Socio-economic changes around Jatigede reservoir, Kabupaten Sumedang, Jawa Barat

M H D Susilowati, H Setiadi and F R Hikmawati

Department of Geography, Faculty of Mathematics and Natural Sciences (FMIPA), Universitas Indonesia, Depok 16424, Indonesia

Corresponding author’s email: mhdsusilowati@gmail.com

Abstract. Construction of Jatigede Reservoir raises socio-economic changes in the form of changes in livelihoods, incomes, and unemployment rates. This study aims to analyze how the socio-economic changes that occur in residents living around the reservoir. This study uses descriptive analysis method and spatial analysis. This study uses variables including income, livelihood, and unemployment rate. Spatial analytics are used by dividing the research area into three radius, i.e. 0–500 meters, 500–1000 meters, and 100–1500 meters from Jatigede Reservoir. High socio-economic changes occur in areas with high and medium farmer densities. The largest socio-economic change is in the radius of 0–500 meters from the reservoir. The changes of income are always follows the changes of livelihood, but the changes of unemployment rates are not always follows the changes of livelihood.

Keywords: Jatigede reservoir, socio-economic changes, livelihood, income, unemployment rate

1. Introduction

Construction of Jatigede Reservoir in Kabupaten Sumedang is one form of development that affects and affected by the environment. Jatigede Reservoir is one of the largest reservoirs newly built in Indonesia with an area of about 5,000 hectares and can accommodate the volume of water up to 979.5 million m³. The existence of the Jatigede Reservoir is not only beneficial to Kabupaten Sumedang but also for the districts around Sumedang, such as Majalengka, Indramayu, and Cirebon. Especially for the surrounding districts, these reservoirs can cope with drought during the dry season and control floods during the rainy season. Also, this reservoir can generate 175 MWatt of electricity. As for the community itself, Sumedang, Jatigede Reservoir can give positive impacts in the form of electricity charges, freshwater fisheries, and tourism. According to Bappeda of Kabupaten Sumedang, the area around Jatigede Reservoir promises economic activity for the community; so that, it will provide a better economic impact for the surrounding community.

The construction of Jatigede Reservoir caused changes to the surrounding environment, such as socio-economic changes. Social change is a process of shaping that encompasses the whole of society, occurs both naturally and by engineering [1]. The economic environment is the basis of all societal behavior, including the process of social change [2]. Economic changes arise because of a new event, state, or policy applied. In the construction of Jatigede Reservoir, economic changes can affect the incomes of nearby residents.
Construction of Jatigede Reservoir in Kabupaten Sumedang caused many changes to the surrounding environment [3]. Livelihood changes that occur can spur the economic growth of the community which ultimately can clarify the stratification of society based on the source of income, which is usually derived from a series of job activities [4]. Changes in livelihood, income, and unemployment rates are a form of social and economic change resulting from the construction of the Jatigede Reservoir. This study aims to analyze the socio-economic changes based on the distance and road network caused by Jatigede Reservoir development in Kabupaten Sumedang, Jawa Barat.

2. Methodology
This research uses spatial analysis and descriptive analysis. Spatial and descriptive analysis are used to explain the facts from the data obtained both primary data field survey results and interviews and secondary data. Spatial analysis is done by overlapping the map of changes in livelihood, income, and unemployment rate. The overlay result is intended to find out how far the area experiencing socio-economic changes around the Jatigede Reservoir. Descriptive analysis is used to explain the socio-economic changes in each radius. This is done to determine differences in livelihood, income, and unemployment in each radius.

Data needed in this research is primary and secondary data, where primary data obtained from field survey while secondary data obtained from related institution. Information on primary data was obtained through interviews and direct survey at the research sites. This study uses variables including income, livelihood, and unemployment rate. The method of determining the sample using Quota Sampling technique where the sample has been determined that is several 60 respondents and divided into three groups, which are located at a distance of 0–500 meters, 500–1000 meters, and 1000–1500 meters. Respondents for interviews in this study have the following criteria: (1) Settled for more than two years (prior to completion of Jatigede Reservoir construction in August 2015) and, (2) Represents the head of the household or wife/husband of the head of the household.

