JOURNAL OF PURE AND APPLIED MICROBIOLOGY, Nov 2015. Vol. **9**(Spl. Edn. 2), p. 181-192

Ecological Risk Assessment on Water Resources by Using Tier Model

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(Received: 16 August 2015; accepted: 11 September 2015)

Ecological risk assessment, using modeling Tier is systematic and appropriate process in determining the risk of a stimulant and its dangers that Its application, will be effective in predicting and assessing the risks of effluent discharge to surface water and river. In these studies, four scenarios based on river conditions and type of waste is raised. Finally, by calculating the probabilities of risk exposure and the severity of the effects of stimulus, pollutant deterioration coefficient in river water environment and risk factors for BOD and DO were estimated. The first and second scenarios in the screening assessment showed low risk while the third and fourth scenarios that are related to untreated wastewater need to better risk assessment in the basic assessment. BOD and DO parameters have less uncertainty than other factors. With increasing distance to the place of discharge, the rate of BOD in the river decreased and risk for the environment is decreased. On the contrary, DO, less linear relationship indicates and by increasing the distance to the site of discharge at first it declined and in lower limit remains constant and then it gives ascending trend.

Key words: Screening level, The basic level, BOD, DO, Risk management, Risk classification.

The releases of wastewater impose different types of compounds with different concentrations to the components of the environment. Concentrations of these chemicals, especially in the collections of water and some organisms such as fish tissues or aquatic plants can be studied. A new substance should be evaluated based on environmental behavior and potential risks, while often measured levels of the substance are not available[14]. In some cases it is required that a predetermined material values must be re-evaluated and measured during monitoring programs, re-measured and well used in the evaluation. In order to evaluate this pollutant, a variety of data records are available which are suitable for estimating the potential environmental concentrations of pollutants. The data that are required for such estimates includes water quality, flow rate, flow characteristics and riverbed. In addition, environmental fate of original material parameters should be record that includes the rate of decomposition and release of water in the body. It should be noted that these data alone are not efficient to estimate the concentrations in the environment. In addition, the acceptance rate of

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water collection must be defined. Ecological risk assessment is a term that relates to methods for determining the risk posed by a stimulus for survival or ecosystem health. Under these procedures, risk is defined as the probability of the risk of a certain concentration of the stimulus and creating a detrimental effect for the ecosystem.

Accordingly, risk is determined by measuring the two concepts:

Consequences or effects of an adverse event;

Probability or likelihood of the event happening (risk exposure)

Using this measure, quantify risk as the probability of an adverse event, the risk is calculated by multiplying the probability of exposure and outcome or the impact of the exposure. Therefore, the purpose of risk assessment is ecological estimate the probability of occurrence of adverse events in the environment triggers. Earlier, ecological risk assessment was used to evaluate the effects of the release of a specific chemical pollutant in the environment. But now, more ecological risk assessment is used to assess the potential impact of several threats against the effects of predicted or measured using environmental values. It is necessary to mention that the repetitive nature of the risk assessment will update the results on the basis of new data and new monitoring data, for the period. Steps to reduce the risk are risk formed by specific stimuli or constituent processes. In this context, ecological risk assessment has an important role in natural resource management based on the principles of adaptive management. The ecological risk assessment studies in a section of the river Taloqan, with Tier model is done. As it turns out, it cannot always be monitored by measuring the amount of pollutants in the environment. Using mathematical models can predict many changes and conditions in the environment. Tier ecological risk assessment model divided at three levels (Tier 1, Tier 2 and Tier 3), each of them has five key tasks:

1) Identify the problem
2) Acceptor properties
3) Assessment of exposure
4) To evaluate the toxicity
5 A description and classification of risk

The above steps are performed to obtain data and information, because risk management decisions taken by them or decide whether it is necessary to go into more detail elsewhere. In short, the degree of detail and quality data at any level can be described as follows:

Tier 1 Qualitative (preliminary assessment of risk)
Tier 2 Semi-quantitative (advanced risk assessment)
Tier 3 Quantitative (advanced risk assessment)

Approach Tier, provides a systematic method for determining the required level in the study, which is suitable for site problems, reduces uncertainty and leads to better use of resources. The model performed well in New Zealand, Canada and Australia. Tier model of the barrier, where there is repeated. Repeat is re-evaluation and unexpected data that may occur at any time during the risk assessment, to be conducted in response to a need for new information or increase questions during the assessment. . Such repetition is common classification of risk assessment, but it is a planning stage and not official. It is important to mention that from Tier 1 to Tier 2 and Tier 3 is going to reduce the conservatism and the level of certainty that the obtained values are approximately correct values. Regardless of the level of detail described in each section, the surface must be selected that in each level risk assessment has appropriate characteristics, scope and importance. In general, ecological risk assessment carried out during the phase of a project RI CERCLA / SARA or during the phase of a project RCRA RFI. Although this may initially be in a preliminary manner, screening level ecological risk assessments are often divided into an ecological risk assessment (Tier 1) and a basic level (Tier 2) ecological risk assessment (Figure 1).

