

**INTERNATIONAL CONFERENCE ON  
FRESH WATER CRISIS AND  
POPULATION EXPLOSION  
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**ABSTRACTS**

**KEY NOTE ADDRESS**  
**FRESH WATER CRISIS & POPULATION EXPLOSION**

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**Abstract:**

Current situation of the population explosion and fresh water crisis are presented in this review. Population growth may be dangerous if allowed to go unchecked. The sources of water which took millions of years to gather underground (such as Ogallala in USA) are being depleted. Nature has bestowed the mankind with fresh water resources and we are continuously depriving ourselves of these. River Tigris and Euphrates in large are the most terrible examples of gross misuse. Both the rivers used to nourish the land and its inhabitants for centuries but now their fresh waters are contaminated a lot. Similarly, all three major rivers of North China are also polluted while the Yellow river is drying up at a rapid pace. These are the classical examples of our misuse of natural resources.

Water consumed per person is highest in America followed by European Union. We are indiscriminately consuming our non renewable resources including fresh water due to adaptation of lavish life styles. Modern diets made up of potatoes, rice and beef consumes water at an alarming rate.

On the other hand, human race is going the wrong way. As for "Might is Right" is befitting in this situation; the rich and industrialized nations like USA and Europe are taking lion's share of water and food for their never ending greed and desire with almost complete disregard to poor countries. What a rich and powerful man's greed is doing to his poor fellows and other living things on the planet such as trees, birds, fish & animals... destroying the entire ecosystem, where pollution, carbon dioxide emission and global warming are adding up every hour. Nothing seems to be frightening the man today. Our modern agriculture where 98% of the grain produced for human is consumed by the livestock to raise beef & non-organically grown fruits and vegetables. The man today seems to be in complete *trans* like lotus eaters, half sleep drown in luxurious life style consuming exotic food, irrespective of the time scale when the resources will run out and his own existence will be threatened.

All these problems need to be addressed. According to Colin Charters, IWMI Head, "We need to be thinking about bringing more and more agriculture into the Green Economy, where we value farming practices that protect our precious water resources in the same way we are beginning to value forest management that helps to reduce greenhouse-gas emissions"

A world of seven billion people poses many challenges and countless opportunities to make a positive difference. Seven billion actions established by the UN Population Fund inspire change that will make a difference by highlighting positive action by individual and organization around world.

## DENGUE VECTOR AND WATER

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### **Abstract:**

Dengue virus infection including dengue hemorrhagic fever (DHF) is worldwide rapid growing vector borne disease. Dengue virus belongs to family Flaviridae and is transmitted by mosquitoes of *Aedes* species, *Aedes aegypti* is the principle vector while *Aedes albopictus* can also transmit dengue virus. Poorly designed water drainage system, water storage and poor waste disposal are major contributing factors for its rapid spread; as this mosquito breeds on surface of stagnant water. In our effort for Punjab Government's initial stepping in Dengue Virus control working, we learn that large numbers of larvae were found in both clean as well as dirty stagnant water in different areas of Lahore during current epidemic. We conclude that environmental management strategies through improvement in design and operation of water resources can play a major role in control of this deadly disease.

**Key Words:** Dengue Vector, DFA, Stagnant water, *Aedes*, *Aedes aegypti*, *Aedes albopictus*

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## MICROBIOLOGICAL QUALITY EVALUATION OF DRINKING WATER IN LAHORE

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### **Abstract:**

The most common and widespread health risk associated with drinking water is microbial contamination. Bacteriological contamination of drinking water has been reported to be one of the most serious problems throughout the country in rural as well as urban areas in Pakistan. Such contamination is attributed to leakage of pipes, pollution from sewerage due to problem within the distribution system, intermittent water supply, and shallow water tables. These microorganisms present in water cause ill effects in human body which can be fatal and hence is a matter of great concern when considering the safety of drinking water. The pathogenic organisms can cause intestinal infections, dysentery, hepatitis, typhoid fever, cholera, and other illnesses. The present study was undertaken to determine the microbial contaminations in various water samples taken from different domestic water supply, public places, water filtration/purification plants located in Lahore and also in bottled water. Most of the samples taken from homes and public places are found to contain heavy contamination of coliform, *E. coli*, *Salmonella spp*, *Fecal Streptococci* and

