

## The Environmental Risk And Water Pollution: A Review From The River Basins Around The World

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### ABSTRACT

“Water for Life” has declared as the International Decade (2005 to 2015) for Action for water by the United Nations General Assembly in 2005. Because of the rapid increase in demand for water, and increase in occurrences of pollution of numerous water sources, environmental risks to humans and other life beings are enhanced. Due to changes in the quantity and quality of water, some environmental disasters are causing stress and hardships in a river basin in around the world. This paper reviews empirical evidence on the impact of polluted river water in the context of environmental risk as well as Ecological Risk. A rigorous survey has done on the existing literature of environmental risk and water pollution in respect of ecological, social and economic boundaries in the river basin area. The review findings concluded that polluted river water are seriously caused for hampering of the Sustainable Development (SD) especially in the context of sustainable development, ecosystems change, sustainable livelihoods, land cover, ecosystems, environmental sensitivity, biodiversity and geodiversity as well as social and economic arena in a river basin over the world. The study has drawn Necessary recommendations & policy considerations which would be raised and highlighted for implementation by policy and decision makers throughout the study.

**Key words:** Water Pollution, Environmental Risk, Ecological Risk & River Basin.

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### Introduction

Excessive human pressures on the earth are causing a range of global environmental changes which impact on the safe and secured water for the lives in the world. Due to changes in the quantity and quality of water, some environmental disasters are causing stresses and hardships in a river basin in around the world (Anh, Kroeze, Bush, & Mol, 2010; Arkoosh *et al.*, 2010; Cataldo, Colombo, Boltovskoy, Bilos, & Landoni, 2001). In such issues, water pollution is an important and essential issue in the world which requires ongoing evaluation and revision. The statistical data counted that more than 14,000 people died daily and 700 million Indians have no access to a proper toilet, and 1,000 Indian children die of diarrhea sickness every day (Reporter, 2008; White, 1992).

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On the other hand, of 90% of china's cities suffer from some degree of water pollution and nearly 500 million people lack access to safe drinking water(Baoxing, 2005). In addition to the acute problems of water pollution in developing countries, developed countries continue to struggle with pollution problems as well. In the most recent national report on water quality in the united states, 45 percent of assessed stream miles, 47 percent of assessed lake acres, and 32 percent of assessed bays and estuarine square miles were classified as polluted. Generally, water pollution is covered in water bodies of toxic chemicals and biological agents which exceed what is naturally found in water and may pose a threat to human health and the environment. The polluted water caused serious problems for human health as well as hampered ecological and environmental agents (Zaidi, 1994; Z. Zhang *et al.*, 2010).

Moreover, the range of health risks from climate change include direct, indirect (mediated), and diffuse and delayed effects. The health risks posed by climate change are now beginning to challenge the skills, creativity, and policy engagement of researchers, policy analysts, and stakeholders (Tong & McMichael, 2011). On the same way, studies identified that the huge number of chemicals released into the river which caused for environmental risk around the river basin area. It has concluded that 49% of the overall basin presently have soil loss greater than the tolerable rate, thus indicating that there are zones where the erosion process is critical, meaning that both management and land-use have not been used appropriately in these areas of the basin (Beskow *et al.*, 2009).

In such issues, this study has an aim to do rigorous reviews of empirical evidence on the impact of polluted river water in the context of environmental risk as well as Ecological Risk. This rigorous survey has done on the existing literature on environmental risk and water pollution in respect of ecological, social and economic boundaries in the river basin area over the world.

#### *Background of the Study:*

##### *Water pollution & Environmental risk in the world:*

Water is the alternative name of life and without water life is impossible to continue. Due to increase of the number of population in the earth every day have caused of rapidly increased in demand for water, and increase in occurrences of pollution of numerous water sources, environmental risks to humans and other life beings are enhanced. Due to changes in the quantity and quality of water, some environmental disasters are causing stress and hardships in a river basin in around the world (Anh, *et al.*, 2010; Arkoosh, *et al.*, 2010; Cataldo, *et al.*, 2001). In such issues, water pollution is an important and essential issue in the world which requires ongoing evaluation and revision. The statistical data counted that more than 14,000 people died daily and 700 million Indians have no access to a proper toilet, and 1,000 Indian children die of diarrhea sickness every day (Reporter, 2008; White, 1992).

