

# CONFERENCE PROCEEDINGS



**1<sup>ST</sup> INTERNATIONAL CONFERENCE**  
**WATER: 21<sup>ST</sup> CENTURY CHALLENGES & WAY FORWARD**  
4~6 JUNE 2014, ISLAMABAD

IWC organizers

SAVING HUMANITY FOUNDATION INTERNATIONAL  
RIPHAH INSTITUTE OF PUBLIC POLICY  
AND UNIVERSITY OF HARIPUR

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IWC organizers

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## **Executive Summary**

The conference aims to assess the 21<sup>st</sup> century challenges in Water Resources in context Pakistan. The papers presented covers both aspects of water resources i.e. quantity and quality. An in-depth analysis was carried out in pursuance of the scholarly papers which covers the aspects like; Water pollution in drinking water, droughts patterns, Economic evaluation of different irrigation systems applicable to agriculture, Making the most of aging facilities and shrinking budgets for water systems, Technologies for increasing irrigation water use efficiency in Indus river basin of Pakistan, The impact of water users' associations on the productivity of irrigated agriculture, Isolation of heavy metal resistant bacteria from industrial waste water and their role in bioremediation, Managing water through virtual water trade, Water contamination: Current food safety challenge, Competitive grants program, Safe drinking water through public-private partnership, Safe drinking water and sanitation in Punjab, Challenges and opportunities in urban water supply in Punjab , Knowledge management for better water governance, Sustainable

land and water management in arid areas, The impact of water users' associations on the productivity of irrigated agriculture and Exploration of sanitation in relation to social action in Haripur.

Fresh water is a finite and vulnerable resource, which is essential to sustain life, development and to the environment. Water management approaches focus on how best water is used beneficially and efficiently utilized. The Water allocations considering the principles of sustainability so that the resources remain viable for the use of the present and future generations are the areas of concern. Low water productivity in agriculture attributed to: inadequate and untimely availability of water, conveyance and application losses, water consumed by high delta crops, inefficient irrigation practices, improper irrigation scheduling, low quality groundwater, over pumping and groundwater mining. Although there is no single best way to implement an aquatic ecosystem approach and establish a strong, effective linkage between various stakeholders, all successful approaches follow an adaptive management framework. Adaptive planning and management and institutional capacities recognize the uncertainties and help the knowledge, technologies, and methods in the aquatic ecosystems. This leads to a learning process that integrates the water systems with economic and social understanding, and helps reduce uncertainty in management decisions by using knowledge/information gained from the experiences to reassess priorities for future actions. It strives for continuous improvement through an iterative decision-making process based on trial, monitoring, and feedback. An inclusive decision-making process in accordance with policy framework under the set of priorities in an iterative and participatory fashion for continuous improvement is required. Thus a holistic basin approach for integrating multi-sector and multi-objective planning and management that can minimize the effects of externalities, and ensures sustainability and protection of the resource is pr-requisite for addressing the challenges of Water resources in 21<sup>st</sup> Century.



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Remarks of Chief Guest

**H.E. Mr. Ahsan Iqbal Chaudhry**Federal Minister for Planning, Development & Reforms  
Government of Pakistan

Federal Minister for Planning, Development and Reforms H.E. Mr. Ahsan Iqbal inaugurated the 1<sup>st</sup> International conference on “Water: 21st century challenges & way forward” (June 4~6) at Islamabad.

While addressing the inaugural session Minister expressed that water is vital to every human community and is an essential need for; economic development, agricultural productivity, industrial growth, and human well-being. Water is a multipurpose resource and it is important to look that its various uses should not conflict with each other and it can be enjoyed in its totality by man and others with its right allocation. The qualitative and quantitative conservation are the primary tasks of the water managers. The demand for usable water, like any other resource is increasing fast with the continuous increase in world population and continuous increase in per capita demand and the fact is no different in the developing world like Pakistan.

The minister appreciated this initiative and acknowledged the role of universities and development organizations in this regard and appreciated the efforts of SHFINT, Riphah International university, University of Haripur and PSSP-USAID for taking such initiative on bringing issues like this in the lime light.

The Minister apprised that in the current budget 2014-15, the Govt. has allocated an amount of Rs 64 billion for education, research and innovation which will help the stakeholders in contributing in the socio economic development of the country.

It was further reiterated by the minister that the planning commission will account for the recommendations made as an outcome of the conference by incorporating the same in the national water policy of the country.

Moreover, he concluded in his address that Pakistan has a potential of water resources but the real challenge is to utilize this precious resource effectively and efficiently. The current Govt. has taken the landmark step for development to build Diamir Bhasha dam to add reservoir capacity.



H.E. Mr. Ahsan Iqbal  
Federal Minister for  
Planning, Development &  
Reforms



H.E. Mr. Marcel de Vink  
Ambassador of the  
Netherlands to Pakistan

Dear Readers,

Pakistan is facing serious water challenges. Minister Iqbal said recently that the looming water crisis could be worse than the current energy crisis in the years to come. The water management strategy that the government is therefore currently working on is of great importance to comprehensively and effectively deal with many of the water challenges the country has to deal with.

The Netherlands is well known for its water management skills. Water is in our genes. For hundreds of years we have reclaimed and defended land from the sea. This is a skill that goes hand in hand with water management, spatial planning, water supply and water quality. It has resulted in a unique expertise in the area of water. That knowledge and expertise is being called upon all over the world.

The Netherlands and Pakistan share a long history of working together in the area of water. Since the 1950s the Dutch have assisted Pakistan in various projects. These include hydraulic engineering works and cleaning up tanneries in Karachi as well as flood warning systems. We are also grateful for the support we received from Pakistan in 1953 when a large part of the Netherlands was flooded. But the bilateral relation has moved beyond development assistance, and is shifting from aid to trade.

The water sector was one of the main focuses in the recent Dutch trade and development delegations to Pakistan this year. During the recent visit of the Minister for Trade & Development, Minister Ploumen from the Netherlands and Minister Iqbal agreed to send Dutch water experts to address a number of urgent water management problems. This will hopefully contribute to further strengthening the partnership between Pakistan and the Netherlands on this important issue.

Marcel de Vink  
Ambassador of the Netherlands to Pakistan

His Excellency Mr. Walid Abu Ali highly appreciated the initiative of SHFINT & RIPP and congratulated on successful implementation of 1<sup>st</sup> International Water Conference “WATER: 21<sup>st</sup> Century Challenges & Way Forward” in Islamabad.

His Excellency expressed that availability of clean water for the growing population is the most critical issue in the world especially in the developing countries. In many regions shortage of water is endangering the economy, public health, energy production, and food supply. Millions of people especially children die every year due to unsafe drinking water.

There are six major issues Palestine is facing with Israel and Water is one of them. The insufficient quantity of water available for the Palestinians is a chronic problem.

GAZA with 365 km sq area and around 1.8 million is one of the most densely populated areas in the world; is suffering due to water shortage and water pollution. Gaza is highly urbanized with the bulk of the population living in cities, towns and eight crowded refugee camps, home to over 800,000 refugees, where availability of water is the most critical issue.

H.E. Mr. Walid Abu Ali  
Ambassador of the State  
of Palestine to Pakistan

H.E. Ambassador also shared his experience of participation in many international forums on water issues and upcoming challenges. He also expressed that international community including diplomats, politicians and researchers are very much convinced that next world war could be on water resources. But unfortunately the response from international community is lukewarm to recognize the severity of the situation. If we will not take appropriate actions now; the situation will be beyond the control everywhere in Asia, Middle-East, Africa and EU almost every region.

He further agreed to look in to the possibility for establishing linkage with Palestinian Water Authority for undertaking collaborative project and further to establish a network on water issues in Islamabad supported by OIC.

H.E. Ambassador appreciated the efforts of SHFINT & RIPP and assured his full cooperation and support in this regard.

Welcome Address By

**Mr. Hassan Muhammad Khan**

Pro-Chancellor, Riphah International University

Assalam-o-Alaikum!

This is indeed a great pleasure and honor for me to welcome this august gathering of technical experts, scientists, researcher, policy makers, participants, international delegates and legislators in International Conference on water resources challenges. It is sense of great pride and appreciation for successful holding the conference by providing a common pedestal to all the stakeholders to advocate the 21<sup>st</sup> Century challenges of Water Resources and to share experiences and findings of diagnosis and to develop strategy on water resources of the country.

