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and Environmental Management:
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ICWRE-2013 General Program

Tuesday, April 09th

Opening Remark:

Dr. Nidal Salim, Director and Founder GIWEH- Global Institute for Water Environment and Health.

Introduction:

- **Water, Food, Climate and Energy.** Prof. Szöllözi Nagy, Rector of the UNESCO-IHE Institute for Water Education in Delft- The Netherlands
- **Water Management and Food Security: A Fragile Equation.** Ms. Ann Tutwiler, Special Representative of the Director General to the UN-Geneva and the World Economic Forum, Director FAO Liaison Office
- **Water related technologies: the role of intellectual property, innovation promotion and technology transfer.** Mr. Christian Wichard, Deputy Director General, Global Issues Sector, and World Intellectual Property Organization (WIPO)
- **World Water Forum/2015,** His Excellency Mr. Hyo-sung Park, Ambassador and Deputy Permanent Representative at Korean Mission in Geneva

Session I: Regional Challenges to Water Security

Keynote Speaker: Dr Thomas Fitschen, Ambassador, Deputy Permanent Representative, Permanent Mission of Germany in Geneva.

Panel discussion:

- **The water sector in Morocco - status and strategic vision,** Eng. Mohammad Alaoui, Head of small and medium dams- Directorate of Hydraulic Works, Ministry of Energy, Mines, Water and Environment Morocco.
- **Assessment of institutional and asset-related functions in the urban water sector in Libya,** Dr. Khaled Rashed, University of Tripoli, Department of Civil Engineering Tripoli, Libya.
- **Interférences naturelles et anthropogéniques sur les eaux du lac Fetzara, lac appartenant aux écosystèmes humides,** Ms. Sameh Habes, Université Kasdi Merbah Ouargla, Laboratoire Ressources en Eau & Développement Durable, Algeria.



Session II: Alternative Approaches to Water Security

Keynote Addresses: Coupled Land Use and Hydrological Modelling for Management of Ecosystem Services, Dr. Johannes van der Kwast, UNESCO-IHE, Institute for Water Education, the Netherlands.

Panel discussion:

- **WWF - Water footprint**, Dr. Lifend Li, Director Freshwater Program, (WWF).
- Mr. Kees Van Der Ree, Coordinator Green Jobs Program, International Labour Organization (ILO).
- **An Anthropological Approach to HEPPs in Eastern Anatolia**, Mr. Pervin Yanikkaya Aydemir, Program at Anthropology Department, Yeditepe University, Istanbul, Turkey.
- **The role of Water in shaping the image of rural life in Fadak area- Saudi Arabia**, Dr. Ahmed Alshabban, Department of Geography, Qassim University, Buraydah, Saudia Arabia.

Session III: Wastewater Treatment and Reuse Methods and Concerns

Keynote speech: Hazardous Waste Disposal and Drinking Water Quality, Prof. Walter Wildi, Professor in geology, University of Geneva.

Panel discussion:

- **Application of High Rate Anaerobic Reactor Technology for decentralized wastewater treatment and reuse systems**, Mr. Nanchoz Zimmermann, Autark Engineering AG, Switzerland.
- **Using Treated Wastewater as an Adaptation Measure of Water Scarcity and Climate Change in Gaza Strip**, Dr. Jamal Y. Al-Dadah, Water Authority, Planning Department, Gaza Strip, Palestine.
- **The Feasibility of Water Hyacinth in Treating Wastewater**, Ms. Radwa Bakr, Water Research Institute, Egypt.
- **Synthèse d'un matériau mesoporeux de type mcm41 et son application dans la depollution des eaux usées textiles**, Mr. Abdelhafid Barca, Université des sciences et de la technologie d'Oran Mohamed Boudiaf, Algeria.



Wednesday, April 10th

Session IV (1): New Technologies (Information and Innovation)

Accessing technological information in the area of water related technologies: the role of patent information and WIPO available technical assistance and tools in this area.

Speaker: Ms. Irene Kitsara, Project Officer, Patent Information Section, Access to Information and Knowledge Division, Global Infrastructure Sector, WIPO.

Session IV (2): Innovation promotion and technology transfer of water R&D results and technologies: the role of intellectual property (IP) and WIPO available tools and capacity in this area building

Innovation Division, Innovation and Technology Sector, WIPO.

Speaker: Ms. Olga Spasic, Head, Innovation Structures Section, Innovation Division, Innovation and Technology Sector.

WIPO Green, Global Challenges Division, Global Issues Sector, WIPO.

Speaker: Ms. Yesim Baykal, Senior Program Officer, Climate Change and Food Security, Global Challenges Division, Department for Traditional Knowledge and Global Challenges WIPO.

Session V: Water Governance and Security

Keynote Speaker: L'eau: un élément fédérateur de la coopération transfrontalière, Mr. Charles Stalder, Département de l'intérieur, de la mobilité et de l'environnement, Canton de Genève, Switzerland.

Panel Discussion:

- **Sustainable Development In Iraqi Provinces According To Agenda 21 Indicators**, Assist. Prof. Salah F. A. Sharif, University of Technology, Building and Construction Department, Iraq.
- **Community-Based Water Management: The Oasis of Figiog, Morocco Recenet Extensions and Transformations**, Mrs. Hasnaa El Jamali, Graduate Institute of International and Development Studies, Switzerland.
- **Land Grabbing/ Water Grabbing in Shared Water Basins: The Emergence of New Actors**, Ms. Emel Zerrouk, Kyoto University, Graduate School of Global Environmental Studies, Japan/UK.



- **An Anthropological Approach to HEPPs in Eastern Anatolia**, Ms. Pervin Yanikkaya Aydemir, Program at Anthropology Department, Yeditepe University, Istanbul, Turkey.
- **The long empty canyon: a study of the old/new legal problems of the Nile Basin**, Prof. Shams El Din El Hajjaji, Public Prosecutor, Public Prosecution Bureau- Ministry of Justice, Egypt.



Session VI: Contemporary Water Quality Concerns

Moderator: Prof. John Pote, F.-A, Forel Institute- University of Geneva

Panel discussion:

- **A Modeling Approach Towards Improving Compliance Of Treated Water Quality To Reduce Manpower And Chemicals**, Assist. Prof. Alaa Husaeen Wadie, University of Babylon, Head of Environmental Engineering Department, Iraq.
- **Bacterial Quantification in Sharjah's Home Water Storage Tanks**, Dr. A. Al Amiri, Dr.R. Alkendi, Biology Department, United Arab Emirates University, UAE.
- **Salinity of drinking water and its association with Renal Failure in Gaza Strip Palestine**, Dr. Khalid Qahman, Ministry of Environmental Affairs, Palestine.
- **Biological Treatment of textile Effluent and its reuse in Irrigation: Encouraging Water efficiency and Sustainable Development**, Dr. Senthil Kumar Sadasivam, National College, PG and Research Department of Biotechnology, India.

Session VII: New Technologies: Modelling and Simulation

Keynote Speaker: 3D Groundwater Flow Model for a semi-arid region of Tafilalet Oasis System (South East of Morocco), Prof. Abdelkader Larabi, Ecole Mohammadia, Morocco

Panel discussion:

- **Environmental Impact of Seawater Desalination Plants. Case Study in Algeria**. Prof. Kamal Mohammadi, LEMI, M Bougara University, Algeria.
- **Groundwater Simulation System Study on Physical and Climatic properties on Kuwait Group Aquifer**, Dr. Emad Al Ali, Kuwait Institute for Scientific Research, Kuwait.
- **Feasibility Study of AL-Masab AL-Aam Water Drainage in Thi Qar and Treatment for Irrigation**, Dr. Kadhim Naief Kadhim, College of Engineering, University of Babylon, Iraq.
- **Contribution des systèmes d'informations Géographiques à la gestion des ressources en eau. Cas du complexe aquifère de la plaine de Mascara (Algérie)**, Mr Baghdadi Boukerma, Université des Sciences et de la Technologie d'Oran, Département d'Hydraulique, Algeria.



Thursday, April 11th

Session VII - Roundtable Discussions:

Special Session IX: The Nile Basin

Closing Session: Geneva statement on Water, Food, Energy and Climate Change

Session X: Conclusion and Recommendations

Posters' Session

- **Interactive website with Systems Analysis Environment for Prefeasibility Studies of Small Scale Water and Power Production Units Integrating Renewable Energy**, Mr. Djamel Boudieb, M'hamed Bougara University, Boumerdes, Algeria.
- **The Geomorphological Effects of Urbanization of the city of Karak-Jordan**, Prof. Ali Ananzeh, Director, GNRD in Amman, Jordan.
- **Integration of Renewable Energy to Tala-Oulili Desalination Plant in Algeria. Energy and Exergy Performances Analyses**, Mr. Abdelkader Bouzaine, MESO team, LEMI, M Bougara University, Boumerdès, Algeria.
- **Effect of Alpha-cypermethrin on morphological parameters in tomato plants (*Lycopersicon esculentum* Mill.)**, Mr. Karim Chahid, Laboratoire LAMEC, Faculté des sciences Dhar El Mehraz, Fès, Morocco
- **Modeling and Simulation of Reverse Osmosis system with Renewable Energy**, Mr. Belkacem Absar, Département de Génie des Procédés, Faculté des Sciences et de la Technologie, Université de Mostaganem, Algeria
- **Legal Regulation on Dam Construction on International Rivers: The compliance of Nile Basin upstream States of the Regulations**, Dr. Mosaed Abd ElAtty Shetewy. PhD in International Law, Egypt.
- **Etude de la Contamination par les Eléments Traces Métalliques Plomb (Pb) Et Zinc (Zn) des Sédiments de l'Oued Aissi (Tizi Ouzou, Algérie)**, Ms. Rouibet Boubkeur, Faculté des Sciences Biologiques, Université des Sciences Technologiques Houari Boumediene (U.S.T.H.B), Alger, Algeria.



- **Evaluation des variations climatiques thermiques: cas de Constantine pour la période (1978-2007)**, Ms. Zekri Jihane, Université El Hadj Lekhder Batna, Algeria.



Abstracts

Abstracts are arranged according to the Program presented in this Abstract Book. In each session, abstracts in English go first, abstracts in French go after them.

Session I : Regional Challenges to Water Security

The water sector in Morocco – status and strategic vision

Eng. Mohammad Alaoui

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Abstract

In front of the growing shortage of water, exacerbated by rapid population growth and urbanization, the misallocation of water resources, environmental degradation and mismanagement of water resources, many countries, including Morocco, are facing new challenges that require a new approach to the management of water resources.

Morocco has launched in recent years a vast reform of strategy development and preservation of water resources with the aim to support the country's development without harming the environment.

This presentation aims to give an overview on the state of the water sector in Morocco and future prospects.