Screening level ecological risk assessment is a simple risk assessment, which can be implemented with limited data and conservative assumptions to minimize the chances like that when there isn't a risk in fact, the risk is used. In an ecological risk assessment basis, conservative assumptions were removed and replaced with the best estimates to assess the risk more accurately. When the ecological risk assessment carried out in phases RI and RFI, there is the screening level ecological risk assessment.

Regardless of whether a basic screening

level ecological risk assessment begins, the risk assessment process always includes planning, design issues, analysis, risk classification and risk management. During both the planning and management of risk is essential that risk assessment (who is responsible for the implementation of ecological risk assessment) and risk managers (who is responsible for the overall implementation of reconstruction projects and integrated, general director of project risk or risk consultant) have discussions, because both of them have an important role. During the design, analysis and classification of risk, risk managers are less involved in daily decisions, but need to be aware of what may happen[1].

Group's site that was chosen as a case study is Taleghan River, which is located in the basin and sub-basin Sefid Rud. This river is one of the branches Sefidrood River, which according to its extent and conditions of Alamut region in terms of climate conditions, river, and aquatic species and to other parts of the river is undefeated area. In this area, three family fishes carp, salmon, trout stream and dogs have been identified. Three of carrots, black fish and dogfish stream are most frequent than other species. A total of 312 samples of benthic species belonging to the families Simulidae, Chironomidae and Tabanidae and route to Ephemeroptera, Tricoptera, Diptera and Oligochaeta class have been identified, among which is the most common family is Simulidae. In these studies, in order to cross the river Taleghan ecological risk assessment, the assumptions to simplify the problem and the problem is considered. To study the reactions and behavior of pollutants in the river water and its effects on aquatic species 4 scenario considered. 2 scenarios are dedicated to wastewater into the river, which in the first case, treated wastewater and in the second case, raw sewage had been considered. According to the information available at the time the treated wastewater into the river, usually BOD level will not be higher than 30 mg. The DO is 3 mg per liter that it enters into the river at 30 ° C. Wastewater flow of 800 liters per second is assumed. The most important thing about concentration of pollution is how much is the dilution or self-purification in the environment. In winter, autumn and spring is in the area of high rainfall, river flow rate increases and thus increases the amount of dilution and dispersion in the river. According to the sources and existing standards, the standard for healthy fish (such as carp) for DO and BOD is mg / L 4, which is used to determine the risk factor in the tolerance of the species[2].

MATERIALS AND METHODS

in 1197, the US Environmental Protection Agency (USEPA) has issued guidelines for ecological risk assessment. The process for the design and conduct ecological risk assessment (ERAGS) (Figure 2). Ecological risk assessment process documentation guide describes an eight-stage process in a sequential approach to the implementation of ecological risk assessments. EPA, the following eight steps:

Screening level ecological risk assessment (Tier 1)

Screening level ecological risk assessment approach is applied step by step and burst is a basic risk assessment. Approach level under Tier 1 screening is performed. Ecological risk assessment in Tier 1 is usually very guarded and little or no data in the data field (the evidence) is collected and analyzed. The following items should be included:

1) The background of what is known about its ecological parameters of sensitive sites, including sites of historical information and data available library and field.
2) Fate and effects models must be implemented on existing data to estimate risk. Tier 1 is very conservative modeling to ensure protection.
3) Site visits have to check the ecological parameters and complete exposure pathways Subscribe to run.

The results of ecological risk assessment in Tier 1 are used to make decisions about the following:

1) sufficient information / good to understand that there is no significant risk. Evaluation should be stopped. Or
2) sufficient information / good to understand that there is a very large risk. And must act quickly (eg corrective action, limit, etc.) done. Or
3) sufficient information / not suitable for risk

assessment (e.g. lack of data) or risk assessment was very cautious about the proposed corrective action is uncertain.

Evaluation should be directed to the basic ecological risk assessment (Tier 2) progress. All parts of the assessment, management and legislation must input their site and have agreed to this decision.

