

Evaluation of the Possible Socio – Economic Effects of Dam Projects on People Living on Agricultural Activities: The Case of Laleli Dam in Turkey

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Abstract

It was aimed in the scope of the present study to evaluate the socio – economic structures of people living in the project area of Laleli Dam, whose life style is expected to change with the application of the project and to determine to what extents and size the project may affect these people using Rapid Rural Appraisal technique. Method of the study involves surveying, meeting people, asking questions, listening to their responses and the talks about the solutions and opportunities. Socioeconomic structures of the people living in the study area tried to be determined using also a questionnaire addition to the evaluation meetings. Results obtained from the study showed that total number of people to be affected by the project may be 2.273 among whom 1560 is expected to be affected directly. Average expected household expropriation price to come from the project was determined in the villages included in the project area to be 92.374 Turkish Liras (TL). It was concluded in the study that it will not be possible for people to be affected directly by the project to lead or reconstitute their life and the order they have been sustaining since they were born in the same area anymore through the expropriation price they will be given.

Keywords: Dam construction, communities, social costs, socio-economic impact, livelihoods

1. Introduction

Water is a natural source which have since the beginning of the history been conserving its vitality and strategically important place for human life and development. Throughout their history, humans have constructed storage structures to utilize water efficiently. As the science and technology developed, consistently increasing and diversifying needs tried to be met by constructing larger and more complexed water storing structures (Bisvas 1970, Javaid *et al.* 2012, Mongat *et al.* 2015).

Dams, especially larger ones, are accepted to be an important requirement for socio- economic development. Such structures can be constructed for one or more of the objectives such as irrigation, energy production, urban or industrial water supply, runoff control, fishery and recreation (Berga *et al.* 2006, ICOLD *et al.* 2000). Apart from the mentioned favourable effects, dams may also have negative economic, social and environmental impacts.

Several studies have so far been conducted in literature dealt with the impacts of dam construction on natural environment (Lin 2011, Bartley *et al.* 2014, Kamayama *et al.* 2013, Ghosh & Guchhait 2014, Hansen *et al.* 2014) as well as on their socio – economic effects. It was reported in a study (Oruonye 2012) carried out in the city of Taraba, Nigeria to determine the socioeconomic effects of a project implemented in the city on the people living in the project impact area that even though they were not given the opportunity of participating actively in the planning and application processes of the project, socioeconomic conditions of the affected people reached a better position after the project and some of them preferred living in their own settlements by repairing their old houses even though they were granted enough financial possibility to purchase a new house or private land. The study suggested that people to be fully affected by a project should be given opportunity to participate in the decision making processes in order to eliminate the effects of large projects. Atindana *et al.* (2015) studied the socioeconomic effects of Bui Dam, constructed for hydroelectric power production in Ghana and suggested that the project resulted in both positive and negative socio-economic impacts by reporting that even though employment rate and food diversity increased as the results of dam, a suitable settlement plan could not be prepared for impacted people who lost their houses and lands. Tahmiscioğlu *et al.* (2007) stated that dams may affect in Turkey social, cultural and economic structures of the places where they are constructed and settlements and lands are flooded. Psychology of people obliged to leave their homes may be badly impacted. Martinez (1989) studied on the possible negative effects of planned and being – constructed dams in near future and stated that people who had to migrate from the project areas and their close proximities faced losses in their traditions and cultures. In a study (Tajziehchi 2013) on the quantitative calculation of social impacts of large scale dams in the sample of Alborz dam, socioeconomic cost of the Dam was calculated to be yearly 4.8 million USD, the largest share of which belongs to reduction in agricultural production. Jackson & Sleigh (2000) reported in their study carried out on Three Georges Dam constructed in China that 1.3 million people had to move from the

project area, unemployment increased after the project and the project damaged public health seriously. Oruonye (2015) reported in their study conducted on socio-economic impacts of multi – purposed Kashimbilla dam in Nigeria that people forced to move from their homelands migrated to the settlement area prepared for them without showing any resistance, their agricultural and historical lands were completely flooded and in some parts of the project area diseases increased. According to Fernandes *et al.* (1989) and Fernandes (1991), due to a national development program in India, 20 million people were forced to move from their own lands in 40 years and 75% of these people could not be rehabilitated. It was reported in Mburugu (1993) that after the construction of Kiambere hydroelectric power plant in Kenya, mean land size decreased from 13 ha to 6 ha per farm and average animal number and income decreased by 30% and 82%, respectively.