*Pseudomonas spp.* 27%. A total of 129 samples of 43 brands of bottled water were also analyzed so far, out of which 76 % were found to be unfit for human consumption. Major contaminant of these bottled water samples was *Pseudomonas spp.*(57 %,) while 13 % samples were polluted by coliform and the remaining 7 % were having high bacterial load. However, the water samples taken from water filtration plants installed on public places were found to be 87% potable and remaining 13 % were heavily contaminated with *Pseudomonas* and *Bacillus spp.* No coliforms were detected in bottled water. Therefore, recommendations for implementation of actions to continue improving the quality of water will also be discussed.

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## MICROBIOLOGICAL ANALYSIS OF WATER IN CHICKEN INDUSTRY

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### **Abstract:**

Water is an extremely essential life sustaining commodity for all organisms but on the other hand it is also involved in transmission of diseases. Most of the poultry diseases are directly linked with unhygienic water supply. In Pakistan, water in poultry farms are supplied through water-bore (deep well 80 – 800 feet) which is then stored in water tanks and circulate in poultry shed without passing through any filtration system. The filters if applied, removes only dirt particle but not control microbial contaminants. These pathogens after entering poultry birds produce problems in digestive tract including colibacillosis. Same water is used for administration of drugs including antibiotics, growth promoters and vaccines. A study was conducted in University Diagnostic Laboratory, University of Veterinary & Animal Sciences, Lahore to evaluate water quality supplied to poultry farms. After microbiological analysis of one hundred poultry shed water, it was observed that 44% of samples were carrying more than normal viable bacterial count while 56 % samples were in normal range. Similarly 66% of samples were carrying coliform bacteria. According to Environmental Protection Agency of Pakistan, coliform level in drinking water should be zero. Statistical analysis reveals a significant correlation ( $p < 0.005$ ) between viable bacterial count and coliform count. Also depth of bore plays a significant role in coliform count. With increase in depth of bore, contamination level decreases, indicating that surface water became contaminated with sewage, animal waste and other pollutants. From this study, it is concluded that depth of bore plays significant role in controlling water borne poultry diseases. Also cleaning and chlorination of water storage tanks be done on regular basis for controlling water borne infection to poultry shed and to reduce production cost. Similarly policies should be developed and implemented to improve water quality through source improvements and safer water storage and treatment be recommended to prevent microbial transmission in poultry farm. There is a need

to investigate what are various factors responsible for contamination of water table in Pakistan and how these contaminant levels can be minimized.

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## **FRESH WATER CONFLICTS: THE INDUS RIVER BASIN; A SHARED RESOURCE**

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### **Abstract:**

Both, fresh water and clean air are essential resource for sustaining human population on the planet earth. Since both are free resource available in plenty, their misuse is always possible. In historic perspective, rapid population growth has been a brief and abrupt phenomenon. Two thousand years ago humans scarcely numbered 250 million. This figure reached to One billion in the early 1800's. A second billion was added in 100 years, a third in thirty years and the fourth in just 15 years from 1960-1975. The population is likely to reach 7 billion at the end of 2011.

At many places fresh water is shared natural resource amongst the neighboring countries such as Israel, Jordan and Lebanon; India and Pakistan etc. Similarly the River Nile flows through ten countries i.e. Burundi, Rawanda, Tanzania, Kenya, Zaire, Uganda, Ethiopia, Eritrea, Sudan and Egypt.

In the present paper attempt has been made to briefly describe conflicts between India and Pakistan over the Indus River Basin. In many parts of India for the period 1991-2006 almost a population of thirty percent was without access to safe water and toilet facility as indicated by a recent report on Food Security in South Asia. Conditions are not very different in Pakistan as well. At present fresh water scarcity is emerging as one of the most important issue due to rapid growth of human population and is likely to increase conflicts in the countries with shared water resources like India and Pakistan.