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### *Methodology of the Study:*

This study conducted based on the survey of common empirical studies on the causes of environmental risk through polluted water over the river basin area around the world. In this study, we conducted the general search by the name of “Environmental Risk and River water pollution and causes of environmental risk and impact of polluted water. From this search we found huge numbers of the article abstract, which we have read to determine which articles need to be included in the review of this paper. After reading through most of the articles were found are as case study approach and qualitative analysis of research. But we focus in this papers those are directly empirical and related with the key words of environmental risk and river water pollution and causes of environmental risk and impact of polluted water.

### *Findings of the Study:*

There is large number numerous studies have done to examine how environments are changing due to changes in the quantity and quality of water and why environmental disasters are causing stress and hardships in a river basin in around the world (Anh, Kroeze, Bush, & Mol, 2010; Arkoosh *et al.*, 2010; Cataldo, Colombo, Boltovskoy, Bilos, & Landoni, 2001). Moreover, the statistical data counted that more than 14,000 people died daily and 700 million Indians have no access to a proper toilet, and 1,000 Indian children die of diarrhea sickness every day (Reporter, 2008; White, 1992). The study has recorded rigorous survey of the existing literature on environmental risk and water pollution in respect of ecological, social and economic boundaries in the river basin area over the world. Moreover Wang, C., Y. Feng, *et al.* in 2012 have done a one-dimensional dynamic contaminant fate model, coupling kinematic wave flow option with advection–dispersion–reaction equation in Songhua River, China. The model includes kinetic processes including volatilization, photolysis and biodegradation, and diffusive mass exchange between water column and sediment layer as a function of particles settling and resuspension. The results generally show that the modeled and detected concentrations exhibit good consistency. Flow velocity in the river is most sensitive parameter to Nitrobenzene concentration in water column based on sensitivity analysis of input parameters. It indicates flow velocity has an important impact on both distribution and variation of contaminant concentration. The model performs satisfactory for prediction of organic pollutant fate in Songhua River, with the ability to supply necessary information for pollution event control and early warning, which could be applied to similar long natural rivers (C. Wang, Feng, Zhao, & Li, 2012).

Dawadi, S. and S. Ahmad in 2012 focuses on the effects of climate variability and climate change on the Colorado River flow as well as on implications for water resources management. A system dynamics model was developed for the Colorado River Basin, operating on a monthly time scale from 1970 to 2035. Changes in stream flow were simulated with a hydrologic model that used outputs from 16 global climate models (GCMs) and 3 emission scenarios. Ensemble averages of the GCMs for each emission scenario indicated an increase in temperature over the period of 2012–2035. The magnitude and direction of change in precipitation varied among ensembles of GCMs for different emission scenarios, with A1b showing a decrease and A2 and B1 showing an increase. Ensemble average shows a small increase in precipitation by about 0.4%. An ensemble average reduction in stream flow by about 3% was observed until 2035. This reduction resulted in significant effects on the water supply to the Basin states, with varying reliability values for water supply (Dawadi & Ahmad, 2012).

Zhang, R., G. Zhang, *et al.* in 2012 investigated in the rivers discharging to the Laizhou Bay and the seawater of the bay, and the impacts of river discharge on the marine environment were assessed. The results revealed that the same antibiotics predominated in both the river water and the sea water. Additionally, the detected antibiotics in the river water were generally higher than those in the inner bay and in the open bay, reflecting the importance of the riverine inputs as a source of antibiotics. Risk assessment based on the calculated risk quotients (RQ) showed that enoxacin, ciprofloxacin, and sulfamethoxazole in the two aquatic environments both posed high ecological risks ( $RQ \geq 1$ ) to the most sensitive aquatic organisms *Vibrio fischeri*, *Microcystis aeruginosa* and *Synechococcus leopoliensis*, respectively (R. Zhang *et al.*, 2012).

