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The Effects of Human Activity in Yasuj Area on the Health of Stream City

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***Abstract*—**The Yasuj city stream named the Beshar supply water for different usages such as aquaculture farms , drinking, agricultural and industrial usages. Fish processing plants ,Agricultural farms, waste water of industrial zones and hospitals waste water which they are generate by human activity produce a considerable volume of effluent and when they are released in to the stream they can effect on the water quality and down stream aquatic systems. This study was conducted to evaluate the effects of outflow effluent from different human activity and point and non point pollution sources on the water quality and health of the Beshar river next to Yasuj. Yasuj is the biggest and most important city in the Kohkiloye and Boyerahmad province . The Beshar River is one of the most important aquatic ecosystems in the upstream of the Karun watershed in south of Iran which is affected by point and non point pollutant sources . This study was done in order to evaluate the effects of human activities on the water quality and health of the Beshar river. This river is approximately 190 km in length and situated at the geographical positions of 51° 20´ to 51° 48´ E and 30° 18´ to 30° 52´ N it is one of the most important aquatic ecosystems of Kohkiloye and Boyerahmad province in south-west Iran. In this research project, five study stations were selected to examine water pollution in the Beshar River systems. Human activity is now one of the most important factors affecting on hydrology and water quality of the Beshar river. Humans use large amounts of resources to sustain various standards of living, although measures of sustainability are highly variable depending on how sustainability is defined. The Beshar river ecosystems are particularly sensitive and vulnerable to human activities. The water samples were analyzed, then some important water quality parameters such as pH, dissolve oxygen (DO), Biochemical Oxygen Demand (BOD5), Chemical Oxygen Demand (COD), Total Suspended Solids (TDS),Turbidity, Temperature, Nitrates (NO3) and Phosphates (PO4) were estimated at the two stations. The results show a downward trend in the water quality at the down stream of the city. The amounts of BOD5,COD,TSS,T,Turbidity, NO3 and PO4 in the down stream stations were considerably more than the station 1. By contrast the amounts of DO in the down stream stations were less than to the station 1. However when effluent discharge consequence of human activities are released into the Beshar river near the city, the quality of river are decreases and the environmental problems of the river during the next years are predicted to rise.

***Keywords*—**Health, Human activities, Water pollution, Yasuj , Iran

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I. Introduction

ACCORDING to the U.N. a child dies from a water related disease every 15 seconds, 1 in 5 doesn't have access to safe drinking water, and 1 in 3 people lack access to adequate sanitation. We know less than 0.007 percent of all water on Earth is available to drink and less than 1 percent of all fresh water is readily accessible for human use. So pollution control and protection of water resources systems are necessary and water quality has an important role on the human health and aquatic ecosystems. As we need development for better living, and some of development plants have some disadvantages on environment and water systems, the development plant have to sustainable for decreasing the human activity on water pollution.

The quality of freshwater at any point on the landscape reflects the combined effects of many processes along water pathways. Human activities on all spatial scales affect both water quality and quantity[1].

Hydro geological and biophysical environments are directly affected by changes in land use and socioeconomic processes, which are largely controlled by human activities and resource management. A land management decision is a water resource decision, a fundamental concept for addressing and implementing integrated land and water resources management [2].

The fastest growing food production sector in the world is aquaculture, the farming of aquatic organisms such as fish, mollusks, crustaceans and plants [3] , while their effect on the sustainable environment is not assured. When effluent of aquaculture farms releases to the river ,the amount of dissolved oxygen will be dropped and sedentary animals may die in water. Antibiotics and other curative chemicals added to feed can affect on organisms for which they were not intended when the drugs are released as the uneaten pellets decompose[4].However, many drugs used in fish farms have been found to have minimal harmful effects on the aquatic ecosystem[5].