Assessment of institutional and asset-related functions in the urban water sector in Libya

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Keywords: *Urban water supply, Institutional functions, Asset-related functions*

Abstract

The total urban water supply in Libya is about 600 Million cubic meter per year, of which more than 90% came from groundwater. Surface water resources are minimal and Libya relies on wells, desalination and transported water for urban water supply. Transported water supply is essentially targeted towards the agricultural sector; however, the share of the urban sector has been increased to cope with increasing demand. This paper focuses on the organization of urban water sector with regards to institutional level and asset level, trying to high light the problems facing urban water sector and proposes solutions. In addition to the newly re-established Water and Wastewater Company, there are six main players in the urban water sector today that duplicate institutional and asset-based functions. Three of them deal with supply side (Desalination Company, Water Authority, and Man-made River Authority) and the other three deal with demand side (Ministry of Utilities, Project Execution Authority, and Environment Authority). Due to lack of quality data certain assessments have been based on preliminary estimates, triangulation of information, feedback from interviews correlated with benchmarks from other countries. After assessing the urban water sector mainly around organizational consideration, one can conclude that in terms of institutional setup there is no clarity around supply/demand decisions. On the asset-related side, water and wastewater operations have been confused by frequent re-organizations. Apart from fragmentation, overstaffing of Water and Wastewater Company is significant, especially in light of the level of service provided to consumers. In order to build a professional urban water sector, in terms of institutional and asset-related levels, clear key functions for both levels have been proposed.



Interférences naturelles et anthropogéniques sur les eaux du lac Fetzara, lac appartenant aux écosystèmes humides

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Keywords : *Ecosystèmes, facteurs naturels et anthropiques, lac, pollution*

Abstract

La conservation des écosystèmes des zones humides est essentielle non seulement pour l'approvisionnement en eau douce mais aussi pour la préservation de la biodiversité et pour assurer des services indispensables pour la santé et le bien-être des populations. C'est le cas du lac Fetzara, qui a été classé Zone Ramsar, donc sa protection s'impose, il s'étend sur une superficie d'environ 18600 ha et il est alimenté soit; par trois affluents: Oued El Hout, Oued El Mellah et Oued Zied, soit par les eaux du ruissellement et les eaux traversant les formations géologiques environnantes. Ces eaux avant leur arrivée au lac, traversent des zones agricoles, industrielles et urbaines, dont les eaux rejetées atteignent le lac sans pré-traitement, lui conférant ainsi une modification de sa composition chimique. Donc, le but de notre travail est de montrer les différentes origines de pollution des eaux du lac Fetzara. D'après l'étude géologique de la région du lac, deux formations géologiques caractérisent la région, l'une métamorphique et l'autre sédimentaire. Et l'étude pédologique nous a permis de faire ressortir quatre classes de sols: les sols peu évolués, les vertisols, les sols hydromorphes et les halomorphes. Sans pour autant oublier, que la région d'étude appartient à un climat de type méditerranéen, caractérisé par deux saisons, l'une chaude et sèche, et l'autre froide et humide. Dans l'étude hydrochimique plusieurs méthodes d'interprétation ont été utilisées, telles que: l'ACP, Diagrammes de Piper, Rapport Sr/Ca sur une période d'analyse allant de 2004 jusqu'au 2010.

La matrice argileuse tapissant le fond du lac va influencer la composition chimique de l'eau, la minéralisation des eaux serait également due: au climat, aux apports dus aux terrains traversés qui sont différents (gneiss, calcaires, sables, marnes), aux industries environnantes et une certaine pollution causée par les rejets urbains des villages limitrophes au lac. En conclusion la minéralisation des eaux du lac Fetzara se trouve modifiée par rapport à deux facteurs importants d'ordre naturel et anthropique.



Session II : Alternative Approaches to Water Security

Coupled Land Use and Hydrological Modelling for Management of Ecosystem Services

Dr. Johannes van der Kwast¹, Seleshi Yalew¹, Chris Dickens², Julia Reinhardt³, Stefan Liersch³, Marloes Mul¹, Masoom Hamdard¹, Wim Douven¹

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Keywords: *Intergrated water resources management, Spatial planning, Land-use modelling, ecosystem services*

Abstract

It is well known that land-use changes influence the hydrological cycle and that those changes in the hydrological cycle influence land use. The sophisticated spatial dynamic planning tools that have been developed in the last decades to support policy makers in the decision making process do not take into account the mutual feedbacks between land use and hydrology. In this study an integrated spatial decision support system is developed where the feedbacks between land use and hydrology are taken into account by coupling the SITE (Simulation of Terrestrial Environments) land-use model to the ACRU hydrological model. This framework enables policy makers to assess the impact of their planning scenarios on ecosystem services using a web-based tool that interactively presents trends in space and time of spatial indicators derived from both models.

This approach is tested for an area located along the northern areas of the Drakensberg Mountains which form the border between Lesotho and South Africa. The region is extremely important for its watershed-services as water derived from it is pumped into the Vaal River supplying water to the city of Johannesburg. Because of poor management of ecosystem services, less water is produced by the catchment more erratically, siltation levels are increasing and less carbon is retained in the soil. Biodiversity is threatened by grazing livestock, alien plants and other poor land management practices. In addition, overstocking, frequent burning and lack of soil protection measures have caused rill and gully erosion in areas of communal ownership where an overall management policy is lacking.

Results show that simulations of land use and hydrology improve by coupling models including mutual feedbacks. It can be concluded that the evaluation of spatio-temporal trends in indicators derived from these models are valuable for the assessment of strategies for the better management of ecosystem services.



An Anthropological Approach to HEPPs in Eastern Anatolia

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Keywords: *Anthropology, water, development, HEPPs, Eastern Anatolia*

Abstract

Both water and development have very important functions in human life. Throughout the history, people have designed and constructed dams, reservoirs and irrigation systems to supply agricultural lands with water as well as converting water into energy as part of development projects. While water resources development projects are mostly preferred as they are cheaper and clean compared to other alternatives, impacts of such projects on people, their livelihoods and nature have been particularly devastating in many parts of the world such as Asia, Africa and Latin America. Recently, with an argument of increasing energy demand and reduction in dependence on imported energy, Turkish government has initiated some sort of "mobilization" for small hydroelectric power plants (HEPPs) to be run by private companies, particularly in the Eastern Anatolia and Black Sea regions. Despite recent initiatives, there is no established water policy in Turkey. Outsourcing control over free-flowing streams out of local representational structures into the hands of private companies has resulted in social movements and protests against these projects. I conducted a fieldwork in one of the valleys in Eastern Anatolia where two HEPPs have been constructed. Methods used during the 8-week fieldwork included participant observation, focus group studies and in-depth interviews. Privatization of the water resource in the Aksu Valley (formerly Salaçor) not only gave the entire control of water to the contractor company for 49 years, but also left all the public services in the valley to the mercy of the company while use of water has been historically well-managed by the local community, who was in control and distribution of the water. This paper discusses outcomes of the HEPP project in daily life of the local people in Aksu Valley, asserting that users of water should have been considered as participants in water management, planning, and decision-making.



The role of Water in shaping the image of rural life in Fadak area-Saudi Arabia

Dr. Ahmed Alshabban

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Keywords: *Rural life, Development, Saudi Arabia*

Abstract

The core of the present paper is to address the visual image of Alhait (formerly Fadak) it represent the images of rural life in both of its natural and human life. Although this image is the result of natural and human conditions , however, our study focused on the role of spring water to be considered a major role in the rural life and its interactions, and its role has weakened because of the drought which behind the deterioration of parts of this rural image. The study takes its importance as it review part of the land with a natural geography unique identity and introduce (the rural image) which suffers a shortage of its geographical studies, and tackles Alhait which according to the researcher's knowledge has not been studied geographically. Moreover, this type of study serves several aspects of rural development, especially planning that should mean to sustainable development and is based on the modernization while maintaining the originality. The problem of the study revolves around the knowledge of the role of these springs to draw the image of the countryside and what are the ways to maintain and progress of this image? The answer of this question serves a number of objectives, the study sought to achieve like: determination of the most prominent natural factors that constitute this image, forms an image of rural life, the impact of springs on Alhait in former and recent times. So, the researcher has used the descriptive approach in this study to describe data (image and data) as take advantage of the method of analysis and comparison in the case of imaging stages of the evolution of the outer appearance. The geographical borders of the study is Alhait which surrounding by a wall 7km. Many recommendations have been concluded from this study i.e: the water springs is the main role which helps to draw the image of rural life i.e. (nature, agriculture, social ... etc) and a set of recommendations were offered about how to maintain the image of rural life and its prosperity, and to work to invest the rural development.



Session III: Wastewater Treatment and Reuse Methods and Concerns

Using Treated Wastewater as an Adaptation Measure of Water Scarcity and Climate Change in Gaza Strip

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Keywords: *Climate change, Gaza aquifer, wastewater reuse, Organic matter, ROTHMASTED.*

Abstract

This paper represented the impact of using treated wastewater for irrigation on soil chemical properties including the content of organic matter and plant growth. Two experiments were carried out in Al- Zaitoun area, and Khan Younis Governorate through ICARDA funded projects in Gaza Strip from May 2010 to September 2012. Wastewater reuse will provide an alternative to groundwater for irrigation when tangible quantities of well treated wastewater can be used for irrigation by year 2015, and about 90 MCM of wastewater will be generated in the year 2020. On the other hand, wastewater reuse in GS could provide a mitigation solution to climate change through the reduction in green house gases by using less energy for wastewater management compared to that for importing water, pumping deep groundwater, and seawater desalination. Wastewater effects on the quality of soil are investigated, comparing the results to similar profiles irrigated with groundwater. Soil organic content (OM) significantly increased with wastewater irrigation application and with increasing the period of application which is attributed directly to the contents of the nutrients and organic compounds in the wastewater applied. The soil OM contents accumulated more in the topsoil in all treatments. OM% tends to decrease after irrigation by well water, while the opposite trend was obtained with irrigation by treated wastewater. This is due to high nutrients result in rich biomass production, showing a benefit to the soil. OM as a mitigation strategy addresses both emissions avoidance and carbon sequestration which achieved by lowering NO₂ emissions (due to lower nitrogen input, and less CO₂ emissions through erosion (due to better soil structure and more plant cover, in addition to lower CO₂ emissions from farming system inputs (pesticides and fertilizers produced using fossil fuel). Soil carbon sequestration is enhanced through long term application of wastewater which promote greater soil organic matter (and thus soil organic carbon) content and improve soil structure to absorb more carbon in the soil, which portrayed numerically by using ROTHMASTED model.