Whitworth, K. L., D. S. Baldwin, *et al.* in 2012 examined the biogeochemistry and hydrology underpinning this extreme event and found that multiple drivers contributed to the development and persistence of hypoxic blackwater. Inundation of both forested and agricultural floodplains that had not been flooded for over a decade mobilised large stores of reactive carbon. Altered flow seasonality, due to a combination of climatic effects and river regulation, not only increased the risk of hypoxic black water generation but also shifted the proportion of bioavailable carbon that was returned to the river channels. Hypolimnetic weir discharge also contributed to hypoxia at some sites. These findings highlight the need for a whole-of-system perspective for the management of regulated river systems—especially in the face of a changing climate (Whitworth, Baldwin, & Kerr, 2012).

Da Costa, T. C., K. C. T. de Brito, *et al.* in 2012 looked at the genotoxic potential of samples from a contaminated site on the banks of the Taquari River, RS, Brazil, where potential environmental problems had

been identified (pentachlorophenol, creosote and hydrosalt CCA). Positive mutagenicity results in the Salmonella/microsome assay of the material exported from the area indicate that contaminant mixtures may have drained into the Taquari River. This was confirmed by the similarity of mutagenic responses (frameshift indirect mutagens) of organic extracts from soil and river sediment exported from the main area under the influence of the contaminated site. The *Allium cepa* test showed significant results of cytotoxicity, mutagenic index and chromosome aberration in the area under the same influence. However, it also showed the same similarity in positive results at an upstream site, which probably meant different contaminants. Chemical compounds such as PAHs, PCF and chromium, copper and arsenic were present in the runoff of pollutants characteristically found in the Taquari River sediment (da Costa *et al.*, 2012).

Davutluoglu, O. I., G. Seckin, *et al.* in 2011 was studied of chemical fractionation of seven heavy metals (Cd, Cr, Cu, Mn, Ni, Pb and Zn) by using a modified three-step sequential procedure to assess their impacts in the sediments of the Seyhan River, Turkey. Samples were collected from six representative stations in two campaigns in October 2009 and June 2010, which correspond to the wet and dry seasons, respectively. The total metal concentrations in the sediments demonstrated different distribution patterns at the various stations. Cadmium was the only metal that was below detection at all stations during both sampling periods. Based on RAC classification, Cd and Cr pose no risk, Cu and Ni pose low risk, Pb and Zn were classified as medium risk metals, while the environmental risk from Mn was high. In addition, based on the sediment quality guidelines (SQG), the Seyhan River can be classified as a river with no, to moderate, toxicological risks, based on total metal concentrations (Davutluoglu, Seckin, Ersu, Yilmaz, & Sari, 2011).

Chen, Y., Z. Ye, *et al.* in 2011 analyses the desiccation tendency and hydrological regime of the Tarim River, discusses the causes of this condition, the point of zero flow movement, and the influence on the ecological security in the Tarim River basin that may be caused by the further development of desiccation. The main causes of the river desiccation were the increase in irrigated area of the head stream section in the upstream region, the rise in water consumption in the upper and middle reaches, and the construction of reservoirs in the mountain areas. Accordingly, possible countermeasures and ideas for mitigating the desiccation tendency are suggested, so as to provide decision-making references for water resource management and sustainable and healthy social, ecological and economic development in the Tarim River basin (Yaning Chen, Ye, & Shen, 2011).

Anticona, C., I. A. Bergdahl, *et al.* in 2011 Since 2006, three studies have reported elevated levels of lead (Pb) among the indigenous population of the Corrientes river, in the Amazon basin of Peru. Due to the large evidence of environmental pollution related to oil exploitation in the area, this activity has been suggested as the source of exposure. This study aimed to evaluate Pb levels in the population and environment of two communities exposed and one community non-exposed to the oil exploitation activity. Blood lead levels (BLL) were determined by the instrument Leadcare. A comparison with the graphite furnace atomic absorption technique was performed in order to validate the Leadcare results. Environmental samples were analyzed by inductively coupled plasma atomic emission spectroscopy. Among 361 capillary samples, mean BLL of the communities exposed and non-exposed to the oil activity were not significantly different. Pb levels in environmental samples were below the maximum permissible levels. The sources of exposure could not be identified. Elevated levels of Pb in the oil-non-exposed community pointed out at other sources not yet clarified (Anticona, Bergdahl, Lundh, Alegre, & Sebastian, 2011).