Pakistan is one of the richest countries in the world in terms of natural resources but also one of the poorest among them in their management and its effective and efficient utilization of these precious resources and this may be very much applicable to Water Sector of the country as well.

I hope this Conference will highlight these aspects and will look way forward for better water management practices and its judicious utilization. On the behalf of Riphah International University, I am to assure my best support in all respect as this is a societal and national obligation on the part of the University to highlight these issues and trough advocacy and propose remedial measures.

I am much thankful to the organizers of the workshop specially Mr. Ch Faisal Saleem, Executive Director, Saving Humanity Foundation International (SHFINT) and Dr. Rashid Aftab, Director RIPP and Dr. Jahangir, University of Haripur.

I am also to acknowledge the role of Prof. Dr Prof. Stephen Davies, Country Head Pakistan Strategy Support Program, USAID and eminent scantiest and researchers from University of Girona, Spain, University of Nebraska-Lincoln, USA, COMSATS, International Islamic University, Pakistan Institute of Development Economics, University of Haripur, Public Health Engineering Depts, Planning Commission and individual professionals.

Special and sincere thanks to Professor. Ahsan Iqbal, Federal Minister for Planning and Development who is always kind enough to grace such professional occasions with his presence.



Mr. Hassan Muhammad Khan  
Pro-Chancellor  
Riphah International  
University



H.E Mr. Nedim Makarevic, Ambassador of Bosnia and Herzegovina in Pakistan shared his views on international water related issues and challenges of growing population and industrial growth.

He appreciated the participation and contribution of local and international scholars and experts and emphasized on the importance of regional cooperation and initiatives to meet the future challenges.

His Excellency also highlighted the water related issues of central Asia and its impact. He appreciated the organizers for this initiative and shared his experiences and efforts for better regional cooperation.

H.E Mr. Nedim Makarevic

Ambassador  
Bosnia and Herzegovina  
Embassy Islamabad

Representative of the Italian Embassy in Islamabad Mr. Domenico Bruzzone (Director Italian Development Cooperation) participated in the conference and shared details of different international cooperation initiatives of Italian government especially for developing countries.

Mr. Domenico Bruzzone also discussed the water related challenges faced by Italy and different initiatives to overcome the problems. He congratulated the organizers SHFINT, Riphah International University and University of Haripur for successfully conducting 1<sup>st</sup> International Water Conference in Islamabad.

He highly appreciated the contribution of young scholars from different universities. Mr. Domenico Bruzzone motivated the young researchers to play their role in research and development, especially in water sector.



Mr. Domenico Bruzzone

Director  
Italian Development Cooperation

# International Water Conference, Islamabad (4 – 6<sup>th</sup> June, 2014)



## Knowledge Management for Better Water Governance

Prof. Steve Davies\*, Ghazi Alam  
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### Abstract:

Knowledge management theories and technologies are now mature enough for organizational confidence and policy endorsement. Now this is the time to bring all stakeholders of knowledge (i.e. knowledge seekers, providers and brokers) on one platform. A knowledge sharing model should be used for the rationalization of data acquisition and development. Flip-side of coordination, conversation about data, transparency, accountability, equity, better service delivery, evidence in trans-boundary conflict resolution, metrics for measuring performance, single source of truth, effective yet affordable government role, transformational initiative for better water governance, changing face of institution are the major areas of focus for the development of a knowledge based platform. This platform is an single source of knowledge that is used for problem solving on various levels.

With an expanded knowledge system in place, stakeholders can interact on a more regular and systematic basis, using more consistent evidence and models, and perhaps come to faster agreements on issues. In our view, the potential for better decisions and more trust between actors in the system can increase when interactions take place within a stable structure, where all stakeholders view and can critique the same data and analyses, and pose questions that are addressed widely across participants using standard and agreed upon approaches.

Some benefits of a major knowledge management platform will be to improve the coordination of planning and operations at provincial and federal levels, as departments tend to be trapped in “silos” which, without adequate services or interfaces, may be little more than containers that store static information. Also, data and training needs may become clearer if put into a framework that all can see and evaluate. Pakistan, particularly its public sector, lacks technical maturity and therefore use of knowledge is limited in many institutions, but they can have access to a wider set of solutions and benefits from discussion that take place.

(PTO)

# International Water Conference, Islamabad (4 – 6<sup>th</sup> June, 2014)



## Knowledge Management for Better Water Governance

Prof. Steve Davies\*, Ghazi Alam  
Pakistan Strategy Support Program, Islamabad, Pakistan

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Critical training needs then can be added, and included as online modules in many instances.

Because many models and analyses exist across a wide variety of domestic and international settings, a Knowledge Management system will also facilitate and expedite research if analysts know that greater opportunities exist to have an impact when their analyses support issues identified in the knowledge management structure. This would also lead to having models developed more efficiently as well, and could include simulation modeling and scenario analysis, databases that are updated consistently (which would foster more and better targeted surveys)

Acting as a single and reliable source of analysis and independent data provision, an integrated knowledge base can also inform the debate on local and international trans-boundary water conflicts. More transparent and promptly available data will contribute towards reducing the extensive inter-provincial and cross-border mistrust and guide decision makers towards evidence based conflict resolution.

A coordinated flow of data may also be used to generate metrics measuring past and present performance of the local institutions, and act as a crucial factor in fulfilling funding requirements of donor agencies and development partners. What would this look like? Part of it would be a relatively large web based structure, which has been built in Australia (and CSIRO is currently examining opportunities for its use now). Also, there might be a set of protocols for analyses and for stakeholder to participate. There could even be RFPs given to solicit ideas, analyses and data collection. There needs to be a source of funds, institutional commitment by the government.

**Key words:** Knowledge based platform, public-private partnership, policy.

# International Water Conference, Islamabad (4 – 6<sup>th</sup> June, 2014)

## Research Competitive Grants Program: Description and Project Summary

Dr. David Orden\*

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### **A**bstract:

The main purpose of these grants is to engage and empower Pakistan academia and research institutions through a competitive program of policy-relevant applied economic and social science research. Till now there are three rounds of applications and awards under this program. Research Advisory Committee (RAC) receives nearly 200 applications in 1<sup>st</sup> and 2<sup>nd</sup> rounds; 325 in 3<sup>rd</sup> round. After this there is a three-step review process, where 37 projects are awarded and either underway or completed. Furthermore, 25-35 new projects are to be selected this month in third round.

After the award of project, a project contract is developed. Oral presentations and written interim reports, internal and external reviews of interim reports, oral presentations and written final reports, internal and external reviews of final reports are the processes leading to the final reports “finalized” as PSSP Working Papers and other written outputs.

**Keywords:** Research competitive grants, Research, policy.



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Water Contamination: Current Food Safety Challenge

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### Abstract:

With growing industrialization, lack of awareness, insufficient regulations and strategies for implantation of food security and safety polices made the vast population of Pakistan on risk. Among various factors, ground water contamination with sewerage waste, industrial toxins and pesticide residues are major factors affecting human health. In last decades; these problems emerged as major challenge for food safety in this region. Mostly, the industrial waste is left untreated, dumped near residential areas, or dumped in natural running waters i.e. canals or rivers. The water from aforementioned sources is being used, either as drinking water by humans and animals or used as irrigation water to various crops and vegetables. So the toxicants, travels from industry to human, animal or plants, without any barrier. This toxic waste material is a serious food security threat and emerged as a great challenge, to be deled in Pakistan. Due to water contamination, various diseases are being spread, that includes, gastrointestinal and skin diseases.

**Keywords:** Water contamination, Industrial effluents, Food safety



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Problem of Water Pollution in Drinking Water of Khyber-Pakhtunkhwa

Abdul Sattar Shah<sup>1\*</sup>, Malik Muhammad Hashim<sup>2</sup> and Abdul Basir<sup>3</sup>

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### Abstract:

Nature has blessed Pakistan and especially Khyber-Paktunkhwa with adequate surface and groundwater resources and gushing river. However, fast population growth, urbanization and the continued industrial development has placed immense stress on water resources of the Province and especially of big cities of Province. The water shortage and growing competition for several uses of water has adversely affected the overall quality of water.

The research was carried out to study the pollution of drinking water at Agriculture Research Institute, Tarnab, Peshawar. Water samples from different regions in Khyber-Paktunkhwa were analysed for physicochemical and microbial analysis. Results showed that most of the samples in all cities of province are microbiologically contaminated. Furthermore, high turbidity and metal contamination (Iron, Arsenic, Nitrate) was also found on risk level to Human health.

