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An Introductory Perspective to the Ecotoxicology of the Iraqi Marshes Anthropogenic Problems

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Abstract

To facilitate the effective protection of valuable environmental systems subjected to anthropogenic activities, there must be a basic understanding of three areas, these are; how the variety of biological components of the ecosystem are exposed to stress. How the ecosystem responds to that disturbance? And how they recover or adapt? This is the so called "ecosystem exposure-response-recovery relationship". This ecotoxicity approach may be utilized in the overall process of risk assessment-risk management of chemical input into the Iraqi marshes ecosystem. Concerning the Iraqi marshes case, the risk assessment of releasing chemical, biological, and other harmful agents directly or indirectly into the marshes ecosystem begins by the organization of the fundamental considerations in to three basic categories, these are; the fate, the transport, and the effects of such agents on the marshes ecosystem quality. Hence, the perspective we would like to introduce by this study is to consider the marshes ecosystem and its interaction with the large number of chemicals, such as heavy metals, pesticides, oil, waste discharges, . etc for ecotoxicological evaluation. This is, of course, a long step approach, from recognition, to standardization and to implementation of methods that address the needs for various tasks of evaluation in such virgin, valuable, and under restoration ecosystem of the southern Iraqi marshes. We anticipate the outcome of such ecotoxicology evaluation program will pilot to dramatic improvement in water quality and to the protection of the marshes ecosystem on the long run bases of the restoration process. National and international support, efforts, organization, and implementation of the various segments of such approach is vital in the overall process of the restoration of the unique ecosystem of the Iraqi marshes following its massive devastation in the nineties of the last century.

1-Introduction

The Insight:

Ecotoxicology is the science that seeks to predict the impact of chemicals upon ecosystems. This involves describing and predicting ecological changes resulting from a variety of human activities that involve release of xenobiotics and other chemicals to the environment (Levine, *et al.*, 1989). In this paper we would like to introduce the ecotoxicological perspectives in an attempt of sound participation in understanding and evaluation of the impact of chemicals upon Iraqi marshes ecosystems. Well, as it is well known, that virtually any discussion of the risk assessment of releasing chemicals into the environment begins by organizing the fundamental considerations into three categories; evaluation of fate, transport, and effects of the chemicals upon the targeted ecosystem. Each of these segments is dependent on the ecosystem in to which the chemical is introduced (the marshes ecosystem in this case), therefore none can be resolved adequately without a perspective that considers the ecosystem and its interactions with the introduced chemicals.

Throughout the world, wetlandsas as well as marshes are well known to support the diversity of life; they maintain biodiversity, provide food, clean water and other vital resources. Also, act as a buffer against flooding, storm surge and sea level rise. Hence, people must take care of wetlands and manage them wisely so these crucial wetland values and functions are preserved. The key to wise use of wetlands is the effective monitoring, evaluation, and management (Finlayson and Spiers, 1999). Iraqi marshes (Fig.1) is the oldest (about 5000 y. old), largest (about 20,000 sq. km. with more than 50,000 native residents), and is the most unique ecosystem in the Middle East (29 55-32 45 N, 45 25-48 30' E). Some of its exclusive characteristics are shown in the (Fig.2), and many are listed in several publications (Bedair, et al., 2006, and others). A summary of the Iraqi southern situation is well documented in the literature (TJNEP, 2001; Ajeel, et al., 2006; Alwan, 2006; Bedair, et al., 2006; NGN, 2006; RichardsonandHussain, 2006). This unique ecosystem has suffered dramatic deliberate desiccation, ecological changes, and environmental hostilities during the 90's of the last century due to wars, pollution, and mismanagement.

The Geo-Environmental Activities:

Industrialization, urbanization, agriculture, and resource exploitation are activities associated with development in societies (Yong, *et al.*, 2002).

These are so called Geo-environmental activities, which play a major role in the Sustainability of the natural ecosystems, such as marshes. A focus on such a society's geo-environment and the natural capital that defines it requires initiation of highly specialized scientific, research authorities to deal thoroughly with such complex ecological issues and changes. So, the effects of anthropogenic activities on the accumulation of pollutants such as heavy metals, oil and hydrocarbons,

pesticides, organic wastes and discharges, and other compounds in waters, sediments, and organisms, of the marshes are to be emphasized in this paper.

