



# HELP



## Hydrology for the Environment, Life and Policy



HELP is a joint UNESCO IHP-WMO initiative and is a cross-cutting programme of the Sixth Phase of the International Hydrological Programme of UNESCO



# NEWSLETTER

Issue No3  
January 2006

### Message from Mike Bonell, Global Co-ordinator of HELP



Dear HELPers,

We are pleased to include more details on the new HELP Centre on Water Law, Policy and Science under the auspices of UNESCO following approval by the UNESCO 172nd Executive Board and 33rd UNESCO General Conference in October 2005.

It is also good to see other major HELP initiatives emerging independent of the Paris secretariat, such as those in the South Pacific, through the UNESCO Field office (Apia) in close collaboration with New Zealand Landcare Research Ltd and the SOPAC (South Pacific Geoscience Commission).

In addition, we highlight the Tarim HELP basin, in China, which includes a new Sino-Belgian research project. Because of the very low rainfall, this basin provides an excellent example of vulnerability of its water resources to human impacts.

Another major development was the acceptance of the proposal from the South African Department of Water Affairs in collaboration with the International Water Management Institute (IWMI), Pretoria office, for hosting the next international HELP Symposium entitled "*HELP in action: Lessons from the South*", in November 2007. The 2nd session of the ISSC (International Symposium Steering Committee) will meet in Mexico City, 15-17 March 2006, and full details of the Symposium will emerge soon afterwards for placement on the HELP website and in the next Newsletter.

Elsewhere, we include a report from another IHP-VI expert group which is contributing towards HELP through the use of selected HELP basins. We intend to report on the outputs from other IHP-VI projects which are linked with HELP in future editions of the Newsletter. This also serves as a reminder that within the IHP-VI, HELP in conjunction with FRIEND, is a cross-cutting activity of the principal IHP themes.

Finally for those who are attending the 4th World Water Forum in Mexico City, there will be a HELP contribution to the session "Advancing local actions in Basins, Sub-Basins and Aquifers (BSA) through comprehensive IWRM learning and global networks" on 18th March 2006.

Mike Bonell

### HELP in ACTION

#### In this issue:

##### Forthcoming Events

Selection of forthcoming workshops and meetings at which HELP will be represented. (page 2)

##### Pacific HELP Symposium, Nelson, NZ

The first HELP meeting in the South Pacific was organized in New Zealand in November 2005. The Symposium focused on devising ways in which HELP can contribute to strengthening catchment area management practices in the Pacific particularly considering the limited data collection and processing capacity available in the region. (page 3)

##### Dundee Centre Reception, UNESCO HQ

The First Proposed UNESCO IHP HELP Centre in the UK, at the University of Dundee, was celebrated in UNESCO headquarter in Paris, on 17 October 2005. (page 4)

##### The new HELP Centre on Water Law, Policy and Sciences under the auspices of UNESCO

Dr Patricia Wouters describes the establishment of a unique Centre of Excellence in water law, policy and science with a strong research focus in Dundee, UK. (pages 5 and 6)

##### Formation of a new Expert Group. Vienna

Inaugural IHP Expert Group Meeting within the framework of IHP, FRIEND, HELP and the Integrated Science Initiative on "Climate variability and land cover change impact on flooding and low flows - at what scales?" Technical University of Vienna, Austria, 28-30 November 2005 (page 7)

##### Catchment of the month, Tarim basin, China

Overview of the physical and environmental characteristics, issues and research in the Tarim HELP basin in the arid zone of north west China. This basin provides an excellent example of integrated approach to restore the degraded ecosystem arising from short-term socio-economic development interests and inefficient water management in the arid zones. (pages 8 and 9)

##### Sino-Belgian Project in the Tarim HELP basin

Overview of the Sino-Belgian project on support of integrated water resources management by hydrological modelling and remote sensing of arid and semi-arid ecosystems in the Tarim basin. (page 10)



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## Hydrology for the Environment, Life and Policy

The HELP Network

### HELP Southern Symposium. November 2007

A key decision of the last session of the International Symposium Steering Committee (ISSC) was to solicit HELP basins in the “South” for hosting the Symposium, based on several selection criteria.

The sub-committee of the International Symposium Steering Committee had a very difficult time coming to a satisfactory decision because most of the proposals addressed a large number of the criteria stipulated in the letter of invitation. In the end, the sub-committee selected the proposal from the South Africa Department of Water Affairs, in collaboration with IWMI (Pretoria office).

On behalf of the ISSC, we would like to thank all basins that submitted proposals and we express appreciation for the considerable efforts that were clearly made.