Beck, L. and T. Bernauer in 2011 focused on the ZRB because it is both substantively important and analytically challenging in terms of demonstrating the value of our methodological approach: The results indicate that current water abundance in most parts of the ZRB is unlikely to last. While, perhaps surprisingly, climatic changes are likely to have only relatively small effects on water availability, population and economic growth as well as expansion of irrigated agriculture and water transfers are likely to have very important transboundary impacts. Such impacts involve drastically reduced runoff in the dry season at key locations and changing (relative) shares of ZRB countries in the basin's total runoff and water demand. These results imply that effective governance mechanisms for water allocation and for dealing with flow variability should be set up within the next few years in order to manage the situation cooperatively (Beck & Bernauer, 2011).

Tuikka, A. I., C. Schmitt, *et al.* in 2011 assessed of the toxicity of four polluted sediments and their corresponding reference sediments from three European river basins were investigated using a battery of six sediment contact tests representing three different trophic levels. The msPAF and TU-based toxicity estimations confirmed the results of the biotests by predicting a higher toxic risk for the polluted sediments compared to the corresponding reference sediments, but partly having a different emphasis from the biotests. The results demonstrate differences in the sensitivities of species and emphasize the need for data on multiple species, when estimating the effects of sediment pollution on the benthic community (Tuikka *et al.*, 2011).

Bonachea, J., V. M. Bruschi, *et al.* in 2010 determined whether an acceleration of geomorphic processes has taken place in recent years and, if so, to what extent it is due to natural (climate) or human (land-use) drivers. The study results obtained indicate that sedimentation rates during the last century have remained essentially constant in a remote Andean basin, whereas they show important increases in the other two,

particularly one located in the São Paulo metropolitan area. Rates in the estuary are somewhere in between. It appeared that there is an intensification of denudation/sedimentation processes within the basin. Rainfall remained stable or varied very slightly during the period analyzed and does not seem to explain increases of sedimentation rates observed. Human drivers, particularly those more directly related to capacity to disturb the land surface (GDP, energy or cement consumption) shows variations that suggest human forcing is a more likely explanation for the observed change in geomorphic processes. It appears that a marked increase in denudation, of a “technological” nature, is taking place in this basin and leading to an acceleration of sediment supply. This is coherent with similar increases observed in other regions (Bonachea *et al.*, 2010).

Zhang, Z., F. Tao, *et al.* in 2010 examined of Surface water quality and its natural and anthropogenic controls in the Xiangjiang River were investigated using multivariate statistical approaches and a comprehensive observation dataset collected from 2004 to 2008. Cluster analysis (CA) grouped the 15 different sampling stations into five clusters with similar hydrochemistry characteristics and pollution levels. The results revealed that 62% of the contributions of the spatial sites were responsible for variations in heavy metals, while 83% of the contributions from the sampling time were responsible for natural variations observed. However, no significant spatial or temporal contributions were found to be responsible for the nutrient and organic variations (Z. Zhang, *et al.*, 2010).

Cazenave, J., C. Bacchetta, *et al.* in 2009 assessed water quality of the Salado River basin by using a set of biomarkers in the fish *Prochilodus lineatus*. Multiple biomarkers were measured, including morphological indexes (condition factor, liver somatic index), hematological (red and white blood cells) and biochemical (glucose, total protein and cholinesterase activity) parameters. Besides, detoxication and oxidative stress markers (antioxidant enzymes, lipid peroxidation) were measured in liver, gills and kidney. Despite water quality assessment did not show marked differences between sites, biomarkers responses indicate that fish are living under stressful environmental conditions. According to multivariate analysis glucose, glutathione S-transferase activity, lipid peroxidation levels and the count of white blood cells are key biomarkers to contribute to discrimination of sites. So, we suggest using those biomarkers in future monitoring of freshwater aquatic systems (Cazenave, Bacchetta, Parma, Scarabotti, & Wunderlin, 2009).

