

**Analisis Skenario Perubahan Iklim CMIP6 Untuk Kajian Risiko Bencana Banjir Di Daerah Aliran Sungai Cirarab**

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### INTISARI

Perubahan iklim mengakibatkan perubahan pola hujan dan kejadian hujan ekstrem yang berkontribusi pada frekuensi dan intensitas banjir. Penelitian ini bertujuan untuk 1) Mengembangkan skenario perubahan pola hujan di DAS Cirarab berdasarkan proyeksi perubahan iklim; 2) Menganalisis perubahan tingkat bahaya bencana banjir akibat perubahan iklim di DAS Cirarab berdasarkan skenario perubahan iklim; 3) Menganalisis tingkat kerentanan masyarakat terhadap bencana banjir di DAS Cirarab; 4) Menganalisis perubahan tingkat risiko bencana banjir sebagai akibat perubahan iklim di DAS Cirarab berdasarkan skenario perubahan iklim. Data yang digunakan mencakup topografi (kemiringan lereng, elevasi, TWI), iklim dan hidrologi (curah hujan, *drainage density*), tutupan lahan (NDVI, MNDWI), aspek spasial (jarak ke sungai), aksesibilitas (jarak ke jalan dan rumah sakit), serta demografi penduduk (kepadatan penduduk, populasi penduduk usia rentan, populasi perempuan). Analisis data dilakukan dengan menggunakan metode *statistical downscaling* dan *Analytical Hierarchy Process* (AHP). Hasil penelitian menunjukkan perubahan iklim menyebabkan pergeseran pola hujan di DAS Cirarab. Proyeksi curah hujan menunjukkan pergeseran distribusi curah hujan yang ditandai dengan peningkatan intensitas curah hujan terutama pada puncak musim hujan (Desember-Februari) dan bulan peralihan (Maret-Mei dan September-November), serta kondisi puncak musim kemarau (Juni-Agustus) yang relatif lebih basah dibanding periode historis. Lebih lanjut, Bahaya banjir di DAS Cirarab meningkat selama periode proyeksi dan terdistribusi di bagian tengah dan hilir DAS. Kelas kerentanan tinggi hingga sangat tinggi teridentifikasi di Kecamatan Pasar Kemis dan Cikupa yang dipengaruhi faktor kepadatan penduduk yang tinggi dan keterbatasan akses ke fasilitas kesehatan serta transportasi. Secara keseluruhan, luas risiko banjir kategori tinggi hingga sangat tinggi meningkat sebesar 31,79 %, terutama di bagian tengah DAS khususnya Kecamatan Pasar Kemis dan sebagian Kecamatan Cikupa. Diperlukan pengelolaan DAS yang terintegrasi dengan *Disaster Risk Reduction* (DRR), yang mencakup pembangunan struktur pengendali banjir, konservasi lahan di bagian hulu dan pengembangan *Early Warning System* (EWS). Peningkatan resiliensi masyarakat juga perlu disertakan melalui penguatan aspek organisasional berupa pembentukan tim tanggap bencana berbasis komunitas, penyusunan rencana kontinjensi yang dilakukan secara partisipatif dengan melibatkan masyarakat, serta pelaksanaan pelatihan simulasi bencana banjir secara rutin di tingkat RW/ Kelurahan pada wilayah berisiko tinggi, sebagai rekomendasi untuk implementasi.

**Kata Kunci** : CMIP6, DAS Cirarab, Perubahan Iklim, Pola curah hujan, Risiko Banjir

**CMIP6-Based Climate Change Scenario Analysis for Flood Disaster Risk Assessment in the Cirarab Watershed**

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**ABSTRACT**

Climate change causes changes in rainfall patterns and extreme rainfall events that contribute to the frequency and intensity of flooding. This study aims to 1) Develop scenarios for changes in rainfall patterns in the Cirarab watershed based on climate change projections; 2) Analyze changes in the level of flood disaster risk due to climate change in the Cirarab watershed based on climate change scenarios; 3) Analyze the level of community vulnerability to flood disasters in the Cirarab watershed; 4) Analyze changes in the level of flood disaster risk as a result of climate change in the Cirarab watershed based on climate change scenarios. The data used included topography (slope, elevation, TWI), climate and hydrology (rainfall, drainage density), land cover (NDVI, MNDWI), spatial aspects (distance to rivers), accessibility (distance to roads and hospitals), and population demographics (population density, vulnerable population, female population). Data analysis was performed using statistical downscaling and Analytical Hierarchy Process (AHP) methods. The results of the study show that climate change has caused a shift in rainfall patterns in the Cirarab watershed. Rainfall projections show that high-intensity rainfall occurs not only at the peak of the rainy season (December-February), but also in the transitional months (March, April, November), indicating a shift in the rainy season and increasing the potential for flooding. Furthermore, the risk of flooding in the Cirarab watershed increased during the projection period and was distributed in the middle and downstream parts of the watershed. High to very high vulnerability classes were identified in the Pasar Kemis and Cikupa subdistricts, which are affected by high population density and limited access to health facilities and transportation. Overall, the area at high to very high risk of flooding has increased by 31.79%, especially in the central part of the watershed, particularly in Pasar Kemis District and part of Cikupa District. Integrated watershed management with Disaster Risk Reduction (DRR) is needed, including the construction of flood control structures, land conservation in the upstream area, and the development of an Early Warning System (EWS). Increasing community resilience also needs to be included through organizational strengthening in the form of establishing community-based disaster response teams, developing contingency plans in a participatory manner involving the community, and conducting regular flood disaster simulation training at the neighborhood/village level in high-risk areas, as recommendations for implementation.

**Keywords :** Cirarab Watershed, Climate Change, CMIP6, Flood Risk, Rainfall Pattern