Basic ecological risk assessment (Tier 2)

Ecological risk assessment is the basis for Tier 2. Ecological Risk Assessment Tier 2 to Tier 1 uses the more specific information. As the need to reduce uncertainty, Tier 2 is suggested. Laboratory and field studies to determine the exposure or effects may correct input. The more input data are combined, the risk estimates are less cautious. Basic ecological risk assessment includes:

New data models, effects and fate combined. Risk assessment and enhancing the ecological basis of the best estimates are extremely conservative estimates for replacing the data.

1) Studies to identify specific issues.
2) Laboratory tests of short-term (usually less than 6 months, including design, initial testing, final testing, and statistical analysis) or limited field studies (e.g. collecting water or soil or better sample collected from a particular population of animals) to fill gaps in data in analyzing the risk exposure and ecological effects. The ecological risk assessment results can be used as a basis for making decisions in the following field:
3) There is sufficient information to conclude that there is no significant ecological risk. Evaluation should be stopped. Or
4) There is sufficient information to conclude that the risks are very large and have corrective action (eg, compensation, prevention, etc.) to be done immediately. Or
5) sufficient information to estimate the risk (eg lack of data), or estimation of risks and uncertainties, many of them are very causation, there is no corrective action proposed. The assessment should be corrected.

All departments responsible for evaluating, managing and conditions, and must agree with the decision they should have input.

1. Planning
2. Issue

The general strategy for evaluating the risk on the site plan is developed. In order to be more successful, the question of ecological risk assessment should be developed as well. This part of the ecological risk assessment should identify targets more ecological risk assessment, provide a conceptual model for the site, define risk potential adopters and a program to provide data analysis and classification of risk. Generally the hierarchy below shows how it goes ecological risk assessment. In fact, most of these events occur at the same time and transformed and until all available information is collected, will be reviewed. Model and the final result at the end of their final issue, then all the data collected and assessed for credibility and respect in accordance with the site conditions.

Describe the stressor and exposure

Information about the characteristics of the potential ecological pollutants (COPEC), in addition to any other stressful collected at the site, and if the ecological components (such as plants, mammals and fish) determines or may be at risk be stressful.

Ecological components potentially at risk

what are the ecological components that have or may be at risk of potential environmental pollutants.

Ecological effects

existing historical, ecological potential effects on ecological features and potential toxicity of pollutants is determined.

Conceptual Site Model

It provides a model that shows potential exposure pathways to environmental pollutants across the ecological components. This model explains how ecological potential contaminants may affect the ecological components.

Gaps in the data

Data and other information to determine whether the site is suitable for the classification of risk are sufficiently available. Are gaps in existing data determines what data or information is needed and why?

Evaluation of results

Determines what specific ecological components that must be protected and what aspects of these components must be protected.

Table 1. General conditions and low river water in wet seasons

7.3 m3/s	The minimum flow in summer	24.4 m3/s	The maximum flow rate in March
0.7 mg/l	Minimum BOD	0.6 mg/l	Maximum BOD
4.5 mg/l	Minimum DO	5.1 mg/l	Maximum DO
0.2 m/s	The minimum speed of the water	0.2 m/s	The maximum speed of the water
25°C	The minimum water temperature	15.5 æ%C	The maximum water temperature
2 m	Minimum water depth	4 m	Maximum water depth
0.2	Bed ratio N	0.2	Bed ratio N
0.4 l/day	Deterioration or aeration coefficient (K2)	0.4 l/day	Deterioration or aeration coefficient (K2)

Table 2. Assumptions related to the treated wastewater entering the river

m3/s	0.8	Qs	Raw wastewater discharge
mg/l	30	BODs	Biochemical oxygen demand
mg/l	3	DOs	Dissolved oxygen
°C	30	Ts	The temperature of the raw wastewater
l/day	0.07	k	The treated wastewater

Table 3. Assumptions related to untreated sewage entering the river

m3/s	0.8	Qs	Raw wastewater discharge
mg/l	180	BODs	Biochemical oxygen demand
mg/l	1	DOs	Dissolved oxygen
°C	30	Ts	The temperature of the raw wastewater
l/day	0.2	k	For raw sewage

Table 4. Tier 1 level risk assessment results in the first to fourth scenario

Q mix	BOD mix	DO mix	SENARIOS
8.1	3.5938	4.3519	SENARIO1
25.2	1.5333	5.0333	SENARIO2
25.2	4.3905	4.9698	SENARIO3
8.1	18.409	4.1543	SENARIO4

Table 5. For the Tier 2 risk assessment calculations in the third scenario

Q mix	BODmix	DO mix	T mix	Kc,20	K2,20	kc,T mix	k2,T mix	LC0
25.2	4.390476	4.969841	15.96032	0.23	0.218016628	0.184558	0.198098	6.424806

The final results of the assessment that describes the environmental impacts t should be directed towards the decision-making process.