### Selected Forthcoming Events

#### Planning Meeting for HELP “Lessons from the South” Symposium 2007

The second planning meeting of the HELP “Lessons from the South” Symposium will be held in Mexico, 15-17 March 2006.

The provisional themes that are being considered for the Symposium are:

Theme 1: Action on the ground - methods and approaches.

Theme 2: New integrating science being developed under HELP

Theme 3: Connecting environment, economy, social and cultural impacts

Theme 4: Institutional and legal lessons for successful HELP implementation

Theme 5: Indicators of HELP success

Theme 6: Implementing HELP in basins with limited resources and capacity

Numerous presentations and activities will be organized in order to maximize exchanges and dialogue around these themes.

#### The 4<sup>th</sup> World Water Forum

The World Water Forum is an initiative of the World Water Council to raise the awareness on water issues all over the world. As the main international event on water, it seeks to enable multi-stakeholder participation and dialogue to influence water policy making at a global level, thus assuring better living standards for people all over the world and a more responsible social behavior towards water issues in line with the pursuit of sustainable development. This 4th Forum will take place in Mexico 16-22 March 2006.

HELP will be the subject of a special topic session: Linking Hydrology and the Needs of Society at the Local Level using a Global Network of River Basins: Hydrology for the Environment, Life, and Policy (HELP) Initiative.

For more information: <http://www.worldwaterforum.org>

#### Congrès International Megève 2006

The second Congrès International « L'Eau en Montagne » in collaboration with the EURO RIOB meeting on the European Water Framework Directive will take place in Megève, France, 20-22 September 2006.

More information and a call for abstracts will be distributed through the HELP network.

#### Summary of the planned workshops schedule for the Expert group on Climate variability (see page 7)

- 1st Methods of change and feedback analysis in hydrological extremes. late Feb. / early March 2007 Tucson, USA, in conjunction with the San Pedro HELP basin  
Planning meeting: 27-28 April 2006 in Bratislava.
- 2nd Catchment and aquifer typology - floods and low flows. early/mid 2008  
Planning meeting: September 2007
- 3rd Controls of transitional climate and land cover regimes on flow paths and hydrological extremes. early/mid 2009. Ecuador in conjunction with the Chaguana HELP basin  
Planning meeting: September 2008 in Potsdam, Germany
- 4th The relative roles of climatic variability and land cover change on floods and low flows as a function of scale. early/mid 2010  
France in conjunction with the Hérault HELP basin.  
Planning meeting: Fall 2009 in France



## Hydrology for the Environment, Life and Policy

### Pacific HELP Symposium, New Zealand

This event marked the first formal HELP event to take place in the Pacific region. The Symposium was hosted jointly by the New Zealand Crown Research Institute Landcare Research Ltd. and UNESCO Apia Office, and was held in the city of Nelson, adjacent to the Motueka Demonstration HELP Basin, from 7 to 11 November 2005.

The Symposium focused on devising ways in which HELP can contribute to strengthening catchment area management practices in the Pacific considering the limited data collection and processing capacity in the region.

The Symposium was attended by a total of ten representatives of six Pacific high volcanic island countries (Papua New Guinea, Solomon Islands, Vanuatu, Cook Islands, Samoa, and Fiji) and Japan, as well as by a broad range of stakeholders and scientists working in and around the Motueka Basin area. Also taking part were representatives of the South Pacific Applied Geoscience Commission (SOPAC), the Australasian HELP Regional Coordination Unit, NIWA (New Zealand's National Institute for Water and Atmospheric Research), and the UNESCO Regional Bureau for Science in Jakarta.

The Symposium was arranged to coincide with the Landcare Research Ltd. Annual General Meeting of New Zealand Regional Councils, allowing for an active and productive exchange during two days of shared sessions between the Pacific Island participants and around 80 catchment managers and scientists from across New Zealand.

Also included in the Symposium programme was a very comprehensive field trip to the Motueka HELP Demonstration Basin. The field trip involved discussions with a very broad range of stakeholders, including forestry and farming communities, as well as several representatives of the local Iwi (Maori indigenous groups). Furthermore, Iwi representatives attending the sessions throughout the week provided additional perspective to the discussions.

The Pacific participants provided case studies of particular catchment management issues in their respective countries, and as part of the concluding session, developed a series of draft frameworks for action under the heading "HELP in the Context of the Pacific Regional Action Plan on Sustainable Water Management - A Framework for Action".