Van Sprang, P. A., F. A. M. Verdonck, *et al.* in 2009 assessed the potential environmental risks associated with current use patterns of Zn in nine EU river basins in Germany, France and Belgium, thereby using more advanced methodologies which are largely in line with the recommendations made by SCHER. Based on monitoring data we estimated predicted environmental concentrations (PEC) for the different EU river basins between 1.3 and 14.6 µg dissolved Zn/L. PNEC values varied between 22.1 and 46.1 µg dissolved Zn/L. This resulted in deterministic risk characterization ratios (RCR) that were below 1 in all river basins, suggesting that there is no deterministic regional risk associated with current use patterns of Zn in these river basins. A detailed analysis showed that this different deterministic conclusion of risk is mainly due to the fact that the EU RAR (i) uses an additional assessment factor of 2 to derive the PNEC and (ii) uses a more conservative approach for implementing bioavailability (BioF approach). They also argued that the larger conservatism in the EU RAR mainly originates from decisions made to deal in a pragmatic way with (i) uncertainty related to the across species extrapolation of BLMs and (ii) the relatively high sensitivity of some multi-species toxicity studies (Van Sprang, Verdonck, Van Assche, Regoli, & De Schampelaere, 2009).

Bell, V. A., A. L. Kay, *et al.* in 2009 uses a distributed hydrological model, the Grid-to-Grid (G2G), to assess future changes in peak river flows for a range of catchments across the Thames Basin. The G2G model has been used as input an ensemble from the UK Climate Projections (UKCP09) Regional Climate Model (RCM), under the A1B emissions scenario, to analyze changes in flood frequency between two 30-year time-slices (October 1960–September 1990 and October 2069–September 2099). The findings indicate considerable spatial variation in projected changes in peak flows. Towards the downstream end of the fluvial Thames, the average estimated change in modelled 20-year return period flood peaks by the 2080s is 36% with a range of –11% to +68%, which is broadly in line with recent government guidance for the Thames Basin. The study also recommended that where further monitoring/modelling may provide early warning of statistically significant changes in observed flows, due to climate change (Bell *et al.*).

Bogen, J. in 2009 examined about the impact of unusual events on the sediment dynamics in rivers. The increase in the number of extreme precipitation events and other unusual weather events in Norway strongly suggests that weather conditions are changing. The study found that the availability of sediment increased with the increasing soil moisture content in the area. As the ground became saturated, more active slope processes caused erosion rates to increase markedly. The combined effects of climate change and human impact on sediment transport in rivers appear to enhance downstream sediment delivery. Flood protection works along river channels prevent sediment from being deposited on the floodplain. River channels that have been lowered in order to reduce groundwater levels in agricultural floodplain areas will experience the same effect. During the last decade extensive ecological changes have taken place in the coastal areas of southern Norway as 90% of the sugar kelp forest has been lost. This change has been attributed to an apparent increase in sediment delivery to the sea along with a rise in sea temperatures (Bogen, 2009).

Dai, X., J. A. Dearing, *et al.* in 2009 analyzed about the of particle size, mineral magnetism, organic carbon, nitrogen and phosphorus in a sediment core taken from the Longhekou reservoir. Census data compiled from the local Shucheng County provide records of population and land use, complemented with analyses of satellite images. The Xiaotian river delivers over 65% of the total water and silt to the reservoir. Analyses indicate that the fluvial regime tracks the monsoon climate over seasonal time scales, but human activities have a strong mediating effect on sediment supply, sediment delivery and, to a lesser extent, runoff over longer time scales. Notable periods of human impact on erosion include the Great Leap Forward (1958–1960) and Great Cultural Revolution (1966–1976). A rising trend in precipitation and new land use changes at the present time may be leading to an enhanced flood risk (Dai *et al.*, 2009).

Van Vliet, M. T. H. and J. J. G. Zwolsman in 2008 assessed the effects of droughts on the water quality of the river Meuse in western Europe, based on analysis of existing water quality data. Time series of water quality were investigated at two monitoring stations during two severe drought periods, occurring in the years 1976 and 2003. Water quality during these droughts was investigated and compared to water quality during the reference periods, representing common hydrological conditions and similar chemical pollution. The results indicate a general deterioration of the water quality of the Meuse river during droughts, with respect to water temperature, eutrophication, major elements, and some heavy metals and metalloids. This decline in water quality is primarily caused by favorable conditions for the development of algae blooms (high water temperatures, long residence times, high nutrient concentrations) and a reduction of the dilution capacity of point source effluents (van Vliet & Zwolsman, 2008).