Measurement results

Identify indicators that show whether the evaluation of the final results occurs or might occur. These indicators may measure exposure or size effects, and should be specifically related to the final results will be evaluated.

Agenda

Work program documents evaluation of the decisions taken during the design problem, and determine the duties that require additional studies are completed.

The analysis phase

The analysis of ecological risk assessment, includes data collection, evaluation of technical data to calculate the exposure of existing and potential ecological impact site. This analysis is based on information collected often includes additional assumptions and models for interpreting the data in the model site. To classify the exposure and ecological effects, the uncertainty associated with field measurements and the assumptions that there are no specific data are not available and must be documented.

The classification of risk

in classification of risk, likelihood and severity of risks and uncertainties related to the final results of the evaluation of the ecological assessment is described[4]. Talk about risk should be fully sufficient for evaluation by risk managers in determining any necessary remedial action for the site. Risk classification is composed of two parts: risk assessment, and explain the risks. Risk assessment is determining the likely adverse effects on the evaluation of the final results. This was accompanied by complete information on risk exposure and summarize the effects of risk is calculated uncertainties. For example, the screening

Table 6. Calculation for scenario 3 HQ at various distances from the sewage discharge into the river

X (m)	HQ-DO	HQ-BOD	X (m)	HQ-DO	HQ-BOD
100	1.24117	1.57189807	30000	0.998569	1.092989
1000	1.22973	1.55479912	35000	0.980553	1.028552
2000	1.217372	1.53601834	40000	0.967517	0.967914
3000	1.205378	1.51746442	45000	0.958994	0.910851
4000	1.193744	1.49913461	50000	0.954553	0.857152
5000	1.182463	1.48102622	55000	0.953794	0.806619
6000	1.171528	1.46313656	60000	0.956349	0.759065
7000	1.160934	1.445463	70000	0.970066	0.672203
8000	1.150674	1.42800292	80000	0.993287	0.59528
9000	1.140743	1.41075374	90000	1.023962	0.52716
10000	1.131135	1.39371292	100000	1.060356	0.466835
15000	1.087741	1.31154714	110000	1.101011	0.413414
20000	1.051597	1.23422541	120000	1.144702	0.366105
25000	1.022068	1.16146215	130000	1.19041	0.324211

Table 7. For the Tier 2 risk assessment calculations in the fourth scenario

Q mix	BOD mix	DO mix	T mix	Kc,20	K2,20	kc,T mix	k2,T mix	LC0
8.1	18.40864	4.154321	25.49383	0.22	0.616644144	0.296776	0.702459	27.59383

Table 8. Calculated HQ for Scenario 4 at various distances from the sewage into the river

X (m)	HQ for DOx	HQ for BODx	X (m)	HQ for DOx	HQ for BODx
100	1.031377	4.596305	30000	0.31531003	3.141126
1000	0.968747	4.54394	35000	0.350953143	2.947402
2000	0.903656	4.486455	40000	0.405254757	2.765625
3000	0.843085	4.429698	45000	0.47270811	2.595059
4000	0.78682	4.373659	50000	0.548990048	2.435012
5000	0.734658	4.318329	55000	0.630729274	2.284836
6000	0.686404	4.263699	60000	0.715318373	2.143922
7000	0.641871	4.209759	70000	0.88555094	1.88763
8000	0.60088	4.156503	80000	1.048999905	1.661976
9000	0.56326	4.10392	90000	1.200028325	1.463298
10000	0.528847	4.052002	100000	1.336129309	1.28837
15000	0.399627	3.8021	110000	1.456683671	1.134354
20000	0.329724	3.567611	120000	1.562163627	0.998749
25000	0.305301	3.347584	130000	1.653628642	0.879355

level ecological risks assessment, risk ratios are most commonly used to show the corresponding risks. Two related approaches are discussed in more detail in this section: PEC estimates have been developed in accordance with US Environmental Protection Agency and the processes through which the Europe Union (EEC).

The authorities may use other mathematical models to determine the PECs / EECs.

PEC approaches using mathematical models to estimate the original classification is based on the laws of conservation of mass and the continuity equation.