It is expected that these draft documents will form the basis for the development of HELP activities in the Pacific over the coming five years, as well as linking into new and emerging regional catchment management programmes. In this way, it is hoped that the contributions of the HELP programme will become an integrated and essential component in the development of integrated water resources management activities across the Pacific high island countries.

A proceedings document containing all presentations and discussions at the Symposium will be published by UNESCO Apia Office and Landcare Research, Ltd. in early 2006.

By Hans D. Thulstrup, Science Programme Specialist, UNESCO Apia Office







## Hydrology for the Environment, Life and Policy

### UNESCO reception for the HELP Centre for Water Law, Policy and Sciences



From left to right: Assistant Director General for the Natural Sciences sector, Mr Walter Erdelen; Principal and Vice-Chancellor, University of Dundee, Sir Alan Langlands; H.E. UK UNESCO Ambassador, Mr Timothy Craddock; Dundee Centre Leader, Ms Patricia Wouters and Global HELP Coordinator, UNESCO, Mr Michael Bonell.

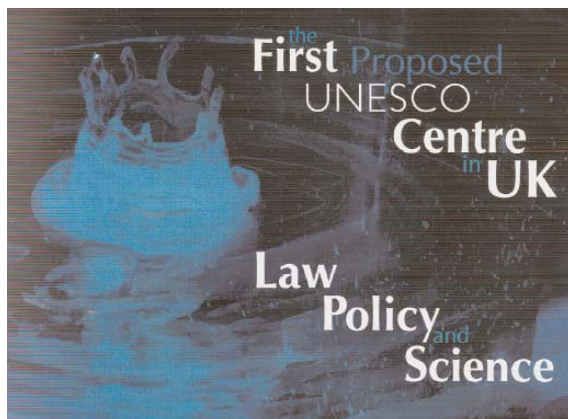


On 17 October 2005, the First Proposed UNESCO IHP Centre in the UK, at the University of Dundee, was celebrated by a reception at which bagpipers, together with a group of Brazilian Drummers (Macumba) performed against the background of a sparkling Eiffel Tower. The UK Ambassador to UNESCO, Mr Timothy Craddock and the Rector of the University of Dundee, Sir Alan Langlands, spoke words of encouragement for the proposed UNESCO IHP Centre which was approved by the 33rd session of the UNESCO General Conference on 19 October 2005.

Dr Patricia Wouters, Director, Water Research Institute, University of Dundee, will be leading the projects at the UNESCO Category II Centre in Dundee and her enthusiasm and congenial working spirit will continue to be appreciated by all. The University of Dundee is delighted and honoured that its Centre for Water Law Policy and Science will be the first of its kind within the UN system.

Details of the UNESCO Executive Board documents for establishing this Centre can be found on the UNESCO website through the database system: <http://unesdoc.unesco.org/>

by R. Briffault, UNESCO Division of Water Sciences



The flyer of the Centre for Water Law, Policy and Sciences, under the auspices of UNESCO



Margaret Coxon, Mike Bonell, Sir Alan Langlands, Patricia Wouters and Robinia Briffault joined by two bagpipers.



# HELP



## Hydrology for the Environment, Life and Policy

**HELP Centre for Water Law, Policy and Sciences, under the auspices of UNESCO**

### Introduction

On 25 October 2005, the 33rd Session of the UNESCO General Conference adopted a Resolution for the creation of the University of Dundee IHP-HELP UNESCO Centre for Water Law, Policy and Science. This is the first UNESCO Centre in the UK, and the first of its kind in the world. This global recognition provides an exciting opportunity to move forward with the HELP programme through providing a focal point for integrating water law, policy and science in world-class research projects around the world.

The key aim of the Dundee UNESCO Centre, which will be housed in a purpose-built new office space and attract 5 new staff, is to establish a Centre of Excellence in water law, policy and science with a strong research focus.

### Good Science Alone is Not Enough

It is generally accepted that "good science" alone will not provide the solution to the world's water problems - there is a need for an integrated approach, including as an essential component, expertise in water law and policy - an element which is often overlooked. Ensuring "water for all" requires a transparent, enforceable and responsive framework for implementation that addresses the needs of all stakeholders and at all levels -- from international agreements to national water laws, local regulations and contractual arrangements. By setting out the "rules of the game", water law levels the playing field, and reduces the potential for water conflicts, a current and growing concern of the international community. The recent UN Summit (September 2005) focused on the need for enhanced environmental (water) security, and joined-up water law, policy and science provides one avenue for meeting this challenge.