Vargas, V. M. F., S. B. Migliavacca, *et al.* in 2008 assessed the ability of these assays to diagnose environmental quality in an area where petrochemical impacts occur. The percentage of mutagenic activity was higher at the sites sampled in front of the petrochemical complex in both periods, but there were more significant mutagenic responses in the first assessment. However, comparing the percentages of samples with mutagenic and cytotoxic activity observed during the two periods it becomes clear that there are more cytotoxic samples during the second period throughout the area studied. The genotoxic activity analyzed by the microscreen phage-induction assay was constant in the second period. Chronic toxicity studies with the microcrustacean *Daphnia magna* confirm the toxic effects observed. The mortality of individuals was higher at the site most influenced by the petrochemical complex, followed by the station located upstream from this area, while the formation of ephippial eggs was uniform at all stations (Vargas, Migliavacca, Horn, & Terra, 2008).

Volk, M., J. Hirschfeld, *et al.* in 2008 presents the results of the FLUMAGIS project, in which they developed a spatial decision support system (SDSS) to support the implementation of the European Water Framework Directive (WFD). Analyses were performed for baseline conditions and specific management and planning scenarios to improve water quantity and quality at micro-, meso- and macro-scale. The results of the study indicate that substantial, expensive water and land management changes at different scales would be necessary to achieve the WFD water quality targets in this basin. Ecological-economic analysis of cost-effectiveness reveals that the costs of achieving certain goals of the WFD can vary more than tenfold depending on which measure is chosen out of the pool of management alternatives. Moreover, the study shows that the differentiation between landscapes and other regional characteristics although considered essential to the successful implementation of WFD measures is very data intensive (Volk *et al.*, 2008).

De Moor, J. J. W., C. Kasse, *et al.* in 2008 reconstruct the Holocene landscape development and fluvial dynamics of the Geul River (The Netherlands) and the main forcing mechanisms of environmental change. Field studies were carried out and we used OSL and <sup>14</sup>C dating methods to reconstruct the Holocene valley development. Our study shows that 2 periods of deforestation (during the Roman Period and the High Middle Ages) led to severe soil erosion and increased floodplain sedimentation in the catchment of the Geul River, possibly combined with periods of increased wetness during the High Middle Ages. Alluvial fans have been active since the Roman deforestation phase. Our results show that the Geul catchment is highly sensitive to changes in land use (de Moor, Kasse, van Balen, Vandenberghe, & Wallinga, 2008).

Damásio, J., R. Tauler, *et al.* in 2008 assessed about the environmental factors affecting aquatic invertebrate communities by using *Daphnia magna* in situ bioassays and biological indices based on community assemblages of benthic macroinvertebrates. In both rivers there was a clear deterioration of the ecological water quality parameters and benthic communities towards downstream reaches. In all but one of the 19 locations studied, transplanted organisms were affected in at least one of the five measured responses. The study results emphasize the importance of combining biological indices with biomarkers and more generalized and ecologically relevant (grazing) in situ responses to identify ecological effects of effluent discharges from sewage treatment plants in surface waters (Damásio *et al.*, 2008).

Brouwer, R. and C. De Blois 2008 presented an overview of the most important sources of uncertainty when analyzing the least cost way to improve water quality. The estimation of the cost-effectiveness of water quality measures is surrounded by environmental, economic and political uncertainty. The model provides insight into the robustness of the ranking of water quality measures by explicating the probability that one measure is more cost-effective than another, applying different distributional assumptions. We show that the

interaction between environmental and economic uncertainty is not straightforward. In the presented case study, the level of uncertainty in the cost-effectiveness indicator can be approximated by the highest uncertainty value in either the cost or effectiveness estimate (Brouwer & De Blois, 2008).