HQ= PEC or EEC / Threshold or NOEC or NOEL

Where:

HQ= Hazard Quotients

NOEC= No Observed Effect Concentration

NOEL= No Observed Effect Level

PEC= Predicted Environmental Concentrations

EEC= Estimated Environmental Concentrations

Explanation of risk shows the importance

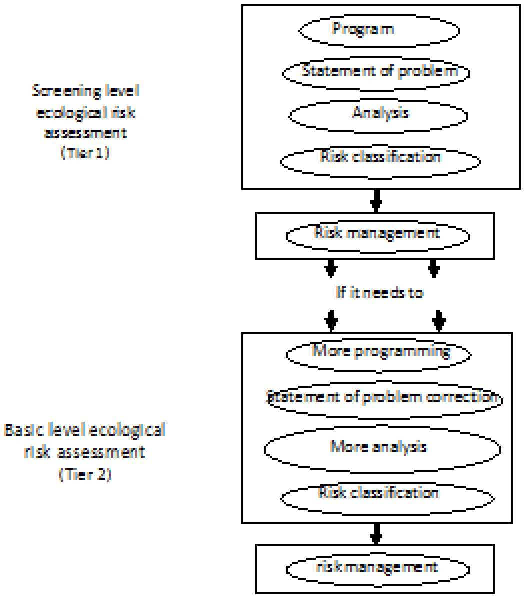

Fig.1. Component of ecological risk assessment process in screening and basic stage

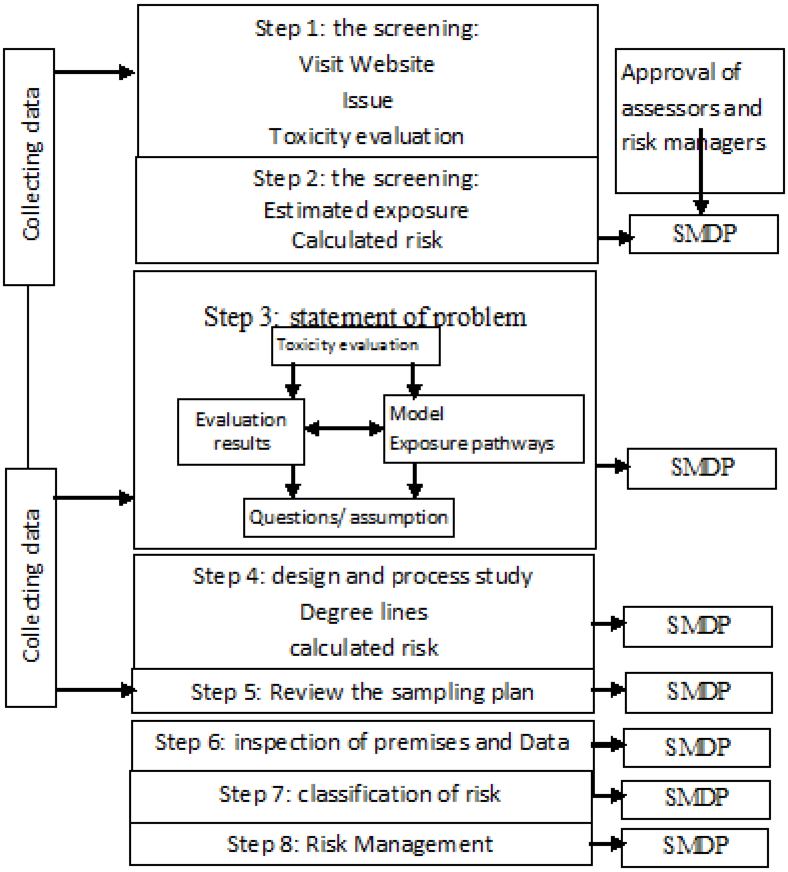

Fig. 2. Eight stage of ecological risk assessment process.

for the interpretation of risk, which should determine the level of adverse effects to assess the final results. The risks should be summarized. Efficiency estimates will be assessed by a discussion of the different types of data collected during the process of ecological risk assessment. Click to enlarge ecological importance and risks, to assess the results shall be specified.