Natural water quality varies markedly and is affected by the geology, biology, and hydro climatic characteristics of an area [6]. Even under natural conditions, water may be toxic or otherwise unfit for human consumption. The occurrence of high and toxic metal concentrations is not uncommon and can be attributed to weathering of naturally occurring ore deposits. Although generally non-toxic, the solute concentrations of "pure" bottled spring water can vary by several orders of

magnitude worldwide. However, the concept of pollution is relative, in that it reflects a change from some reference value to a value that causes problems for human use [7]. A worldwide reference value is difficult to establish because insufficient monitoring has occurred prior to changes in water quality due to human activities. Furthermore, there is no universal reference of natural water quality because of the high variability in the chemical quality of natural waters [7].

Natural water quality variations occur over a wide range of time scales [7].

Human influences have had a direct effect on the hydrologic cycle by altering the land in ways that change its physical, chemical, and biological characteristics [8,6,9]. Physical alterations such as urbanization, transportation, farming (irrigation), deforestation and forestation, land drainage, channelization and damming, and mining alter hydrologic pathways and may change the water quality characteristics by modifying the materials with which the water interacts . For example, the impervious surfaces created by urbanization produces overland flow and high amounts of runoff even at moderate rainfall intensities [10]. In addition, these human activities alter water quality not only by changing hydrologic pathways, but by the addition of substances and wastes to the landscape. These activities include application of pesticides, herbicides, and fertilizer, and leaching to groundwater and surface water from landfills, mine tailings, and irrigated farmland. The situation of some of pollutant source in the Beshar stream were showed in figures 1 to 3.

Fig. 1 Effluent of yasuj waste water treatment plant are used by cows.

Human activity is now one of the most important factors affecting hydrology and water quality. Humans use large amounts of resources to sustain various standards of living, although measures of sustainability are highly variable depending on how sustainability is defined [11]. Nevertheless, the land must be altered to produce these resources. Irrigated agriculture alone is responsible for about 75 percent of the total water withdrawn from “surface water and groundwater sources,” and more than 90 percent of this water is consumed and delivered to the atmosphere by evaporation [12].

Fig. 2 Storage of effluent of sugar factory in the basins net to the Beshar stream

Some human-derived substances, including pesticides, micro organic pollutants, nitric acid, and sulfuric acid from fossil fuel combustion, have been found in virtually every remote area, and the occurrence and distribution of many of these is due to long-range transport in the atmosphere (e.g., pesticides,) [13]. For example, the pesticide atrazine has been found in lakes and rain in Switzerland [14] and organo chlorine compounds have been found in the Arctic [15] and the Antarctic [16].

Conversely, the resource demands of downstream users may result in the diversion of water, which may have been used for headwater agriculture, from basin headwaters. In some cases, land conversion to agriculture may ultimately cause soil salinization, which effectively poisons the land [17]. Similarly, conversion to irrigated agriculture can increase evapotranspiration from crops and alter the regional climate [18,19].

Fig. 3 Solid wastes on near to the Beshar bridge on the bed stream.

Effects of human activities on a small scale are relevant to an entire drainage basin. Furthermore, local, regional, and global differences in climate and water flow are considerable, causing varying effects of human activities on land and water

quality and quantity, depending on location within a watershed[1], ecology, biology, physiographic characteristics, and climate. These natural characteristics also greatly control human activities, which will, in turn, modify (or affect) the natural composition of water[1].

Current research on toxicity relies primarily on exposure of biota to various types of runoff [20] and less on a systematic assessment of mixtures of compounds that may have symbiotic effects on biota.

The concept of human intervention in the landscape and the disposal of substances have created chemical time bombs. Our understanding of transport through basin materials evolved as our attention focused on major human health issues associated with the disposal of toxic substances in the landscape [21]. This concept of chemical time bombs has emerged in the past few decades through environmental toxicology investigations and results of environmental remediation. Our perceptions of the risk associated with exposures to toxic substances has likewise evolved [22].