Project area is on Coruh river nearly 21 km northeast of Bayburt province and 1 km southeast of Laleli village, located 50 km northeast of Bayburt province in northeast of Turkey (Anonymous 2007). Electric production licence was given by DSI to Energy Market Regulation Committee (EPDK) for 49 years valid from 2011 in the scope of Water Use Contract Regulation (Anonymous, 2012).

Laleli dam and HEP project was planned to be finished in a four – year period, one year for project preparation and three years for the completion of facilities.

Project will be applied on an agricultural area to a large extent, where agricultural activities were actively performed. Settlement units covering the structures such as houses, stalls, haylofts, schools, mosques, cemeteries and fountains in addition to river band, sandy and stony lands will be flooded by the future dam lake area.

In the present study, it was aimed to determine possible changes in socioeconomic states of people living in Laleli dam project area and whose life styles may change with the application of the project and to what extent they may be impacted by the project. Since the study is the first one to evaluate the project area it has a uniqueness value.

2. Material and Method

2.1 Material

Material of the study is composed of data obtained from the evaluation meetings conducted at the settlements with the participation of people affected by the project, face to face interviews, public institutions and questionnaire prepared conveniently with the aim and applied to headmen and villagers. All these activities in the study area were conducted in June and July 2015.

2.2 Method

Rapid Rural Appraisal (RRA) method is employed in the study to obtain data. The method includes surveying, meeting people, asking questions, listening to responses and talks to determine solutions and opportunities. Evaluation meetings were conducted at all villages fully or partly affected by the project to learn the opinions of local people about the project. In addition to the evaluation meetings, socioeconomic structure of the locals tried to be determined through the questionnaire applied to them.

Expropriation price is a vitally important matter for families impacted by dam investments in the way that they had to leave their living environment and live in another place. Therefore, perhaps the most important stage of an investment requiring expropriation challenges is the accurate appraisal of assets. From this point of view, the amount of money to be given to each family was detected by appraising the expropriation price of the lands and structures. The factors thought to be effective directly on the production such as soil, ecological and climatic characteristics of the area where assets are present, accessibility of the assets, consciousness and skills of farmers, marketing the crops produced and the use of quality seed and fertilizer were evaluated. The methods of capitalisation of incomes, cost analysis and combination were used for agricultural lands, buildings and housing lands, respectively in the appraisal of expropriation price. Appraisal of housing lands is generally conducted by using the methods of market value and capitalisation of incomes together. In the capitalisation of incomes method, the value of assets sourcing from net income they provide is taken into consideration while in market value method, contribution of the factors out of direct incomes is reflected in the value.

3. Results

Project area lies in the borders of Pazaryolu district (Erzurum) and central district of Bayburt province covering totally 12 settlements in its direct impact area. Among 12 settlement units, only a limited part of 6 ones is included in the project area while only agricultural lands in 4 of the rest of the settlement units are to be occupied by the project area. In this respect, people affected by the project in various degrees and types have different approaches and adoption levels. Besides, rehabilitation policies to be applied to each individual or family affected by the project in different ways are expected to be different.

Project area is inhabited by 2.273 people in 594 households. Female population has higher concentration in the area. Mean household population is 3.95. Low household population in rural settlements

may sign the migration from the area. As in whole Turkey, it is difficult for the youths in the area to stay in their villages due to hard life conditions and the lower size of agricultural lands per capita than optimum farm size.

Totally 397 households and 1.560 people are affected by Laleli Dam project together with all their structures (e.g. houses, stalls and haylofts) and lands which will be under dam and expropriated. Conditions of the households affected fully by the project are of course different from those affected partially. Therefore, there is an obligation to evaluate individual examples in different statues. Only some or whole of production tools are expropriated belonging to families partially affected by the project while both living areas and production tools are taken from the families fully affected by the project.

Agriculture (plant and animal production including vegetable growth and apiculture) is the main economic occupation of the families in all villages in the project area.

Even though the main occupation is agriculture in the project area, there are alternatives income sources for the area other than agriculture even out of the area. Income sources out of the area can be categorised in three groups. The first group involves those living permanently in the villages but working in city centres or districts as officers or pensioners since the mentioned settlements are very close to the project area. These people have additional income from their animal or plant production activities and are bounded to their villages physically and psychologically. In the second group, people live with their families in the villages but in certain terms they go to metropolitan cities to work temporarily and have income. These temporary workers are generally qualified construction workers and they have insufficient lands to perform agricultural activities or redundant workforces in families. The third group is composed of those who have a house or relatives in the villages and spend some part of their yearly holidays there. They have weak links with the villages.