Eljarrat, E., M. Á. Martínez, *et al.* in 2008 evaluated the environmental impact associated to PCDDs/Fs and dioxin-like PCBs in the Ebro River basin. Seventeen toxic PCDDs/Fs and 12 dioxin-like PCBs were analyzed by GC-MS. The results obtained indicated significant accumulation of dioxin-like PCBs, but not PCDDs/Fs, in sediments and fish at the Flix site compared to the other sites. Concomitantly, cytochrome p450 1A (CYP1A) expression, a known indicator of pollution by dioxins and dioxin-like PCBs, was significantly elevated in barbel (*Barbus graellsii*) from the Flix site, compared to the population from the Barbastro site. CYP1A expression correlated with the concentration of dioxin-like PCBs in the fish fat, whereas no significant correlation was found with PCDDs/Fs concentrations. The study suggests a significant biological impact on the Flix site, closely related to the presence of dioxin-like PCBs, whereas the PCDDs/Fs contribution to this impact appears to be non-significant, at least in the studied sites (Eljarrat *et al.*, 2008).

Brown, A. E., G. M. Podger, *et al.* in 2007 assessed how a land use change model can be linked to the Integrated Quantity and Quality Model (IQQM) for the Murrumbidgee River system in southeastern Australia. Linking the two models allows the impact of potential plantation expansion to be assessed at various points throughout the river system and allows changes in stream flow in upland areas to be converted into impacts on allocations and diversion for downstream water users. The finding shows that, at the regional scale, the impacts of these plantation scenarios are small on a mean annual basis, with reductions in allocations, diversions and end-of-system flows being 0.7%, 0.4% and 2.6%, respectively for the maximum impact scenario. However, when there is a large increase in the area of plantations in one sub-catchment, the local scale means annual streamflow reductions can be significantly higher (up to 23% reduction for the modelled scenario), with larger percentage reductions seen in lower flows than in the higher flows (Brown, Podger, Davidson, Dowling, & Zhang, 2007).

Bonzongo, J.-C. J., B. W. Nemer, *et al.* in 2006 mentioned that the Carson River flows in a closed basin system and the total flow of the river water decreases downstream due to both evaporation and consumptive uses. The investigated hydrologically driven changes in water chemistry of the river system and the resulting effects on Hg cycling were examined. Results show that periods of low water flow correspond to high water pH (up to 8.3), relatively high concentrations of oxyanion forming elements (e.g., As, Se, Mo and W), and low Hg methylation potential in sediment. In contrast, periods of high flow bring about dilution, which results in lower pH (~7), lower concentrations of oxyanion forming elements, but higher Hg methylation potential. Overall, changes in flow regimes likely affect rates of methyl-Hg (MeHg) production through a combination of factors such as high pH, which favors MeHg demethylation, and the occurrence of relatively high concentrations of Group VI oxyanions that could interfere with microbial SO<sub>4</sub> reduction and MeHg production (Bonzongo, Nemer, & Lyons, 2006).

Terrado, M., D. Barceló, *et al.* in 2006 Identified about the main contamination sources of heavy metals, organic compounds and other physicochemical parameters in Ebro river surface waters and the description of their temporal and spatial distributions, are analyzed using Chemometrics and geostatistical methods. Historical data available from the Confederación Hidrográfica del Ebro (CHE), which is the organization in charge of the management of the Ebro river basin; covering different years since 1992 for water, sediments and fish samples are investigated. Due to the great amount of data in these databases and to their complexity, Chemometrics modelling (using principal components analysis, PCA) coupled with geographical information systems (GIS) is proposed to evaluate the environmental quality of the Ebro river basin (Terrado, Barceló, & Tauler, 2006).

Wilby, R. L., P. G. Whitehead, *et al.* in 2006 have done a case study of the River Kennet illustrates how the system can be used to investigate aspects of climate change uncertainty, the deployable water resources, and water quality dynamics in upper and lower reaches of the drainage network. The results confirm the large uncertainty in climate change scenarios and freshwater impacts due to the choice of general circulation model (GCM). This uncertainty is shown to be greatest during the summer months as evidenced by large variations between GCM-derived projections of future low river flows, the deployable yield from groundwater, severity of nutrient flushing episodes, and long-term trends in surface water quality. Other impacts arising from agricultural land-use reform or delivery of EU Water Framework Directive objectives under climate change could be evaluated using the same framework (Wilby *et al.*, 2006).