$$q_uC_u + q_e e = qc$$
$$q_uC_u + w = qc$$
$$q = q_u + q_e$$

In the above equation, qu and cu, are respectively upstream flow and concentration of pollutants discharged into the river, qe and ce are the flow and concentration of discharges, w is contaminant load input and q and c are equal to the flow and concentrations downstream of the mixing. The above mass balance equation used at the entrance to the secondary currents of the river and the pollution load discharge. The concentration of dissolved oxygen in water resources due to the dependence of aquatic animals and plants, it is of great importance. With the entry of pollutants, consumption of oxygen dissolved oxygen concentration, especially in the vicinity of the discharge of pollutants will be reduced. To manage the dissolved oxygen concentration in the river, the amount of pollutant in the quality, the amount of oxygen required for oxidation of pollutants to estimate the amount of oxygen is reduced and it is necessary to determine critical areas. Dissolved oxygen constantly enters the water from the air and used by organisms in the water. The difference between the entry and consumption of dissolved oxygen shows that the concentration of the variable quality of river water quality. Bleeding process makes the oxidized contaminants and pollutants away from the source, the river returns to its original state again and dissolved oxygen concentration increases. Changes in dissolved oxygen concentration of oxygen is called drop curve to curve. Rate of deterioration depends on

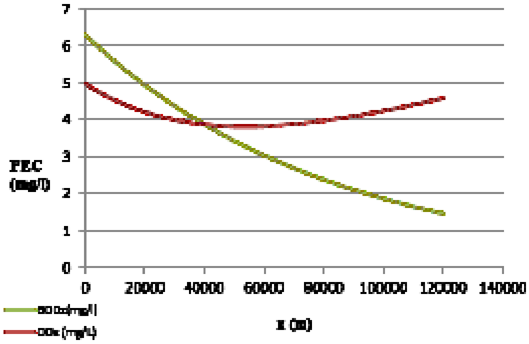

Fig. 3. PEC changes in the parameters of BOD and DO in the Tier 2 risk assessment for the third scenario

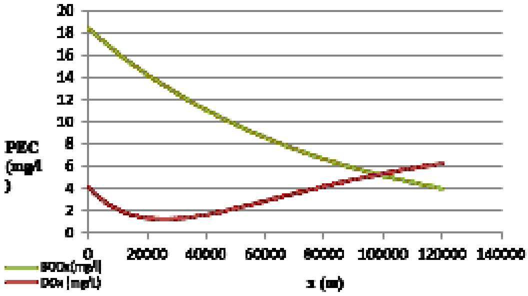

Fig. 4. PEC changes parameters in terms of BOD and DO are the Tier 2 risk assessment for the fourth scenario

the characteristics of pollutants, water temperature and the ability of organisms to remove BOD. The critical oxygen deficiency (Dc) can be calculated as follows:

$$D_c = \frac{k_c}{k_2} L_{c_0} . e^{-k_c . t}$$

Many biological processes raise the temperature quickly. These tests are usually done at CÚ20 and BOD fixed rate according to the following equation can be obtained at other temperatures:

$$k_{c.T} = k_{c.20} . (\theta)^{T-20}$$

Where Kc.T equals the rate of decay, BOD according to (1 / day) at T oC, kc.20 equals the rate of deterioration of BOD in vitro and CÚ20 at times (1 / day) and ¸ is an empirical coefficient. When the water temperature is between 4 to 20 degrees Celsius, ˜ value is 135/1 and when the water temperature is between 20 and 30 ° C, it is considered equal to 056/1.

In river system, the decay of BOD was higher than the laboratory, because of the mixing and turbulence and oxygen consumption by microorganisms in bottom sediments and suspended in water. Aeration coefficient (K2) is a function of temperature, velocity and turbulence of the river. To modify K2, at the river, used the following equation and coefficient is considered equal to 024/1.

$$K_c = k + \frac{v}{h}\,\eta$$

Where in:
Kc: BOD decay coefficient in the river at CÚ20 (1 / day)
V: flow rate (m / s)
K: BOD decay rate in vitro and at CÚ20 (1 / day)
s: bed activity coefficient (1/0 to 6/0 or more deep water to flow at high speeds)
K2's different relations to calculate the physical properties are provided. One of the relationships that are often used in construction work, by Dobbins and O'Connor has been proposed as follows:

$$K_2 = \frac{3.9 \times v^{\frac{1}{2}}}{h^{\frac{3}{2}}}$$

The following equation suggested by (1967) Duram and Longbein. It is used to calculate K2:

$$K_2 = \frac{2.2208 \times v}{h^{\frac{4}{3}}}$$

In the above equations the variables are defined as follows:
K2: coefficient CÚ20 aeration at times (1 / day)
v: average speed of the water (m / s)
h: depth (m)
The final BOD value (Lc0) can be defined according to BOD5, calculated as follows:

$$BOD_5 = L_{c0} - L_{c0}.e^{-k_{c.20} \times 5}$$

Also:
$BOD_t = L_0 (1-e^{-kt})$
Where:
K: BOD reaction rate constants and units of 1 / time.
L0 is oxygen demand of the final carbonaceous material. It is amount of oxygen needed by microorganisms to carbon oxidation of organic wastes, as these compounds break down into CO2 and water.