**Key words:** Water Pollution, Water contamination, Microbiology, Chemical analysis of Water.



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Safe Drinking Water and Sanitation in Punjab

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### Abstract:

This study is conducted to raise the concerns about situation on “Safe Drinking Water and Sanitation in Punjab”. It provides an overview of the existing water supply and sanitation situation in Punjab, together with some observations on points of relevance to water supply and sanitation models for the Province. It is based on information, the experience of Public Health Engineering Department (PHED) officials and engineers who worked on the PRWSSP and PCWSSP projects. One point to be taken into account when considering possible management arrangements for wastewater disposal, and indeed for water supply, is the limited technical capacity of TMAs. Most TMA staff are untrained and employed at low grades. For instance, only 1% and 3.3% of the staff employed by Rawalpindi TMA in 2004 were above grade 17 and in the range 11 – 16 respectively. No less than 92% of the TMA’s staff were at grade 5 or below. This situation is typical and is unlikely to have changed significantly since 2004. The key point is that TMAs do not have capacity to either manage or provide support and oversight for rural and peri-urban water supply schemes. A related point is that TMAs are financially dependent on transfers from higher levels of government and do not have the resources to support operation of village level water supply and sanitation schemes.

**Key words:** Drinking-water standards, water policy, Government of Punjab.



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Challenges and Opportunities in Urban Water Supply in Punjab Province

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Islamabad

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### **A**bstract:

In the past nobody in Pakistan has developed drinking water act as this is a sensitive subject. Housing, Urban Development and Public Health Engineering Department realizing the need of the day considering protection and conservation of water resources as the water table is depleting and realized that it is the time to sensitize users to rationally use water resources. It is also the right time to ensure water treatment and safety issues especially after promulgation of National Drinking Water Quality Standards.

The Government of Punjab (GoPb) attaches great importance to municipal services and wishes to improve the provision of Water Supply services in the largest cities of the province. The GoPb is well cognizant of the need, to improve municipal services, through policy, regulation and institutional reforms targeting the urban municipal services providers i.e. Water and Sanitation Agencies (WASAs) in the province. Provincial Government is investigating options for improving efficiency of Water Supply service providers through reforms, capacity building, public-private partnerships (PPP) and financial incentives including output-based financing Assistance (OBA).

**Key words:** Drinking-water standards, water policy, Government of Punjab.



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Drinking Water and Its Effects on Human Health

Muhammad Riaz<sup>1</sup>, Naseema Bano<sup>2</sup>, Yasir Amin<sup>2</sup> and Zia-ur-Rahman<sup>1,\*</sup>

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### Abstract:

Survival of all living organisms in general and human beings in particular is dependent on presence and availability of safe and healthy drinking water. This study has been carried out in the municipality of Havelian District Abbottabad, Khyber Pakhtunkhwa Pakistan. Ground water through tube wells is the major source of drinking water in Havelian, District Abbottabad, Khyber-Pakhtunkhwa, Pakistan. The main purpose of this study was to find out the quality of drinking water and doc area. A total 70 samples were collected from 5 different locations (1 from Tube well as main source and 13 from different Homes) for the analysis of various physiochemical parameters. Color, smell, taste, pH, and chloride of samples were within the permissible limits, but total dissolved solid, total hardness, phosphate and bacteriological values of 45% samples were not in permissible limits. On the other hand, results of the social survey reveals that drinking water of the area is contaminated due to poor sanitation and water supply systems; causing various waterborne diseases in community. This study recommends some protection measures on immediate basis in order to safeguard the health and welfare of the local community.

**Key words:** Pollution, waterborne diseases, drinking water.



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Exploration of Sanitation in Relation to Social Action in Haripur City, Khyber Pakhtunkhwa, Pakistan

Idrees Khan<sup>1</sup>, Zia-ur-Rahman<sup>1\*</sup> and Muhammad Jahangir<sup>2</sup>

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### Abstract:

Residents of District Haripur, in the province of Khyber-Pakhtunkhwa, are exposed both directly and indirectly to the risks posed by the existing sanitation system. Eighty percent (80 %) people of this district believe that sanitation is a social issue for our community, while 20 % think that sanitation is not a much huge problem for us, they are prioritizing; problems like poverty, unemployment and others. Various contributing factors to the current status of water sanitation were found to be an ages old system, small channels, and leakages near hazardous sites of various nature, un-managed urbanization and population growth. Furthermore this study has revealed that local community is not aware and hence no collective action has been so far taken in order to bring some improvement in terms of water safety and welfare. Some of the contributing factors in this regard were found to be low literacy, low income, resentment of the public from government and deficiency of funding to the concerned authorities. Based on the study findings it is recommended that this locality need a shift of priorities in its local politics for the creation of a reasonably practicable sanitation system in line with both national and international standards. Moreover, this study recommends socially acceptable solutions in the form of guidelines for capacity building of locals in the context of sanitation as well as productive social action for all relevant stakeholders.

**Keywords:** Water sanitation, social actions, Haripur.



# International Water Conference, Islamabad (4 – 6<sup>th</sup> June, 2014)

## Combined Industrial Effluent Characterization of Industrial Waste Water

Haleema Khan, Zulfiqar Ahmad Bhatti and Qaiser Mahmood\*

Department of Environmental Sciences, COMSATS Institute of Information Technology, Abbottabad.

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### Abstract:

Industrialization comes with its effects on life if left with untreated discharge leading to water, soil and sediment pollution. Current study aimed to characterize the industrial effluent discharge quality of Hattar industrial estate, Haripur, using physical and chemical parameters. Effluent discharge samples were taken from three different drains, each drain having the combined effluent of many industries. All the three samples of combined effluent were characterized for pH, temperature, TS, TDS, TSS, EC, DO, BOD, COD, turbidity, nitrates, phosphates, ammonia and different heavy metals. As all samples were found to have increasing trends towards pollution limits, therefore industrial effluents need a continuous monitoring and proper management before discharge in order to reduce future hazards in reference to aquatic and human life.

**Key words:** Pollution, chemical characterization, industrial effluents.



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Evaluation of toxic metals in the waste water, contaminated soils and crops of Hattar industrial area

Faridullah<sup>1</sup>, Arif Alam<sup>2</sup>, Zulfiqar Ahmed Bhatti<sup>1</sup>, Muhammad Amjad Sabir<sup>3</sup>, Muhammad Umer<sup>3</sup>

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### Abstract:

An experiment was carried out to assess the effect of industrial waste water on the growth of vegetables and cereals as well as the translocation potential of heavy metals of this plant. The accumulation of metals Cr, Cd, Ni, Fe, Zn, Hg and Cu in contaminated soils was observed in the order HNO<sub>3</sub> > EDTA > NaOH > KNO<sub>3</sub> > H<sub>2</sub>O. Sequential extraction method was followed to estimate the different fractions of heavy metals in soils irrigated with Hattar industrial state effluents and adjoining fields irrigated with polluted water. Top layer of the soil sampled from wheat crop field showed higher concentration of heavy metals as compared to the soil sampled with onion crop. Exchangeable, water soluble and total form of the heavy metals were detected in the contaminated soils, already grown crops and vegetables. We found that there was metal accumulation in the effluent, irrigated field and crops. Concentrations of Cr, Cd, Ni, Fe, Zn, Hg and Cu was higher in the wheat crop field as compare to onion field. The results show that the pollutants from the Industrial plant may be a source of these elements. Rapid growth of the population in Pakistan has been coupled with increasing environmental pollution.

(PTO)



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Evaluation of toxic metals in the waste water, contaminated soils and crops of Hattar industrial area

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The industrial areas are now facing increasing metal pollution pressures because of the elevated metal discharges from various sources. Industrial discharges are important sources contributing to metal pollution in Hattar industrial state. High metal contents can be detected in the soil collected across the stream in Hattar industrial state. Alarmingly high metal concentrations are observed in the soils, water and plants collected from the heavily industrialized areas. Elevated levels of metal contamination along Hattar environment can increase the risk of metal exposure to humans by vegetable consumption, raising the alarm for more stringent control of discharge of metals into environment.

