

INTISARI

Waduk Wonogiri merupakan bangunan air yang berfungsi untuk layanan kebutuhan air dan pengendali banjir di wilayah Sungai Bengawan Solo Hulu. *Inflow* waduk berasal dari aliran di sepuluh DAS dengan luas genangan maksimum 1.343 km². Kapasitas tampungan air waduk semakin berkurang yang disebabkan oleh sedimentasi, terutama dari DAS Keduang. Untuk mengatasi masalah sedimentasi telah dibangun *spillway* baru, *closure dike* dan *overflow dike* yang memisahkan tampungan menjadi 2 bagian, yaitu *main reservoir* dan *sediment storage reservoir*. Dengan perubahan kondisi tampungan tersebut, pola dan pedoman operasi waduk perlu disesuaikan dengan dukungan perangkat lunak simulasi hidrologi-hidraulika agar kinerja pengendalian banjir dapat ditingkatkan.

Pada penelitian ini dilakukan pemutakhiran perangkat lunak simulasi hidrologi-hidraulika yang dibuat terdiri dari 4 komponen model simulasi, yaitu alihragam hujan-aliran untuk hitungan hidrograf *inflow* waduk, penelusuran aliran di waduk untuk memperkirakan fluktuasi muka air waduk, alihragam hujan-aliran *lateral inflow* untuk memperkirakan hidrograf *lateral flow* dari anak-anak sungai Bengawan Solo di hilir waduk, dan penelusuran aliran banjir di alur sungai untuk mengevaluasi kondisi aliran di daerah rawan banjir hilir waduk. Perangkat lunak simulasi hidrologi-hidraulika disusun menggunakan *Microsoft Visual Studio Community 2017*, *Microsoft Access 365*, dan *HEC-RAS 4.1.0*.

Luaran model simulasi hidrologi-hidraulika ini terdiri dari: hidrograf banjir *inflow* waduk dari 10 DAS, fluktuasi muka air di *main reservoir* dan *sediment storage reservoir*, serta debit dan muka air maksimum pada beberapa titik kontrol di ruas Sungai Bengawan Solo dari Bendung Colo sampai dengan Pos AWLR Jurug di Kota Surakarta. Untuk menghasilkan kinerja yang lebih akurat diperlukan pengembangan lanjut model dengan memperhitungkan beban *lateral inflow* di hilir waduk yang lebih detail. Penerapan perangkat lunak ini diharapkan dapat membantu pengambilan keputusan operasional Waduk Wonogiri yang lebih cepat dan akurat untuk mendukung kinerja pengendalian banjir di wilayah Sungai Bengawan Solo Hulu.

Kata kunci: *Pedoman operasi waduk, simulasi hidrologi-hidraulika, penelusuran banjir, keputusan operasional*

ABSTRACT

The Wonogiri Reservoir is a water structure that functions to service water needs and flood control in the upper basin Bengawan Solo River region. Reservoir inflow originates from streams in ten watersheds with the maximum inundation area is 1,343 km². The reservoir water storage capacity is decreasing due to sedimentation, especially from the Keduang watershed. To overcome the problem of sedimentation, a new spillway, closure dike and overflow dike have been built which separates the reservoir into 2 parts, the main reservoir and the sediment storage reservoir. With the change in reservoir conditions, reservoir operating patterns and guidelines need to be adjusted with the support of hydrological-hydraulic simulation software so that flood control performance can be improved.

In this research, the updated hydrological-hydraulic simulation software update consist of 4 model components, i.e rainfall-runoff translation to calculate reservoir inflow hydrograph, reservoir routing to estimate reservoir water level fluctuations, rainfall-runoff translation of lateral inflow to estimate lateral flow hydrographs from Bengawan Solo River tributaries in the downstream of the reservoir, and hydraulics channel routing to evaluate the flow conditions in flood-prone areas in the downstream of the reservoir. Hydrological-hydraulic simulation software was compiled using Microsoft Visual Studio Community 2017, Microsoft Access 365, and HEC-RAS 4.1.0.

The output of the model consists of: reservoir inflow hydrographs from 10 watersheds to the main reservoir and the sediment storage reservoir, water level fluctuations in the main reservoir and reservoir sediment storage, as well as maximum water level and discharge at several control points of Bengawan Solo River, from Colo Weir up to the Jurug AWLR station in Surakarta City. In order to produce more accurate performance, further development of the model is needed by calculating the lateral inflow in the downstream of the reservoir in more detail. The application of this software is expected to support the operational decision making of the Wonogiri Reservoir more quickly and accurately to improve the performance of flood control in the upper basin of Bengawan Solo River region.

Keywords: *Reservoir operation guidelines, hydrological-hydraulic simulation, flood tracking, operational decisions*