Risk Management

Risk management, ecological risk assessment results with other studies and decisions specified reduction is integrated. In a screening level ecological risk assessment, risk management decisions (RPM) clearing the site should be aligned with the effects of clearing them[6].

Planning and Design issue

In this paper, cross-sectional sample of Taleghan River is in the region of Alamut. Then, according to the current situation in the region and measurements carried out in the area, it has been suggested that pollution of the river at this point is to what extent, it can be contaminated if sewage into the rivers and the pollution to the distance is outside the standard range and then it will be up to standard. Of course this is self-purification capacity of the river is Taleghan. Therefore, the calculation of the flow rate, flow velocity and the cross-section is considered. The present study was conducted to evaluate the ecological risk in the river, therefore, the sensitivity of aquatic organisms to toxic chemicals and pollutants should investigated, Based on tolerance, the standard for any concentration of risk in entering a river is determined.

According to the above, in this case needs to be examined, according to the changing conditions of the river Taloqan, in terms of flow rate, water temperature, water speed and the load is transferred to the distance and the distance which on-site waste is to what extent will feed concentration. Analysis of biological oxygen demand and dissolved oxygen levels in the river are important indicators for assessing the ecological risk.

Because firstly, the species that live in the river, they are as indicators. They are sensitive to the reduction of dissolved oxygen in the water. And secondly, these two parameters are independent and chemical assays for qualitative certainty about them. Given that, it is possible to measure the behavior of pollutants measured in the environment is not always possible, therefore, in this study using Tier and mathematical calculations to predict and modeled. The first step of this model, as well as for each of the four scenarios were considered, and then according to the results of this stage, it was clear that the scenarios 3 and 4 need more and more detailed risk assessment to be done.

Analysis and description of risks

Risk analysis and describe the most important part of the ecological risk assessment. In this part of the risks identified, analyzed and applied to each priority. Prioritizing risk in risk management is very important. Because of that, risk control measures should recognize that the risks in relation to other risks and should be a priority for them faster than other management measures should be considered. By reducing the risk of higher to lower levels, risk assessment needs to be reviewed and considered for the analysis of scenarios commensurate with the risks and issues, prioritization and risk analysis done. In fact, this risk assessment is feedback[8].

Introduction scenarios

General conditions of the river

To evaluate changes in river pollution and deterioration over the river, we need to consider the condition of the river, such as velocity, flow rate, water depth, and water temperature coefficient is the bed. According to information from the region and the measures taken, the river is the following table:

Scenarios 1 and 2

In the first scenario the raw wastewater into the river, sewage treatment is considered and ecological risk assessment for this scenario in the Tier 1 was conducted. Assumptions related to the maximum concentration of BOD and DO, and temperature coefficient of the reaction rate in treated wastewater from the available data (Table 2).

Scenarios 3 and 4

The third and fourth scenarios as well as the first and second scenario, a constant stream of water in the river is full of scenarios 3 and 4 in terms of dehydration river scenario, but the raw wastewater into the river, and raw sewage is untreated. Using existing data sources and assumptions related to raw or untreated wastewater characteristics are summarized in Table 3

The results of risk assessment scenarios

The scenarios are defined according to existing data and assumptions, risk assessment is done at the level of Tier 1. Each scenario and the data is evaluated once a screening level. Then, according to the threshold of fish, if there is a risk of a more accurate risk assessment is performed using the Tier 2Bray.

Sstage TIER 1

The risk assessment carried out at the Tier 1 level for each of the proposed scenarios, in Table 4 is:

Based on these results, scenarios 1 and 2 are in good condition and do not require further study. But scenarios 3 and 4 should be studied more closely so that the second phase of risk assessment (Tier 2) for the third and fourth scenarios is done.

Stage TIER 2

The risk assessment carried out in the Tier 2 scenarios 3 and 4, as follows:

The results of Scenario 3

The Tier 2 calculations for the third scenario is presented in Table 5. The PEC two parameters BOD and DO curve is shown in Figure 3.