3. General description
Overall it can be explained that land use in Kabupaten Sumedang consists of agricultural land and non-agricultural use. Agricultural land consists of irrigated rice fields, rainfed rice fields, plantations/gardens, and moor/fields. While non-agricultural land consists of forests, settlements, shrubs, and others (empty land, non-cultivated vegetation, and rivers) [5]. Prior to the construction of Jatigede Reservoir the use of agricultural land in these five kecamatan reached 53.93 % while non-farm land use was 46.07 %. After the construction of Jatigede Reservoir the use of agricultural land decreased to 9.56 % to 44.36 %. In addition, non-agricultural land use also decreased after the construction of the reservoirs, which amounted to 2.53 % to 43.54 %. The largest change in agricultural land occurs in rainfed lowland, where there is a decrease of 6.00 %.

4. Results and discussion
4.1. Socio-economic changes and its relationship with farmer density
Most livelihood changes occur in people who have livelihoods as farmers before the construction of the Jatigede Reservoir. Prior to the construction of farmers percentage reservoir of 28.33 % but reduced to 16.67 % after the construction of the reservoirs. While people who have non-farmer livelihoods such as employees and traders do not experience major changes as is the case with farmers.

Construction of Jatigede Reservoir in addition to the impact on livelihood, also affect the incomes of the surrounding population. Based on field survey results, 57.67 % of them experienced a decrease in income 43.33 % had fixed income, and 0 % experienced an increase in income. Changes in income experienced by pensions around the Jatigede Reservoir represent a decrease in income. These revenue
changes vary from Rp 125,000 to Rp 1,500,000/month with an average revenue change of Rp 620,588.
Based on the data, income change is classified into four classifications, namely (1) No change; (2) Low change: <Rp 300,000; (3) Medium: Rp 300,000–Rp 600,000; and (4) > Rp 600,000.

Construction of Jatigede Reservoir located in five districts in Kabupaten Sumedang is expected to absorb the workforce and reduce the unemployment rate of the surrounding population. Prior to the construction of the reservoir, 90 % of the population around the Jatigede Reservoir had jobs and worked over 35 hours in a week. Meanwhile, after the construction of reservoirs, the number of occupants who have jobs decreased by 16.67 % from the initial 90.00 % to 75.00 % while the percentage of the population who became open unemployment and underemployment increased.

Overall socio-economic changes occur at various levels of farmers' density, either low, medium, or high farmer density. If seen in figure 1, socio-economic changes are dominated by high farmer density. This indicates that in areas with large numbers of farmers, their socio-economic changes tend to increase. Whereas in low farmer density, socio-economic changes tend to decrease.

If seen in figure 1 above, at the cross-section of a-a' socio-economic changes all occur at high density. Both socio-economic changes are high, medium, and low. In addition, at cross-section b-b' socio-economic changes occur in high and medium farmer density. Where socio-economic change is dominated occurs in high farmer density. The same is true of the cross-section of c-c' where socio-economic changes occur in the density of medium and high farmers with the dominance of high peasant density. While in the cross-section of socio-economic changes dominated occur in areas that have a density of medium farmers. In settlements not covered by cross-section, socio-economic changes occur in three areas of peasant density, i.e. low, medium, and high with the dominance of changes occurring in areas of high farmer density. So, it can be concluded that socio-economic change is dominated in areas with high farmer density.

4.2. Socio-economic changes based on distance and road network

4.2.1. Section a-a'. Figure 2 shows, at a radius of 0–500 meters from the reservoir, where the density of farmers is high, with high population density and surrounded by the use of rainfed lowland areas there is a high socio-economic change. Of all samples taken on this settlement are all farmers and undergoing livelihood changes. The change that occurred was 3.33 % of farmers switched professions to traders and 3.33 % of other farmers experienced changes to unemployment. Changes in income that occurred is 5.00 % of the population experienced income changes of more than Rp 600,000/month and 1.67 % of the population changed less than Rp 300,000/month.

At 500–1000 meters from the reservoir, where the high density of farmers with low population density and surrounded by rain–fed rice fields of socio-economic changes that occur is moderate. Livelihood change that occurred was 1.67 % which is a change of farmers into another, while 5.00 % did not experience changes in livelihood. 3.33 % of the people who have livelihood as farmers and traders experience income changes of more than Rp 600,000/month.