The Feasibility of Water Hyacinth in Treating Wastewater

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Keywords: *Water hyacinth, water quality, drainage water*

Abstract

Water resources in Egypt are becoming scarce. Reuse of agricultural drainage water, returned to the rivers, in irrigation is becoming influential. There is water quality problems related to the disposal of drainage water. The drainage water in Egypt carries numerous point and non-point sources, including sewage effluent, wastewater from industries, agricultural discharges from farmlands. It has become a major requirement to improve the water quality of this polluted drain to re-use for irrigation. Aquatic plants are the most up to date methods to improve the quality of the wastewater. The aim of this paper is to determine the feasibility of *Eichhornia crassipes* (water hyacinth) in treating wastewater. Water hyacinth is very efficient in removing vast range of pollutants, from suspended materials, BOD, nutrients, organic matter to heavy metals and pathogens. It is important to emphasize that water hyacinth has a huge potential for removal the vast range of pollutants from wastewater. In this study, several scenarios were constructed to study the influence of the water hyacinth on the drainage water. These include the self-purification of the drain by selecting a reach has no bending and the role of existence water hyacinth in the study area. Appreciable reduction in biological oxygen demand (BOD) and chemical oxygen demand (COD) was observed in drainage water, but little or no change was observed through other treatment system.



Synthèse d'un matériau mésoporeux de type mcm41 et son application dans la dépollution des eaux usées textiles

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Keywords: *Matériaux mésoporeux, MCM41, adsorption, Colorants organiques, dépollution des eaux*

Abstract

Avec le développement de l'urbanisation et de l'industrialisation, ainsi que l'évolution des modes de consommation, les rejets d'eaux dites "usées" ont considérablement évolué en quantité et en qualité. La pollution des eaux par certains produits chimiques d'origine industrielle (hydrocarbures, phénols, colorants) ou agricole (pesticides, engrais,...) constitue une source de dégradation de l'environnement et suscite à l'heure actuelle un intérêt particulier à l'échelle internationale.

Face à ces problèmes récurrents, de nombreuses recherches ont été mises en œuvre, afin de diminuer le pouvoir polluant (toxicité ou rémanence) des micropolluants et d'autre part afin de traiter les eaux polluées de façon efficace. Aujourd'hui, de nombreuses techniques existent pour traiter les eaux chargées en micropolluants organiques et inorganiques. L'adsorption reste la technique la plus utilisée et parmi les adsorbants les plus utilisés, on peut citer le charbon actif, les résidus agricoles, les argiles, les zéolites. Toutefois, les principaux inconvénients de ces adsorbants sont leur faible capacité d'élimination.

L'objectif de notre travail, a pour objectif la synthèse d'un matériau mésoporeux de type MCM41. Puis sa modification afin d'obtenir une taille de pore plus grande augmentant ainsi la capacité d'élimination. Enfin les matériaux obtenus seront testés pour la dépollution des eaux usées textile (testes d'adsorption sur les colorants anioniques et cationiques).



Session V : Water Governance and Security

Sustainable Development In Iraqi Provinces According To Agenda 21 Indicators

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Keywords : Sustainable, Development, Iraqi, Provinces, Agenda 21

Abstract

Iraq, unlike other countries, has a dramatic social and economic reserves helps to do the ideal sustainable development, according to Agenda 21 indicators, in a standard period. On the other hand humanity stands at a defining moment in history of Iraq. A perpetuation of disparities within the people, a worsening of poverty, hunger some times, ill health and spreaded illiteracy, and the continuing deterioration of the ecosystems on which that people depend for their well-being. However, integration of environment and development concerns and greater attention to them will lead to the fulfillment of basic needs, improved living standards for all, better protected and managed ecosystems and a safer, more prosperous future. This work will focus on the importance of local and international cooperation to implement and speed up the progress toward sustainable development. It will, also, stress the necessity for the governments of each individual to implement new policies, laws and strategies aimed at socially responsible development. An effort has been tried to assess the sustainable development indicators in the Iraqi provinces according to Agenda 21. Through this assessment, the collected data, shows that Iraq have the best convenient conditions to adopt ideal comprehensive sustainable development plan.



Community-Based Water Management: The Oasis of Figuig, Morocco, Recent Extensions and Transformations

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Keywords: *Community, Water Management, Oasis, Common-Pool Resources, IWRM, Free-riding*

Abstract

The Oasis of Figuig, Southeast of Morocco, is an intrinsic case for water management. The oasis is shaped by two water management models: Community management inside the oasis and private initiatives established outside opting for new technologies. The research illustrates the conditions under which people collectively manage the commons and the reasons behind peoples' free-riding. Discourses and theories of the Integrated Water Resources Management approach (IWRM) and Common-Pool Resources (CPR) have been embraced in water management models. However, these discourses reveal shortcomings as they foster equilibrium models for water management. The study demonstrates that both community and private models of water management are relevant, complementary and possibly reinforce each other. The case for "the death of the oasis" is not vindicated by current facts. The present research concludes to the enduring validity and viability of oases as they undergo renewal. Securing their long evolution, however, requires efficient and effective water management. These should focus on correcting the inequalities within community management and effectively monitoring free-riding.



Land Grabbing/ Water Grabbing in Shared Water Basins: The Emergence of New Actors

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Abstract

Land grabbing by foreign governments and international companies is on the rise. Faced by population growth and an ever decreasing availability of useable/affordable land in populace States, many are looking to buy land where it is available, predominantly for agricultural and industrial purposes. But land alone is not sufficient for either of these uses. The availability of useable water resources is also a prerequisite to each land purchase. To buy land is to own its green water and have access to any blue water available to it. The development of hydropower projects, however, endeavours to buy the use of blue water, and must also come with a purchase of the surrounding lands. Thus it can also be seen as a type of water grabbing. Where the locally affected, vulnerable, pre-existing stakeholders are against the project and the loss of livelihood and rights it engenders, a hydropower project may be labelled as a vehicle for water and land grabbing. For an international river, a part of a shared basin, the water grabbing affects stakeholders living under different political regimes and with disparate local power relations. The affects of the projects on both sides of a border may be the same; however the manner in which the two governments handle the effects will be difficult. Here in lies an opportunity for increasing dialogue and equity across the impacted area of the basin. The Case of the Hatgyi Dam development on the Salween River, a joint project between China, Myanmar and Thailand, is an example of the above. As a controversial dam being built on an international, border river, the Hatgyi Dam case study exemplifies many of the issues to be found in similar developments across the developing world.



L'eau: un élément fédérateur de la coopération transfrontalière

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Abstract

Les relations transfrontalières sont multiples et complexes.

Elles s'appuient sur des législations différentes. A Genève comme en France voisine, il a fallu faire preuve d'adaptabilité, en adoptant un outil français comme le contrat de rivière, ou genevois comme le schéma de protection, d'aménagement et de gestion des eaux (SPAGE) pour appréhender les cours d'eau véritablement au niveau du bassin versant au-delà des frontières.

Les partenariats font intervenir des collectivités aux pouvoirs très différents qu'il s'agisse d'aménagement du territoire ou de ressources financières.

Et plus que tout autre chose, il a fallu faire évoluer les mentalités, de part comme de l'autre de la frontière.

Le dynamisme de la région, qu'il s'agisse de population, d'urbanisation, d'emplois ou de mobilité nous poussent à repenser aujourd'hui les partenariats, à adapter les processus, à chercher de nouveaux outils pour poursuivre les collaborations transfrontalières dans le cadre du projet d'agglomération franco-valdo-genevois. Sans cela, les problèmes s'aggraveront avec le développement de l'urbanisation.

La solution du partage équitable de l'eau est plus que jamais d'actualité. Il s'agit de mettre en place une politique globale et une gestion durable de l'eau qui soient coordonnées au développement territorial. Cela implique de :

- Prendre en compte systématiquement la problématique de l'eau dans les outils de planification de l'aménagement du territoire;
- Pérenniser l'utilisation des outils opérationnels de gestion des eaux (schéma d'aménagement et de gestion des eaux (SAGE) et SPAGE).
- Faire vivre cette communauté transfrontalière de l'eau dont le protocole d'accord vient d'être signé en décembre 2012.



Session VI: Contemporary Water Quality Concerns

A Modeling Approach Towards Improving Compliance Of Treated Water Quality To Reduce Manpower And Chemicals

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Keywords: *Coagulation, Feed forward, Model, Turbidity*

Abstract

This paper discusses investigations into the application of feed forward control on the clarification process of a small-scale pilot plant. The application is aimed towards maximizing the efficiency of the chemical coagulation process. To achieve this, a simple computer program written in Visual Basic version 6 models to a chief the process operating conditions. Mathematical models based on historical plant data covering 18 months were analysis by stepwise multiple regression analysis. The following parameters were important determinants of coagulant dose and pH control reagents: river turbidity, pH, temperature, total dissolved solids, and plant flowrate. A predictive equation was developed from the data, of the form:

$$\text{Al}_2(\text{SO}_4)_3(\text{mg/L}) = a*Q + b*\text{Turb} + c*\text{TDS} + d*\text{pH} + e*\text{Temp} + f$$

The aim of this model is to provide water treatment operators with a tool that enables prediction of chemical reagents and treatment conditions for selected removal of turbidity, based on raw water quality data. The advantages of software program are significant in the water treatment plant operation. The program was designed as an aid, so the user can still customize and optimize the computer suggested design. Users are able to move forward in adjusting or optimizing the design in minutes, which is difficult for manual system. This system was an initial system, many new features and functions are to be added to the program to enhance the functions and make it commercially robust. It was concluded that this system is very powerful tool in improving compliance of treated water quality to reduce manpower and chemicals. This is the underlying concept behind the development of this work and to facilitate the organizations and individuals with better understanding on how their actions can have a direct impact on the treatment.



Bacterial Quantification in Sharjah's Home Water Storage Tanks

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Keywords: *Microbiological, quality, Total bacterial count, total coliform, fecal coliform, E.coli, Membrane filtration, storage tanks, water*

Abstract

Maintenance of the microbiological quality of water has been used as an important means of preventing waterborne disease. The household water storage tanks lack regular maintenance and may remain years without cleaning and/or disinfection. Therefore, the quality of water may get affected overtime which may pose a health risk to household members. The objective of this research is the examination of the microbial quality of water storage tanks by using Membrane Filter Technique. This paper reviews microbial standards for Total bacteria, Coliform bacteria, and Escherichia coli in the water storage tanks available in different homes in Sharjah by using Membrane Filtration (MF) method. The MF method decides on the presence or absence of bacteria within 24 hours. Twenty two samples of water were collected from both tank levels (ground and roof top) located in each household. The results showed that all of the tested samples were free from E.coli bacteria which indicate no fecal contamination. However, more than half of the samples collected for this study (72.7%) showed higher Total Bacterial Count (>10CFU/100ml). Exceeding the standard level is not an indicator of pathogenesis unless otherwise analyzed for bacterial identification. Also, the presence of total coliform which generally does not imply an imminent health risk but does require an analysis of all water systems facilities and their operation to determine how these organisms entered the water system. In addition, this result implies that there might be other contaminants present in the water coming from the same route as total coliform bacteria.



