

## ESTIMASI LAJU PENYERAPAN KARBON ATMOSFER MELALUI PROSES PELARUTAN BATUAN KARBONAT DI KAWASAN KARST JONGGRANGAN, KABUPATEN KULONPROGO-PURWOREJO

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### INTISARI

Karbon dioksida atmosfer ( $\text{CO}_2$ ) sebagai bagian dari gas rumah kaca memiliki kontribusi yang besar pada terjadinya fenomena perubahan iklim. Bentuklahan karst memiliki peran penting dalam penyerapan gas karbon dioksida atmosfer ( $\text{CO}_2$ ) di atmosfer yang terjadi pada saat proses karstifikasi. Keberadaan kawasan karst di seluruh kepulauan Indonesia mencapai  $\pm 140.000 \text{ km}^2$  atau 20% dari total luas wilayah. Melalui proses denudasi kawasan karst di Indonesia, jumlah karbondioksida yang terserap diperkirakan mencapai 13.482 Gg  $\text{CO}_2$ /tahun. Penelitian ini dilakukan di Kawasan Karst Jonggrangan yang meliputi Sungai Bawah Tanah (SBT) Gua Kiskendo, Sungai Bawah Tanah (SBT) Anjani, dan Mataair Mudal. Tujuan dari penelitian ini adalah: (1) Mengetahui variabilitas tingkat pelarutan  $\text{CaCO}_3$  di Kawasan Karst Jonggrangan; (2) Mengetahui variabilitas laju penyerapan karbon dioksida atmosfer melalui proses pelarutan batuan karbonat di Kawasan Karst Jonggrangan.

Penelitian ini termasuk ke dalam penelitian kuantitatif karena penelitian bersifat objektif dengan melakukan pengukuran terhadap variabel-variabel penelitian. Penelitian dilakukan selama periode Maret 2018 hingga Maret 2019. Data yang digunakan dalam penelitian ini, yaitu debit aliran, karakteristik kimia aliran berupa kandungan  $\text{HCO}_3^-$  dan  $\text{Ca}^{2+}$ , serta karakteristik fisika aliran berupa suhu, pH, TDS, dan EC. Keseluruhan data diperoleh melalui observasi dan pengukuran langsung dilapangan. Data diolah untuk mengetahui tingkat pelarutan mineral  $\text{CaCO}_3$ , laju penyerapan karbon dioksida atmosfer, serta faktor-faktor yang berpengaruh terhadap kedua hal tersebut. Analisis yang digunakan dalam penelitian ini adalah analisis deskriptif, analisis grafis, dan analisis spasial.

Hasil penelitian menunjukkan bahwa terdapat variabilitas secara spasial baik untuk tingkat pelarutan mineral  $\text{CaCO}_3$  maupun laju penyerapan karbon dioksida atmosfer di ketiga lokasi kajian. Tingkat pelarutan mineral  $\text{CaCO}_3$  tertinggi dimiliki oleh Mataair Mudal dengan nilai yang mencapai  $138,31 \text{ m}^3/\text{tahun}/\text{km}^2$ , sedangkan SBT Gua Anjani memiliki tingkat pelarutan mineral  $\text{CaCO}_3$  terendah dengan nilai sebesar  $37,54 \text{ m}^3/\text{tahun}/\text{km}^2$ . Mataair Mudal juga memiliki laju penyerapan karbon dioksida atmosfer tertinggi dengan nilai mencapai  $152,03 \text{ ton}/\text{km}^2/\text{tahun}$ , sedangkan laju penyerapan karbon dioksida atmosfer terendah berada di SBT Gua Anjani dengan nilai sebesar  $97,43 \text{ ton}/\text{km}^2/\text{tahun}$ .

**Kata Kunci:** Karst Jonggrangan, Laju Penyerapan, Karbon Dioksida Atmosfer, Tingkat Pelarutan, Mineral  $\text{CaCO}_3$

## THE ESTIMATION OF ATMOSPHERIC CARBON SEQUESTRATION RATE THROUGH CARBONATE ROCKS DISSOLUTION PROCESS IN JONGGRANGAN KARST AREA, KULONPROGO-PURWOREJO DISTRICT

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### ABSTRACT

*Atmospheric carbon dioxide (CO<sub>2</sub>) as the part of greenhouse gasses has a huge contribution on climate change phenomenon. Karst landform has an important role on atmospheric carbon dioxide sequestration during karstification process. The existence of karst area throughout Indonesian archipelago reaches ±140,000 km<sup>2</sup> or 20% of total area. Through karst area denudation process, the amount of carbondioxide absorbed is expected at 13.482 Gg CO<sub>2</sub>/year. This research was done in Kiskendo Groundwater River, Anjani Groundwater River, dan Mudal Spring as part of Jonggrangan Karst Area. The aims of this research were: (1) to know the spatial variability of CaCO<sub>3</sub> mineral dissolution rate in Jonggrangan Karst Area and (2) to know spatial variability of atmospheric carbon dioxide sequestration rate through carbonate rocks dissolution process in Jonggrangan Karst Area.*

*This research was quantitative research because it was conducted by doing the measurement directly on its variables. The research's period was from March 2018 until March 2019. The data used in this research were water discharge, water chemical characteristics such as HCO<sub>3</sub><sup>-</sup> and Ca<sup>2+</sup>, and water physical characteristics such as temperature, pH, TDS, and EC. The data were collected through direct observation and measurement in the field. The data processing was done to know CaCO<sub>3</sub> mineral dissolution rate, atmospheric carbon dioxide sequestration rate through carbonate rocks dissolution process, and the factors affected them. The analysis used in this research were descriptive analysis, graphic analysis, and spatial analysis.*

*The results showed that there were spatial variability both on CaCO<sub>3</sub> mineral dissolution rate and atmospheric carbon dioxide sequestration rate. The highest rate of CaCO<sub>3</sub> mineral dissolution was at Mudal Spring with a value of 138.31 m<sup>3</sup>/year/km<sup>2</sup>, while Anjani Groundwater River had a lowest CaCO<sub>3</sub> mineral dissolution rate with a value of 37.54 m<sup>3</sup>/year/km<sup>2</sup>. Mudal Spring also had a highest atmospheric carbon dioxide sequestration rate with a value of 152.03 ton/km<sup>2</sup>/year, while the lowest was at Anjani Groundwater River with a value of 97.43 ton/km<sup>2</sup>/year.*

**Keywords:** *Jonggrangan Karst, Sequestration Rate, Atmospheric Carbon Dioxide, Dissolution Rate, Caco<sub>3</sub> Mineral*