ABSTRACT


There are many stakeholders in Cicatih watershed ranging from farmer to water industry laborers. In relation to the water resources stakeholders in the Cicatih watershed, the more stakeholders are the higher its potential to becoming conflicting each other. However, the most prevalent conflict is among industrial and domestic use; as according to the socio-economic survey, water uses conflict tend to erupt whenever spring water that already been utilized by local people then subsequently also utilized by water company that make shortage water for local people. The conflict ever erupted since ten years ago and has increased since 5 years ago. So as to minimize conflicts, the proportion of water use by water users need to be more transparent. The objectives of this research are: (1). Characterization and analysis of water availability and identification of effects of land cover change and the influence trend of climate change on water availability, (2). Characterization and analysis of water demands (agriculture, domestic, and industry) at various scenario water use models, and (3). Development of OptiWaSh software as an optimization model to develop recommendations of optimal water-sharing between sectors to minimize water use conflicts. The analyses using the optimization approach gave the following results. Using Verhulst projection model, the population of Cicatih Watershed could be nicely projected from 1971 through 2030 with a value of $r^2=0.98932$. The total population in 1971 was 546 402 persons to become 1.047.164 persons in 2030. The result of trend analysis on climate variability, represented by the increase in temperature, decrease in rainfall and debit, as well as the increase in evapotranspiration through Mann Kendall analysis gave the indication of the climate change trend in Cicatih Watershed. To minimize conflicts of water use required an optimal distribution among water users, by applying the concept of optimal water sharing. To realize the optimal water-sharing concept has been developed OptiWaSh model that can be used to calculate the optimum water demands. This model has the objective function to maximize the added value of water use with the constraint that the population needs to be fulfilled. On the condition of business as usual with existing water management systems, application IP300 can only be done until 1999, whereas IP200 until 2020, and IP100 until 2028. This condition can be anticipated if the water demands to be optimized to obtain the optimum allocation of water use using the OptiWaSh model. Applications of OptiWaSh model shows that the optimum allocation of water demand are: (a) For one cropping the optimum allocation ranged from 29.5% to 30.0% (domestic), from 6.3% to 6.9% (non bottled water industry/NBWI), and from 63.2% to 64.2% (agriculture), (b) For two cropping, the optimum allocation ranged from 25.3% - 25.5% (domestic), 3.7% - 3.8% (NBWI), and 70.7% - 71.0% (agriculture), (c) For three cropping conventional irrigation, the optimum allocation ranged from 17.8% - 17.9% (domestic), 2.7% - 2.8% (NBWI), and 79.6% - 79.7% (agriculture).

Keywords: water supply, water demand, optimal water sharing, Cicatih watershed