Salinity of drinking water and its association with Renal Failure in Gaza Strip Palestine

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Keywords: *Gaza aquifer, Groundwater, Drinking water quality, Salinity, Renal Failure*

Abstract

The environment in Gaza Strip suffers considerable strain. Groundwater is the only source of water in Gaza Strip including the southern part of Gaza Strip; more than 90% of the population is connected to municipal ground water wells. Water salinity is a major problem which threatens ground water in the southern part of Gaza strip. There are two sources of water in the southern part of Gaza Strip; the municipal wells are currently used for all domestic purposes, and the Israeli Water Company (Makorot) which serves the eastern villages in Khanyounes governorates. The overall water quality of the Makorot source is acceptable compared with WHO guidelines. The overall aim of the study was to determine, salinity of drinking water and its association with renal failure in the southern part in Gaza Strip. Another aim was to explore the relationship between renal failure and socio-economic demographic variables. Descriptive, analytic design was used with survey sample for renal failure patients. Face to face questionnaire for renal failure patients were developed. The sample size for patients was 194 subjects, with response rate 70%. It was proportional with respect to its size. Reliability was approved by Cronbach alpha test, and validity were approved by content and face validity method. Analysis of the quantitative extracted four domains that reflected subjects perception for drinking water salinity level in their localities. All water chemical tests of the southern municipal domestic wells have been reviewed since 1987. The tests were fluoride, chloride, nitrate, TDS, and sodium levels in all groundwater wells, which reveal a general trend of increasing from north to south in the southern part. The results show that only 8% of the municipal wells meet the WHO drinking standards in chloride level. Chloride, nitrate, TDS, fluoride and sodium concentration exceed 2-9 times the WHO standards in 92% of the southern wells. The study findings showed that there was no association between renal failure prevalence and chloride level, sodium level, TDS level and nitrate level and showed only association with fluoride level, there was strong and positive association. So there is an urgent need to modify the mixing process according to fluoride level, and initiate public information and awareness programs.



Biological Treatment of textile Effluent and its reuse in Irrigation: Encouraging Water efficiency and Sustainable Development

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Keywords: *Azo dye, Disperse red F3B, Decolourization, Biodegradation, Bacillus subtilis, AOP, Horse radish peroxidase, H₂O₂*

Abstract

Reactive azo dyes, such as the Disperse Red F3B are frequently used in textile industries. Reactive dyes have a low utilization degree compared to other types of dyestuff, since the functional group of the dye also binds to water creating hydrolysis. It is imperative to remove the colour from the waste water before disposal. The present study is an attempt to achieve complete decolourization and degradation of azo dye disperse red F3B by a two-stage treatment process, involving microbial cells and advanced oxidation process (AOP). In the first step, the dye disperse red F3B was decolourized using a novel bacterial isolate and the decolourization of up to 88% was achieved in 48 h under optimal conditions such as pH 7, 37°C, non-static (shaking-120 rpm) conditions and with the dye conc. of 100 mg l⁻¹. The bacterial isolate was subjected to 16srDBA sequencing and was identified to be *Bacillus subtilis* species. In the second stage of treatment, the biologically decolourized dye was subjected to advanced oxidation process involving H₂O₂ and horse radish peroxidase. In which, a decolourization of up to 99% was achieved and the investigation into its spectrophotometric and chromatographic (TLC and HPTLC) characteristics revealed the degradation of disperse red F3B involving molecular rearrangement. The dye has undergone a total and radical colour change to become like that of water. Toxicity of the decolourized water is yet to be analyzed to evaluate the microbial and AOP-treated dye to be let in to the environment or water bodies.



Session VII: New Technologies: Modelling and Simulation

3D Groundwater Flow Model for a semi-arid region of Tafilalet Oasis System (South East of Morocco)

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Keywords : *Plain of Tafilalet, Oasis, Arid, Groundwater, Agriculture, Three-dimensional model, Calibration*

Abstract

The plain of Tafilalet contains an important oasis located in the Southeast of Morocco in a pre-Saharan area, characterized by an arid climate with a large deficit water budget. It has a behavior of a large depression resulting from erosion of a set of geological coverage during the Quaternary period. It also forms a small Mesopotamia crossed by two main rivers from the mountains of the High Atlas: Ziz and Rheris. The oasis of Tafilalet is an area of old traditions irrigation where agriculture is the main activity of the region that represents approximately 37% of the total area (637 km²). Agricultural land and date palms are recovering the center of the plain and forming the largest palm grove in the Maghreb. The area is irrigated mainly by 82% of the surface waters dropped by the Hassan Addakhil dam reservoir into the Ziz river bed, located at 26 km north of the plain. Other part of the oasis is also irrigated to 18% by the diversion small dams flood located on the Rheris wadi, but these contributions are very irregular and random, from 0 to 6 times per year, and at short-term. The water situation of Tafilalet is fairly precarious, although in a normal year the water resources from Hassan Addakhil do not cover the totality of its need (about 90M m³/year). Indeed, for 56% of time series (1971-2008) the endowments are lower than the average (49M m³/year), and can even be zero in case of prolonged drought such as the periods of 1982/85 and 2000/02.

Under these conditions, groundwater is therefore playing an important role to satisfy the water demand in the Tafilalet plain. Groundwater is exploited by artificial traditional drains called 'khattaras', traditional wells and pumping stations that provide a total extracted groundwater volume estimated to 35 Mm³/year. Surface water is well controlled and managed for a long time by large dam reservoir and the small dams of deviation of floods, however groundwater in the Tafilalet plain is less controlled and exploited in a personal way on all the area of the plain.

In this study, a three-dimensional model of groundwater flow was developed for the aquifer system of Tafilalet, to assist the decision makers as a "management tool" in order to assess alternative schemes for development and exploitation of groundwater resources in the Tafilalet plain, using Modflow2000 code. It is the first mathematical model performed for this oasis plain, taking into account the most possible real hydrogeological conditions and using the geographical information system (GIS) for the organization and treatment of data and applying a multidisciplinary approach combining geostatistical and hydrogeological modeling.



The conceptual model, in terms of hydrogeological modeling was therefore considered as a monolayer model and the aquifer system is mainly heterogeneous with lateral different hydraulic conductivities, which are ranging from 3.10^{-7} to 5.10^{-2} m/s, but most of them are

located between 2.10^{-4} and 8.10^{-3} m/s. The results of the model calibration under steady state (1960) and transient state conditions, starting from this time, show reasonable agreement between observed and simulated water levels for the observation wells. After calibration, the model contributed to better groundwater characterization, the hydrodynamic parameters obtained from the model are much representative of reality. As a management tool, this model can help the manager to take exploitation measures by applying future alternative future schemes of exploitation of the aquifer system in conjunction with surface water.

The results from this numerical investigation of the Tafilalet unconfined aquifer shows that: (1) the groundwater regime appears to be closely linked to atmospheric and hydrological conditions (Zizand Rheris wadis) as well as to the periods of irrigation; (2) The number of fluctuations and their amplitude vary significantly according to the years and more than the season, especially after the Hassan Addakhil dam reservoir design in 1971, and these are very noticed in the irrigated areas than in the rest of the plain; (3) About 88% of the most water exchangers are vertically between the water table and the surface; (4). The idea of lowering water table by pumping wells is not exactly true, as well the development of groundwater abstraction has not prevented the wound of water table in 2011, the pumping wells accompanied more than it triggers the lowering of water table and it is mainly the succession of dry periods causing the decreases of the piezometric level. This situation confirms the important role of groundwater is playing as " buffer " during drought periods.



Environmental Impact of Seawater Desalination Plants. Case Study in Algeria

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Keywords: *Desalination, Environment*

Abstract

Water shortages, whether cyclical or structural, are a fact known to worsen in the future, while nearly one billion people still lack access to safe drinking water and demand on resources exceeds the renewable supply. In the EUMENA, irregular and declining rainfall situation combined to the rapidly increasing needs for irrigation, industry and the population incompressible needs pushed authorities to mobilize more groundwater and surface resources and use water desalination. Desalination is nevertheless a potential threat to the environment by inducing damage to the environment. The research devoted to the assessment of impacts of desalination on the flora and fauna are so far limited. We present a case study on the environmental impacts of Cap Djinet (Algeria) seawater desalination plant. These impacts are mainly due to brine discharge but also to a lesser degree the chemicals used in the cleaning of various modules, thermal pollution, etc.. We perform the measurement of four parameters (temperature, pH, salinity and conductivity) and a numerical simulation to visualize the effects of rejection. Measurements of temperature and pH are compliant Algerian liquid discharges indicated in the legislative knowing that there are no limits imposed on the conductivity and salinity. Overall there is no impact even if there is a local minimal impact due to the relatively small size of the resort of Cap Djinet (500 m³/day). We propose to extend this study to the desalination reverse osmosis 200,000 m³/day of Hama (Algiers), then the entire Algerian coast (1600 km) and initiate an initiative across the western basin Mediterranean.



Groundwater Simulation System Study on Physical and Climatic properties on Kuwait Group Aquifer

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Keywords: *Groundwater, Treated wastewater, Reverse osmosis, Total power consumption*

Abstract

Water scarcity is the predominant issue in the arid and semi arid countries. In particular, most Middle East countries and the Gulf Cooperation Council (GCC) countries), in particular, are characterized by extremely arid climate and limited surface water supplies. The major water resource for these countries is groundwater (91%) and desalination of seawater (7.2%). The lack of freshwater resources in these regions constitutes a major deterrent to their sustainable development. A conceptual design system was developed to address the problem of water scarcity and sustainability in general, and specifically to represent the Kuwaiti water quality and quantity limitation problem. The conceptual design system consists primarily of utilizing brackish groundwater in conjunction with treated wastewater augmentation and a reverse osmosis unit for plant production. To test the sensitivity and the durability of the conceptual design system, Visual basic, lump, model simulation approach was simulated for different ranges of hydrologic, hydrogeologic, and climatic parameters to determine the total power and treated wastewater consumption. From the simulation study results, the increase in evapotranspiration had the highest increase effect on the system total power consumption per unit area and the highest increase effect on the treated wastewater consumption per unit area. On the other hand, the increase in the aquifer porosity had the least increase effect on both the total power consumption and the treated wastewater consumption by the system. In contrast, the hydraulic conductivity increase had no direct effect on either the total power consumption or on the treated wastewater consumption per unit area.



Feasibility Study of AL-Masab AL-A'm in Thi Qar and its Treatment for Irrigation Purposes

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Keywords: *Feasibility Study, Al-Meseb Al-A'm, Treatment, Irrigation Purposes*

Abstract

This study is concerned with assessing suitability of drainage water of AL-Masab AL-Aam for irrigation with or without treatment. The chemical and physical properties of drainage water and the nearest rivers water was studied, Included study the water of Al Gharraf river in the AL-Fajr city northern of Nassiriyah , And the water of Euphrates river southern of Nassiriyah.

The strategy adopted for treatment drainage water it's the blending strategy with fresh water of nearest river. Water samples were monthly taken from four locations, Two from drainages water and Two from rivers over the period from June 2011, to July 2012. These 48 samples were physically and chemically analyzed for EC, TDS, PH, Ca⁺⁺, Mg⁺⁺, Na⁺ , K⁺ , Cl⁻, SO₄, NO₃, Turb., PO₄ and T.H. It is concluded that the Sodium Adsorption Ratio (SAR) for drainage water its less than 12 and this value its acceptable for irrigation. In case of salinity the drainage water of AL-Masab AL-Aam its acceptable for irrigate the halophytes were the electrical conductivity (EC) its less than 8000 Micro Siemens/cm . The blending between the drainage water and the fresh water of Al Gharraf river showed that the blending ratio (R7) result good water for irrigation where the (EC) its less than 3000 Micro Siemense/cm.