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## **IMPACT OF URBANIZATION ON POTABLE WATER**

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### **Abstract:**

The rapid increase in population of Pakistan has resulted radical decrease in per capita water availability. In the search of livelihood and basic commodities; trend of migration from rural to urban areas is increasing.

Ultimately, the urbanization imposed adverse effects on water quantity and quality by multiple uses of water. Pakistan Council of Research in Water Resources (PCRWR) has conducted a case study under its National Water Quality Monitoring Program. This program covered water sampling and their analysis from 21 major cities. This paper will discuss water quality and water table depth behavior since last couple of years in second largest city of Pakistan and biggest city of Punjab province; Lahore, where water table depth is decreasing and groundwater contaminations (Arsenic, Iron (Fe) and Bacterial) are increasing progressively.

**Key words:** Urbanization, Water Quality, Groundwater contamination, Water table.

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## **WATER POLLUTION AND SUBSTITUTED PHENOLS: SOURCES, EFFECTS AND TREATMENT**

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### **Abstract:**

Substituted phenols are important industrial products and ubiquitous in aquatic environment. Their environmental toxicity and resistance against biodegradability make them a persistent pollutant and major environmental hazard. The presence of these phenols in water either drinking or waste have long term health risks and have been reported to affect the human nervous system. The wide spread use of these contaminants have posed many health problems and hence substantial amount of work was done to degrade these contaminants into less toxic byproducts. Nanoparticles are known for their high surface to volume ratio that enabled them to have better catalytic reactivity as compared to their bulk counterparts. Majority of the catalysts are in use to treat these carcinogens and found to be effective in safe removal of these chemicals from the water. The need is thus to design those catalysts that are cost-effective and result in byproducts that themselves do not pose health hazard. Fe-Mg is found to be one such catalyst that enables safe degradation of the substituted phenols into environment friendly products.

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## **CITRUS FRUIT WASTE-BASED ADSORPTION TECHNOLOGY FOR THE TREATMENT OF HEAVY METAL BEARING WASTE WATER**

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### **Abstract:**

Due to vast industrialization, the environment is getting polluted with poisonous gases, organic molecules and heavy metals. Pollution with the latter category of metals can lead to disastrous effects on the ecosystem. Included in the group of toxic metals are lead, cadmium, chromium, mercury, zinc, copper and nickel. Environmental contamination by toxic metals is a serious problem due to their incremental accumulation in the food chain. Unlike most organic wastes and the microbial load in aquatic bodies, metal contaminants are not biodegradable, tending to accumulate in living organisms, thus becoming a permanent burden on ecosystems. Industrial effluents, particularly those containing heavy metals, are thus a cause of serious hazard to human health and other forms of life. Increasing attention is, therefore, being paid to the development of know-how for their removal from metal bearing effluents before their discharge into water bodies and natural streams.

The present study reports the development of a low-cost biosorbent system from citrus peel waste (CPW) of fruit industry. The CPW was successfully used for the decontamination of wastewater containing heavy metals. This new biosorbent removed Cd, Pb, Cu, Zn, Cr and Ni from aqueous solutions very effectively. The metal laden biosorbent was desorbed with 0.1 M HCl. The regenerated biosorbent was reused successfully in five repeated cycles. The ability of CPW to remove these metal ions was so effective that the heavy metal contaminated water after treatment with this agrowaste material was well below the maximum limits recommended by UNEP for discharge of sewage water.

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## **NANOTECHNOLOGY APPLICATIONS FOR WATER PURIFICATIONS AND WASTEWATER TREATMENT**

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### **Abstract:**

People dwelling in different cities of Pakistan are facing the problems of safe drinking water. Different conventional methods like alum, bleach, chlorine etc. are used for water purification and wastewater treatment all over the world including Pakistan. With the emergence and increase of microbial organisms resistant to multiple antibiotics, and the continuing emphasis on health-care costs, many researchers have tried to develop new, effective low cost technologies for water purification and antimicrobial reagents.

