Groundwater hydrochemical condition in Delta Cimanuk River, West Java, Indonesia

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Introduction

Delta Cimanuk River which is located in Indramayu northern part of West Java Province, is the most rapidly growing delta in Indonesia (Yuanita, 2008). Moreover, Cimanuk itself is the second largest river in Indonesia. Several studies have been conducted to understand the formation process of this delta. Previously, the results showed that fluvio –marine is the dominant process in the creation of Delta Cimanuk (Solihuddin, 2010). Where, the terrestrial materials of this delta were coming from large amount of sediment from Cimanuk River. Hehanusa (1975) had calculated that sediment of Cimanuk River is 2,850 mg/l and 8,840 mg/l, respectively for average and maximum value. The rate of delta formation was about 200 m/year with the most rapidly process was happened in 1947 until 1965 (Hehanusa, 1975; Astjario, 2007).

In this presentation, we will discuss about groundwater hydrochemical condition in the area of Delta Cimanuk River. By using primary and secondary data, we analyse the effect of delta formation to groundwater quality. There are 33 samples that have been taken in 2016 from shallow groundwater. Hydrochemical analysis is described by parameter cation: Na^{+}, K^{+}. Ca^{++}, and Mg^{++}; and anion: Cl^{-}, HCO_3^{-}, and SO_4^{--}. We also made two bore holes in this area to compromise the groundwater quality result.

Research Location and Methods

The research was carried out in part of Indramayu District. The groundwater samples and boreholes lines were coming from Jatibarang in the southern part of Indramayu, until Karangsong in the northern part of Indramayu (fig. 1). Sampling period was taken in September 2016 with monthly precipitation 150 -200 mm.

Parameter pH, conductivity, and HCO_3^{-} were analysed in the field. pH and conductivity were measured by using water quality checker and HCO_3^{-} were analysed by titration method.

Major ions were analysed in laboratory. The laboratorium analysis method were: spectrophotometry for Na^{+}, K^{+}. Ca^{++}, and Mg^{++}; turbidimetric for SO_4^{--}; and argentonometric for Cl^{-}. The hydrochemistry facies of groundwater were simulated by using Geochemist Workbench’ s ver. 11. The drilling process was done in 2016 and 2017 with the depth of each bore hole was 30 m above ground.

Results and Discussion

Groundwater in the research locations have neutral pH of 6.5 to 7.4. Conductivity value start from 487 to 10,500 μS/cm. The groundwater has classification as freshwater, moderately brackish and saline water in coastal area (Rusydi, 2017). Major ions simulation result by utilizing GWB ver. 11 (Fig. 2) indicates the main facies of groundwater are Ca-Mg-Cl (70%). Then, Na-Cl (18%) and Ca –Na- HCO_3 (12%).

The dominant of cation and anion content in this region are Ca^{++} and Cl^{-} (Rusydi, 2017). Concentration of both ions tend to increase from Jatibarang (upstream of research location) to coastal area in Karangsong (Fig. 3). This situation revealed that research location is carbonate environment which influenced by sea water at the time of land formation (Effendi, 2003; Rusydi, 2017).

The data is supported by log bore results at Jatibarang area which indicate in the depth of 20 –30 m have been found carbonate sandy granules. Whereas, from bore results at coastal area carbonate stones are found from the depth of 2.5 m above the ground. Other than that, soil on coastal area also contains Mollusca fossils until 40 m depth. Those Mollusca fossils were trapped in land in the time of formation. Mollusca also source of high level of ion Ca^{++} ion in this location.

Keywords: Indramayu, Delta Cimanuk River, Groundwater, Major ions

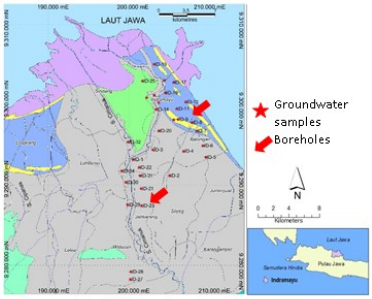

Fig 1. Sampling location

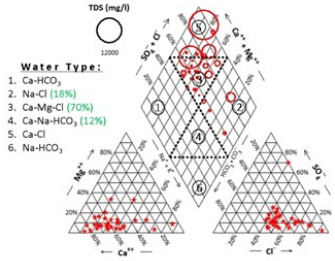

Fig 2. Piper diagram

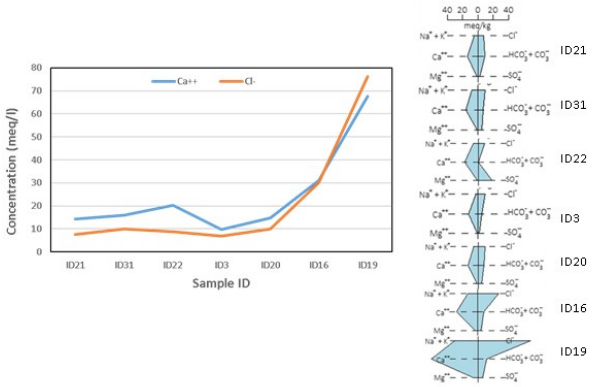

Fig 3. Ca++ and Cl- pattern along Cimanuk River (Rusydi, 2017)