Contribution des systèmes d'informations Géographiques à la gestion des ressources en eau. Cas du complexe aquifère de la plaine de Mascara (Algérie)

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Keywords : *Gestion, Ressources, Eau, SIG, Mascara*

Abstract

L'utilité d'un système d'informations géographiques (SIG) n'est plus à démontrer, particulièrement dans le domaine des sciences de l'eau. Aussi les différents acteurs cherchent-ils à gérer et préserver la ressource en eau, à l'aide de techniques modernes et fiables.

Dans cette optique, On propose la mise en place d'un système d'informations géographiques lequel devrait prendre en charge toutes les informations (hydrogéologiques et autres) concernant le complexe aquifère de la plaine de Mascara (Ouest Algérien).

La dite plaine confine une ressource en eau souterraine très exploitée pour les besoins de l'irrigation et de la population locale.

Cependant, cette ressource est souvent menacée quant à sa qualité et sa quantité. La dégradation de la qualité de l'eau provient des rejets des eaux domestiques non épurées, des rejets industriels et de l'utilisation irrationnelle d'engrais et de pesticides dans l'agriculture. La diminution des réserves s'explique par le fait d'une surexploitation intensive et des pompages illicites. Ces deux aspects de dégradation de la ressource en eau souterraine, constituent une problématique environnementale préoccupante.

Diverses études ayant trait aux ressources en eau de la plaine de Mascara, ont généré une masse d'informations très importante. Dans la plupart des cas, ces données sont disparates et se trouvent consignées dans des documents papiers, difficilement exploitables.

L'utilisateur se trouve ainsi confronté à la gestion de ces informations, lesquelles nécessitent un type d'organisation, de stockage, de disponibilité et d'analyse.

Ainsi fallait-il organiser ces informations par la mise en place d'un système d'informations géographiques (SIG).

Ce système constituera un outil efficace d'aide à la décision en ce qui concerne la gestion, l'exploitation et la protection des ressources d'eau.



Special session IX: the Nile Basin

The long empty canyon: a study of the old/new legal problems of the Nile Basin

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Abstract

The Nile River Basin witnesses a long history of tension and negotiation among riparian states. There are two legal frameworks govern the Nile Basin. Firstly, the private legal framework reflected in legal history on the Nile. The most legal active period among Nile Basin states was the period between 1890th and 1930th. The legal solutions to the Nile Basin problems came to an end with the end of the colonization in Africa, especially the Nile riparian states. During this period, the tension among liberal states took a different shape. Harmon and Nyerere doctrine were introduced among the riparian states. This led to the refutation of most of the private legal framework from most of the independent states. Thus, riparian states started to explore new legal ground to regulate their relationship. On the other hand, the public legal framework represented in the work of the International Law Association, which started with Helsinki rules in 1966, and the 1997 UN Convention. Many scholars argue that the legal solution is the best one for the Nile question, based on the previous frameworks. However, this note argued that the international legal framework governing the international rivers generally and the Nile specifically cannot offer a solution to the disputes over the water of the Nile. This note discusses both the private legal framework and the public legal framework to the Nile on one hand. On the other hand, it highlights the points of indeterminacy of both frameworks to solve the Nile dilemma. It argues that the solutions of the present and future disputes through legal tools are not enough. The legal dilemma of the Nile concentrated in the absence of common agreement between the Basin States. This note goes beyond the most proposed recommendation to form a comprehensive treaty as the solution to the riparian problems. It asserts that the law is not a tool to end the states tension, rather than it is a tool to persevere good faith and prevent future dispute. A main role of the extra-legal solutions must be played. It based its argument on substantive and formulate dilemma in the previous frameworks!



Posters' Session

Interactive website with Systems Analysis Environment for Prefeasibility Studies of Small Scale Water and Power Production Units Integrating Renewable Energy

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Keywords: *Desalination, renewable energy, co-generation, performance, systems analysis*

Abstract

Most Middle East and Northern Africa (MENA) countries are facing growing problems of water supply. Impressive efforts are dedicated to the implementation of large scale equipment with well proven cost-effective technologies for central sea water desalination at coastal sites or brackish water desalination near inland cities. However there are many technically neglected places remote from the countries' centres of water and power production. EU is co-operating with scientists in MENA countries in the development of the systems analysis environment (SAE) RESYSproDESAL for the prediction of technical, economic and ecological performance of water and power point systems including desalination (e.g. membrane and thermal processes), renewable energy sources for power (e.g. wind energy and photovoltaics) and conventional power supply (e.g. Diesel GenSet). Therefore European experts in small and medium scale desalination and hybrid power generation from conventional and renewable energy sources are developing engineering methods for Integrated Water and Power Point (IWPP) systems, characterised by flexible design, fast implementation, energy efficiency and low emissions. The SAE is applied to a small scale container system for 10m³/day seawater reverse osmosis desalination powered from Diesel and photovoltaics. Starting from a reference design case three alternative configurations and size are developed and analysed for comparison. Starting from a reference design case three alternative configurations and size are developed and analysed for comparison.

Results show a considerable potential for economic improvement of the plant concept, bringing the project closer to affordability for the target population: Optimised Diesel and batteriesizes reduce levelised water cost by about 15%. Up-sizing the whole system from 10 to 50m³/d and power recovery reduce specific power consumption by about 45% and integration of water production with village power supply may meet user needs better and increase reliability of back-up.



Integration of Renewable Energy to Tala-Oulili Desalination Plant in Algeria. Energy and Exergy Performances Analyses

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Keywords: *Desalination, Renewable Energy, Reverse Osmosis*

Abstract

This work focuses on the study of the integration of renewable energies for the simultaneous sustainable production of water and energy for the desalination plant Tala Oulili in Algeria. The exergy performances analysis has revealed the most destructive components of exergy (52.99% in membranes, 24.95% in pumps, 16.4% in the decanter, mixing chamber 3.08% and expansion valve 2.38% of the total exergy). These results provide key guidance points to design and optimize the installation. The exergy destroyed in the expansion valve can be recovered by replacing the expansion valve with a pressure exchanger (PX) which allows recovering up to 90% of the exergy lost in this component. Installing more efficient pumps and membranes will also reduce these losses.

The proposed alternative hybrid renewable energy system (PV, wind turbine, hydraulic turbine, diesel genset and batteries) is integrated to the Desalination plant and optimized using HOMER software. Exergy analysis of the hybrid system shows that the hydraulic turbine seems more appropriate for this site, with an efficiency of 76.82%. It is therefore technically advisable, to consider the increase of hydropower installed capacity in order to optimize the production of energy as much as the brackish water will be used in the desalination station.



Effect of Alpha-cypermethrin on morphological parameters in tomato plants (*Lycopersicon esculentum* Mill.)

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Keywords : *Insecticides, Tomato, Seed germination, Plant growth*

Abstract

Devastating insects are responsible of losses in quantity and quality of agricultural production. To overcome this problem, farmers use pesticides, obtained by chemical synthesis and representing the major cause of agricultural contamination of soil and groundwater. Thus, pesticides may present important risks because of their persistence, biodisponibility and mobility, in spite of their correct application. In our research, we study the effect of alpha-cypermethrin (pyrethroids class), largely used in tomato (*Lycopersicon esculentum* Mill.) treatment in the Northern area of Morocco. The effect of alpha-cypermethrin on seeds germination and seedlings growth of tomato has been studied based on morphological parameters and by using four dilutions of the normal concentration used in agriculture (100%, 75%, 50%, 25%) for germinating seeds, and only the recommended concentration in agriculture for growing plants. Our results show that alpha-cypermethrin induced a delay of germination and growth process. The germination rate of treated seeds was generally 20% lower compared to control, and the length of roots and shoots in treated seeds and plantlets was significantly reduced.



Modeling and Simulation of Reverse Osmosis system with Renewable Energy

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Keywords: *Reverse osmosis, Orthogonal collocation, Finite element method, Wind energy, Weibull*

Abstract

The objective of this work is to study the possibility of substituting conventional electrical energy by a renewable energy such as wind energy. For that purpose, the meteorological data of some coastal regions of Algeria are studied to determine their wind potential.

Two mathematical models are developed to describe the operation of reverse osmosis modules. The two most used modes of circulations are studied: co-current and counter-current circulation modes. The resolution of the mathematical models developed for the counter-current flow pattern is subjected to the split boundary value problem. To solve this problem, a robust and efficient procedure based on orthogonal collocation on finite element method was developed.

Two checkings of both developed mathematical models, with their variants (with and without polarization concentration phenomenon), were carried out. The first checking was done with a real case which is the sea water desalination plant of Bousfer, Oran, situated in the west of Algeria. The second checking was carried out with previous work using reverse osmosis in a closed loop (concentration system). The results obtained in both cases show a good adequacy between the values obtained by both developed mathematical models and real ones.

The second part of this work was the assessment of wind resources of coastal areas for the study of a possible substitution of the electrical energy, produced by power plants, by electrical energy produced by wind turbines.

Statistical analysis begins with the study of time variation of wind speeds in the monthly, annual and multiannual scale. It is followed by the determination of the parameters of Weibull distribution. For that purpose, two methods were used: linear and non-linear regression. The Weibull distribution parameters enabled the calculation of the available specific powers at the level of every studied site.



Etude de la Contamination par les Eléments Traces Métalliques Plomb (Pb) Et Zinc (Zn) des Sédiments de l'Oued Aissi (Tizi Ouzou, Algérie)

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Keywords : *Oued, Sédiments, Eléments traces métalliques, Pollution*

Abstract

La pollution des eaux par les métaux est un problème d'actualité qui nécessite une prise en charge pour la protection des écosystèmes aquatiques. Les sédiments sont une composante fondamentale de ces écosystèmes et contribuent à leur diversité et à leur fonctionnement. Ils jouent un rôle de puits et peuvent stocker des quantités importantes de contaminants (métalliques et autres).

L'objectif de la présente étude est d'évaluer le niveau de contamination par les éléments traces métalliques plomb (Pb) et zinc (Zn) des sédiments de l'Oued Aissi et ses affluents. Les sédiments superficiels ont été prélevés, en quatre campagnes de Mai 2008 à Février 2009, dans 21 stations choisies de l'amont en aval des cours d'eau. Les métaux ont été évalués dans la fraction inférieure à 45µm et dosés par Spectrophotométrie d'Absorption Atomique à flamme.