As another example, the concentrations of DDT, an insecticide that was banned in 1972 from further production and use in the U.S., remains high in agricultural soils, stream water, suspended and streambed sediment, and in fish in the Yakima River basin, Washington [23,24].

II. Materials And Methods

Many human activities can contribute to producing pollution and declining water quality in the Beshar river. Some of these activities include agricultural farms, aquaculture facilities located within and next to the river, heavy industries such as, sugar factory, gravel and sand mines on the river bed or next to the river, waste water treatment plants and solid wastes.

In order to evaluate the effects of the mentioned pollutants on the quality of the Beshar river and evaluation of temporal water quality changes during 2008 to 2009, five monitoring stations were selected along its course as have been shown in figure no.4.

Fig. 4.Water sampling stations on the Beshar river

At first location of the station were selected ,then research team were taken the water samples with field observation and surveying as shows as figures 5 and 6.Finaly water quality parameters as follow as were evaluated.

Temperature

Water temperature affects the ability of water to hold oxygen, the rate of photosynthesis by aquatic plants and the metabolic rates of aquatic organisms. Causes of temperature change include weather, removal of shading stream bank vegetation, impoundments, discharge of cooling water, urban storm water, and groundwater inflows to the stream.

pH

pH is a term used to indicate the alkalinity or acidity of a substance as ranked on a scale from 1.0 to 14.0. Acidity increases as the pH gets lower. A pH of 7.0 is neutral. Aquatic organisms differ as to the range of pH in which they flourish.

Electrical Conductivity

Electrical conductivity (EC) is a measure of the ability of water to pass an electrical current. Conductivity in water is affected by the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, and phosphate anions or sodium, magnesium, calcium, iron, and aluminum cations. Organic compounds like oil, phenol, alcohol, and sugar do not conduct electrical current very well and therefore have a low conductivity when in water. Conductivity is also affected by temperature: the warmer the water, the higher the conductivity. For this reason, conductivity measurements are reported as conductivity at 25 degree Centigrade.

Turbidity

Turbidity is a measure of the amount of particulate matter that is suspended in water. Water that has high turbidity appears cloudy or opaque. High turbidity can cause increased water temperatures because suspended particles absorb more heat and can also reduce the amount of light penetrating the water.

Dissolved Oxygen

Although water molecules contain an oxygen atom, aquatic organisms rely upon a small amount of oxygen that is actually dissolved in the water. In general, rapidly moving water contains more dissolved oxygen than slow or stagnant water and colder water contains more dissolved oxygen than warmer water. Bacteria consume oxygen as organic matter decays. As a result, an oxygen-deficient environment can develop in lakes and rivers with excess organic material. These conditions can eventually lead to fish kills.

Biological Oxygen Demand (BOD)

The BOD is the amount of oxygen consumed by bacteria in the decomposition of organic material. It also includes the oxygen required for the oxidation of various chemical in the water, such as sulfides, ferrous iron and ammonia. While a

dissolved oxygen test tells you how much oxygen is available, a BOD test tells you how much oxygen is being consumed. BOD is determined by measuring the dissolved oxygen level in a freshly collected sample and comparing it to the dissolved oxygen level in a sample that was collected at the same time but incubated under specific conditions for a certain number of days. The difference in the oxygen readings between the two samples in the BOD is recorded in units of mg/L.

Nitrate

Nitrate is a major ingredient of farm fertilizer and is necessary for crop production. When it rains, varying nitrate amounts wash from farmland into nearby waterways. Nitrates also get into waterways from lawn fertilizer run-off, leaking septic tanks and cesspools, manure from farm livestock, animal wastes (including fish and birds), and discharges from car exhausts. The U.S. Public Health Service has established by U.S. Environmental Protection Agency 10 mg/L of nitrate-nitrogen as the maximum contamination level allowed in public drinking water.