### Bridging the Operational Gap

At the global scale, there is a weak interface between hydrological research and the development of responsive legal, institutional and policy instruments (in all areas: international, national and transnational). This results in the diminished capacity to uptake scientific and related research for use in developing consistent water policy and law. Equally, the scientific community has insufficient appreciation of what new scientific research is required for effective water law policy and legal instruments. This operational gap, which the Dundee UNESCO Centre is seeking to bridge, adversely affects the practical application of good science.

### Implementation

The Dundee UNESCO Centre will seek to integrate scientific research with law and policy, making use of the extensive UNESCO IHP network and all 67 global HELP basins, in addressing national and international water resource management issues. The facility will provide a strategic platform for the consolidation and augmentation of the formidable capabilities in water-related research that currently exist at the University in the Departments of Law, Geography, and Political Science and in the School of Life Sciences and the Faculty of Engineering. By means of outreach efforts, the research findings will be disseminated through local experts to those who need it most. The Dundee UNESCO Centre would take the lead on devising and supporting HELP-based approaches to European basins and provide legal expertise for all HELP basins world-wide. To this end, it is envisaged that the Spey Basin will be developed as a model HELP basin that could be used for training purposes of water resource experts around the world - an exercise that would benefit Scotland and have application globally. Action has been taken on this front already, with a basin-twinning proposal put forward to link the Spey with the Motueka basin in New Zealand.

Implementing the HELP Centre's mission will demand a close working relationship between the water law professors and water science professors in order to maximise the increase in mutual understanding between the two fields. The proposal to develop the Spey basin as a model HELP basin would provide a concrete focus to develop this strategy, and is a cornerstone activity. International workshops and seminars will be organised in Dundee, based on the successful Dundee water law conferences that have been held since 1997, to propagate the communication of research strategies and priorities. In addition, new postgraduate teaching and training programmes will be developed, with efforts being made to secure scholarships for candidates from the developing world, which will ensure that policy makers and decision makers are fully aware of the interface between law and science and the mutual interdependence of both.



Dr Patricia Wouters and Professor Alan Werritty in front of the refurbished building which will house the new HELP Centre for Water Law, Policy and Sciences, in Dundee, Scotland.



# HELP



## Hydrology for the Environment, Life and Policy

### HELP Centre for Water Law, Policy and Sciences under the auspices of UNESCO (continued)

#### Key Objectives

The research agenda of the HELP Centre will play an essential role in ensuring that the key objectives are met. Broadly, research will focus on poverty alleviation, and in particular looking at the application of the HELP basin approach linking law, policy and science. Specific focus will be placed on comparing the lessons learned in both Scotland and in the broader international arena, including the comparative analysis of the Spey and Motueka basins.

The key objectives:

1. To establish a global Centre of Excellence in water law, policy and science and enhance Scottish excellence in water-related research;
2. To enhance existing excellence in water law through the creation of two new chairs in water law to serve the HELP Centre, supported by post-doc / PhD research studentships (a broader research base);
3. To enhance existing excellence in water science through the creation of one new chair in water science, to serve the HELP Centre, supported by post-doc / PhD research studentships;
4. To develop an operational model of engagement that enhances the integration of research and uptake of research across the disciplines of water law, policy and science (broadly defined, i.e. hydrology, life sciences, economics, political science);
5. To focus on identifying means to assist States to address their water-related challenges, including supporting developing countries to meet their MDGs through research outputs and training and educational tools developed and disseminated by the HELP Centre;
6. To act as Regional Coordinating Unit for the European HELP basins and provide water law and policy input for the global HELP network
7. To develop and implement the "Water Law, Water Leaders" executive style LLM postgraduate and training course, especially in developing country regions, i.e. Africa, Central Asia, South-east Asia
8. To convene international symposia, including high-level meetings on relevant topics, featuring UNESCO HELP basins as developmental case studies for the integrated approach to water law, policy and science;
9. To develop the Spey basin as a "model" HELP basin for training expertise on integrated water law, policy and science approaches to addressing basin-wide water resource management issues; to link the Spey to other HELP basins as a testing ground for integrating and interfacing water law, policy and science;
10. To act as an international think-tank, bringing together researchers from Scotland and abroad for symposia and experts meetings to address the world's water resource management problems, with a particular focus on poverty reduction.

#### Future Plans and Work-in-Progress

At present, work is well under way to complete on time (April 2006) new offices for the UNESCO Centre, with a beautiful listed building at the University of Dundee being completely refurbished for this new group - where water lawyers, hydrologists, engineers, social and life scientists will intermingle work together on water research projects. The Scottish Executive has provided £1.5M for this infrastructure refit and will commit an additional sum to hire five new staff, including a new Chair of Water Law, and a new Chair of Water Science. These posts will be supported by a new Business Development Manager, 2 new clerical posts, and 2 new PhD studentships. Recruitment for new staff has commenced and it is hoped to have the Centre fully operational by June 2006.