The straightforward aim for this paper is the establishment of an ecological risk assessment strategy for the Iraqi southern marshes. This strategy is to cover the marshes components and organisms of interest such as fish, birds, invertebrates, plants, weeds, sediments, and waters utilizing sound ecotoxicology monitoring procedures, that should aim for evaluation and solving problems arising from pollution due to activities such as industrialization, urbanization, agriculture, and natural resources overexploitation, as well as from military hostilities and ammunition remains still found in the environment and the vicinity of the southern marshes of Iraq. This tentative project is to be defined as the "Iraqi Marshes Ecotoxicology Program (IMEP)", which is an embetious project intended for curren and future investigation of the risks and impacts of contaminants on the highly valued freshwater ecosystems of the southern Iraq.

The Major Objectives:

The major aim of this project is to establish the "Marshes Ecotoxicology Laboratory (MEL)" facility, which may be located within the Marine Science Center (MSC) of the University of Basrah, Iraq. This MEL facility will be a purpose-built facility, which must be designed for the performance of high quality ecotoxicological assessments.

The other aim is to establish a supportive, up to date library and a data center for this project. This vital facilty is to be called the "Marshes Data and Statistics Division (MDSD)".

2: Materials and Methods

Environmental monitoring is to be carried on continuous bases in several well defined, fixed stations. The tentative work may include samples for investigations of basic levels of xenobiotics such as heavy metals, oils and hydrocarbones, pesticides, organic wastes in water, sediments, and organisms. Ecotoxicological tests are to be carried out in the laboratory, and measures of the response of representative species to chemicals or complex to be conducted on bases of Good Laboratory Practices (GLP) by utilizing the methodologies proposed by the United Nations Environment Program (TJNEP), the USEPA standard methods of toxicity testing, and the other International Standards (ISO) and applications used in toxicity testing and in water research facilities worldwide.

Due to lack of experience, resources, and professional vision, some official cooperation may be sought with well established laboratories for strengthen the Iraqi experience in this field, and for exchange of scientific visions and experiences with promenent national and international institutions and research centers in wetlands ecotoxicological field of investigation. Toxicity testing using fully developed and documented protocols is to be carried out on a range of representative aquatic species of the freshwater ecosystems across the southern

marshes, Euphrates and Tigres Rivers, Shatt Al-Arab Estuary, and the Gulf region. The organisms may be cultured and reared in aquaculture or in the laboratory facilities, (Fig.3).

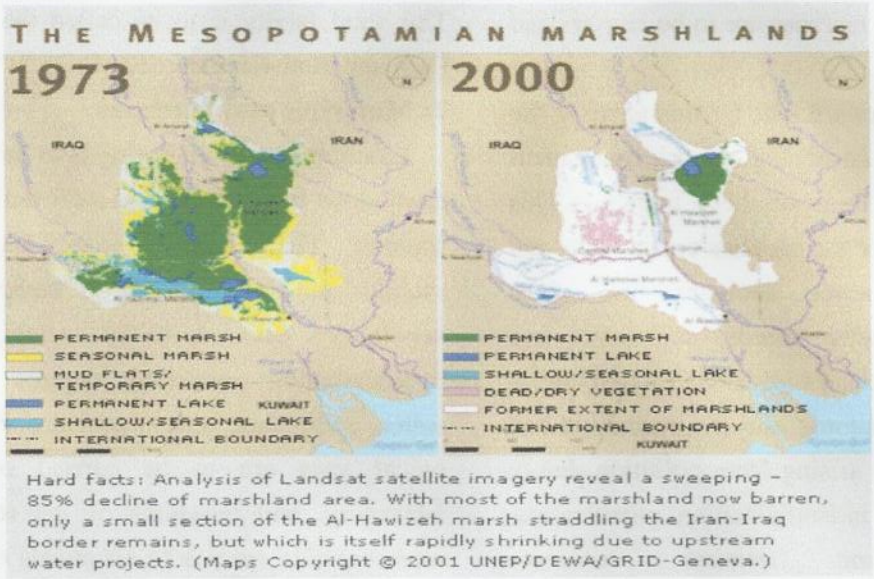

Fig. 1: The Mesopotamian marshlands in 1973 and 2000. After, UNEP, Geneva 2001.