Nanotechnology is offering effective solutions to such problems of clean drinking water. Nanotechnology is one of the fastest developing technologies of today with great emphasis on applications in Industrial, strategic and socio-economic arena. It is being termed as another INDUSTRIAL REVOLUTION in the offing. *The use of materials at nanoscale greatly enhances the production, quality and the performance of the industrial products.* Thus it is affecting and going to affect all types of industries including water purification and wastewater treatment, food and agriculture, health and environment etc. Applications of nano sized materials like carbon nanotubes, silver nanoparticles and polymer nanomembranes may provide more efficient and cost effective water purification process. Nanosensor is another area of this technology which can provide efficient, on site cost effective detection of toxic metals in the water and wastewater.

The antibacterial activity of silver is well known and the nano- size silver particles have shown great efficiency as compared to macro sizes. A research project of Pakistan Academy of Sciences (PAS) related to antibacterial effect of different sized silver nanoparticles against waterborne pathogens is in progress at PINSAT laboratory. As a part of this study, fresh drinking water samples from about 55 water supply sites of CDA in Islamabad were collected and analyzed for total coliform (TC) and faecal coliform (FC) bacteria as well as for total heterotrophic bacterial counts (THBC). The results of this study will be presented in this conference.

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**ASSESSING THE IMPACT OF EFFLUENT DISPOSAL IN RIVER RAVI AT  
LAHORE ON THE FRESH WATER QUALITY UPSTREAM OF BALLOKI  
BARRAGE, PAKISTAN (A Review)**

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**Abstract:**

River Ravi passes by and receives effluent from the Lahore city at a number of locations. The Qadirabad-Balloki link canal carries about 18,000 cusecs freshwater from Chanab River into River Ravi at 5 km upstream of Balloki barrage, which has a dilution effect. In this paper the impact of the effluent on the fresh water quality of River Ravi upstream of Balloki barrage located at 60 km downstream are evaluated. Water quality of the effluents of River Ravi was determined by water sampling over a period of six months (August-January) that includes the periods of maximum, average and minimum flows in the river. Six major drains were selected for water sampling near their disposal point. Water sampling was also carried out in River Ravi at Lahore Bridge (upstream boundary and control for this research) and at Balloki barrage in main river channel and in Balloki-Sulemanki off take link canal. The samples were processed and



analyzed for COD, BOD, TDS, TSS, anions ( $\text{SO}_4^{2-}$ ,  $\text{Cl}^-$ ,  $\text{CO}_3^{2-}$ ), cations ( $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{Na}^+$ ), and heavy metals (Fe, Cu, Cr, Ni) in the laboratory. Dissolved oxygen, temperature, pH and EC were determined in the field at the time of sampling by using DO meter, pH meter and EC meter. Locations of sampling were noted in UTM by using Global Positioning System (GPS; *etrex vista* by GARMIN). Discharge data of the river and the canals was collected from Irrigation and Power Department, Punjab for the sampling dates. Discharge of the drains was estimated from velocity-area method. The results of the sampling were compared with four standards including USEPA, WHO, FAO, and WWF for Pakistan. An outcome of our research leads to the conclusion that river water quality at the Balloki Barrage was acceptable during average and high flow periods and was much above the permissible limits of the standards during low flows. It reflects that the dilution effect does not work during low river flows and needs some alternate solution to make the water quality acceptable for the above uses.

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## CONVENTIONAL TECHNOLOGIES USED FOR INDUSTRIAL WASTE WATER TREATMENT IN PAKISTAN

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### **Abstract:**

Our biosphere is under constant threat from continuing environmental pollution. Impact on its atmosphere, hydrosphere and lithosphere by anthropogenic activities can not be ignored. Man made activities on water by domestic, industrial and agricultural activities have negative influence over biotic and abiotic components. In recent years, different approaches have been discussed to tackle man made environmental hazards. The need of treating and recycling of domestic and industrial wastewater is increasing progressively not in the entire world but especially in Pakistan which is just approaching toward the water scarcity. The aim of this research is to describe conventional wastewater treatment technologies used in various industries especially in textile sector. The reduction in pollution load can be varied by using integrated process. Treated wastewater will be suitable for irrigation purpose.