#### Note of Thanks

This major initiative, spearheaded by the International Water Law Research Institute (University of Dundee), has been successful largely through the efforts of Sir Alan Langlands, (Principal, University of Dundee); H.E. UK UNESCO Ambassador, Tim Craddock; Andras Szollosi-Nagy (Director of the Division of Water Sciences ) Mike Bonell (Chief of Section: Hydrological Processes and Climate; global co-ordinator of HELP). Many thanks to these leaders and supporters. Thanks also to Professor David Boxer (Vice-Principal, Research and Innovation, University of Dundee) David Duncan (University Secretary, University of Dundee), Professor Colin Reid (Dean, Faculty of Law and Accountancy, University of Dundee), the UK IHP delegation (especially Gwyn Rees), all of Mike Bonell's team at UNESCO (Robinia 'Binnie' Briffault, Guillaume Narnio and Marie-Camille Talayssat, also Jonathan Baker); and all of the IWLRI team (Andrew Allan, Alistair Rieuc Clarke, Margaret Coxon) and the University of Dundee Research and Innovation Services (Graeme Findlay, Margaret Teven and their team).

We look forward to welcoming you to Dundee.

By Dr Patricia Wouters  
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# HELP



## Hydrology for the Environment, Life and Policy

### Formation of a new Expert Group on Climate Variability Impacts

In the context of the IHP-VI Project 2.1 ( Extreme events), and the cross-cutting activities FRIEND, HELP and the recently launched International Flood Initiative; the UNESCO Division of Water Sciences has initiated this working group on identifying the relative role of climatic variability and land cover change on floods and low flows as a function of spatial scale. The mandate of the working group, over a period of five years, is to

- summarise the state of the art of the subject, in particular, to identify at what scales each of the controls become important,
- develop the key science questions,
- plan a five year research strategy for testing in HELP basins and other research experimental basins,
- plan a series of workshops and potential publications from the workshops,
- consider possible locations of the workshops, one per year, and
- any other follow-up activities that the group may identify.

The described research strategy also has to integrate modelling requirements with field experimental hydrology. These activities could provide a road map of how to address these issues and act as a catalyst for motivating communication and targeted research.

Workshops were identified to summarise the state of the art, to contribute to the planning of research strategies for testing in HELP basins and to further the understanding of land use and climate impact on hydrological extremes. The workshops will be designed to provide a road map of how to address impact issues and to act as a catalyst for motivating communication and targeted research.

Some of the topics identified at the working group meeting are closely related to each other and should therefore be dealt with at the same workshop. Issues of change and feedbacks are intimately linked as the type of feedback often controls system dynamics, including their resilience. This is the topic of the first workshop. Data issues and ways of identifying simple indices of change, e.g., through hydrological typologies, are the topic of the second workshop. The third workshop focuses on understanding both atmospheric processes as well as catchment flow processes in the context of impact analyses. Hence, the third workshop deals with the effect of climate variability and land use changes on flow paths in catchments and on their consequences for hydrological extremes. The final workshop integrates the findings of the previous workshop with a scale focus. Management aspects will be integrated in all workshops.

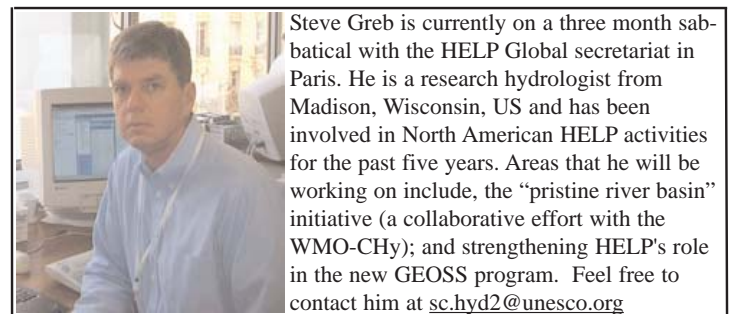
The meetings should be kept relatively small (<30 participants for each workshop) to strengthen the focus of the meetings. It is envisaged to invite a small number of local policy makers to enhance the management content of the meetings. A planning meeting should be held 6-8 months before each workshop. The meetings are planned to rotate among different continents. (see page 2)

By Mike Bonell

Global Coordinator of the HELP network



From left to right:  
Dieter Gutknecht, Günter Blöschl (chair), David Matamoros, Manfred Dorninger, David Goodrich, Jan Szolgay, Mike Bonell, Bruno Merz, Sandra Ardoin, and Paul Shand behind the camera.