Keywords: heavy metals; bioavailability; onion; wheat; industrial effluent



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Metal Induced Metabolite Accumulation in Brassica

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### Abstract:

Among environmental hazards, great attention has been paid to metals not only because of their increasing amount due to rapid industrial development but also because of the variation of metal composition in soil this has produced. Cultivation of crops close to industrial areas or irrigation with contaminated water may result in both growth inhibition and tissue accumulation of metals. *Brassica* species are well known as metal accumulators and are being used for phytoremediation of contaminated soils. However, the metal tolerance mechanism in the plant still remains unclear. In order to investigate the metabolomic changes induced by metal ions in *Brassica*, plants were subjected to various concentrations of copper (Cu), iron (Fe) and manganese (Mn) in separate treatments. Nuclear Magnetic Resonance spectroscopic (<sup>1</sup>H NMR and two-dimensional NMR) spectra coupled with principal component analysis (PCA) and partial least square-discriminant analysis (PLS-DA) were applied to investigate the metabolic change of *Brassica rapa* (var. *Raapstelen*). Manifold metabolic alterations as the consequences of metal stress, were observed. Drastic variation in various metabolites is observed, especially the glucosinolates and hydroxycinnamic acids conjugated with malates were found to be the discriminating metabolites as well as carbohydrates and amino acids. This study showed that the metabolomic changes in plant are metal and concentration specific.

**Keywords:** *Brassica rapa*, metabolomic analysis, metal ion, NMR.



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## The Role of Rhizobacteria in Chromium Uptake by Giant Reed

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### Abstract:

The heavy metals like chromium affect the aquatic and terrestrial environments in number of way which are currently well established. The objective of the study was to investigate the role and nature of microorganisms in the rhizosphere of giant reed (*Arundo donax*) that could enhance decontamination of Cr., each having equal amount ( $250\pm 5$  g) of plants (*A. donax* L.) per pot. Two sets of plants were managed i.e. first group designated as control group and second group named as experimental group. In the control group, the plants were given Cr treatments in range of  $25\sim 100$  mgL<sup>-1</sup>; this control group itself contained a control (with no metal treatment). The experimental group also received same Cr treatments but in addition to metal content, they were exposed to antibiotic treatment in order to inhibit growth of rhizospheric bacteria. The experimental results clearly demonstrated that the inhibition of the rhizobacterial populations had great influence on the metal uptake. However, it could not be completely inhibited as we observed some of the metal uptake after the rhizobacterial inhibition which was significantly less than the Cr uptake values by plants without such inhibition. The Cr concentrations accumulated in various parts of the plant were quite promising. The range of Cr accumulated in the roots was 3 to 7.65 mg L<sup>-1</sup> for all the treatments.

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# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

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A similar trend of increasing Cr accumulation was also noted for stem and leaves. The maximum Cr accumulation was observed for stem which ranged 2.15 to 42.4 mg L<sup>-1</sup>, the highest accumulation took place at 100 mg L<sup>-1</sup>. In leaves, the range of Cr content was observed to be 13.7 to 15 mg L<sup>-1</sup>. In leaves, the Cr accumulation did not show greater variations. It was observed from the overall results that Chromium metal uptake in *A. donax* plant (without rhizobacterial inhibition) was root < leaf < stem. However, the amount of Cr uptake in plants with rhizobacterial inhibition was significantly less than those without such inhibition. However, the plants showed their ability to tolerate high concentrations of Cr when their rhizobacterial communities were intact. As shown by BF and TF of plants (without rhizobacterial inhibition), the values of these bioconcentration factors were always higher than baseline recommended value of 1, which suggested that plant is quite capable of bioremediation of Cr contamination. Three bacterial genera from the rhizosphere of *A. donax* on the basis of culture, morphology, and biochemical characteristics from twenty isolates: *Azotobacter* spp., *Pseudomonas* spp., and *Bacillus* spp.

Keywords: Bioremediation, chromium contamination, metal toxicity, rhizobacteria



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Undesirable Changes in Juices Due to Poor Water Quality and Sodium Benzoate

Zulfiqar Ahmad Bhatti<sup>1\*</sup>, Syeda Kiran<sup>1</sup>, Farhana Maqbool<sup>2</sup>, Faridullah<sup>1</sup> and Qaisar Mahmood<sup>1</sup>  
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### Abstract:

Clean water is a basic necessity for human as well as for food industries especially those industries who involved in juices production. Poor water quality, high in microbial load, is greatly effecting on juice shelf life even after pasteurization. Use of preservatives in juices becomes very important now to avoid spoilage during storage or in the market especially in summer season. Sodium benzoate is one of the most frequently used preservative in the juice industry to control microbial spoilage. Some serious concern has been raised about benzene formation in juices due to presence of sodium benzoate. To study the benzene formation from sodium benzoate in juices, seven different brands juice samples were collected from local market. Out of seven samples, benzene was detected in four samples and in two out of four was exceeding the permissible limit 0.005 ppm. In these two samples sodium benzoate was found 18 ppm, 33 ppm and vitamin c 301 ppm and 190 ppm with benzene concentration 0.259 and 0.229 ppm detected while other two samples benzene concentration was 0.13 and 0.12 ppm. In the remaining three samples, benzene was detected below the standard limit. There is serious attention required to explore more in detail to control benzene formation in juices.

Keywords: Pasturization, Sodium benzoate, Benzene, Vitamin C, Preservatives.



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Spread of Water-borne diseases in District Haripur, Khyber-Pakhtunkhwa,

Pakistan



Saima Qureshi, Noureen Aurangzeb\*, Tariq Khan, and Zia-ur-Rahman



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### Abstract:

Water-borne diseases appear to be the common health problem among the sample households in the study area. Water borne diseases are equally common among male and female population, where children are often severely affected. One of the basic reasons of the spread of the water-borne diseases is the combination of drinking water and sewage water pipelines. This combination usually occurs due to faulty water supply and sewage water pipelines inside and outside the houses in some locations of the study area. Plastic pipelines are being used mostly in the study areas, which are easily breakable. Secondly, the main water supply tanks for the community are not regularly monitored. Thirdly, improper solid waste dumping also results in mixing with the drinking water, especially during the raining season. Fourthly, poor hygiene practices also contribute significantly in the spread of water borne diseases in the study area.

**Key words:** Water-borne diseases, Sanitation, waste management.



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Physio-chemical Analysis of Water and Soil Effected by Industrial Effluents

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### Abstract:

Industrial pollution has been a major factor causing the degradation of the environment around us. Many industrial activities are responsible for discharging waste into the environment. This waste contains many poisonous substances that will contaminate the soil. Soil contamination by effluents from different industries at Hattar Industrial Estate, Haripur, Khyber-Pakhtunkhwa, was the subject of this research. Effluents of selected industries and soil around the industrial area were sampled and analyzed for levels of pollutants using standard analytical method. Samples were collected from various industries or locality around these industries. Samples were analyzed for various physical and chemical parameters like pH, EC, TSS, TDS, COD and CI. The pH of the samples of the industrial effluents ranged from 4.1 to 7.8, temperature ranged from 35.6 °C to 130 °C, EC ranged from 513 to 762  $\mu\text{S}/\text{cm}$ , TSS 682 to 2740 mg/L, TDS from 3940 to 5480 mg/L and COD from 242 to 412 mg/L.

The physio-chemical parameters of the effluent samples showed a significant pollutant contamination in all of the samples. The study recommends that industrial effluents must be treated before discharging to water bodies or as solid waste, whereas regular governmental monitoring should be introduced.

**Key words:** Industrial effluent, Physio-chemical analysis, Waste.



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Quality Evaluation of Drinking Water

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### Abstract:

Drinking water samples were collected from three different filtration-plants located in District Haripur were analyzed to assess physiochemical parameters, biological parameter and suitability of water for drinking purpose. Physiochemical parameters such as pH, temperature, color, odor, taste, Turbidity, Electrical conductivity, Total dissolved solids (TDS), Total suspended solids (TSS), Chemical oxygen demand (COD) and biochemical oxygen demand (BOD) and biological parameter such as Standard plate count (SPC) and Total coliform (TC) were determined according to standard protocol. The results revealed that samples obtained from filtration-plant have better water quality and is more suitable for drinking purposes than tap water. Ultra filtration system is considered to be the best system for treatment of water. Still due to lack of maintenance, these filtration plants

The study recommends that for the sake of public health, water filtration system require careful selection, installation, maintenance, operation, supervision, administrative support. It is also suggested that these filters may be replaced according to manufacturer's specifications and good monitoring can very much improve the efficiency of these filtration plants.