It can be seen when the number of households living on an income wholly or partly out of village that the largest group involves people living abroad, which is 150 families. However, because these families do not live at an addresses in the villages, they cannot be counted among the household number showed in previous tables. They will possibly be affected by the project due to the losses of their assets in the villages and perhaps their emotional losses will be larger than economic ones. There are 45 households whose owners work abroad. There are also 21 people living in villages and going to work outside the villages daily. This group involves workers from 5 villages.

Affected families living in the project area are categorised as follows according to their links with the village and income sources.

- Families to be affected in the first degree are those living in the villages and whose income source is only agricultural activities.
- Families to be affected in the second degree are those living in the villages and whose income sources are working outside the region and agricultural activities.
- Families to be affected in the third degree are those living in the villages and whose income sources are regular salaries since they are public officers, workers or pensioners and agricultural activities.
- Families to be affected in the fourth degree are those living in the villages and who have real - estates in the villages and work abroad.

Average number of cattle per village in the project area is 188, which are majorly culture or culture hybrid races. The number of dairy livestock farms is larger than others. Average cattle number per household ranges between 1.9 and 6.3 for the villages. The need for animal feed in the area is met by growing forages and using pasturelands. Poultry is a production activity for only domestic uses in almost all households in the area and in 2 villages apiculture activities are conducted for marketing.

It was determined that there is an important difference between the actively used and privately owned land surface areas since they haven't been given the certificate of inheritance for long and only one family uses the lands with more than one inheritor. In addition, the lands owned by those living out of the villages are used by renting or sharing crops. The rate of lands used by their owners was also determined. It was found in a general assessment that a family uses lands belonging averagely to 5.4 people. The rate of land to be expropriated was estimated after the changes were accepted in the project (2 dams + 1 Hydro Electrical Power Plant) by revising previous works.

With the application of Laleli Dam Project, the largest surface area of private lands to be expropriated belongs to agricultural fields (6.257 da), followed by turfs, gardens / orchards, stalls and haylofts, house and housing lands. Field and turf areas to be expropriated are officially absolute agricultural lands and gardens / orchards are planted agricultural lands according to Code 5403 related to Soil Conservation and Land use. Assets belonging to treasury are rangelands, school, mosque and fountains while those belonging to village legal entity are cemeteries, mosque, housing lands, fields and roads.

Household real property rate to be expropriated was calculated by finding the ratio of total area to be expropriated in settlement units affected by the project according to their types to the number of households in the settlements. The rates of areas to be expropriated per household in the villages affected by the project are

13.4 – da field, 1.7 – da turf, 183 - m² garden, 69 m² housing land, 85 - m² house and 86 - m² stall and hayloft. Since these values represent average household rates accurate household rates may be deviated significantly.

State Hydraulic Works (DSI) is known to be a public institution which expropriates the largest land surface as the requirement of the project it implements in Turkey. It is estimated when considered the projects continuing in Turkey that nearly 1% of Turkish territory will be expropriated through easement rights and other techniques (Toker 2010).

Almost all of lands and fields on which Laleli Dam and Hydro Electrical Power Plant will be constructed and flooded are agricultural areas. Private assets and real estates are agricultural fields, gardens, orchards, turf, construction lands, houses, stalls and haylofts.

Mean total expropriation area per households was determined through an appraisal study. Lands belonging to treasury, village legal entity and common use were not taken into consideration. In order to determine net total payment per household in the evaluation, a ratio of 5.4 was used to calculate the amount by considering the possession, common use and inheritance problems of fields and turfs. This ratio represents the fact that a family uses a land part normally belonging to 5.4 people.

Average expropriation price to be paid per household affected by the project is 92.374 TL, about 70% of which comes from house, stall and hayloft and the rest 30% is from lands.

4. Discussion and Conclusion

According to the study of World Dams Commission, economic outcomes of dams are generally exaggerated whereas their social and environmental impacts are never focused on or showed to be lower than they are (www.wwf.org.tr). In the same way, Sever (2005) pulled attractions on negative impacts of dams and hydro electrical power plants (to be) constructed today on geographical environment because of faultily or insufficient planning. Dams and hydro electrical power plants which have turned out to be an important troublesome in the last years and been evaluated differently from various points of view are accepted to cause some problems difficult to solve e.g. deterioration in ecological balance, difficulties in planning, expropriation and resettling, damage to touristic values, short lifespan and low rentability (benefit/cost) ratio.