Steve Greb is currently on a three month sabbatical with the HELP Global secretariat in Paris. He is a research hydrologist from Madison, Wisconsin, US and has been involved in North American HELP activities for the past five years. Areas that he will be working on include, the “pristine river basin” initiative (a collaborative effort with the WMO-CHy); and strengthening HELP’s role in the new GEOSS program. Feel free to contact him at [sc.hy2@unesco.org](mailto:sc.hy2@unesco.org)



# HELP



## Hydrology for the Environment, Life and Policy

### The Tarim HELP basin, China

The Tarim basin is an example of an evolving HELP basin within the arid zone of north west China. It is an endorheic basin and provides an excellent example of integrated approach to restore the degraded ecosystem arising from activities with short-term socio-economic development interests and inefficient water management in the arid zones.

The Tarim River (1,328 km long) and basin are located in the Xinjing Uygur Autonomous Region in north west China. The total drainage area is about  $1 \times 10^6$  km<sup>2</sup>. The basin, with the elevation varying from 760m to 1400m above sea level, is surrounded by alpine mountains [(Tian Shan (north) Kunlun and Altun mountains (south) and Pamir Plateau (west)] and, in the centre, the vast Taklimagan desert exists. A green corridor is located along the downstream Tarim where groundwater levels decrease to within about 4m from the surface. The prevailing climatic conditions can be characterized as dry and continental, with warm summers and cold winters. Average precipitation is 219mm in the mountains and only 50mm in the plains, which results in an average of 117mm of which the majority is lost as non-beneficial evapotranspiration. Much of the available moisture is stored in glaciers and seasonal glacier melting, notably in July, determines a large component of the total runoff (more than 60% of total flow). The Tarim is a pure dissipative inland river and is completely supplied by its headstreams. Surface water flow only reaches the lower parts of the Tarim basin during floods (in July and August) and natural flows are thus highly variable.

Most of the population (8.26 million) traditionally live in the basin's oases, where Kashgar is the largest city. The total water use amounts to 30.54 km<sup>3</sup>/yr of which 0.98 km<sup>3</sup>/yr is extracted from groundwater and 29.56 km<sup>3</sup>/yr from surface water resources. Most water is withdrawn to supply irrigation and drainage systems, which have benefited the region greatly by providing for agricultural production (mainly cotton plantations). Farming, centered in the oases, is the main source of income, followed by oil and tourism.

Higher water use, in combination with a recent warmer climate, has resulted in a reduction of flow in the region. Due to excessive land reclamation, overgrazing and mismanagement of water resources in the headwaters; downstream ecosystems are deteriorating and oases are disappearing with a resulting desertification. More seriously, the downstream flow rarely reaches many parts of the Tarim basin anymore. In addition, about 40% of the farm land suffers from salinization.

To restore the ecosystem, the Chinese central and provincial governments have implemented various programmes facilitating (i) an increase in water usage efficiency via the application of advanced irrigation technology, crop species selection and improved nutrient use and (ii) limited scale return of farmlands to grassland, pasture and forest and (iii) the transfer of water from Bostan Lake to the lower reaches of the Tarim through the Konqi river and the artificial Kuta Trunk Canal. To date, seven transfer schemes have been implemented with encouraging results of recovered trees, increased groundwater reserves in downstream Tarim basin and even water restored in the previously dried, receiving lake. The latter initiative is especially impressive. Water used to replenish the dried river course is first stored in a reservoir which is usually filled during high flows and emptied via large irrigation canals, and then discharged into the Tarim. However, since 2003 the inflow into the Bostan Lake has decreased, limiting the pumping rate into the Kuta Trunk Canal and implementation of the proposed transfer schemes. The drought over the last two years has resulted in a careful review of contingent transfers because of conflicts between Bostan lake requirements and irrigation and human consumption needs. It is recognized that an integrated approach for water allocation, at the river basin level, should be adopted rather than depending on a sole tributary contribution.

It is evident that for the sustainable management of agriculture and the water related issues in the region, an integrated resources management approach is needed. This requires the hydrological features to be described at a basin level and linked with ecological conditions. A significant number of on-going research projects are carried out by local partners, supported by the Chinese government, UNESCO-HELP, the World Bank and several bilateral projects. The design of a comprehensive and integrated decision support system, based on hydrological and ecological models is also a research need.