**Key words:** healthy water, waterborne quality, water filtration.



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Economic Evaluation of Different Irrigation Systems for Wheat Production in Rechna Doab, Pakistan

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### Abstract:

Water productivity (WP) has been reported to be lower in Pakistan as compared with that at the international level. This paper investigates the causes responsible for low water productivity (WP) and demonstrates various irrigation techniques at farmer's field for its improvement. A comprehensive questionnaire was designed and 230 farmers were interviewed in the cotton-wheat area (Samundary-site I), mixed crop area (Chiniot site II) and rice-wheat area (Hafizabad site III) in Rechna Doab, Punjab, Pakistan. This survey pointed out that majority of the farmers expressed their major concerns about shortage of canal water, energy and fertilizer. These issues were the main factors affecting their land and water productivity. Field experiments were conducted at the above mentioned sites. The results indicated that drip irrigation was found as the most efficient irrigation technique, which produced maximum WP of 2.26 kg m<sup>-3</sup> for wheat. Drip irrigation was 98% efficient and water saving was 40% compared with that under conventional irrigation. Perforated pipe irrigation technique also resulted in relatively better WP of 1.51 kg m<sup>-3</sup> and water savings was 18%. Benefit Cost Ratio (BCR) for drip was the highest compared to that for perforated pipe and conventional irrigation systems at site-I. BCR for perforated pipe was profitable for all the sites but the highest one at site-II.

(PTO)



# International Water Conference, Islamabad (4 – 6<sup>th</sup> June, 2014)

## Economic Evaluation of Different Irrigation Systems for Wheat Production in Rechna Doab, Pakistan

A. Bakhsh<sup>1</sup>, M. Ashfaq<sup>2</sup>, A. Ali<sup>2</sup>, M. Hussain<sup>2</sup>, G. Rasool<sup>1</sup>, Z. Haider<sup>1</sup>, and R. H. Faraz<sup>1</sup>

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The Internal Rate of Return (IRR) for drip irrigation over conventional and perforated pipe was 40% and 19%, respectively at Samundri site. The results indicated that IRR for perforated pipe over conventional irrigation was the highest (45%) for Chiniot site. These findings suggested that flexible irrigation techniques in response to crop water requirements can improve land and water productivity, which can be achieved by building on farm water storages and conveying water through pipes thus minimizing water losses.

**Key words:** Water productivity, perforated pipe irrigation, drip irrigation.



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Estimation of Useful Life of a Reservoir Using Empirical Methods



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### Abstract:

The most important and critical issue regarding performance of reservoirs is estimation of rate of sedimentation and Trap Efficiency, as due to sedimentation reservoirs gradually reduce their storage capacity and loss irrigation & power benefits. There are various empirical methods which can be used to estimate the Trap Efficiency (Te) of reservoirs. These methods differ in terms of various input factors. In the present study, empirical relations suggested by Brown (1943), Churchill (1948), Brune (1953), Dandy (1974), Gill (1979), USDA-SDC (1983) and Siyam (2000) Methods are used to estimate Trap Efficiency and life of Tarbela & Mangla reservoirs. By using Capacity / Inflow (C/I) ratio, Te and density of sediments, life of both reservoirs has been estimated. By using empirical methods and sediment inflow characteristics, it is estimated that useful life of Tarbela reservoir is 51 years (up to year 2065) and useful life of Mangla reservoir is 101 years (up to year 2115).

**Key words:** Trap Efficiency, sedimentation, water reservoirs



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Sustainable Land and Water Management in Arid Areas through Construction of Small Private Dams

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### Abstract:

Pakistan's economy depends on agriculture which contributes 24% of the Gross Domestic Product (GDP). Of the total agricultural area, the Pothwar area is known to have great potential for agricultural development. However, due to inherent shortage of water, much of the areas is underexploited. Since dry season agriculture and the pre-rainy season establishment of food and cash crops cannot be undertaken without large quantities of water, there is a need for development of innovative and sustainable methods and techniques specifically suited to arid lands. Moreover, along with the need for adopting sustainable agriculture, it is also as much important to learn from best sustainable land and water management practices which have been adopted by individuals, communities or countries. This paper discusses the case study of a sustainable land and water management initiative taken by a private land owner, who with the help of local community built a small dam on a rain-fed stream passing through his land. This reservoir provides the vital irrigation water supply for the fields. Although primarily for irrigation, this structures is also used for fish farming, domestic water purposes, drainage sumps, groundwater recharge, flood amelioration and conservation storage.

**Keywords:** Sustainable, Land, Water, Arid, Agriculture.



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Droughts in Pakistan: A Spatiotemporal Variability Analysis Using the Standardized Precipitation Index

Hua Xie<sup>1</sup>, Claudia Ringler<sup>1</sup>, Tingju Zhu<sup>1</sup> & Ahmad Waqas<sup>2</sup>

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### Abstract:

We investigated the spatiotemporal variability of drought incidence in Pakistan during 1960–2007 by calculating Standardized Precipitation Index fields for 3-, 6- and 12-month scales using gridded precipitation data. Principal component analysis revealed that droughts are wide-spread and often occur simultaneously over large areas. Furthermore, spectral analysis identified a 16-year drought recurrence period. Three such drought-intensive periods were identified: the late 1960s to early 1970s; the middle 1980s; and the late 1990s to early 2000s. Hence, drought patterns need to be integrated into long-term water planning as well as emergency preparedness.

**Keywords:** drought; Pakistan; Standardized Precipitation Index; principal component analysis.



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## The Impact of Water User's Associations on the Productivity of Irrigated Agriculture in Pakistani Punjab

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### Abstract:

The government of Pakistan has been involved in the transfer of irrigation management to farmers' organizations at different levels of irrigation networks. Khal Panchayats or water users' associations are mandated to mediate water distribution conflicts, maintain watercourses, report on tampering of outlets and shortage of water supply in the outlet to minor or distributary-level farmer organizations, collect water charges, and provide timely information about rotational running of channels to the farmers. As such, irrigators on watercourses with Khal Panchayats can potentially perform better than those without such institutions. This study explores whether or not the presence of Khal Panchayats on a watercourse and farmer organizations on the canal improves farmers' productivity and the returns to land as was envisioned during the Irrigation Management Transfer. The study utilizes the Pakistan Rural Household Panel Survey (Round 1.5) that has detailed plot level information with highly disaggregated data on irrigation type, methods, and institutions. We used the Hausman-Taylor model to regress the value of output per acre on agricultural inputs, soil and water conservation practices, plot characteristics, household demographics, and the presence of institutions such as Khal Panchayats and farmer organizations. We find that households whose plots are located on watercourses with Khal Panchayats are likely to earn 27 percent more value per acre as compared to farmers on watercourses without such institutions.

(PTO)



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## The Impact of Water User's Associations on the Productivity of Irrigated Agriculture in Pakistani Punjab

Dawit Kelemework Mekonnen<sup>1</sup>, Hira Channa<sup>2\*</sup>, Claudia Ringler<sup>1</sup>

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The effect of the presence of Khal Panchayats is more pronounced in Kharif (the main rainy season) than in the Rabi season. Khal Panchayats lead to improved water management mainly through reducing water theft and conflicts around water, as well as improving maintenance of the watercourse and timing of water arrival. This suggests that while the Irrigation Management Transfer (IMT) progress has been slow in Punjab province, largely due to resistance to change by the vested interests embedded in the Punjab Irrigation Department, even the limited implementation of the IMT has already yielded substantial benefits. The presence of farmers' organization (FO) on the minor or distributary as well as the interaction of the presence of a KP and an FO, are statistically insignificant, though they have the expected positive signs.

**Keywords:** Farmers' organizations, irrigation management, productivity, Pakistan water users.



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Managing Water Through Virtual Water Trade

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### Abstract:

Increasing population is putting pressure over local water resources through increase in demand for food and other usages. Developments made in water management are not substantial to deal with growing demand. Although, integrated water resource management is advocated in Government policies, but still there is a need to include measures related with water used in the production of commodities consumed. Our work highlights the importance of virtual water trade for managing water resources. Virtual water is the amount of water needed in the production of commodity. Interprovincial trade in virtual water can help to save scarce water resources of provinces for alternative usages. Almost all of the provinces are found utilizing more water resources than the water resources available at their disposal. Similarly, all provinces are found as water scarce, but level of scarcity is significantly different between provinces. Moreover, opportunity cost of producing crops in term of water also differs substantially between provinces. Provinces can use their potential based on comparative advantage in water use efficiency to tackle the issue of water scarcity and save water globally. This study calls forth the inclusion of virtual water trade in water sector policies to understand water management in a broader perspective.