Les teneurs moyennes en mg/kg ms des métaux dosés sont de $35,2 \pm 13,3$ pour le Pb, et 123 ± 65 pour le Zn. Par analogie à la moyenne de fond géochimique mondiale (40 mg/kg ms pour le Pb et 240 mg/kg ms pour le Zn), la première teneur est similaire à celle-ci alors que la deuxième est largement en dessous de cette moyenne. Les variations temporelles des teneurs en Pb et Zn des sédiments de l'oued Aissi révèlent des variations saisonnières importantes avec des teneurs élevées au printemps pour le Pb et en été pour Zn.

Le Pb et le Zn ont souvent une origine commune qui est due à l'action anthropique par les différents rejets domestiques et industriels. La fréquence du Zn pourrait être aussi attribuée à la nature de la roche mère (abondance des argiles).



Evaluation des variations climatiques thermiques: cas de Constantine pour la période (1978-2007)

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Keywords : *Changements climatiques, Vagues de chaleur, Etage climatique, Est Algerien*

Abstract

L'Algérie est sous l'influence du climat méditerranéen, il fait partie des zones arides à semi arides qui sont vulnérables aux changements climatiques. Dans cette optique, on peut s'interroger sur les modifications climatiques éventuelles qui pourraient être introduites; quels seront les nouveaux régimes de température, les nouvelles répartitions annuelles des températures. On a choisi la région de Constantine (situé dans le Nord-Est Algérien) parce qu'elle est soumise à la double influence d'un régime méditerranéen donnant un climat tempéré au Nord et à un degré moindre à un régime subtropical au Sud.

Nous proposons de calculer et d'analyser le nombre ainsi que les durées des vagues de chaleurs. D'après nos résultats, on peut dire que parmi 29 ans quatre années ont connus des vagues de chaleur avec des intensités exceptionnelles et même mortelles, ce qui nous permet de supposer que les vagues de chaleur seront plus fréquentes à l'avenir. L'été le plus chaud a été celui de 1999, suivi de l'année 2003, le plus froid a été celui de 2001, L'analyse détaillée de l'année 1999 montre que le cycle présente des pics importants, et aussi d'après les résultats obtenus sur le spectre thermique ,cette année réputée froide de l'hiver et par contre considérée comme la plus chaude des 10 dernières années, le mois de juillet est considéré comme un mois caniculaire et les onze dernières années figurent parmi les années les plus chaudes depuis 50 ans. Aussi on constate que le réchauffement s'est ainsi considérablement accéléré pour atteindre des hausses alarmantes de 0.9°C par décennie au niveau annuel et 0.5°C au niveau saisonnier plus particulièrement durant la saison estivale sur une période de 30 ans ! La comparaison du Q2 de la zone d'étude de la période de Seltzer (1913-1938) et celles de la période récente (1978-2007) montre un déplacement de la station de Constantine du subhumide vers le semi-aride.



Off Sessions' Abstracts

In this part of the Abstract Book, the abstracts of those authors who had applied for participation in the ICWRE-2013 but could not come to Geneva because of different reasons or withdraw their participation are collected. The abstracts are presented in the alphabetic order of the abstracts' titles.

An Evaluation of Samarra City Drinking Water Treatment Plants

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²M.Sc. Environmental Engineering

Keywords: *Treatment plant, Turbidity, Samarra City, Raw water, Filtered water*

Abstract

The necessity calls for a comprehensive study to evaluate the drinking water quality in Samarra City in Iraq. The research started from December, 2004 to May, 2005. The work was included the evaluation of performance of treatment plants of Samarra city (conventional water treatment plant and compact unit). The studied parameters were (turbidity, temperature, total dissolved solids (TDS), and pH) for stages of treatment plants.

The results show low clarifiers turbidity removal efficiencies of (48.323%) and (32.09%) for treatment plant and compact unit respectively, and filters removal efficiencies of (63.2%) and (39.05%) respectively. The monthly average turbidity of supplied water for conventional water treatment plant and compact unit were (4.3 and 18.2) NTU, the percent of violation to Iraqi specifications were (29.4% and 64.7%) respectively.

Effect of treatment stages on other parameters (temperature, TDS, pH) was also insignificant. Doses of chlorine in both treatment plants were low and interrupted.



Benefits distribution pattern of a WatSan program

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Keywords: *Water, Sanitation, Health, Poverty, Empowerment*

Abstract

Largely, the water and sanitation programs do help alleviate poverty, but whether these programs distribute the benefits equally among the households having varying wealth status has been a big question mark. Hence, the objectives of the study was to determine the impact of a water and sanitation program on households having different wealth status in alleviating poverty through: a) reducing their medication cost; b) enhancing income generating opportunities; c) improving education, health, gender equity and empowerment of the households. Also, the research was intended to know about the perceptions of the beneficiary households about these benefits if they really perceive them as a help towards escaping from the vicious circle of poverty and empowering the excluded?

For the study, 48 households in six villages were selected. Methodology for selecting villages and households was based on wealth ranking exercise. For the field study, a questionnaire was prepared with the intention of using it for the semi-structured interviews with the men and women of the selected households.

The findings of the study revealed that the target households are drawing multiple benefits from the program interventions. In addition to attaining the goal of the program, i.e., "improving the quality of life through reducing the diarrhoeal incidences in the target population," the program has an appreciable impact on poverty reduction. The program interventions have empowered the beneficiary households through involving them in all phases of the program. However, the degree of empowerment varies significantly and corresponds to the degree of well being. By and large, the richer households have control over the program issues. Due to the poorer households' low rate of literacy, less exposure to outside, and incapability to handle issues; they are excluded from active participation in the program. Therefore, these households did not see any significant change in their household empowerment.



Calibration of System Input Volume and Non-Revenue Water Index in Edo North, Nigeria

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Keywords: *Physical loss, Apparent loss, Water Reduction, Revenue, Index, Available Water, Leakage*

Abstract

Water scarcity is a serious problem in developing world. It could be physical scarcity or economic water shortage. The output of physics-based study conducted in Edo North, Nigeria revealed that physical water losses in the water distribution network have compounded the accessibility and affordability of safe drinking water. Water supply and loss variables such as Water Supply (WS), Physical Water Loss (WLP), Apparent Water Loss (WLE), Water Loss Reduction Index (WLRI) and Available Water (AW) were mathematically modeled to produce realistic and efficient water loss management and improve water revenue. The result of the modeling iterations show that the average physical and apparent losses of 4,000m³ and 2,700m³ of (WLP) and (WLE) correspond to 13,200m³, 6,400m³ and 0.5 of WS/SIV, AW And WLRI in 2007. Strong indication exists between the Water Loss Reduction Index (WLRI) for both physical and apparent losses with the coefficient of determination R₂=0.83 and 0.99 respectively. This relationship shows that more water is being lost through real loss with average total of 59.2% and 40.8% of apparent losses. However, a reduction of Total Non-Revenue Water (TNRW) from 50.7% to 10.6% was recorded between 2007 to 2011. This reduction led to a total increase of 4,400m³ of Revenue Water, decrease in Non-Revenue Water reduction cost from 36% in 2007 to 7% in 2011 and saving of US\$17,400 which could be used to provide health facility for malaria treatment for 14,500 people on daily basis. Water efficiency, and particularly drinking water loss, is a serious issue which has significant financial and economic depression; awareness in this respect is totally unrecognized by both individual and governmental sector. Generally, long-term strategies towards the reduction of water losses should continue to be sustained by Edo State government, donor agencies and some private sectors in the area of water supply in order to support the fulfillment of the Millennium Development Goals, control of leakage and water losses.



Effect of fertilizer treatments on soil chemical properties and crop yields in mine affected watershed

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Keywords: *Reclamation, Mines, Yield, Pot experiment, Fertilizer levels*

Abstract

Coal mining is an economic activity which degrades top soil quality and adversely affects the crop production of an area. The reclamation of top soil is therefore very essential part of mine area development. The present study was carried out to evaluate the effect of different fertilizer treatment combinations on amendment in soil and response to crop production in a mine affected watershed of Jharkhand state in India. Soil sample from 20 locations were collected from study area and analyzed for pH, EC, Available Macronutrients (N, P and K), Available Micronutrients (Cu, Zn, Fe, Mn) and heavy metals (Ni, Cu, As, Pb). The result of analysis shows that the soil in mine area was moderately acidic and deficient in organic carbon, macronutrients and some micronutrients. A pot experiment was conducted to analyze the effect of different inorganic and organic fertilizer treatments on soil chemical properties, crop yield and growth in a Maize-cowpea-paddy cropping system. A randomized complete block design was employed with seven treatments and four replicates per treatment. The treatments were: T1-Control, T2-Lime at 0.5T/ha, T3-Chemical fertilizer at 100% recommended dose of N, P, K (CF₁₀₀), T4-Organic matter at 100% recommended dose of N, P, K (OM₁₀₀), T5-Lime + CF₁₀₀(LCF₁₀₀), T6-Lime + OM₁₀₀(LOM₁₀₀) and T7-Lime + CF₅₀+ OM₅₀(LCF₅₀OM₅₀).

Result of experiment shows that the maximum improvement in pH of soil was observed in treatments T2 and T6 which raise pH of soil near to neutral. Most plants achieve optimal growth in soil at neutral pH. Many metabolic processes are impeded or inhibited altogether in acidic environments. The highest uptake of Nitrogen (N) was found in treatment T3, Phosphorous (P) in T4 and Potash (K) in T6 at the end of experiment. The organic soil amendment results in maximum improvement in organic carbon of soil and grain yield of all three crops. Grain yield of Maize was recorded significantly ($p < 0.05$) higher with treatment T4 and that of cowpea and paddy were recorded significantly ($p < 0.05$) higher with treatment T6. Treatments with application of organic matter also revealed the maximum plant height and dry matter produce during the experimental period.



Finite Element Analysis of Concrete Cofferdam

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Keywords: *Concrete, Cofferdams, Finite-element method*

Abstract

This paper present nonlinear finite element analysis to predict the load deflection behavior of circular cell cofferdam under lateral load by using ANSYS (ANalysis SYStem) (version 12.1) computer program, eight-node solid element (SOLID 65) has been used to model the concrete cofferdam and (line search on) method is used for the nonlinear solution algorithm. In this study circular concrete cofferdam with width to height ratio (D/H) = 1.0 on concrete foundation and another case circular concrete cofferdam on concrete foundation with (0.4 from the height of the cell) concrete berm was analyzed.

Also in this work the fractured cracking or crushing types of fracture occurred at concrete elements are indicated as circles located at sampling points inside the elements, each integration point of a brick element can crack in up to three different planes. The first crack occurred at an integration point is shown with a red circle outline, the second crack is presented with a green circle outline, and the third crack is shown with a blue circle outline.

The cracks were occurred around the place of applied load (at one third of the cell height) and the crush which represented by octahedron outline occurred at the place of applied load. From numerical analysis found that using (0.4H) concrete berm reduce the displacement by about (34.22%).