While at 1000–1500 meters where the condition of the area is surrounded by the dominance of fields with high farmer density and low population density, socio-economic changes are low. In this area there is no change in livelihood and unemployment rate. While low income changes still occur in this region, the change in income that occurred was 1.67 % of the population who work as traders decreased income between Rp 300,000/month to Rp 600,000/month.

Collector path through along the cross–sectional line from point a to point a’. At a 0–500 meter radius is also traversed by local roads with a livelihood change of 6.67 % of the total respondents. At a radius of 500–1000 meters there are 1.67 % of the affected population located on collector roads.

4.2.2. Section b–b’. Figure 3 shows, at 0–500 meters from the reservoir, where changes occur in areas that have high density of farmers with low population density and surrounded by rain–fed rice fields, occur moderate socio-economic changes. Livelihood changes that occurred were 1.67 % of farmers...
Figure 1. Relation of socio-economic changes with farmer density.

Figure 2. Section a–a’

became laborers and 1.67% of farmers became unemployed. While 6.67% of the population who work as traders do not change. At this radius the income change is moderate where the average income change between Rp 300,000 to Rp 600,000/month.

At 500–1000 meters from the reservoir, where the condition of its territory is surrounded by rainfed lowland with high density of farmers and medium density, the socio-economic changes that occur are moderate. In this radius no population is experiencing changes in livelihoods and unemployment while 1.67% of the population experienced a decrease in income between Rp 300,000 to Rp 600,000/month.

At 1000–1500 meters from the reservoir, the condition of the area is not too much different from before, where the area is surrounded by rain-fed rice paddies with high density of farmers, and the
population density in this region is high. In this radius no socio-economic changes occur, this can be seen from the absence of changes in livelihood, income, and unemployment rate. Along the b-b' cross-sectional line is traversed by collector road and local road. At a distance of 0–500 meters traversed by collector roads and local roads, there are 3.33 % changes where 1.67 % of the changes lie in local roads, and another 1.67 % occur on collector roads. While at 500–1000 meters and passed by the collector road does not change. At a distance of 1000–1500 meters from the reservoir is traversed by local roads and there is no change.

4.2.3. Section c-c’. Figure 4 shows, at a distance of 0–500 meters from the reservoir where the condition of the region is surrounded by rainfed rice fields, with high farmer density and high population density low socio-economic changes. In this radius, livelihood changes are low with 1.67 % of farmers being traders and 1.67 % of traders unchanged. The revenues change in this radius is high with the average income change in this region over Rp 600,000 in a month. While there is no change in unemployment rate in this radius.

At a distance of 500–1000 meters from the reservoir where the area is surrounded by rainfed lowland rice with a high density of farmers and population density dominated by high density, the socio-economic changes are moderate. The change in livelihood that occurred was 1.67 % change of employee into another. However, these changes did not occur due to the construction of the Jatigede Reservoir but for personal reasons. 3.33 % of the population who work as traders do not experience changes
in livelihood but experience income changes more than Rp 600,000/month. While the unemployment rate changes do not occur in this radius. At a distance of 1000–1500 meters from the reservoir, socio-economic changes do not occur. It can be seen that in this radius, changes in livelihood, income, and unemployment rates did not occur.

Along the c-c’ cross-sectional line is traversed by collector road and local road. At a distance of 0–500 metereter traversed by local roads and collectors, where the population located on the street collector changes, and residents located on local roads have not changed. The c-c’ cross-section of a 500–1000 meter radius is traversed by collector roads and local roads. Residents located on collector roads have changed, while residents on local roads have not changed. Radius 1000–1500 there is only local road and no change.

4.2.4. Section d-d’.

Figure 5 shows, at a distance of 0–500 meters, where the area of moderate peasant density and moderate population density is surrounded by rainfed lowland, socio-economic changes are high. The high livelihoods change occurred in this radius, where 1.67 % of the population with double livelihoods as farmers and traders switched professions to traders and 1.67 % of the population who had multiple livelihoods as farmers and traders became unemployed. In addition, 3.33 % of the population who have livelihoods as farmers also become unemployed. The rate of income change in this region is high, with an average revenue change of over Rp 600,000/month. Changes in the unemployment rate are included in the high classification, where changes occur at 5.00 % in this radius.