It is inevitable to construct dams to meet the needs of increasing population demanding high life standards for food based on agricultural production, running water and electricity. Dam investments account for an important part of national investment budget. When making decisions on the number and the sizes of dams, demands of the local people and how they may change are not considered and also the effects of dam constructions on environment, socioeconomic structure and other sectors are not accepted to be so important in Turkey. Dam constructions cannot often provide profits anticipated at project stage. Turkey's superficial policy on dam construction should be prepared and applied more realistically and smartly from economic point of view. Therefore, State Hydraulic Works (DSI Turkish Acronym) should adopt a complementary watershed management approach where water supplies can be managed more productively in the dam investments. Turkey has planned that almost all its water reserves will have been used by the end of 2030 through dams. However, such a target may throw sustainability of natural life in danger and cause irreversible loss of water reserves (Toker 2010).

Land use change may be defined to be the allocation of a land part to an irreversible production type out of existing characteristics and type of the mentioned land or its optimal use as a production factor. One of the most notable examples of land-use changes is dam construction. An important rate of the lands to be expropriated in Laleli Dam Project is the bottom of valley, fertile and allocated to agricultural use. With the application of the project these fertile lands will undergo changes and will not be used for agricultural aims.

People affected by the project in varying sizes and completing questionnaire forms were asked their opinions about the project. Their common view was found from the replies to be that they got rid of unfinished dam construction for various reasons. Another big deficiency was reported by the villagers to be that they were not informed at any stage of the dam project by governmental or authorised sides. Talks about the project based not on official declarations caused several speculations and unfavourable situations beginning from the very early dates. Other public investments than the Dam project may be prevented by the project itself causing the idea that the area gets enough public investment while the project may cause lessening individual long-term investments.

Mean values of irrigable and not irrigable field land in project area were calculated to be 13.1 TL/m² and 1.93 TL/m², respectively while that of turfs and orchards was found to be 6.56 TL/m² and 27.7 TL/m², respectively.

Values of houses, stalls and haylofts were appraised based on official approximate unit costs of structures in 2015 and as the results of the calculation to be 537.5 TL/m² for hoses and 231.25 TL/m² for stalls and haylofts.

Value of the lands in the villages affected by the project was appraised to be 15 TL/m² as the result of field observations and based on the capitalisation of incomes.

Since local participation at planning stage of a dam project is not seen to be a priority in Turkey, it is generally not possible for the masses directly affected by the project to accept and adopt it in Turkey. It is the people inhabiting project area who are directly affected by the projects applied while whole country benefits from the value the project produces. So, in the scope of Laleli Dam Project, the number of households to be affected possibly by the project is 594 and population is 2.273 while the number of directly affected households and people is 397 and 1.560, respectively. Especially, the people affected directly by the project do not have any chances to lead a life in the same area. Average expropriation price per household was calculated in the villages affected by the project is 92.374 TL while the highest price was determined to be 276.107 TL. This rates accepted involuntarily by the villagers are paid to them in return for their living areas covering their houses and production facilities i.e. stall, hayloft, field and orchards. Almost no one among the villagers can reconstitute their life at the same standards using the amount they were given.

The people who are to leave their native lands are affected by the dam project the most. They will experience absolute negative effects on their life style, culture and psychological structure. The amount of money they are compensated for their lands is not enough to found a new life and when they spend it they will be in a status of disqualified worker. A similar situation with the mentioned one was experienced in Altinkaya Dam project, where some of the villagers whose lands were expropriated settled in Vezirköprü, a district, but majority of them could not get accustomed to city life for long and had a difficult life. They spent money given them in return for their lands in a very short time since they were seen to be disqualified workers and remained to be unemployed (Yılmaz 2013).

It is mainly anticipated that a dam project will absolutely make contribution to reducing migration of people employed in agriculture sector and even to increase in the population of project area, however; in several dam projects it was contrarily witnessed that population decrease continued due to the unstopped migration and changing social status and therefore migration to large cities cannot be ceased.

People obliged to leave their homeland due to a project will inevitably encounter new additional socioeconomic and cultural problems they have already had. People having lived for long on the expropriated lands and taken their roots from these lands like a plant will have to stay away from their native environments where they have inhabited since they were born with social foundations, organisations, family structures, traditions and customs in short, cultural properties they established.