Gaza Water Resources under Vulnerable Climatic Changes Conditions in the Gaza Strip as Sea Level Rise

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Keywords : *Gaza Strip, Groundwater Modeling, Climate change, Sea Level Rise, MODFLOW*

Abstract

Gaza Strip will be exposed to the global climate change effects the same as the other countries. According to the survey and primary findings of UNDP-PAPP Report 2009, agriculture and water resources are the most vulnerable to climate change and are expected to be exposed to direct effects of temperature, precipitation change and sea level rise, but still the potential impact of global climate change is one of the least addressed factors in water resources planning in developing countries. Moreover, the potential impacts of climate change have not been quantified at local level yet. This paper aims to evaluate the groundwater resource under sea level rise scenarios for Gaza Strip. To evaluate the potential impact of sea level rise as an impact of climate change on Gaza water resource, a 3D groundwater model is used after calibrating the developed model versus existing situation. The results shows that all the groundwater along the coastal line will be directly affected and around 66 Km² of the water resource will be invade by sea water in a very short time.



High-order, sensitivity analysis of the Bowen-ratio energy budget to enhance the effectiveness of evaporation estimates from Nasser Lake, Egypt

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Keywords: *Sensitivity analysis, Lake Nasser, Evaporation, Bowen-ratio energy budget*

Abstract

The Bowen ratio energy budget method (BREB) was evaluated and examined for determining evaporation from Lake Nasser. Parameters sensitivities were obtained based on an extension of the State Dependent Parameter modelling using a smoothing spline Anova recursive method. The relative importance of the input parameters in the BREB method was quantified by means of variance based sensitivity indices. The sensitivity results showed that the change in stored energy parameter is the most influential parameter followed by the Bowen ratio parameter. The first and second-order indices proved that there must be interactions among the input errors in the BREB method.



Integrated Basin Management

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Keywords : *Water Resources Management, Sustainability, Integrated Basin Management*

Abstract

Nowadays, the highest priority issue of water resources management is supply of increasing water demand with limited water resources. Water resources are a basis of sustainable development, so sustainable approach should be based on usage and management of water resources. In the twenty first century, the world is faced with a major water crisis. And the problems are originated from deficiencies and errors in the management of water resources. Thus, sustainable use of water resources is crucial for humanity. The sustainable development is defined as supply objectives and needs of today without jeopardizing objectives and demands of future generations. The long-term objectives instead of short-term ones should be considered in the assessment of water resources. Water resources are handled as a whole in basin management. This approachment constitutes the notion of integrated water resources management.



Managing the River Corridors, Estuarine and Coastal Wetland Areas of Catanduanes Island (Luzon Philippines) Under the Prospectus of Climate Change

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Abstract

In this paper we argue that the political ecology strategy on sustainable inland fisheries and aquaculture in rivers and mountain streams of Catanduanes Island in Luzon, Philippines needs to incorporate the prospects of climate change. We explored into of the island's remarkably productive freshwater systems (FWS) and coastal wetlands of the immediate past, which are increasingly confronting a series of threats due to various economic development, socio-ecological processes exacerbated by climate change. The livelihoods of the local people connected to the aquatic agricultural systems are described within the lens Blaikies political ecology and social-psychological theory of Serge Moscovici. Threats on natural resource degradation are in turn driven by the local government efforts and the new state university's perspectives to transform the island province into economically viable agricultural and aquacultural production ventures through water programs on water, food, renewable energy and climate change in collaboration with the country's agriculture department and the fisheries and aquatic resources bureau.



Potential Effects of Climate Change on Irrigation Water Use in Gassim Area of Saudi Arabia

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Keywords: *Irrigation, Crop, Agricultural, Climate change, Gassim*

Abstract

This paper describes an assessment of the sensitivity of water use in irrigation to climate change in the Gassimarea of Saudi Arabia. The paper estimates of crop water requirements (CWR) for wheat under current climate conditions. Outputs from three General Circulation Models (GCMs) HadCM3, CGCM2 and ECHAM4 for current (control) and future (2020s and 2080s) are analysed, with two emissions scenarios (A2, high, and B2, low). Changes in temperature, relative humidity, wind speed and sunshine duration are used to calculate future changes in evapotranspiration (ET_o) and CWR for wheat. CWR are estimated based on the FAO approach for the observed climate. Warming by the 2020s, in comparison to the baseline climate, is between 1°C and 1.5°C , and by the 2080s, the range is between 3.2°C and 4.9°C . ET_o and CWR are projected to increase by about 3% by the 2020s, and by about 12% (A2) and 9% (B2) by the 2080s. A small increase in temperature such as 1°C could result in an increase in CWR of about $103\text{ m}^3/\text{ha}/\text{season}$ for wheat in Gassim. This is the first integrated study into the possible impacts of climate change on agricultural water use in the region.



Scheduling Pumped Hydro Power Storage Systems Under Price and Flow Uncertainty

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Keywords: *Pumped Hydro Storage Systems, Electricity price, Optimization, Scheduling*

Abstract

Hydroelectric power plants are important energy resources as they are environmentally friendly, have low level of potential risks and they are relatively cheap. If properly utilized, it can replace some thermal power plants and hence decrease the harmful effects to the environment. A Pumped Hydro Storage System which is a special type of hydroelectric power plant can be used to store energy and to use the water more efficiently. When the energy demand and the energy price are high (peak hours), the water at upper reservoir is used to generate electricity and the water is stored in the lower reservoir. Revenue is gained from the power sale to the market. When the demand and the energy price are low (off peak hours), the water at lower reservoir is pumped back to the upper reservoir. Cheap electricity is used to pump the water. The hourly market price and water inflow are uncertain. The main objective of a company is to find an operation schedule that will maximize its revenue. In this paper we develop a model that includes hourly inflow and power price data and delivers an operation schedule. Historical water inflow and power price data are used to generate scenarios. A real case study is developed to validate the model based on the historical river data and electricity prices.



Seepage Phenomenon for Wadi Megenin Dam

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Keywords: *Seepage, GPR, Dam, Megenin*

Abstract

Most of the recorded dam failures around the world are related to seepage problems. Therefore to avoid failure of earth dams due to seepage, settlement, and piping, continuous field observations are essential.

The Megenin dam is a 38 m high rock fill dam located 75 Km south of Tripoli. A concrete cut-off wall and grout curtain were constructed below the dam body to prevent reservoir seepage through the foundation. The dam was constructed in 1972, for two main purposes; first to control floods for the cultivated fields downstream and to protect Tripoli city, secondly to collect water for irrigation.

On 15th May 2003 during the 3rd filling, the water level in the reservoir reached the level +271.86 m, while seepage water was observed in the wadi bed downstream of the main dam. This phenomena were also observed in previous times. The Piezometric water level was much higher compared to that previously measured. To assess the seepage phenomena and it's impact on dam safety, a study was carried out applying the technique of ground penetrating radar survey (GPR), piezometric analysis, and temperature field evaluation. Also a flow net model was constructed for the dam. The results of the study showed that:

- GPR profiles describe critical zones in the dam site.
- Identify the water seepage paths from the reservoir to the down stream side of the dam.
- Determine the amount of total water seepage capacity through the dam foundation ($Q = 0.08 \text{ l / s}$).
- The essential points to avoid any problem that may occur in the future in Megenin dam due to seepage problems.



The Use of SCADA System in Water Resources Management. Management of Shatt Al-Hilla in Iraq as a Case Study

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Keywords: *SCADA, PLC, Routing, HEC-RAS, Shatt Al-Hilla*

Abstract

The SCADA system and its use in water resources management are discussed in details. It is used for the management of Shatt Al-Hilla in Iraq as a Case Study.

Shatt Al-Hilla situates in Hillacity, 100 Km south of Baghdad city in Iraq. The reach length considered of Shatt Al-Hilla is 33 Km and starts from the intake point [head regulator of Shatt Al-Hilla at Km (00+000)] to the gauge station in Hilla city at Km (33+000).The hardware architecture of SCADA system was established for this reach and the controlling of the head regulator of Shatt Al-Hilla at sta. (0+000) is simulated. The head regulator of Shatt Al-Hilla was run for three cases with six scenarios. The first case is for the daily discharges supplied to the head regulator (2011), the second case is for the monthly water demanded to the head regulator (2011), and the third case is for the daily discharges that can be supplied to the head regulator for summer season 2012. All cases and scenarios are acceptable and suitable for application except scenario (6) for the three cases because there are deficits in supplying the discharges in many days through the year, also for case (2) there are deficits of (1.57%, 16.67%, 18.46%, and 14.04%) of the total demanded discharges for Mar, Apr, June, and July respectively.



Unsustainable Agricultural Practices – Experience from Wafra Agriculture Area, Kuwait

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Keywords: *Dry land agriculture, Irrigation Management, Crop water requirements, Water table rise.*

Abstract

Agriculture management in dry lands is critical, with irrigation as one of the most important variable. In study area the current practices lead to excessive over irrigation, resulting in depletion of precious water reserve and deterioration in soil quality. This study presents results from Wafra Agriculture area of Kuwait, which has experienced dramatic increase in agriculture activity in the past 30 years. The number of farms increased from 127 during 1976 to 1673 during 2008. The unimpeded supply of irrigation water and the thin soil profile has resulted in water logging in parts of Wafra. A multi-dimensional pragmatic approach was designed and adopted to ascertain the spatial extent of the water rise problem. Thematic datasets on water level, water quality, topography, geophysical analyses were integrated to understand the horizontal and vertical extent of the problem and to estimate their contribution in aggravating the water rise issue in the study area.

This wasteland development is a result of apathy towards irrigation management. This led to water table rises in the low land areas, and water logging of about 30% of the agriculture area, turning them into wasteland. The responsible authorities in Kuwait started a campaign to seal the deeper, high discharge wells in Dammam aquifer, this proved useful and the water logged areas were reclaimed.

The solution for sustainable management of this agriculture area lies in adopting efficient irrigation management practices. The crop water requirement for each crop should be estimated, and irrigation scheduling be done to keep the requirement-application balance. Modern irrigation practices will save both the water and soil, and will ensure sustainability of the agriculture area. Preliminary observation indicated that the irrigation exceeds the CWR by 60 to 100%.



Aspect hydrogéochimique des eaux souterraines utilisées à l'irrigation des sols dans la plaine Algérienne du Bas-Chélif

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Keywords : *Eau souterraine, Irrigation, Indice de saturation, Alcalinité résiduelle, salinisation, sodisation, Bas-Chélif*

Abstract

La plaine Algérienne du Bas-Chélif est une région agricole caractérisée principalement par un climat semi-aride sévère où l'irrigation inévitable pour la plupart des cultures pose des problèmes de salinisation avec parfois une sodisation des sols. Les eaux souterraines qui sont donc de plus en plus sollicitées montrent un faciès chloruré sodique dominant et leur forte salinité montrent généralement une qualité médiocre inconvenable pour l'irrigation. D'après les critères géochimiques basés sur l'alcalinité résiduelle généralisée, utiles pour étudier qualitativement l'évolution chimique des eaux durant leur concentration suite à l'évaporation, trois classes d'eau ont été établies selon leurs caractéristiques chimiques dont la voie saline neutre chlorurée est la principale caractéristique de cette évolution suivie par la voie alcaline sodique et la voie saline neutre sulfatée. La simulation d'évaporation expérimentale de trois types d'eaux représentant les trois voies salines a permis de mieux représenter le concept d'alcalinité résiduelle généralisée et suivre le comportement des éléments chimiques des eaux d'irrigation. La précipitation successive des minéraux a montré que les eaux de la plaine du bas- Cheliff peuvent se transformer au cours de l'évaporation en plusieurs phases minérales principalement en Calcite, gypse et sépiolite.



