

## ABSTRACT

This research was conducted in the Dengkeng sub-district which is located in Kendal Regency, Central Java Province. The Dengkeng sub-watershed is part of the Putih sub-watershed, which is entirely covered by the Bodri watershed. The research area includes the Singorojo District (Kaliputih Village, Getas Village and Cening Village) and Limbangan District (Kedungboto Village). Phosphate nutrient pollution can be caused by several sources through fertilizers, pesticides, industrial waste, motor vehicle exhaust. As an effort to detect pollution in water, mapping the distribution of pollutant sources is needed, one of which is using remote sensing data. This research was conducted to (a) build a model for the detection and identification of nutrient phosphate pollution in agricultural land areas in the Dengkeng sub-watershed based on the integration of optical satellite data and digital elevation models (DEM) (b) to determine the effect of nutrient phosphate contamination in the upstream on the accumulation of nutrient phosphate contamination in the downstream (c) to test the accuracy of modeling results for nutrient phosphate pollution in the Dengkeng sub-watershed with reference to independent field measurement data. This study uses DEM data for hydrological modeling. DEM data is processed into flow direction modeling, flow accumulation and toposhape making. Besides that, Sentinel-2A imagery is also used to determine land use in the study area. Sampling in the field was in the form of river water in the Dengkeng sub-watershed. Data on the concentration of phosphate nutrient contamination was obtained from the analysis of river water samples in the laboratory. From the modeling it is known that the concentration value of phosphate nutrient contamination ranges from 0.297 – 0.847 ppm. Most of them have exceeded the threshold set for river water quality standards. The modeling RMSE value is 0.022281 and the Standard Error of Estimate (SEE) value is 0.080104. Land use is very influential on the value of phosphate accumulation.

**Keywords:** flow direction, flow accumulation, toposhape, phosphate, hydrological modeling

## INTISARI

Penelitian ini dilakukan di sub Sub-Dengkeng yang terletak di Kabupaten Kendal, Provinsi Jawa Tengah. Sub Sub-DAS Dengkeng merupakan bagian dari Sub-DAS Putih yang keseluruhannya dinanungi DAS Bodri. Wilayah penelitian meliputi Kecamatan Singorojo (Desa Kaliputih, Desa Getas dan Desa Cening) dan Kecamatan Limbangan (Desa Kedungboto). Pencemaran nutrisi fosfat dapat disebabkan oleh beberapa sumber melalui pupuk, pestisida, limbah industri, asap kendaraan bermotor. Sebagai salah satu upaya mendeteksi pencemaran di air, dibutuhkan pemetaan sebaran sumber pencemar salah satunya dengan data penginderaan jauh. Penelitian ini dilakukan untuk (a) membangun model deteksi dan identifikasi pencemaran nutrisi fosfat pada areal lahan pertanian dalam sub Sub-DAS Dengkeng berdasarkan integrasi data satelit optik dan model elevasi digital (DEM) (b) mengetahui pengaruh cemar nutrisi fosfat di hulu terhadap akumulasi cemar nutrisi fosfat di hilir (c) melakukan uji akurasi hasil pemodelan pencemaran nutrisi fosfat di sub Sub-DAS Dengkeng dengan referensi data pengukuran lapangan independen. Penelitian ini menggunakan data DEM untuk pembuatan pemodelan hidrologi. Data DEM diolah menjadi pemodelan *flow direction*, *flow accumulation* dan pembuatan *toposhape*. Selain itu digunakan juga citra Sentinel-2A untuk mengetahui penggunaan lahan di daerah penelitian. Pengambilan sampel di lapang berupa air sungai di dalam sub Sub-DAS Dengkeng. Data konsentrasi cemar nutrisi fosfat didapatkan dari hasil analisis sampel air sungai di laboratorium. Dari pemodelan diketahui nilai konsentrasi cemar nutrisi fosfat berkisar dari 0,297 – 0,847 ppm. Sebagian besar telah melampaui ambang batas yang telah ditetapkan untuk baku mutu air sungai. Nilai RMSE pemodelan adalah 0,022281 dan nilai Standard Error of Estimate (SEE) adalah 0,080104. Penggunaan lahan sangat berpengaruh pada nilai akumulasi fosfat.

Kata kunci: *flow direction*, *flow accumulation*, *toposhape*, fosfat, pemodelan hidrologi