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## INTEGRATED TREATMENT SYSTEM FOR CARWASH INDUSTRY WASTEWATER USING UASB REACTOR

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### **Abstract:**

Car wash industry wastewater contains many obnoxious pollutants which need to be removed to achieve EPA standard. Almost 100 liters of water consumed to clean a car which goes to sewage after washing. Major components are oil, grease, detergents and solid particles which need to be removed before discharging into sewage lines. An up flow anaerobic sludge blanket (UASB) treatment option was proposed. The reactor was fed with trace element and glucose as carbon source for two weeks to achieve maximum 99% COD removal efficiency when synthetic wastewater was used. Later on it was shifted to treat carwash industry wastewater. Natural sedimentation (NS) was allowed for 3 hour where 80% solids were removed followed by aeration then direct feeding to UASB. It was observed 98% COD, 97% BOD and 85 % turbidity was removed. Proposed integrated treatment system of NS, aeration and UASB reactor was successful to removed COD up to EPA acceptable standard.

**Keywords:** UASB; COD; Natural sedimentation; Turbidity.

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## ASSESSMENT OF WATER QUALITY FOR IRRIGATION A CASE STUDY IN PUNJAB

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### **Abstract:**

Irrigation water quality is an essential component of sustainable agriculture. Past few years have resulted in deterioration of water quality due to human activity. The aim of this study is to provide an insight into irrigation water quality criteria and assess the suitability of water in different areas of Punjab for which a case study has been performed. Samples were collected and analyzed on the basis of five parameters i.e. pH, salinity, sodicity, alkalinity and ions. The fitness of water (suitable, marginal fit, unfit) was judged by irrigation water quality standards.

**Key words:** Water quality, irrigation, parameters, Punjab.

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# TRADITIONAL AND MODERN WATER CONSERVATION MEASURES IN AGRICULTURE SECTOR IN PAKISTAN

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## **Abstract:**

At present, the annual per capita water- availability in Pakistan is about 1,100 cubic meters, but due to enormous population increase, the situation in Pakistan indicates that the country is nearing very soon conditions of chronic water-stress. While the exact shape of the future climate regime in the Indus Basin is also uncertain, but it is very likely that there will be greater variability – both of droughts and floods. Due to climate change, reduced water availability coupled with the increase in ambient temperature in most parts of Pakistan will result in a critical situation for the national economy. Other problem is of water reservoirs, there is only about 30 days of storage capacity in the Indus basin. As an agricultural country, it is using 90 to 95 % of its total resource in agriculture sector, but unfortunately wastage of water in agriculture sector can be from 50 to 60 % and the water efficiency of the irrigation system is low. Groundwater is over-mined & also being contaminated. Major investments are needed to store more water, especially in the monsoon or in winter rainy periods in both in surface and groundwater reservoirs, in projects small (such as local rainwater harvesting) and big (such as large dams), also to reduce the negative impacts of the floods in the down streams. In rain-fed as well as in irrigated agriculture there is an urgent need of implementation of water conservation measures, besides supply side measures we have a wide variety of water demand management measures, which can be grouped into measures to reduce losses, and measures to increase the efficiency of irrigation water applied. Pits, furrows, basins, bunds, ridges and terraces can be employed as useful measure to minimise runoff losses allowing better soil infiltration. Evaporation losses can be minimised by mulching and shading and the water storage capacity through incorporation of organic matter and deepening the root zone. To reduce transpiration wind breaks and improvement of shading of crops are being the most important techniques. Other important water conservation methods are e.g. increasing the efficiency of irrigation water use, selecting best suited crops and cropping methods, and reducing the losses of stored water and improving the water availability. Efficiency increase in irrigation water can be accomplished e.g. by application of “supplemental”, “deficit” or “surge” irrigation. Other modern & traditional efficient irrigation methods like micro-sprinkler, trickle, or pitcher can be applied. Water wastage can be avoided in conveyance (losses can be 30-50%), in distribution and in application. To achieve optimum water conservation & improved water use efficiency, education and training, public incentives, management of supply infrastructure, an optimized resource policy and further research are also essentially needed.