In addition to statistical analyses of available data, and the development of a flood model by local partners (by MSc and PhD students); a joint Sino-Belgian research project from the Belgian Federal Science Policy Office will support the implementation of a regional surface water model. This model will describe the sub-basin's rainfall-runoff processes and the river network in the entire Tarim basin. As a secondary objective, preliminary modelling activities will be initiated in order to investigate the surface water - groundwater interactions, and relations between the basin's ecological status and hydrological variables such as the groundwater depth and the flooded areas.

The modelling products developed by the Sino-Belgian project will be linked with the UNESCO - HELP project, to develop elements of an envisaged integrated water resources management system. The decision support system can be used for scenario-analysis and the evaluation of water management alternatives in order to solve the "dry-out" and ecosystem deterioration problems in the basin.

By Prof Jiebin Zhang  
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## Hydrology for the Environment, Life and Policy

Map of the Tarim HELP basin, China

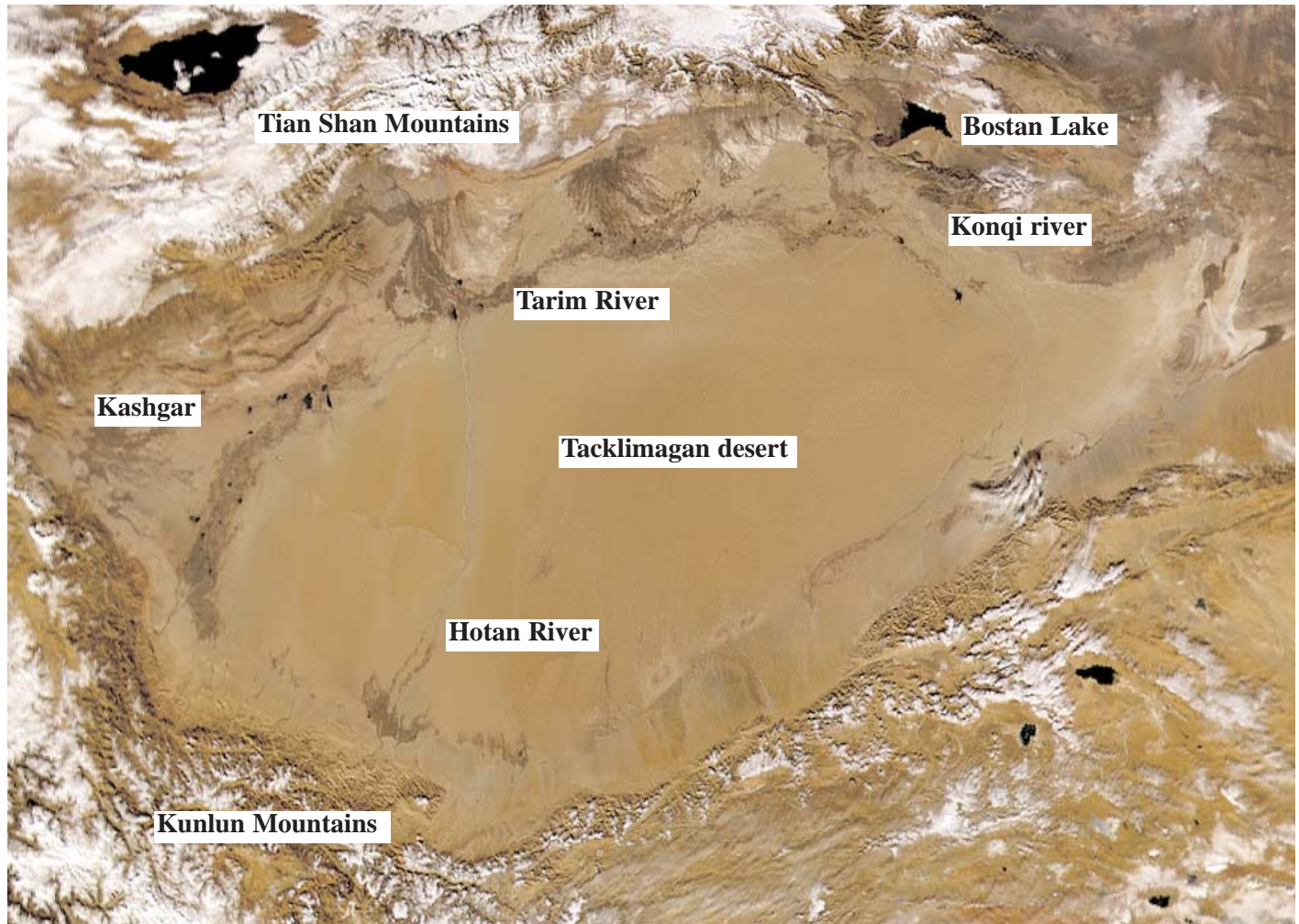


Image provided by the NASA/Goddard Space Flight Center, SeaWiFS Project, and ORBIMAGE.  
<http://visibleearth.nasa.gov/search.php?q=Tarim>



Effects of “dry out” (left picture) and salinization (right picture) in the Tarim basin.