**Keywords:** Scarcity, Virtual Water Trade, Commodities, Comparative Advantage.



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Provision of Safe Drinking Water through Public-Private Partnership Model in Pakistan



Dr. Rashir Aftab<sup>1</sup>, Muhammad Wasif Bashir Babar<sup>2</sup>, Nazir Ahmad Wattoo<sup>3</sup>, Muhammad Jahangir<sup>4</sup>

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### Abstract:

Water is crucial for the economy and influences both in negative & positive form. Pakistan has moved from surplus to water deficit country within last 60 years. On quality side the evidences from various researches and investigations suggested that most of the drinking-water supplies are not safe for drinking purposes which has serious effect on health and livelihood as 1/4th of the diseases are water born. Total expenditures on health are 2.5% of GDP of Pakistan and water related vector born disease much contributed in household's health burden.

While low literacy rate ,poor knowledge about hygienic measures, unethical water utilization behavior of people and inadequate institutionalization capacity about water measurement & management contributed at optimum level in water quantity issues for citizens. It seems very difficult to achieve the Millennium Development Goals (MDGs) earmarked by UN for the provision of safe drinking water and sanitation to the citizens of the country for sustainable environmental development.

(PTO)



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Provision of Safe Drinking Water through Public-Private Partnership Model in Pakistan



Dr. Rashir Aftab<sup>1</sup>, Muhammad Wasif Bashir Babar<sup>2</sup>, Nazir Ahmad Wattoo<sup>3</sup>, Muhammad Jahangir<sup>4</sup>

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On one hand the policy and plans instruments are either not available or subsisted but in sluggish form and have very meager implementation trait due to less political well, stability, poor institutional capacity, pitiable integration between service providing agencies both public- private sectors and limited approaches to engage local communities in water resource management which ensure the ownership and sustainability of service.

This paper review the water quality & quantity situation of the country and suggested that a deeper and serious change is required through a paradigm shift by adopting public-private partnership model to meet national as well as international obligations through an integrated and sustainable approach for the provision of safe drinking water to citizens of Islamic Republic of Pakistan.

**Key words:** Drinking-water, policy, public-private partnership, sustainable approach



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Decision support system for water supply in a low-flow Mediterranean river watershed

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Universitat Rovira I Virgili, Spain

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### Abstract:

The general aim of the project is to provide a better overall understanding of the effects of climate change on freshwater ecosystem services in Iberian rivers as a result of loss of quality associated with water scarcity and prevent further deterioration of rivers and enhance the status of water resources. In order to achieve this goal, the following tasks are carried out:

- A model capable of simulating water allocation in a low flow Mediterranean river watershed is developed.
- The effects of climatic extremes on the delivery of hydrological ecosystem services in a Mediterranean low and medium flow river basins are assessed.
- Decision support system to allocate water to different levels of water use units to provide water for all essential uses even under aggravated climatic conditions, is developed.

This study showed the applicability of the AHP method to integrate stakeholder groups' preferences in the decision making process of alternate water resource management.

For the selection of combination of alternate water resources, environmental, economic and technical aspects are considered. The scenario that has best sustainability ranking includes storage reservoirs and artificial aquifer recharge (AAR) for agricultural use. Together the effects of climate change determine the need of a correct approach for water allocation system and the appropriate alternate water resources at a catchment level due to water scarcity.

**Key words:** Simulation of water allocation, artificial aquifer recharge, Water management.



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## The Impact of Water User's Associations on the Productivity of Irrigated Agriculture in Pakistan

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### Abstract:

The government of Pakistan has been involved in the transfer of irrigation management to farmers' organizations at different levels of irrigation networks. Khal Panchayats or water users' associations are mandated to mediate water distribution conflicts, maintain the water course, report tampering of outlets and shortage of water supply in the outlet to minor or distributary level farmer organizations, collect water charges, and provide timely information about rotational running of channels to the farmers. For a country like Pakistan, with nearly 107,000 watercourses stretching for more than 1.6 million kilometers and irrigating about 35 million acres of land across 12 inter-link river canals of the Indus basin, the success or failure of such irrigation management transfers has far-reaching implications on the country's agricultural production, its poverty reduction efforts, and its wider economy at large. Despite the importance of irrigation management transfer in one of the world's largest irrigation networks, there are not enough rigorous studies in the literature that shed light on whether such transfer of irrigation management in Pakistan has resulted in the expected benefits of improved water management and the resulting benefits of increased agricultural productivity. This study explores whether or not the presence of Khal Panchayatas on a water course and farmer organizations on the canal have impact on returns to land as measured in the value of output per acre.

**Keywords:** Farmers' organizations, irrigation management, productivity, Pakistan water users.



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Food Security and Environmental Change

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### **A**bstract:

Food production, storage and distribution have always been connected to environmental conditions along with markets, all sensitive to weather extremes and climate fluctuations. Quality of soil and water are also responsive to food production and quality together with the presence of pests and diseases, and other biophysical influences. The scope and scale of interaction are changing significantly, particularly in relation to the risks of climate change, biodiversity loss and water scarcity. Food security is a principal outcome of any given food system, although in many cases food security is not achieved; instead, people are undernourished and face regular hungry seasons, or struggle with a host of non-communicable diet-related diseases, or spend the major portion of their income on poor or inadequate diets. With the increase in the Global population and change in food habits, the future food demand for cereals will increase drastically. Therefore, among principal global concerns of the twenty-first century are: (1) food security due to a rapid increase in the world population, (2) soil degradation by land misuse and soil mismanagement; and (3) anthropogenic increases in atmospheric greenhouse gases.

Social changes are needed to control population, invest in agricultural sectors of developing countries, reorganize the world trade system for food, reduce misdistribution of food, and alleviate poverty.

**Keywords:** Food Security, climate change, diet.



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Socio-economic Issues Related to Water Mismanagement

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### Abstract:

The aimed to assess the current status of water resource at Tarbela Dam Lake, in District Haripur of Khyber-Pakhtunkhwa. The possible correlation of the water mismanagement with socio-economic factors (population, income, life style) is evaluated. Data analysis revealed that area has problems pertaining to uncontrolled water level in Lake area and also seepage of canals in various localities. Due to mismanagement of water, the study area is facing live threatening problems for neighboring communities to the Lake area. Furthermore, public health, socio-economic conditions and agriculture lands are affected, in addition to losses in forest area, damage to the wetlands and natural habitat of wildlife.

Water management issues can be resolved by involvement of local community and social society at policy development stage and also kept engaged throughout the working of such projects.

**Key words:** Water management, socio-economic factors, policy.



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Assessment of Waterborne Diseases through Social Survey

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### Abstract:

Water-borne diseases are among the prevalent infectious diseases throughout the world. The present investigation was carried out to assess the prevalence rate of water-borne diseases among the residents of Soha; Haripur City of Khyber-Pakhtunkhwa, Pakistan. Social survey and review of relevant literature have been used for the collection of primary and secondary data respectively.

The information obtained from the study revealed a rather grave scenario, showing that almost 69% of the people were illiterate. An average of 42% did not have the facility of community water supply and 21% get their drinking water from a nearby filter plant. The most common illness was diarrhea and vomiting having a prevalence rate of 62.67% followed by skin problems (21% prevalence rate). Water – borne diseases were mostly prevalent in monsoon and summer season (May – September) showing a percentage of 44.67% and 39.33% respectively.

Most of the households (82%) were of the view that they use water for drinking without any pre-treatment. A reasonable majority pointed out that they wash hands before eating meals and surprisingly 6% people of the area admitted that they do not wash hands after visiting toilet. On the other hand, public health facilities are scarce in the study area and some welfare organizations are there to help the locals. In order to safeguard the health and welfare of the local community the study area needs to be explored comprehensively for the quality of drinking water and the associated health risks.