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# EVALUATION OF DC ELECTRICAL RESISTIVITY SURVEY FOR IDENTIFYING SALTWATER / FRESHWATER INTERFACE IN THE YOUNG KWANG COASTAL REGION, SOUTH KOREA

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## **Abstract:**

Electrical resistivity method has been used to investigate sea water intrusion into freshwater aquifers in the coastal area of Young Kwang South Korea. Vertical electrical sounding method employing the Schlumberger array was used to acquire data for eleven vertical electrical soundings to investigate the vertical extent of seawater intrusion. The study revealed that the subsurface in contact with the Young Kwang was invaded by saline seawater. The Schlumberger electrode array which utilized current electrode half spacing from 1 to 200 m was used to acquire resistivity. Typical curve types reported for coastal areas such as the H and A were observed in the investigated area. The subsurface lithology comprised of surface soil, marine clay, sand and fractured granitic rocks. The resistivity of the intruded saline water was found to range between 1.8-37.2 ohm-m at a different depth interval and the thickness of saline layers was found to be greater in the proximity of the coastline. The result of the investigation revealed that even under non-pumping conditions, the study area suffers from acute saline water intrusion and could be aggravated if there is groundwater abstraction.

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## **OVER VIEW OF ARSENIC IN GROUND WATER**

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## **Abstract:**

Arsenic is a poisonous substance, which is released both from certain human activities and naturally from Earth's crust. Human may exposed to arsenic mainly through food and water, particularly in certain areas where the ground water is in contact with arsenic-containing minerals. Being tasteless and odorless it cannot be detected when drinking contaminant water and even the effects are not immediately visible as people can absorb significant quantities of arsenic without any immediate health complications. However arsenic can damage the nervous system and is also carcinogenic as it can cause various types of cancer. Generally, a healthy person will withstand the arsenic poison for a long period than an under nourished or weak person specially children.

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## SCARCE FRESH WATER AND ENERGY CRISIS IN PAKISTAN

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### **Abstract:**

Water is sign of life and it is true to say that water is the single most precious element to sustain life on earth. It is prime requirement for satisfying basic human needs i.e. health, food production, energy and maintenance of regional and global ecosystems. Although 70% of the Earth, is covered by water, only a fraction of that about 2.5%, is freshwater, of which 30% is the groundwater, while the rest is stored in distant glaciers, ice sheets, and mountainous areas – all places that we can hardly access. This leaves less than one per cent of the world's freshwater resources accessible for human use.

The World Bank estimates that worldwide electricity production for coal is 40%, gas 19% and hydro 16%. Pakistan is situated between Arabian Sea and Himalayas, Hindu-kush and Karakoram ranges and has great political, economic and strategic importance. The total primary energy requirements amounted 60 million tons of oil equivalent.

Beside water, energy is a prime mover for human life. Energy can be generated from water without wasting. It is cheaper than any other sources and it fortuity renewable and atmospheric friendly unlikely nuclear and fossil fuels. Pakistan is deficient in oil and gas but God gifted it abundant of water and other energy resources like, coal wind and solar power. Our responsibility is to exploit such resources and optimize their utilization according to our requirements. At the moment we are only producing 37% of electricity from hydro generation.

Pakistan is blessed with ample of fresh but only able to store 13% of the annual flow of its river while India managed 35% of water only from Sutlej –Bias Basin resources. The feasibility studies carried out by Water and Power Development Authority (WAPDA) in Pakistan indentified an accumulative generation capacity of more than 25000 MW. Hydro potential in Pakistan on main rivers is over 100,000 MW with identified site as 55000MW. Sarhad Hydel Development Organization (SHYDO) has identified about 70 sites for small hydropower in northern region of Khyber Pakhtoon Khawa Province with estimated capacity of 280 MW. Identified sites are not on main rivers but on trajectories or connecting canals. Some sites are in advance level of completion and few of the already contribution power to National Grid.

The paper presents the availability of water resources and their use for energy production.

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