The DO level is higher; there is a better condition in the river. According to Figure 3, the distance is about 30 km from the DO in wastewater entering the river environment and the reduced rate of 4 up to a distance of 50 km and then increases as a constant. This suggests that in this period of polluted water and assimilative river goes back to normal conditions. In the case of BOD, DO opposite is the case. In other words, the rate of BOD rises from the favorable conditions will have to life. Looking at the chart above, the BOD discharge of wastewater into the environment decreased with distance from the site and 50 km from the evacuation to be an appropriate level of risk will be too late to life. Hazard ratio (HQ) of each of the parameters BOD and DO in different distances were calculated in Table 6.

As seen in the table above, with increasing distance from the discharge of untreated wastewater into the river, BOD and risk factor also decreased. So that within 100 meters of its risk calculations 57/1 that the HQ if more than one, the risk to aquatic organisms. However, due to differences over the number one risk is not as high. Away from the discharge of BOD deteriorated until it is at a distance of 40 km to less than one. In this case, there is no risk to the environment. About DO, the state is counterproductive. In these conditions, the relative risk compared to the constant DO 1 indicates reduced contamination of the environment and it is risky. In the above table, it is noted that the DO hundred meters away from the discharge of more than one is reduced with distance from the site. At a distance of 55 km, it reaches the lowest. The trend is upward. And at a distance of 90 km back to it is appropriate.

The results of Scenario 4

the Tier 2 calculation for the fourth scenario is presented in Table 7. The PEC two parameters BOD and DO curve is shown in Figure 4.

According to Figure 4, the amount of DO in wastewater entering the environment is 4 ppm. But it decreases with distance from the discharge site and at a distance of 20 km from the discharge reaches the minimum level. Up to 20 kilometers stays constant and remains at the lowest level and then the rate increases.BOD levels decline with increasing distance and are 120 kilometers away from the discharge is appropriate to limit the risk will be too late to organisms. Hazard ratio (HQ) each BOD and DO parameters at different distances have been calculated in Table 8.

BOD hazard ratio within 100 meters of the discharge untreated wastewater into the river is 59/4. High risk for aquatic organisms and about 4 times more than conventional tolerated. With increasing distance from the discharge rate of BOD deteriorated until it is 120 kilometers to less than one. At a distance of more than a hundred meters from the depletion of DO risk is decreased with distance from the location until it reached the lowest level in 30 km distance to the increase.

Risk Management

According to the results of the ecological risk assessment in Taloqan river management actions are recommended as follows:

According to which the risk of untreated wastewater in scenarios 3 and 4 of untreated sewage in scenarios 1 and 2 have been evaluated, the administrative measures to control discharges untreated wastewater into the Taleghan is a priority. In this regard, according to results of Scenario 4 to 3, in the summer of dehydration, it needs for more control. The high flow filtration coefficient increased river.

The scenario 4 120 km from discharging untreated sewage, there are risks of water pollution BOD. In these conditions, it is recommended that the treated sewage is discharged into the environment. In this case, if there is the possibility of treatment can be provided ponds and kept it for a while wastewater BOD rate is also reduced. The continuous discharge of sewage into the river and not be discontinuous and in different periods of sewage is discharged to the environment is the ability to refine it.

The next time the risks and the risks of development of BOD in the third scenario take precedence. In this part of management actions need to be implemented within a radius of less than 120 km, and in this scenario 4 to 40 km radius of risk decreases. In this section, it is recommended that the first wastewater treatment plant is discharged into the environment, or at least reduce the BOD.

CONCLUSION

In previous studies done in the field of heavy metals, chemical toxins agricultural soil and water resources so that some of them have used modeling method Tier in their studies. In the present study, using modeling methods for parameter BOD and DO Tier ecological risk assessment was carried out along the river. Basically, ecological risk assessment on river systems and evaluate parameter assimilative river to determine the rate of decline, is not easy. Tier model due to its flexibility and computational capabilities can answer this question. The innovation of this study compared to other previous studies regarding the risk of reduction of BOD and DO in wastewater discharges to surface water and their risk is estimated. An important feature of these studies is that compared to previous studies with regard to assumptions in accordance with local conditions and available data, the uncertainty is less. While research has been done in the case of heavy metals and chemical toxins from higher uncertainty and thus provide risk management actions to reduce them is not easy. It is important that risk management measures, levels of risk and likely to reduce, but not eliminate the risk entirely. And always there is a percentage of risk probability at risk.

Gratitude and appreciation

We thank Mr. I. Ghandchi and Consultants (i) have provided some data and Mr. Shahbazi who provided advice and helped us to some sources

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