

## INTISARI

Pencemaran air yang merupakan refleksi dari kerentanan, sangat dipengaruhi oleh berbagai aspek baik lingkungan fisik maupun lingkungan sosial. Belum tergabungnya aspek-aspek tersebut dalam suatu sistem penilaian yang efisien, maka perlu penyusunan suatu instrumen penilaian kerentanan yang berbasis multi indikator. Penelitian ini bertujuan untuk 1) merumuskan indikator-indikator penyusun indeks kerentanan air sungai terhadap pencemaran, 2) memformulasikan indeks kerentanan air sungai terhadap pencemaran, 3) menerapkan indeks kerentanan serta memprediksi tingkat kerentanan air permukaan terhadap pencemaran berdasarkan indikator pengaruh pencemaran melalui penggunaan Jaringan Syaraf Tiruan (*Artificial Neural Network*).

Metode penyusunan indeks kerentanan air ini dilakukan melalui tahapan sebagai berikut: a. perumusan variabel-variabel kunci indeks kerentanan air sungai terhadap pencemaran, b. perumusan formulasi indeks, c. aplikasi indeks serta d. prediksi indeks. Perumusan variabel indeks dilakukan melalui studi literatur, survey, analisis faktor, *Analysis Hierarchy Proccess (AHP)*, dan uji statistik. Pembuatan model prediksi indeks kerentanan air permukaan terhadap pencemaran dengan menggunakan Jaringan Syaraf Tiruan (*Artificial Neural Network*) – perambatan mundur (*backpropagation*). Indeks yang dihasilkan dinamakan sebagai Indeks Kerentanan Air Sungai terhadap Pencemaran (IKASP).

IKASP merupakan suatu alat/"tool" yang secara ilmiah dapat mengkuantifikasi situasi secara lokal yang berhubungan dengan kerentanan terhadap pencemaran. Formulasi IKASP yang terbentuk berdasarkan lima indikator terpilih serta pembobotan berdasarkan tingkat kepentingan di Sub DAS Garang Hilir adalah:

$$IKASP = 0,29.IKA + 0,23.IKP + 0,14.ICH + 0,20.IPLV + 0,14.IHS$$

Implementasi penilaian tingkat kerentanan berdasarkan indeks kerentanan air sungai terhadap pencemaran (IKASP) di tiga segmen Sungai Garang Hilir, masing-masing diperoleh nilai 50,77 (segmen 1); 57,98 (segmen 2) dan 63,90 (segmen 3). Berdasarkan nilai indeks yang dihasilkan, menunjukkan bahwa daerah penelitian termasuk ke dalam kategori "Cukup Rentan" di segmen 1 dan 2, serta kategori "Rentan" di segmen 3. Nilai indeks komposit ini secara umum dapat menunjukkan indikasi kerentanan.

Dalam memudahkan penerapan penilaian tingkat kerentanan air sungai terhadap pencemaran di Sungai Garang, penerapan model prediksi dengan menggunakan Jaringan Syaraf Tiruan / *Artificial Neural Network* - perambatan mundur (*Backpropagation*) dapat menghasilkan suatu model prediksi dan penentuan tingkat kerentanan air sungai terhadap pencemaran.

**Kata Kunci:** indikator, indeks kerentanan, pencemaran air permukaan, jaringan syaraf tiruan

## ABSTRACT

Water pollution that is a reflection of vulnerability, is strongly influenced by various aspects of both the physical environment and the social environment. The incorporation of these aspects in an efficient scoring system requires the establishment of a multi-indicator vulnerability assessment tool. This research aims to 1) to formulate indicators of vulnerability index of river water to contamination, 2) to formulate vulnerability index of river water to pollution, 3) to apply vulnerability index and to predict surface water vulnerability to pollution based on indicator of pollution influence through use of Artificial Neural Network.

Method of preparation of this index of water vulnerability is done through the following stages: a. formulation of key variables of vulnerability index of river water to pollution, b. formulation of index formulation, c. application index as well as d. index predictions. Formulation of index variable is done through literature study, survey, factor analysis, Analysis Hierarchy Process (AHP), and statistical test. Prediction model prediction of surface water susceptibility to contamination using Artificial Neural Network - backpropagation. The resulting index is named as the Index of Vulnerability of River Water to Pollution (IKASP).

IKASP is a tool / tool that can scientifically quantify the situation locally related to vulnerability to pollution. The IKASP formulation formed based on the five selected indicators and weighting based on the importance level in the Garang Hilir sub-watershed is:

$$IKASP = 0.29.IKA + 0.23.IKP + 0.14.ICH + 0.20.IPLV + 0.14.IHS$$

Implementation of vulnerability assessment based on susceptibility index of river water against pollution (IKASP) in three segments of the downstream of Garang River, each obtained value 50.77 (segment 1); 57.98 (segment 2) and 63.90 (segment 3). Based on the resulting index value, it indicates that the study area belongs to the category "Vulnerable Enough" in segments 1 and 2, as well as the "Vulnerable" category in segment 3. The value of this composite index can generally indicate an indication of vulnerability.

In facilitating the assessment of the vulnerability level of river water to pollution in Garang River, the application of prediction model using Artificial Neural Network - Backpropagation can produce a prediction model and determination of river water susceptibility to pollution.

**Keywords:** indicator, vulnerability index, river water pollution, artificial neural network