De Nooij, R. J. W., K. M. Lotterman, *et al.* in 2006 have looked on validity and sensitivity analysis of a model (BIO-SAFE) for assessment of impacts of land use changes and physical reconstruction measures on legally protected and endangered river species. The sensitivity of BIO-SAFE to value assignment has been analyzed using data of a Strategic Environmental Assessment concerning the Spatial Planning Key Decision for reconstruction of the Dutch floodplains of the river Rhine, aimed at flood defense and ecological rehabilitation. Results conclude that linking species to ecotopes can be used for adequate impact assessments. Quantification of sensitivity of impact assessment of value assignment shows that a model like BIO-SAFE is relatively insensitive to assignment of values to different policy and legislation based criteria. Arbitrariness of the value assignment

therefore has a very limited effect on assessment outcomes. However, the decision to include valuation criteria or not is very important (De Nooij *et al.*, 2006).

Tarras-Wahlberg, N. H., A. Flachier, *et al.* in 2001 mentioned that gold mining in the Portovelo-Zaruma district in southern Ecuador is causing considerable environmental impacts; the most important ones are related to the discharge of cyanide, mercury and metal rich tailings into the rivers of the Puyango catchment area. It is shown that the prevailing neutral or slightly alkaline conditions of the rivers ensure that the metals are mainly associated with sediment. It is further shown that large amounts of metals, which are bound to suspended sediment under ambient pH conditions, enter the dissolved and directly bioavailable state in more acidic conditions. Metal levels in carnivorous fish were found to be modestly elevated only, with the exception of mercury. Mercury levels exceeded 0.5 mg/kg in fish from both contaminated and uncontaminated sites, showing that both methylation and bioaccumulation of mercury are occurring in the Puyango river basin (Tarras-Wahlberg, Flachier, Lane, & Sangfors, 2001).

Bishop, C. A., P. Ng, *et al.* in 1998 assessed developmental abnormalities in embryos and hatchlings from eggs of the common snapping turtle (*Chelydra serpentina serpentina*). The study found a significant increase in abnormal development with increasing polychlorinated aromatic hydrocarbon exposure in eggs, particularly PCDD and PCDF concentrations. In contrast, the risk of abnormality was not significantly higher as toxic equivalent concentrations increased in eggs. The study also found significant 7-ethoxyresorufin O-deethylase and Cytochrome P4501A responses in livers of hatchling turtles from Lake Ontario relative to hatchlings from a clean, inland site whereas we did not find any evidence of porphyria in the hatchlings from either site (Bishop *et al.*, 1998).

#### *Conclusion:*

As the objectives of the study to review of empirical evidence on the impact of polluted river water in the context of environmental risk as well as Ecological Risk in the river basin area over the world. In general, the review findings concluded that polluted river water are seriously caused for hampering of the Sustainable Development (SD) especially in the context of sustainable development, ecosystems change, sustainable livelihoods, land cover, ecosystems, environmental sensitivity, biodiversity and geodiversity as well as social and economic arena in a river basin over the world. Moreover, the study also identifies that Flow velocity in the river is most sensitive parameter to Nitrobenzene concentration in water column based on sensitivity analysis of input parameters and the organic pollutants were the main contributing factor to the toxicity of effluents from textile and dyeing plants, pulp and paper mills, fine chemical factories and municipal wastewater treatment plants. On the other hand, the study also indicates that upstream industrial and municipal wastewater discharges along the river bank are major sources of pollution. The accumulation factor and potential ecological risk index indicate that the sedimentation at the Salt River mouth has the most serious degree of Cu accumulation and the highest ecological potential risk. Furthermore, it has noted in this review that the salinity was one of the major stresses affecting macroinvertebrate assemblages, whereas antioxidant and metabolizing enzymes responded differently and were closely related to high and presumably toxic levels of accumulated organic pollutants. Therefore these results indicate that the use of multiple -markers sensitive to water pollution may provide complementary information to diagnose environmental factors that are impairing macroinvertebrate communities. On the other hand, few studies emphasize the importance of combining biological indices with biomarkers and more generalized and ecologically relevant (grazing) in situ responses to identify ecological effects of effluent discharges from sewage treatment plants in surface waters. Moreover, quantification of sensitivity of impact assessment to value assignment shows that a model like BIO-SAFE is relatively insensitive to assignment of values to different policy and legislation based criteria.

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