

## INTISARI

Kajian indeks kerentanan DAS dan tipologi DAS sangat penting mengingat bahwa banjir sering terjadi di beberapa wilayah Indonesia. Debit puncak tinggi berpotensi menyebabkan banjir suatu sungai, kerentanan DAS yang menghasilkan debit puncak tinggi diidentifikasi melalui indeks kerentanan DAS. Penelitian disertasi ini diberi judul Kajian Geografis Hubungan Antara Kerentanan dan Tipologi DAS Dengan Debit Puncak di SWS Kuto-Garang. Materi pokok dalam penelitian ini adalah debit puncak, hujan, lahan (sifat fisik: lereng, batuan, tanah, kerapatan tutupan vegetasi; sifat non fisik (macam penggunaan lahan dan kepadatan penduduk) dan morfometri DAS. Pendekatan kajian menggunakan pendekatan geografis, yaitu pendekatan keruangan, kelingkungan dan kompleks wilayah. Tujuan penelitian ini adalah (1) Mengkaji faktor yang mempengaruhi debit puncak sungai, 2) mengkaji cara menyusun indeks kerentanan DAS, 3) mengkaji tipologi DAS berdasarkan indeks kerentanan DAS dan debit puncak.

Satuan daerah penelitian menggunakan satuan DAS yang berada di SWS Kuto-Garang Jawa Tengah. Indeks kerentanan DAS disusun atas dasar indeks kerentanan hujan, indeks kerentanan fisik lahan, indeks kerentanan morfometri DAS dan indeks kerentanan antropogenik. Indeks kerentanan dibuat dengan tiga pendekatan, yaitu a) cara rating variabel kerentanan, b) cara kombinasi rating dan bobot variabel kerentanan, c) cara scalling variabel kerentanan. Hubungan indeks antara indeks kerentanan DAS dengan debit puncak maksimum dilakukan dengan analisa grafis kecendrungan. Tipologi DAS dibuat dengan analisa klaster dan pencocokan (*matching*).

Hasil penelitian menunjukkan bahwa (1) hujan rata-rata tahunan, bulan basah dan hujan harian maksimum tidak ada hubungan dengan debit puncak; analisa data hujan sesaat dengan debit puncak, menunjukkan bahwa makin besar indeks kerentanan hujan di suatu DAS menyebabkan kenaikan debit puncak. (2) Tingkat hubungan indeks komposit kerentanan dengan debit puncak lebih baik daripada tingkat hubungan indeks kerentanan setiap variabel kerentanan. Fakta tersebut bermakna bahwa debit puncak merupakan hasil proses dari seluruh komponen dalam DAS. Debit puncak maksimum dipengaruhi (mulai dari pengaruh yang) oleh: indeks komposit morfometri DAS, indeks komposit fisik lahan, indeks komposit antropogenik. (3) Indeks kerentanan DAS (IKDAS) merupakan indeks yang disusun secara additive, berpengaruh positif terhadap debit puncak maksimum dengan koefisien determinasi yang tinggi ( $R^2$  berkisar 0.75 sampai 0.89). Atas dasar koefisien determinasi hubungan  $Q_{pm}$  dengan IKDAS, model yang baik adalah cara rating model 4 (IKDAS-R4) dan cara scalling model 4 (IKDAS-Sc4). (4) Cara membuat tipologi DAS yang baik adalah cara pencocokan antara kelas IKDAS dengan kelas  $Q_{pm}$ .

**Kata kunci :** Debit puncak, indeks kerentanan DAS, tipologi DAS

## ABSTRACT

*Studies on watershed vulnerability index and watershed typologi are of critical importance in Indonesia, especially in the flood hazard prone areas. High peak discharge can potentially cause a flood event; and thus such a vulnerable watershed with a high peak discharge can be identified by using watershed vulnerability index. This study is entitled Geographical study on the correlation of the watershed vulnerability and typology with the peak discharge in Kuto-Garang Rivers System Unit. This study focuses on the evaluation of the peak discharge, rainfall, land (physical characteristics, i.e. slope, lithology, soil, canopy cover: and non-physical characteristics, i.e. landuses and population density), and catchment morphometry factors. The geographical approach implemented in this study includes the spatial approach, environmental approach, and regional interdependency approach. This study aims 1) to study the factors affecting the river's peak discharge, 2) to develop a method for providing the catchment vulnerability, and 3) to study the catchment typologi based on the catchment vulnerability index and the peak discharge.*

*The study area is based on catchment unit area, located in Kuto-Garang Catchments system. The catchment vulnerability index was provided based on the rainfall vulnerability index, land-physical vulnerability index, land-anthropogenic index, and catchment morphometry vulnerability index. The vulnerability index was generated by using three different approaches, i.e. 1) rating based, 2) integration of rating and weighting based, and scalling. The correlation index of the catchment vulnerability index and the maximum peak discharge was done by analyzing the graphical trendline. The catchment typology was made based on the cluster and matching techniques.*

*The results are described into three main important parts. First, there are no correlation between the peak discharge and the average annual rainfall, wet months, and maximum daily rainfall, respectively. It simply means that the peak discharge strongly correlates with the single event rainfall. Secondly, correlated with the peak discharge, the composite vulnerability index shows a better correlation rather than that of single variable index. It implies that the peak discharge is a result from the whole catchment components rather than a single dominant component. The maximum peak discharge is dependent to catchment morphometry composite index, land-physical composite index, and anthropogenic composite index. Third, the catchment vulnerability index is better shown with the additive technique. It shows positive correlation with the maximum peak discharge ( $r^2 = 0.75$  up to  $0.89$ ). According to those coefficient determinant, the best model is performed by using the rating based model 4 (IKDAS-R4) and scalling based model 4 (IKDAS-Sc4). In addition, the best method for generating the catchment typology is based on the matching method between IKDAS classes and Qpm classes.*

**Keywords :** *peak discharge, catchment vulnerability index, catchment typology*