process in 2000, an Agreement was signed with John Wiley & Sons (UK) for a five years period, starting in 2001. The Agreement was based on the publication of four issues per year of 104 pages each. The Journal was renamed as Irrigation and Drainage. Due to the enhanced response in receipt of papers since 2004, the number of pages per issue has been increased to 128 and from 2005 the Journal is being published in five issues per year. The 2004 impact factor of the Journal was 0.508.

When the publication through Wiley was on track Janusz Rydzewski retired as editor of the Journal and was succeeded by two Joint Editors, Daniel Zimmer and Paul van Hofwegen. A year later Pres. Hon Bart Schultz succeeded John Hennessy as Chairman of the Board. In 2004, following the retirement of Daniel Zimmer, Paul van Hofwegen has become the Editor. In addition there are at present eight Associate Editors.

In Central Office S P Goyal took care for many years for the logistic support with respect to the Journal. After his recent retirement Dr. V K Labhsetwar is looking after the coordination.

Over the years the Journal has indeed developed as a prestigious peer-reviewed publication and enables ICID to accomplish its objectives of publishing original papers on scientific, engineering and socio-economic issues associated with irrigation, drainage and flood management. The Journal plays an important role as the world struggles to meet the food demands of a rapidly growing population. It addresses the management of water resources for agriculture and flood control. The impact of the Journal on the transfer of technology is large as is its potential for continued success.

In 2004 the agreement with John Wiley & Sons was renewed for the period 2006 - 2008. In 2006 there will be five issues of 128 pages each. Following the international trend in the publication world, it is intended to transfer the dissemination of the Journal as much as possible through online access and to gradually reduce the printing of hard copies. The National Committees will continue to receive ten copies of the Journal free of charge. For these free copies, the National Committees may decide whether they like to receive them online-only, or combined (online + print). Online access only will be given to ICID work body members and Office Bearers. In addition, individual ICID members are entitled to subscribe to the Journal at an extremely competitive rate, which is about 10% of the commercial rate.

For the current year there is a healthy stock of submitted papers ready, or under review. Professionals can submit their papers to the Editor, Paul van Hofwegen <p.vanhofwegen@worldwatercouncil.org>. In addition to the regular issues, a Special Issue on Flood Management is in preparation. This issue will be published in August 2006.

All in all, due to the tremendous voluntary input of the Editors, Associate Editors, Board members and reviewers and last but not least the authors, the Journal is going well and we are working to develop it further. For more detailed information on the Journal please refer to ICID website <www.icid.org/wiley_journal.html> or to the Wiley web site: www.interscience.wiley.com/irrigationanddrainage.

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