As a conclusion, it should not be expected that no dam project has negative economic benefits due to agricultural, ecological and socioeconomic costs in today's conditions people experience all details of information, communication and technology age because in economic cost – benefit analyses, neither an endemic plant species nor another living organism inhabiting or non-living thing sharing Coruh watershed with humans has a cost. In addition, result of the economic calculation of project cannot be in negative sign due to the agricultural factor included in the analysis since the values obtained from agricultural products are too low to compete with those produced by industrial products i.e. the price of an ordinary smart phone is equal to 3 to 4 tons of wheat which is produced in in a 10 to 12 – da field. Therefore, the investment projects resulting in environmental impacts should not be evaluated by only considering pure economic criteria.

References

- Anonim, (1998), “Türkiye Tarım Arazilerinin AKKS’ye Göre Dağılımı (TOPRAKSU, Türkiye Arazi Varlığı”, *KHGM Yıllık Envanter*, Ankara.
- Anonim, (2007), “Laleli Barajı ve HES Fizibilite Raporu Revizyonu”, Yapı-Tek Enerji Elektrik Üretim A.Ş., Eylül.
- Anonim, (2011), “Çoruh Vadisi-Deriner Barajı Altında Kalacak Endemik ve Nadir Bitkilerin Tesbiti, Nakledilmesi ve Yetistirilmesi Projesi”, T.C. Orman ve Su İşleri Bakanlığı Çölleşme ve Erozyonla Mücadele Genel Müdürlüğü.
- Anonim, (2012), “Laleli Barajı ve Hidroelektrik Santrali, Malzeme Ocakları, Kırma-Elemente-Yıkama Tesisi ve Beton Santrali Projesi Yeniden Yerleşim Eylem Planı”, DOKAY-ÇED Çevre Mühendisliği Ltd. Şti., Şubat, Ankara.
- Anonim, (2013), “Artvindeki Barajlara Yakın Bakış”, *Artvin Çoruh Üniversitesi Bülteni*, Yıl:3 Sayı: 3.
- Anonim, (2015), “Nüfus İstatistikleri”, Türkiye İstatistik Kurumu.
- Atindana, S. A., Mensah, P., Alhassan E. H., Ampofo-Yeboah, A., Abobi, S. M., Kongyuure, D. N. & Abarike, E. D. (2015), “The Socio - Economic Impact Of Bui Dam On Resettled Communities; A Case Study Of Lucene And Agbegikuro Communities In The Northern Region Of Ghana”, *UDS International Journal of Development [UDSIJD]*, Volume 2 No. 1, August.
- Bartley, R., Bainbridge, Z. T., Lewis, S. E., Kroon, F. J., Wilkinson, S. N., Brodie, J. E. & Silburn, D. M. (2014), “Relating Sediment Impacts On Coral Reefs To Watershed Sources, Processes And Management: A Review”, *Journal of the Science of The Total Environment* 468, 1138-1153.
- Berga, L., Buil, J. M., Bofill, E., De Cea, J. C., Garcia Perez, J. A., Mañueco, G., Polimon, J., Soriano, A. &

