INTISARI

Banjir rob merupakan fenomena yang disebabkan oleh fluktuasi permukaan laut akibat pengaruh gaya gravitasi benda-benda luar angkasa seperti bulan dan matahari. Di Indonesia, khususnya di Jawa Tengah, salah satu kawasan yang sering dilanda banjir rob yaitu kawasan Tambak Lorok, Semarang. Padahal, banjir rob menimbulkan banyak kerugian dalam sektor ekonomi dan sosial bagi masyarakat setempat apabila tidak segera ditangani dengan tepat. Oleh karena itu, diperlukan strategi mitigasi banjir rob untuk mengurangi risiko bencana melalui simulasi area limpasan rob (*inundation zone*) menggunakan data *Digital Elevation Model* (DEM) terkini. Jenis DEM resolusi tinggi terkini yang mudah diperoleh dan praktis bisa diproduksi menggunakan teknik fotogrametri dan LiDAR UAV. Tetapi, perbedaan tingkat akurasi dan penetrasi *ground* antar kedua DEM ini akan mempengaruhi *inundation zone* hasil simulasi. Terlebih lagi, kawasan Tambak Lorok memiliki jenis tutupan lahan yang kompleks sehingga mempengaruhi tingkatan ekstraksi ketinggian serta distribusi aliran rob hasil simulasi. Kegiatan aplikatif ini bertujuan untuk membandingkan secara menyeluruh hasil simulasi genangan rob berdasarkan data DEM foto udara dan DEM LiDAR. Hasil simulasi tersebut kemudian dikomparasikan untuk mengetahui hubungan antara karakteristik data DEM terhadap hasil luasan genangan rob.

Proses simulasi dilakukan dengan menggunakan metode *neighbourhood operation* (proses manipulasi nilai piksel berdasarkan nilai piksel tetangganya) dan metode iterasi (proses berulang untuk mencapai kondisi tertentu). Kedua metode tersebut dipilih karena lebih merepresentasikan sifat aliran air di dunia nyata. Simulasi dilakukan berdasarkan tujuh skenario kenaikan muka laut, yaitu 0,5 m; 0,75 m; 1 m; 1,25 m; 1,5 m; 1,75 m; dan 2 m. Hasil genangan untuk masing-masing skenario dihitung luas sebaran genangannya. Kemudian, dilakukan *intersect* antara kedua hasil simulasi genangan untuk menghitung *concordance ratio* (CR, yaitu nilai yang menggambarkan kesamaan dua data).

Perhitungan luasan *inundation zone* berdasarkan tujuh skenario menunjukkan hasil yang tidak jauh berbeda untuk kedua sumber data. Hal tersebut ditunjukkan oleh nilai CR yang mencapai rata-rata 92,31%. Nilai CR terrendah adalah pada simulasi 0,5 m di mana terjadi *underestimate* hasil simulasi limpasan pada DEM foto udara terhadap simulasi pada data DEM LiDAR. Fenomena tersebut dipengaruhi oleh perbedaan tingkatan penetrasi dari data foto udara dan LiDAR, terutama di tepian sungai sisi timur area kajian studi.

Kata kunci: genangan rob, DEM foto udara, DEM LiDAR, *neighbourhood operation*

ABSTRACT

Coastal floods are a phenomenon caused by sea level fluctuations due to the influence of the gravitational force of space objects such as the moon and sun. In Indonesia, especially in Central Java, one of the areas frequently hit by coastal floods is the Tambak Lorok area, Semarang. In fact, coastal floods cause many losses in the economic and social sectors for local communities if they are not handled immediately and appropriately. Therefore, a tidal flood mitigation strategy is needed to reduce disaster risk through simulating the tidal runoff area (inundation zone) using the latest Digital Elevation Model (DEM) data. The latest type of high-resolution DEM that is easy to obtain and practical can be produced using UAV photogrammetry and LiDAR techniques. However, differences in the level of accuracy and ground penetration between these two DEMs will affect the inundation zone of the simulation results. Moreover, the Tambak Lorok area has complex land cover types which influence the level of high extraction and distribution of coastal flow results from the simulation. This applicable activity aims to comprehensively compare the results of tidal inundation simulations based on aerial photo DEM and LiDAR DEM data. The simulation results were then compared to determine the relationship between the characteristics of the DEM data and the results of the area of tidal inundation.

The simulation process is carried out using the neighborhood operation method (the process of manipulating pixel values based on neighboring pixel values) and the iteration method (a repeated process to achieve certain conditions). These two methods were chosen because they better represent the nature of water flow in the real world. The simulation was carried out based on seven sea level rise scenarios, namely 0.5 m; 0.75m; 1 m; 1.25m; 1.5m; 1.75m; and 2 m. The inundation results for each scenario calculated the area of the inundation distribution. Then, an intersection is carried out between the two inundation simulation results to calculate the concordance ratio (CR, which is a value that describes the similarity of two data).

Calculation of the area of the inundation zone based on seven scenarios shows results that are not much different for the two data sources. This is shown by the CR value which reaches an average of 92.31%. The lowest CR value was in the 0.5 m simulation where there was an underestimation of the results of the runoff simulation on the aerial photo DEM compared to the simulation on the LiDAR DEM data. This phenomenon is influenced by differences in penetration levels from aerial photography and LiDAR data, especially on the riverbanks on the eastern side of the study area.
Keywords: coastal inundation, aerial imagery DEM, LiDAR DEM, neighborhood operation.