Etude des caractéristiques hydrodynamiques et hydrochimiques des Lacs d'Oued Righ

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Keywords : *Lacs, Piézométrie, Hydrodynamique, Minéralisation, Oued Righ*

Abstract

Le canal d'Oued Righ est devenu un important cours d'eau pérenne du Bas Sahara. Du sud de la ville de Touggourt jusqu'au Chott Merouane, il relie une vingtaine de lacs dont les eaux proviennent de la nappe phréatique. Cette dernière est contenue dans les sables fins à moyens d'âge Quaternaire et draine l'excès d'eau d'irrigation et d'assainissement.

On a constaté, depuis déjà une décennie, une dégradation progressive de la qualité des eaux des lacs ainsi que l'état environnemental des écosystèmes lacustres en amont de l'Oued Righ. L'objectif de cette étude est de mettre le point sur la relation hydraulique entre les différentes entités de ce système lacustre et d'expliquer l'origine et l'évolution de la minéralisation des eaux des lacs.

C'est ainsi qu'on a réalisé trois campagnes piézométriques en s'appuyant sur un réseau de points de prélèvement couvrant toute la nappe. L'examen des cartes piézométriques dressées a permis de constater que l'écoulement souterrain se fait suivant une direction du Sud-Ouest vers le Nord-Est. L'axe de drainage des eaux souterraines coïncide sensiblement avec le canal d'Oued Righ qui draine les eaux d'irrigation et les eaux usées.

L'étude de la fluctuation de la nappe entre la période de mars et celle de septembre 2010 montre que les fluctuations les plus importantes se manifestent en amont de la nappe pouvant atteindre 0.65 m.

L'étude hydrogéochimique a été réalisée afin de caractériser la qualité des eaux souterraines et en déduire les facteurs naturels et anthropiques qui l'influencent. L'interprétation des résultats d'analyses a montré la présence de quatre faciès chimiques, dominés par la présence des chlorures et sulfates. La répartition spatiale des éléments chimiques a confirmé que l'origine de ces faciès est fortement liée à la nature lithologique de la nappe. La dissolution des formations carbonatées et évaporitiques est à l'origine de cette minéralisation.



Evaluation de la Qualité Ecologique de l'Oued Rhumel: Approche de type Triade

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Keywords : *Triade, physico-chimie, biologie, écotoxicologie, oued Rhumel*

Abstract

L'oued Rhumel, un des principaux cours d'eau du bassin versant Kebir Rhumel au Nord-Est Algérien, de par sa longueur (125 km), fait l'objet de pressions anthropiques importantes liées aux activités humaines agricoles, domestiques et industrielles. La surveillance de la qualité des cours d'eau et le suivi des impacts des activités anthropiques sur ces derniers font généralement appel à des mesures de paramètres physico-chimiques, biologiques voire écotoxicologiques sur les diverses matrices de ces écosystèmes en particulier l'eau et les sédiments. Dans ce contexte, ce travail s'est appuyé sur une triple approche associant des caractérisations physico-Chimique basée essentiellement sur l'évaluation de la contamination métallique, biologique basée sur la détermination de l'indice biotique et écotoxicologique basée sur une batterie de tests d'écotoxicité sur des organismes aquatiques appartenant à différents niveaux d'organisation: le Microcrustacé *Daphnia magna*, la bactérie *Aliivibrio fischeri*, l'algue *Pseudokirchneriella subcapitata* et le cladocère *Ceriodaphnia dubia*. L'évaluation combinée via l'approche triadique, a porté sur cinq stations d'études associées à des pollutions d'origine diverses, échantillonnées en quadruplicats. L'évaluation du niveau de contamination métallique a fait ressortir des cas d'enrichissements relativement importants pour un grand nombre d'éléments trace métalliques (Cd, Cr, Cu, Ni, Pb, Zn). Les teneurs pseudo-totales enregistrent l'ordre d'abondance suivant :Zn>Pb>Cr>Cu>Ni>Cd. Les concentrations sont de l'ordre de: 0.56-3.4 µg/g pour le Cd, 10-216 µg/g pour le Cr, 9.6-446 µg/g pour le Cu, 10-46 µg/g pour le Ni, 11-167.5 µg/g pour le Pb, 38-641 µg/g pour le Zn. L'indice biotique chute de 8 à 2 dans les stations adjacentes aux rejets industriels et urbains et traduit des altérations considérables de la qualité du cours d'eau. Les tests d'écotoxicité pour les quatre organismes montre que l'algue *Pseudokirchneriella subcapitata* est l'organisme le plus sensible. Le paramètre d'inhibition de croissance est le plus réactif aux contaminants présents dans les échantillons testés. *Ceriodaphnia dubia*, *Daphnia magna* et *Aliivibrio fischeri* n'ont pas établi de discriminations importantes parmi tous les échantillons analysés.



Impact des eaux d'irrigation sur la salinisation de sols dans la plaine du Bas-Chélif

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Keywords : *Bas-Chélif, Pluviométrie, Irrigation, Salinité, Parcelle*

Abstract

Actuellement, les pays en développement souffrent, dans leur majorité, d'une crise d'insuffisance alimentaire due à la gestion des eaux ajoutées aux phénomènes de désertification et de salinité des sols. La salinité des sols est un phénomène complexe faisant intervenir l'histoire géologique ou sédimentaire, le climat, la topographie et l'influence de l'homme. En Algérie, plus de 20 % des sols irrigués sont concernés par le problème de la salinité. Dans la partie nord-ouest de l'Algérie, la plaine du Bas-Chélif qui fait l'objet de notre zone d'étude est la plus touchée; elle se situe à 220 Km d'Alger et s'étend sur plus de 60000 ha. En plus de l'aridité du climat, cette zone connaît de graves problèmes de dégradation de son milieu physique qui est due essentiellement à la salinisation des sols.

Le but principal de notre travail est de faire un suivi à l'échelle de parcelle de façon ponctuelle en fonctions du couple irrigation-précipitation, pour voir l'influence des précipitations et des irrigations sur la salinisation des sols.

Les résultats obtenus montrent le rôle négatif des pratiques agricoles telles que l'irrigation qui aggravent la situation lorsqu'une eau de mauvaise qualité est utilisée en irrigation. Contrairement à cela, les précipitations entraînent une lixiviation des sels stockés au cours de la période d'irrigation vers les profondeurs tout particulièrement en présence d'un système de drainage. Il a été également trouvé que la salinité qui dégrade chimiquement les sols a des effets positifs sur le maintien et l'amélioration de la stabilité structurale tout en maintenant le pH à des valeurs en deçà de 8 empêchant dans ceci tout processus d'alcalinisation.



Impact des rejets (industriels et urbains) sur la qualité des eaux superficielles: cas de la région de Annaba

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Keywords : Pollution, Ressource en eau, ETM, Rejets

Abstract

Dans leurs courses effrénées vers le développement et le bien être de la population, les responsables Algériens ont omis de prendre en considération les méfaits des rejets industriels et urbains sur les eaux superficielles qui sont utilisées pour l'irrigation et parfois pour la consommation humaine dans les contrées éloignées. La région étudiée à vocation agricole jadis a abrité en l'espace de quelques années d'importants sites industriels tel que les engrais, la métallurgie....L'implantation de ces sites s'est accompagnée par la réalisation à la va vite de cités devant abriter les travailleurs du secteur industriel. De ce fait de nouvelles villes ont été érigées tel que Sidi Amar (100.000 habitants), El Bouni (80.000 habitants), la localité des Allemands (30.000 habitants) située sur le flanc Ouest de la ville. Les eaux déversées sans prétraitement s'acheminent vers les Oueds Seybouse ou Meboudja, augmentant le risque de pollution des eaux.

Pour cerner ce problème nous avons utilisé l'outil hydrochimique, ce dernier se basant les analyses des eaux prélevées au niveau de différentes zones tel que:

- Les rejets d'ARCELOR MITTAL, et de la literie l'Edough,....
- les rejets urbains particulièrement ceux de Sidi Amar et ceux des Allemands, notons que les eaux usées d'El Bouni, sont rejetées à même l'embouchure de la Seybouse.

Les dosages réalisés ont porté sur les éléments majeurs et sur les ETM. Le dépouillement des analyses a montré que les eaux sont riches ETM, particulièrement, le fer, le manganèse, le plomb, le Chrome, L'étain, le cuivre et le zinc. Ces répartitions diffèrent selon l'origine des rejets, ainsi le fer, le Manganèse et l'étain sont plus importants dans les eaux des rejets d'Arcelor Mittal par contre le plomb et le cuivre caractérisent les rejets urbains.

Les eaux rejetées par la literie induisent une pollution organique caractérisée par forte DBO5 et DCO. Cette dernière est due au processus de fabrication. La présente étude a montré que les méfaits du développement industriel sont néfastes à l'homme et à l'environnement particulièrement quand ils sont utilisés sans précautions.



Les Bassins Versants de Skikda et l'état Global des Réserves Hydriques

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Keywords : *Skikda, Evaluation, Ressource en eau, Réservoir, Bassin versant, Gestion intégrée*

Abstract

L'amélioration de la connaissance de l'état global des réserves en eau et l'importance d'une gestion adéquate ont fait l'objet de cette approche au sein des bassins du côtier constantinois centre. Située au Nord Est algérien, la région d'étude couvre une superficie de plus de 4000 Km². Son sous-sol est bien pourvu en ressources d'eau souterraine, même si toutes les nappes ne présentent pas des capacités d'exploitation intéressantes (nappe des grés et nappe des flysch dans la vallée de Safsaf), reste les dépôts alluviaux (formations meubles du Quaternaire), formés le long des oueds constituent le magasin essentiel des eaux souterraines de la région.

Ces réservoirs sont considérés importants du point de vue hydrogéologique en raison de la grande perméabilité de leurs formations (sables et graviers) et leurs grandes épaisseurs, ainsi que leur extension. Par ailleurs, la ressource hydrique superficielle constitue une part importante du patrimoine hydraulique des bassins versants de la région, avec un écoulement permanent des différents cours d'eau qui charrient un volume considérable, avec des ouvrages hydraulique peu importants, qui permettent la régularisation de ce volume. Lors de la mise en œuvre de cette approche, on a pu identifier une réserve hydrique bien importante comparée à celles des autres bassins versant avoisinants. Néanmoins, sa mobilisation en vu d'une gestion intégrée et une satisfaction globale des trois secteurs concernés (AEP, IRR, AEI) reste insuffisante devant une population en augmentation constante et une expansion continue des unités industrielles dans cette région.