Fig. 2: Harmony and loveliness of the Iraqi southern marshes. NGN, 2006.

Fig. 3:Some test organisms used by international ecotoxicology monitoring programs for toxicity testing, such as The SSD Ecotoxicology Laboratory of Australia.

3- Results and Discussions

One purpose of the ecotoxicological research at the MEL is to get compatible results that can be utilized for providing information on water quality for the official authorities needing them. The sectors of interest are health, nutrition, drinking water, social and recreation purposes. Also, to provide sound data for contribution in the rehabiliation process of the dramatically affected marshes. Focuse will be on risk assessment of chemical threats resulting from discharges of waste waters and the associated variables such as biochemical oxygen demand, suspended solids, nitrogen and phosphorous enrichments, microbial pathogens, and trace elements that might be linger in the marshes water and sediments. Evaluation of the toxicity of the prevalent heavy metals, pesticides from agriculture, oils and petroleim hydrocarbones, and dioxins will provide insight for solving the environmental problems and adopting suitable procedures to minimize the risks.

Discussions:

As it has been stated earlier, we aim for the improvement of the marshes water quality and for maintainence of its natural resourses. We also aim for the control of unfavorable conditions caused by pollution activities in such valuable ecosystems. The other purpose is to design and implement standard methods for the treatment of anthropogenic pollution affecting marshes ecosystem and its natural beauty and resources.

As stated in many professional studies "wetlands are an important and sadly diminishing habitat in many parts of the world"; they contribute significantly to the planet's biodiversity, housing thousands of species of plants and animals (Haslam, 2006). In the Iraqi wetlands case, and because the marshes are so rich in their fauna and flora, they are served as livestock grazing fields (Fig.4), fish, birds, and other wildlife breeding places (Fig.5), farmland for rice, and other crops. They are crucial as incubators for many exotic fish, birds, and other vertebrates and invertebrate species. These ecosystems represent a critical factor in the complex web of life for the Iraqi rivers, Shatt Al-Arab estuary, the Gulf, and the surrounding land ecosystems. Impact of human activities, such as farming, building, recreation, over exploitation of resources, and more over, is the hostile military activities witnessed in the Iraqi marshes during the 90's of last Century, has dramatically affected the water quality, the nature, and the ecology of such expensive environment (Bedair, *et al.,* 2006). This massive devastation and very dangerous ecological catastrophic hostilities must be carefully considered, monitored, assessed, and treated. In response for the urgent need of restoration, an aggressive yet conservative ecotoxicological approach to evaluating marshes ecosystem, we compiled this paper to provide a crucial insight on the need for establishment of the IMEP program. This program will work hard on monitoring, sampling, testing, and developing strategies for assessing anthropogenic

contamination in the Iraqi marshes ecosystems. The authors, upon request, are ready to provide full coverage of research topics and management issues from cross-section of research data in the field of ecotoxicology. They can explore and furnish information on current advances in monitoring of aquatic responses to pollution, fundamental concepts of ecotoxicology specific to marshes, and useful insights that offer a direction and priorities for resolving specific problems challenging the protection and conservation efforts of such valuable habitats.

Fig. 4: Marshes are excellent grazing fields for certain livestock. MSC, 2006.

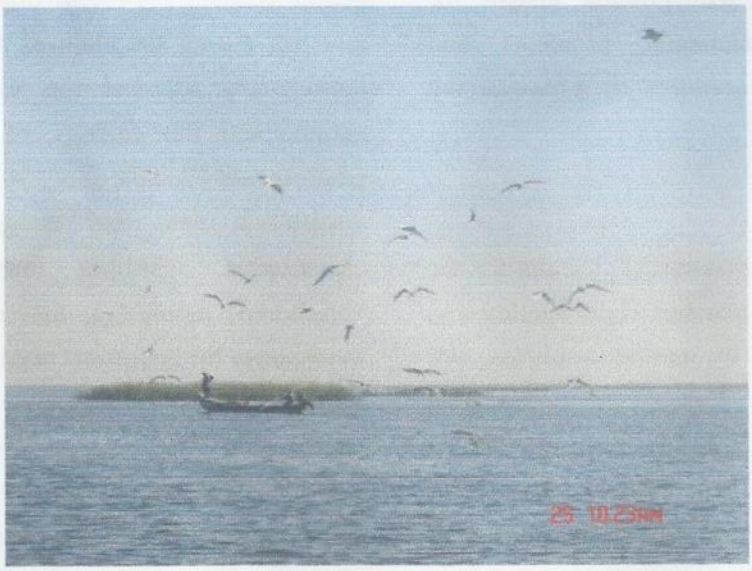

Fig. 5: Marshes are fish and birds breeding sanctuary. MSC, 2006.