- Yagüe, J. (2006), "Dams and Reservoirs, Societies and Environment in the 21st Century", Taylor & Francis.
- Biswas, A., K. (1970), "History of hydrology, North-Holland Publishing Company", Amsterdam, Netherlands.
- Eken, G., Bozdoğan, M., İsfendiyaroğlu, S., Kılıç, D.T. & Lise, Y. (2006) "Türkiye'nin Önemli Doğa Alanları", *Doğa Derneği*, Ankara.
- Fakıoğlu, S. & Kağncıoğlu, N. (2009) "Doğu Karadeniz ve Çoruh Havzalarının hidroelektrik Enerji Üretimi Açısından Değerlendirilmesi. Doğu Karadeniz Bölgesi Hidroelektrik Enerji Potansiyeli ve Bunun Ülke Enerji Politikalarındaki Yeri", Trabzon.
- Fernandes, W. (1991), "Power and Powerlessness: Development Projects and Displacement of Tribals", *Social Action* 41(3), 243-270.
- Fernandes, W., Das, J. C. & Rao, S. (1989), "Displacement and Rehabilitation: An Estimate of Extent and Prospects: In Development, Displacement and Rehabilitation. W. Fernandes and E. Ganguly Thukral, *Indian Social Institute*, 62-68.
- Ghosh, S. & Guchhait, S. K. (2014), "Hydrogeomorphic Variability Due To Dam Constructions and Emerging Problems: A Case Study of Damodar River, West Bengal, India", *Journal of Environmental Development Sustain* 16, 769-796.
- Güleryüz, M. & Ertürk, Y. (1999), "Erzurum İline Bağlı Pazaryolu İlçesindeki Elma Bahçelerinin Mevcut Durumu ve Geliştirilmesi", *Atatürk Üniversitesi Ziraat Fakültesi Dergisi* 30 (2), 147-150.
- Hansen, Z. K., Lowe, S. E. & Xu, W. (2014), "Long-Term Impacts Of Major Water Storage Facilities On Agriculture And The Natural Environment: Evidence From Idaho (U.S.)", *Journal of Ecological Economics* 100, 106-118.
- ICOLD, (2013), "Open letter from COLD, IHA and ICID on The Final Report of The World Commission on Dams, <http://unep.org/dams/documents/default.asp?documentid=450>.
- Jackson, S. & Sleight, A. (2000), "Resettlement for China's Three Gorges Dam: Socio-Economic Impact and Institutional Tensions", *Communist and Post-Communist Studies* 33, 223-241.
- Javaid, F., Arshad, M., Khan, M. A., Shabbir, A. & Shakoor, A. (2012), "Performance Assessment of Lined Watercourses In District Jhang", *Pakistan Journal of Agricultural Sciences* 49(1), 73-77.
- Kamayama, S., Shimazaki, H., Nohara, S., Tatsmaki, S., Fujl, Y. & Kudo, K. (2013), "Hydrological and Sediment Transport Simulation to Assess The Impact of Dam Construction In The Mekong River Main Channel", *American Journal of Environmental Science* 9(3), 247-258.
- Lin, Q. (2011), "Influence of Dams on River Ecosystem and Its Countermeasures", *Journal of Water Resources and Protection* 3, 60-66.
- Martinez, H. (1989), "La irrigación Jequetepeque-Zaña: Impacto De La Presa De Gallito Ciego", *Socialismo Participación* 45, 18.
- Mburugu, E. K. (1993), "Dislocation of Settled Communities In The Development Process: The Case of Kiambere Hydroelectric Project", In *Involuntary Resettlement in Africa*, ed. C. C. Cook. World Bank Technical Paper No. 227, World Bank, Washington, DC.
- Mongat, A.S., Arshad, M., Allah Bakhsh., Shakoor, A., Anjum, L., Hameed, A., Kalsoom, U. & Shamim, F. (2015), "Design, Installation and Evaluation of Solar Drip Irrigation System at Mini Dam Command Area", *Pakistan Journal of Agricultural Sciences* 52(2), 481-488.
- Oruonye, E.D. (2015), "Assessment of The Socio-Economic Impact of Kashimbilla Multipurpose Dam Project in Takum LGA, Taraba State, Nigeria", *Global Journal of Interdisciplinary Social Sciences* 4(5), 9-15.
- Oruonye, E.D. (2012), "An Assessment of the Socio-Economic Impact of Urban Development-Induced Resettlement Scheme in Nigerian Cities: A Case Study of the Nyamusala – ATC Road Construction in Jalingo Metropolis, Taraba State", *International Review of Social Sciences and Humanities* 3, 1-9.
- Özgül, M., Aksoy, A. (2010), "Laleli Barajı ve Hidroelektrik Santrali Havza Özellikleri (Toprak, Topografya ve Müstemilet) Ön Değerlendirme Raporu", Atatürk Üniversitesi Ziraat Fakültesi, Erzurum.
- Sever, R. (2005), "Çoruh Nehri Enerji Yatırım Projeleri ve Çevresel Etkileri", Çizgi Kitabevi, Konya.
- Tahmiscioğlu, M.S., Anul, N., Ekmekçi, F. & Durmuş, N. (2007), "Positive and Negative Impacts of Dams on the Environment", International Congress on River Basin Management, Antalya.
- Tajziehchi, S., Monavari, S. M., Karbassi, A. R., Shariat, S. M. & Khorasani, N. (2013), "Quantification of Social Impacts of Large Hydropower Dams- A Case Study Of Alborz Dam in Mazandaran Province, Northern Iran", *International Journal of Environmental Research* 7(2), 377-382.
- Toker, E. (2010), "Borçka ve Deriner Barajlarının Çoruh Havzasında Neden Olduğu Arazi Kullanım Değişiminin ve Arazi Tahribatının İrdelenmesi", Artvin Çoruh Üniversitesi Fen Bilimleri Enstitüsü, *PhD Thesis*, Artvin.
- Yılmaz, C. (2013), "Altunkaya Barajının Veziköprüye Etkileri", *Ondokuzmayıs Üniversitesi Eğitim Fakültesi Yayınları*, Samsun.