(Pictures from Patrick Willems)



# HELP



## Hydrology for the Environment, Life and Policy

### Bilateral Sino - Belgian project on hydrological modelling in the Tarim basin, linked to the UNESCO - HELP Programme

The Belgian Government is supporting a new research project on hydrological modelling in the Tarim river basin in the Xinjiang Province of China. The project entitles "Support of integrated water resources management by hydrological modelling and remote sensing of arid and semi-arid ecosystems in the Tarim basin" and is linked to the UNESCO - HELP Programme.

The Tarim river basin, one of the basins in the UNESCO - HELP Programme, is located in the Xinjiang Autonomous Region in Northwest China. It forms one of the world's largest closed hydrological drainage systems and has ideal land for agriculture if enough water is available. Its farmers produce 80% of Xinjiang's cotton, or one-sixth of China's total cotton production. Unfortunately, since the 1950's excessive land reclamation, over-grazing and unreasonable utilization of water resources in the upper reaches of the basin have intensified environmental deterioration, especially manifested by cattle stock reduction (water shortage), withered poplars and other vegetation and parched land, along the lower reaches of the basin. Riparian forest areas have also been severely degraded. The higher water use in combination with temperature increase due to climate change has caused huge hydrological problems in the basin. Since the 1970's a strong "dry-out" of the lower region is observed. This "dry-out" seriously deteriorated the basin's downstream ecosystems, with an expanding desertification. The Tarim river has shortened 320 km in this period. In the lower region of the basin, the situation is very serious. It can be described as an ecological disaster, with dying trees and vegetation, rivers drying out, reduction of fish population and increased salinization.

The "dry-out" and ecosystem deterioration problems coexist in most arid river basins that experienced short-term benefit development in the world and have long been a concern for both the public and governments at various levels as well as for world organizations engaged in implementing regional poverty eradication policy and sustainable development. It is clear that integrated and sustainable water management planning is important to reverse the past practices and to improve living standards and quality. Supported by the UNESCO - HELP Programme, and in collaboration with a large on-going project for the Central Chinese Government and the World Bank Loan, an integrated water resources management plan is being set up. This plan aims to incorporate the ecosystem protection into the national and local social and economic plans, and to coordinate the management activities of the water bureaus of prefectures and counties with the ones from the central Tarim river basin administration. One of the objectives is the set-up of a comprehensive and integrated decision support system for the entire basin.

Mathematical models would be very useful as key elements in the development of that decision support system. Both hydrological and ecological models are required and need to be integrated at the basin scale. The joint Sino-Belgian project aims to meet this research need on hydrological modelling. The main objective is the set-up of a regional surface water model, which will take the form of a conceptual model for the subbasin's rainfall-runoff processes and the river network in the entire Tarim basin. As secondary objective, preliminary modelling activities will be started up in order to investigate the surface water - groundwater interactions, and relations between the basin's ecological status and hydrological variables such as the groundwater depth, the flooded areas, etc. Remote sensing data will be used to produce rainfall, evaporation, soil moisture and land use data, and to produce earth observation input data for the hydrological models. They also will be applied to analyse indications of historical trends in land use, and to investigate the impact these changes had on the hydrology of the basin.

The modelling products in the final stage of the joint Sino-Belgian project will be linked with the UNESCO - HELP project, to grow into elements of the envisaged integrated river basin management support system. The decision support system can be used for scenario-analysis and the evaluation of water management alternatives (including a cost - benefit analysis).

The project started on 1 December 2005 and runs for an initial period of 2 years. It is financed by the Belgian Federal Science Policy Office and will be carried out under the scientific responsibility of the Xinjiang Institute for Ecology and Geography from the Chinese side, and the Katholieke Universiteit Leuven from the Belgian side. Other partners are the Tarim Water Resources Management Bureau, the Xinjiang Meteorological Administration, and the Flemish Institute for Technological Research (VITO) in Belgium.

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