Conclusion:

As a conclusion, the tentative program 1MEV and its tools, the MEL laboratory and the accompanied data and statistics facility MDSD should be very useful and certainly will be able to hand over essential information on marshes pollution status, marshes enhancement, marshes restoration strategies, and marshes monitoring programs. On the other hand, some selected management topics include designing and managing special marshes areas for wildlife protection, recreation and tourism, and for marshes education programs will be developed as the IMEP program proceeds. These can be considered as a natural outcome for such indispensable program. Laws and regulations may be also, designed to protect and regulate the marshes use according to the findings of the program.

Recommendations:

Our advise to take home, that we highly recommend for the university of Basrah, represented by its well reputable MSC to take the initiative in accordance with the insight of its "second conference on the marshes rehabilitation" and issue a call for national and international fund raising. This call should facilitate the initiation of the 1MEV, and its elements, the MEL and the MDSD.

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منظور تمهيدي لتقييم مشاكل التلوث البيئي في الاهوار العراقية

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الملخص

ضمن تسهيل عملية الحماية الفاعلة للانظمة البيئية الثمينة، كالاهوار العراقية، المتاثرة سلباً باسباب التلوث البيئي المختلفة، فانه لابد ان يتوفر اولاً فهماً اساسياً من ثلاثة نواحي مهمة، وهي: حصر الملوثات وتحولها المتوقعة ومن أين تأتي لكي تؤثر على مكونات النظام البيئي، ثم كيف يتم نقل تلك الملوثات وتحولها في النظام البيئي. أي التعرف على طبيعة حركياتها، واخيراً كيف يتعافى منها او كيف يتأقلم معها النظام البيئي المقصود؟ تسمى هذه العلاقة فعل التلوث ورد الفعل البيئي، وهي تساهم في تفسير تصرف الأنظمة البيئية تحت تأثير التلوث. فيما يخص الاهوار العراقية فقد تبدو هذه العلاقة مباشرة جداً، ولكن في الواقع لازلنا بحاجة إلى الفهم الكافي والى التشخيص التطبيقي للمشاكل البيئية من منظور "السمية البيئية" للعديد من المركبات والملوثات التي ستفضي بصورة مباشرة إلى غير مباشرة إلى بيئة الاهوار التي هي ألان تحت إعادة التأهيل والتنمية، أي في مرحلة حرجة جداً بحسب جميع المقاييس. أن مناقشة منظور تقييم تأثير السمية البيئية يبدا بتصنيف الاعتبارات الأساسية تحت ثلاثة مجاميع أساسية، وهي: مصير الملوثات، وعملية نقل وتحول الملوثات المعروفة بالتحرك السمي البيئي، واخيراً تأثيرات التلوث على النظام البيئي للاهوار. ومن خلال هذه الورقة البحثية فإننا نود أن نعرض لمفهوم المنظور التمهيدي لدراسة السمية البيئية في الاهوار لغرض توفير الفهم الاساسي لمشكلة التلوث البيئي في الاهوار على اساس علمي تطبيقي من خلال المساهمة الجادة على الصعيد المحلي والعالمي في عملية إعادة التأهيل وحماية بيئة الاهوار لمصلحة سكان المنطقة وديمومة موارد محيطها البيئي. ونتوقع ان تكون نتائج هذا البرنامج التطبيقي المتقدم في مجال الدراسات السمية للتلوث البيئي مثيرة في صالح تحسين نوعية مياه الاهوار وثرواته المختلفة، حيث ستودي النتائج لدعم التخطيط العلمي لحماية بيئة الاهوار على المدى البعيد. وأخيراً، سيكون هذا ايضاً منظوراً منطقياً داعماً في مراحله المستقبلية لعملية إعادة تأهيل وتنمية اهوار المنطقة الجنوبية في العراق بعد الخراب الكبير الذي تعرضت له تلك البيئة الفريدة في التسعينات من القرن الماضي.