Fig. 5 Water sampling from effluent of yasuj waste water treatment plant before mixing with the Beshar river and upstream the station 4

III. Results And Discussion

Some water quality parameter such as Temperature, dissolved oxygen, biochemical oxygen demand, PH, total dissolved solids, electrical conductivity, nitrate, phosphate and turbidity of five station on the Beshar river are sampled, than analysed. One of the most important issues for effective resource management is recognition of cyclical and cascading effects of human activities on the water quality and quantity along hydrologic pathways [1]. The degradation of water quality in one part of a watershed can have negative effects on users downstream. Everyone lives downstream of the effects of some human activity [1]. An extremely important factor is that substances added to the atmosphere, land, and water generally have relatively long time scales for removal or clean up[1].

Fig. 6 Field observations on the stream

The nature of the substance, including its affinity for adhering to soil and its ability to be transformed, affects the mobility and the time scale for removal of the substance. Policy alone will not solve many of the degradation issues, but a combination of policy, education, scientific knowledge, planning, and enforcement of applicable laws can provide mechanisms for slowing the rate of degradation and provide human and environmental protection. Such an integrated approach is needed to effectively manage land and water resources [1].

The effects of some above water quality parameters are evaluated based on previous studies and other references.

Nitrate-nitrogen levels below 90 mg/L and nitrite levels below 0.5 mg/L seem to have no effect on warm-water fish, but salmon and other cold-water fish are more sensitive. The recommended nitrite minimum for salmon by U.S. Environmental Protection Agency is 0.06 mg/L.

Numerous scientific studies suggest that 4-5 parts per million (ppm) of DO is the minimum amount that will support a large, diverse fish population. The DO level in good fishing waters generally averages about 9.0 parts per million (ppm).When DO levels drop below about 3.0 parts per million, even the rough fish die. The table in this section shows some representative comparisons.

IV. Conclusion

Water quality of the Beshar River was assessed through surveying the chemo physical water quality parameters . Study was carried out at Yasuj stream to observe the effect of human activity on water quality through field observation and water samples analysis of the Beshar river . In this survey, five study stations were selected to examine water pollution in the Beshar River systems. River ecosystems are particularly sensitive and vulnerable to human activities.

Based on field surveying and laboratory analysis the amounts of water quality parameter including Temperature, pH, Dissolve oxygen (DO), Biochemical Oxygen Demand (BOD5), Chemical Oxygen Demand (COD), Total Suspended

Solids (TDS),Turbidity, Nitrates (NO3) and Phosphates (PO4) were determined at the two stations. Then data were evaluated and classified by SPSS software. The study of Water quality monitoring is very important to help us understand the impacts of declining water quality and discover new ways to help keep the Beshar river healthy.As the results show, the most important pollution index parameters such as BOD5, NO3 and PO4 increase and DO and pH decrease according to human activities ($P<0.05$). However, due to pollutant degradation and dilution, pollution index parameters improve downstream sampling stations. Human activities are affected on the Beshar river water quality. Typical urban human activities may lower oxygen concentrations. Runoff from impervious surfaces bearing salts, sediments and other pollutants increases the amount of suspended and dissolved solids in the Beshar stream water. Organic wastes and other nutrient inputs from sewage and industrial discharges, septic tanks and agricultural and urban runoff can result in decreased oxygen levels. Nutrient input often lead to excessive algal growth. When the algae die, the organic matter is decomposed by bacteria. Bacterial decomposition consumes a great deal of oxygen. In order to reduce the human effects on the Beshar river these needs to be done:

A range of measures can be used to promote water conservation and to improve water quality by reducing nutrient flows into the Beshar river. Initiatives include re vegetation of river banks.New industrial wastewater collection and treatment facilities must be constructed, and existing facilities modernized and upgraded in the city of yasuj. Industrial wastewater facilities such as sugar factory must be more effectively operated. Discharges of industrial wastewater into municipal sewer systems must be pre-treated, especially with regard to hazardous substances.

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