At a distance of 500–1000 meters from the reservoir where the condition of the area is surrounded by rainfed rice field with some areas have high density of farmers and high population density, socio-economic changes that occur is low. In this radius there is no change in livelihood and unemployment rate. While there is a change of income level with average change between Rp 300,000 to Rp 600,000 in a month.

Along the d-d’ cross-sectional line is traversed by local road and collector road. At a radius of 0–500 meters along the local roads of the four samples taken entirely undergoing livelihood changes, whereas on the collector road there is 1 sample and no change. While in the 500–1000 meter radius passed by the local road and not changed.

4.2.5. Not section. Areas that are not traversed by cross section are areas that are not directly adjacent to Jatigede Reservoir. If seen in the table above, there is no significant change in the livelihoods of the population. One of the changes in livelihood that occurred is the change of peasants into unemployment that occurred at a distance of 500–1000 meters of 1.67 %. While at other distances did not change. Changes in revenues occur almost across the radius from 1.67 % to 6.67 %. The highest percentage change occurred at a distance of 1000–1500 meters from a reservoir with a moderate classification.

Figure 5. Section d–d’
Figure 6. Socio-economic changes

The change in income occurs to traders and farmers and laborers with an average change between Rp 300,000 to Rp 600,000 per month. As for the level of unemployment did not happen a significant change. Changes in the unemployment rate that occurs in the low classification of 1.67% and occurs at a distance of 500–1000 meters from the reservoir. While at other distances there is no change in the unemployment rate.

Socio-economic changes are derived from overlapping livelihoods change maps, income change maps, and unemployment rate change maps. The three maps are each assigned different weights, 40% livelihoods change maps, income change maps and changes in the unemployment rate by 30%. This weighting is intended for socio-economic change to be seen more clearly in the area around the Jatigede Reservoir. The result of the overlay of the three maps can be seen in figure 6 below.

In figure 6 it can be seen that the closer to the Jatigede Reservoir the higher the socio-economic changes. The highest socio-economic changes occur in settlements that have a distance of 0–500 meters from the reservoir. At this distance, many residents change their livelihoods from farmers to traders, laborers, and others. People who lost their livelihoods and became unemployed were entirely at a distance of 0–500 meters. In addition, at this distance even higher income changes.

This socio-economic change is also influenced by the condition of roads located around the reservoir, where many roads between sub-districts are cut off both collector roads and local roads. This condition makes it difficult to move people from one region to another. In addition, the condition of damaged roads to the tourist attractions to make the number of tourists decreased and affect the people who trade along the road to the sights.

5. Conclusion
The change of livelihood, income, and unemployment rates defined the change of socio-economic as an impact of the development of Jatigede Reservoir. Significant changes in socio-economic condition occur in areas where there are significant livelihood changes, high-income changes, and changes in the
unemployment rate. Significant changes in socio-economic condition happen on the high and medium farmer density.

The most significant of socio-economic changes are in the radius of 0–500 meters from the reservoir. The changes of income are always following the changes of livelihood, but the changes of unemployment rates are not always follows the changes of livelihood. The socio-economic changes that occur around the Jatigede Reservoir are mostly located on the local road network.

References
[1] Salim A 2002 *Perubahan Sosial: Sketsa Teori dan Refleksi Metodologi Kasus Indonesia* (Yogyakarta: Tiara Wacana Yogyakarta).
[2] Soemarwoto O 1997 *Ekologi, Lingkungan Hidup dan Pembangunan* (Jakarta: Djambatan)
[3] Nureni L 2011 *Dampak Pembangunan Bendungan Jatigede Terhadap Reorientasi Mata Pencarianan Masyarakat di Daerah Calon Genangan Jatigede Kabupaten Sumedang* *Jurnal Pendidikan Geografi Universitas Pendidikan Indonesia* (Bandung: Jurusan Pendidikan Geografi, Universitas Pendidikan Indonesia)
[4] Pertiwi W F T 2016 *Perubahan Mata Pencarianan Masyarakat Dusun Sremo Pasca Dibukanya Kawasan Wisata Waduk Sermo di Kabupaten Kulon Progo* BSc Thesis (Yogyakarta: Jurusan Pendidikan Sosiologi, Universitas Negeri Yogyakarta)
[5] Badan Pusat Statistik Kab. Sumedang 2016 *Kabupaten Sumedang dalam Angka Tahun 2016* (Sumedang: Badan Pusat Statistik, Indonesia)