**Key words:** Water-borne diseases, public health, social survey.



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Making the Most of Aging Facilities and Shrinking Budgets

Dr. Farida Goderya

Senior Professional Engineer, Water Department, City of Fort Worth, Texas USA

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### Abstract:

Utilities today universally face the challenge and increasing pressure to optimizing and maintain current performance and planning for future regulations with ever-diminishing capital and operating budgets. The Village Creek Water Reclamation Facility (VCWRF) owned and operated by City of Fort Worth in Texas, was built in 1958 to serve east Fort Worth and customer cities. Initially the plant was a 5 mgd activated sludge plant. Over the years the plant has undergone many expansions to the current capacity of 166 mgd at average flow and 2 hour peak flow of 369 mgd. VCWRF is a conventional treatment plant with headworks, primary treatment, activated sludge secondary treatment, tertiary filters, and disinfection. The VCWRF has undertaken several projects in anticipation of increasingly stringent permit requirements and to improve the condition and performance of existing facilities, one of which is the Secondary Area and Filter Rehabilitation and Modifications (SA-Secondary Area).

The SA project is a compilation of rehabilitation items identified in a previous condition assessment study including the rehabilitation of secondary clarifiers, return sludge pump stations, return sludge yard piping, primary effluent piping at aeration basins, and automatic backwash (also known as traveling bridge) filters, all within the allotted capital budget of \$10 Million or less. The task was to design and construct the meaningful improvements to numerous facilities within this tight budget.

(PTO)



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

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Typically, project elements are prioritized to allow for bid alternatives or exclusion of certain items in order to meet the budget on bid day. In the case of the SA project, the core elements of the project (secondary clarifiers, return sludge pump stations, and automatic backwash filters) were included because they have already been prioritized. The return sludge and primary effluent piping modifications were added during the design because it became apparent that the improvements to the clarifiers and return sludge pump stations would have little to no impact on the performance and operability of the plant unless the piping modifications were undertaken. In short, the list of high priority items grew as opposed to condensed as the project progressed, however the capital budget remained.

This paper presents design and construction details of various improvements, overall layouts of the major components, photographs of the constructed facilities, as well as challenges and lessons learned during construction and initial start-up operation of the system.

Throughout the project, potential improvements were scrutinized to find cost effective solutions without compromising operational performance or reliability. The resulting improvements are an example of how much existing facilities can be improved without compromising the capital budget, even in a large plant with aging facilities like Village Creek.

**Key words:** Drinking-water, policy, public-private partnership, sustainable approach.



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## The Possibilities of Increasing Irrigation Water Use Efficiency in Indus River Basin of Pakistan

Hassan Abbas<sup>1,\*</sup>, Asghar Hussain<sup>2</sup> and Sheheryar Shafique<sup>3</sup>

<sup>1</sup>UNESCO Chair in Knowledge Systems for Integrated Water Resources Management <sup>2</sup>International Water Management Institute (IWMI), Pakistan Office

<sup>3</sup>COMSATS Institute of Information Technology (CIIT), Wah Campus

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### Abstract:

This paper presents a sub-irrigation technology nicknamed ZeZAK, which could increase water use efficiency for most crops by up to six folds. The technology uses recycled material and industrial pipes to create a four feet triangular grid of inverted filters connected to a water source. The system is buried under the farm surface and source water level is maintained in a way that the root zone keeps receiving moisture from the inverted filters through capillary rise. A pilot project has been established at an experimental plot measuring 214 x 74 feet(0.35acre). Using indigenous industrial products and recycled materials, the cost of establishing the system becomes comparable to other efficient irrigation systems such as drip. The system runs at atmospheric pressure with water delivery done through gravity flow using 3~4inches of water head. Simple float valves control the water level. With small learning curve for farmers, this systems runs at a very low operational and maintenance cost. The system runs automatically as long as there is water in the delivery tank. The system is also compatible with contemporary techniques of zero tillage and also saves application of fertilizers. Deep drainage and evaporation losses are significantly reduced. First crop planted at the pilot is corn and the harvest is expected in late June 2014.

(PTO)



# International Water Conference, Islamabad (4 – 6<sup>th</sup> June, 2014)

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Comparing per acre yields and volume of water used per kilogram of yield from the traditional farms in the area with ZeZAK will help establish performance indicators of the system. With low installation costs, small running and maintenance costs, high water use efficiency and being user friendly to farmers, the system is expected to compete with high yields in the area. The potential of water savings from ZeZAK and its adoption by majority of farmers may lead to establish food security in the face of dwindling water resources.

**Keywords:** Sub-irrigation, efficient irrigation, food security, Indus Basin, global change



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Isolation of Heavy Metal Resistant Bacteria From Industrial Waste Water and



## Their Role in Bioremediation

Tayyaba Naz, Gulmeena Shah, Muhammad Naeem, Mehmood Jan, Ijaz Malook, M. Daud Khan and Muhammad Jamil\*  
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### Abstract:

Water is the main source of life. Rapid development in industrial sector results in the generation of industrial effluent, if remain untreated may result in water and soil pollution. Heavy metal resistant bacteria can be efficient bioremediator of metals and may provide an alternative or addition to conventional methods of metal removal from industrial waste water. In this study, ten bacterial isolates were isolated from soil sample of a sugar industry, Peshawar, Pakistan. Morphological, physiological and biochemical characteristics of these isolate were observed. 16S rRNA sequence analysis revealed that isolated strains were closely related to the species belonging to the genera *Pseudomonas*, *Arthrobacter*, *Exiguobacterium*, *Citrobacter* and *Enterobacter*. Bacterial isolates were resistant with a minimum inhibitory concentration (500-900ppm) to  $Pb^{+2}$ , (500-600ppm)  $Ni^{+2}$ , (500-800ppm)  $Cu^{+2}$  and (600-800ppm)  $Cr^{+3}$  in solid media. Furthermore, biosorption of metals ( $Pb^{+2}$ ,  $Ni^{+2}$ ,  $Cu^{+2}$ ,  $Cr^{+3}$ ) by these isolates were characterized to evaluate their applicability for heavy metal removal from industrial effluent. Results indicated considerable removal of heavy metals by isolated metal resistant strains.

(PTO)



# International Water Conference, Islamabad (4 – 6<sup>th</sup> June, 2014)

## Isolation of Heavy Metal Resistant Bacteria From Industrial Waste Water and Their Role in Bioremediation

Tayyaba Naz, Gulmeena Shah, Muhammad Naeem, Mehmood Jan, Ijaz Malook, M. Daud Khan and Muhammad Jamil\*  
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*Pseudomonas* Sp. reduced 37% (Pb<sup>+2</sup>), 32% (Ni<sup>+2</sup>), 29% (Cu<sup>+2</sup>) and 32% (Cr<sup>+3</sup>) and was thus found to be very effective in removal of the heavy metals whereas *Enterobacter* Sp. reduced 19% (Pb<sup>+2</sup>), 7% (Ni<sup>+2</sup>), 14% (Cu<sup>+2</sup>) and 21% (Cr<sup>+3</sup>) and was found to be least effective. While average reduction of Pb<sup>+2</sup>, Ni<sup>+2</sup>, Cu<sup>+2</sup> and Cr<sup>+3</sup> by *Citrobacter* Sp. was found to be 24%, 18%, 23% and 27% respectively. So present study revealed that *Pseudomonas* Sp. may provide a new microbial community which can be used, in the future, for enhanced remediation of contaminated environment.

**Key words:** bioremediation, Heavy metals, pollution



# International Water Conference, Islamabad

(4 – 6<sup>th</sup> June, 2014)

## Bio-waste Application on Agriculture Lands; Implication on Water and Food Quality

Dr. Zahoor Ahmad\*

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### Abstract:

Hundreds and thousands of tons of bio-wastes are produced every day across the globe and a major portion of it makes its route to the agricultural land for one or other reason. These wastes are used on agricultural lands as a source of plant nutrition or as landfills. Their continuous use as fertilizers or soil amendments on agricultural lands has raised severe health and environmental concerns. More than 150 pathogens have been reported to be present in different bio-wastes, but our knowledge on all these pathogens is very limited. Similarly, each year over the last decade, at least one new pathogen that could be transmitted through the environment has been recognized as a new public health threat; however there is a paucity of knowledge concerning the fate of these new pathogens when exposed to field conditions. Similarly, the techniques used for the detection of pathogens were found to be variable and inconclusive, making it difficult to compare the results of different studies. Different management strategies have been devised to minimize the risks of pathogens, nutrients, heavy metals, and toxic chemicals present in these bio-wastes. Among the different waste management strategies, incorporating the bio-wastes into the soil is one of the best management strategies to control the run-off of nutrients from the soil surface and, in turn, protect surface freshwater resources.

**Keywords:** Bio-solids management; surface application; water pollution.



# Recommendations

The following recommendations were made at 1<sup>st</sup> International conference  
WATER: 21<sup>st</sup> Century challenges & Way Forward.



- Water management and development should be based on a participatory approach, involving users, planners, and policy makers.
- Water has a value in all its competing uses, In order to attain equitable, efficient and sustainable water resources management and based on experiences gained in the country and international understanding, the Water Resources Management must be based on Socio-Economic and Water Allocation Aspects.
- A sufficient supply of water and an adequate means of sanitation are basic human needs and Protection and Conservation of Water Resources has to be addressed.
- The water demand management to be used in conjunction with water supply provision.
- Water for the environment shall be determined on the best scientific information available considering both the temporal and spatial water requirements to maintain the health and viability of riverine and estuary eco-systems.
- Administrative arrangements and decision-making processes has to be place to ensure an integrated approach and institutional and regulatory framework at all levels through a transparent and accountable system.
- Ensure that social and productive sectors, and the environment receive their adequate share of the water resources.
- Ensure effectiveness and efficiency of water resources utilization through innovative technologies and methods to promote the management of water quantity and quality conservation.
- Promote integrated planning and management of water resources.
- Public awareness and broaden stakeholder participation may be ensure in the planning and management of water resources.
- Promote regional and international cooperation in the planning, management and utilization of water.
- Provide the basis for future institutional framework and legislation for water resources management through new concept of public-private governance model.
- Water resources data to be develop and may be available and easily accessible to all and an effective infrastructure and information system has to be placed and operational.
- Water quality has to be maintained to meet agreed objectives and standards.
- National Water Policy must be developed by taking the stakeholders at board for devising a participatory and responsive policy.

INTERNATIONAL CONFERENCE  
**WATER; 21<sup>ST</sup> CENTURY CHALLENGES & WAY FORWARD**  
 ISLAMABAD 2014



Inaugurated by  
**H.E Mr. Ahsan Iqbal**  
 Federal Minister of Planning & Development



Chief Guest H.E Mr. Ahsan Iqbal Federal Minister of Planning & Development with keynote speakers

1<sup>st</sup> International Water Conference “WATER: 21st Century Challenges & Way Forward” was held on June 04-06, 2014 at Islamabad Club, Islamabad. The event convened many national and international leading thinkers from science, policy and social sectors. In addition representatives from different diplomatic missions in Islamabad also actively participated in the activities.

**IWC Guest Speakers**



**H.E. Mr. Walid Abu Ali**  
 Ambassador  
 Palestine Embassy  
 Islamabad



**H.E. Mr. Nedim Makarevic**  
 Ambassador  
 Bosnia and Herzegovina Embassy  
 Islamabad



**Mr. Hassan Muhammad Khan**  
 Pro Chancellor  
 Riphah International University



**Prof. Stephen Davies**  
 IFPRI Senior Research Fellow  
 Program Leader  
 Pakistan Strategy Support Program,  
 Islamabad



**Mr. Domenico Bruzzone**  
 Director  
 Italian Development Cooperation  
**Embassy of Italy**  
 Islamabad



**Dr. Michael L Wyzan**  
 M&E Team Leader  
 Economic Growth & Agriculture (EGA)  
 USAID  
 Islamabad

*About the Event*

Saving Humanity Foundation International (SHFINT) and RIPHAH Institute of Public Policy (RIPP) of RIPHAH International University has organized this conference in collaboration with University of Haripur, Comsats University and IFPRI-USAID.

The conference offered a platform for over 200 academics, policymakers, researchers and development professionals.

Participants from leading national and international universities and research institutes presented 30 research papers on Water.

Presented research papers and recommendations of participants will be published in conference proceedings for global circulation.

The conference fostered exchange across developed and developing countries and regions, seeking to identify and address global challenges of water in 21st century.



**H.E Mr. Ahsan Iqbal**  
 Federal Minister of Planning and Development

Pakistan will be in top 25 economies by 2025, said the Minister of planning and development Mr. Ahsan Iqbal while addressing the inaugural session of the 1st international conference on water: 21st century challenges & way forward held at Islamabad.

The Minister apprised that in the current budget 2014-15, the Govt. has allocated an amount of Rs 64 billion for education, research and innovation which will help the stakeholders in contributing in the socio economic development of the country.

The minister acknowledged the role of universities in this regard and appreciated the efforts of Riphah international university and SHFINT and USAID for taking such initiative on bringing issues like this in the lime light. It was further reiterated by the minister that the planning commission will account for the recommendations made as an outcome of the conference by incorporating the same in the national water policy of the country.

Moreover, he concluded in his address that Pakistan has a potential of water resources but the real challenge is to utilize this precious resource effectively and efficiently. The current Govt. has taken the landmark step for development of build Diamir Bhasha dam.



**Prof. Dr. Manzoor H. Soomro**  
 President  
 ECO Science Foundation



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Participants and guests at 1st International Water Conference "WATER: 21st Century Challenges & Way Forward" Islamabad



H.E Mr. Ahsan Iqbal awarding shields to participants, guests and organizers



IWC Presentations during Technical Sessions



Participants of Technical Session 1st International Water Conference "WATER: 21st Century Challenges & Way Forward" Islamabad

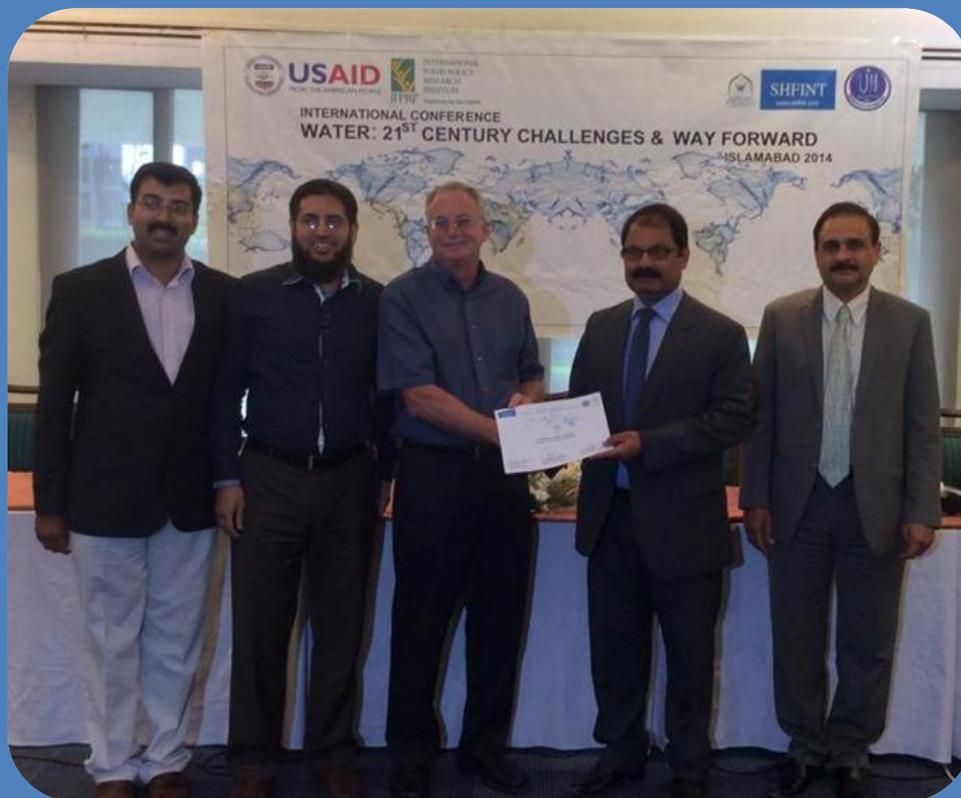


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IWC Certificates Awarding Ceremony

1<sup>st</sup> International Water Conference  
**WATER: 21<sup>st</sup> Century Challenges and Way Forward**



The Organizers and Participants (from right)

Dr. Rashid Aftab (Director Riphah Intl University), Mr. Saeed Akhtar Malik (Director General/ Pakistan Govt), Dr. David Orden (IFPRI/ USAID), Dr. Muhammad Jahangir (University of Haripur) and Ch Faisal Saleem (Executive Director SHFINT)

Organizers



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