

RESEARCH
REPORT



EVALUATION OF ACTUAL
IMPACTS OF THE ATATÜRK DAM

Cecilia Tortajada

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RESEARCH REPORTS

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EVALUATION OF ACTUAL IMPACTS OF THE ATATÜRK DAM*

Cecilia Tortajada

ABSTRACT

The primary objective of this paper is to analyse the extent and magnitude of the actual social, economic and environmental impacts of the Atatürk Dam in the Southeast Anatolia, Turkey, on the region some eight years after its construction was completed. The direct impacts, both positive and negative, due to the construction of the Atatürk Dam on the people living in the two provinces affected directly, Adiyaman and Sanliurfa, as well as on the region as a whole, are reviewed. The emphasis of this analysis was on economic, social and environmental issues, both direct and indirect, over the short to medium term, which could be objectively estimated and evaluated with reasonable accuracy.

INTRODUCTION

The Southeastern Anatolia region of Turkey has been historically an underdeveloped plateau lying at the foot of the Taurus Mountains. It is drained by the Euphrates and Tigris rivers. The region has lagged far behind the rest of the country in terms of all development indicators: per capita income, life expectancies, literacy, infant mortality, manufacturing activities, and health and infrastructure facilities. Güneydogu Anadolu Projesi (GAP), or the Southeastern Anatolia project, as it is presently conceived, is a US\$32 billion multi-sectoral, integrated regional development programme, which primarily aims at strengthening economic, environmental, cultural, social, institutional aspects of human development in this economically disadvantaged region by significantly raising the prevailing living standards and quality of life. With proper planning and management, water is expected to be the engine which will drive the sustainable development of this area in the coming decades. The project, even though it is now far from being complete, has already contributed significantly to reducing the regional disparities.

The GAP project covers nine provinces and approximately 10% (6.1 million inhabitants according to the 1997 census) of the country's total population as well as its surface area. According to the present plan, by the year 2010 the GAP project is expected to produce 27 billion kilowatt-hours of hydroelectric energy, and irrigate 1.7 million ha of land, accounting for nearly one-fifth of the irrigable land of Turkey. This would be accomplished through the construction of 22 dams, 19 hydropower plants with a total installed capacity of 7500 MW, and extensive and extensive irrigation and drainage networks. The project is expected to almost double the existing total area of artificial lakes to 228 136 ha. The irrigated land will increase from 2.9% to 22.8% in the region, but concurrently rain-fed agriculture would decrease from 34.3% to 10.7%.

When this evaluation was carried out, the main components of the GAP project were the Atatürk Dam, Sanliurfa Tunnels, and Sanliurfa-Harran irrigation system. The Atatürk Dam, completed in 1990, has a reservoir capacity of 48.7 billion m³, and generates 8.9 billion kWh of energy annually. Water reaches the Sanliurfa-Harran plains through two parallel tunnels, each 26.4 km long and 7.62 m in diameter. One of these two tunnels was completed in 1995, and by the end of 1998, irrigation in the Harran Plain was being practiced in 90 000 ha with a gross agricultural outputs value of \$179 million per annum. The Sanliurfa-Harran irrigation is the first to become operational among the several irrigation projects in the GAP region. By September 1999, the cumulative energy production in the region (Karakaya and Ataturk Dams) was 155 billion kWh, representing an equivalent of \$9.3 billion.

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The GAP project has already contributed to improvement of the economy and the lifestyle of the population living not only the region, but also in the country as a whole within a period of only a few years. Some indicators of the improvement in the lifestyle of the population in the area are literacy (increased from 55% in 1985 to 67% in 1997); infant mortality (decreased from 111 per 1000 in 1985, to 62 per 1000 in 1995); landless population (from 40% in 1985, to 25% in 1997); rural and urban water supply (from 57% and 15% to 67% and 57%, respectively), decrease in outmigration and very significant improvement in the regional economy.

On the basis of the impressive progress made so far, it is anticipated that all these major structural changes in the region will contribute to significant social, economic and environmental changes, which are most likely to be overwhelmingly positive for its more than 6 million inhabitants. The integrated project includes not only the construction of various multipurpose dams and irrigation systems but also simultaneous consideration of development, and the consequent investments necessary, in all the major productive sectors such as agriculture, energy, transportation, telecommunications, health care, education, and urban and rural infrastructures (Biswas and Tortajada, 1997).

RAPID ASSESSMENT

Being concerned with the successful implementation of the GAP project, and being aware of the importance of the Atatürk Dam and the ancillary hydraulic works in the Southeastern Anatolia region, the GAP Administration and the United Nations Development Programme (UNDP) decided to determine objectively the extent and magnitude of the actual social, economic and environmental impacts of the Atatürk Dam and the reservoir on the region some eight years after construction was completed. Evaluation of the direct impacts (positive and negative) due to the construction of the dam on the people living in the two provinces affected directly, Adiyaman and Sanliurfa, as well as on the region as a whole, was also a component of this study. The emphasis was on economic, social and environmental issues, both direct and indirect, over the short to medium term, which could be objectively estimated and evaluated with reasonable accuracy. The dam clearly has had many national impacts. However, evaluation of the national impacts was not included in this analysis since such impacts require complex and prolonged studies, which could not be carried out during a rapid appraisal over a limited time. A total appraisal of the impacts of the project on the nation as a whole may have to be carried out later. This paper summarises the results of part of the study carried out for GAP-UNDP.

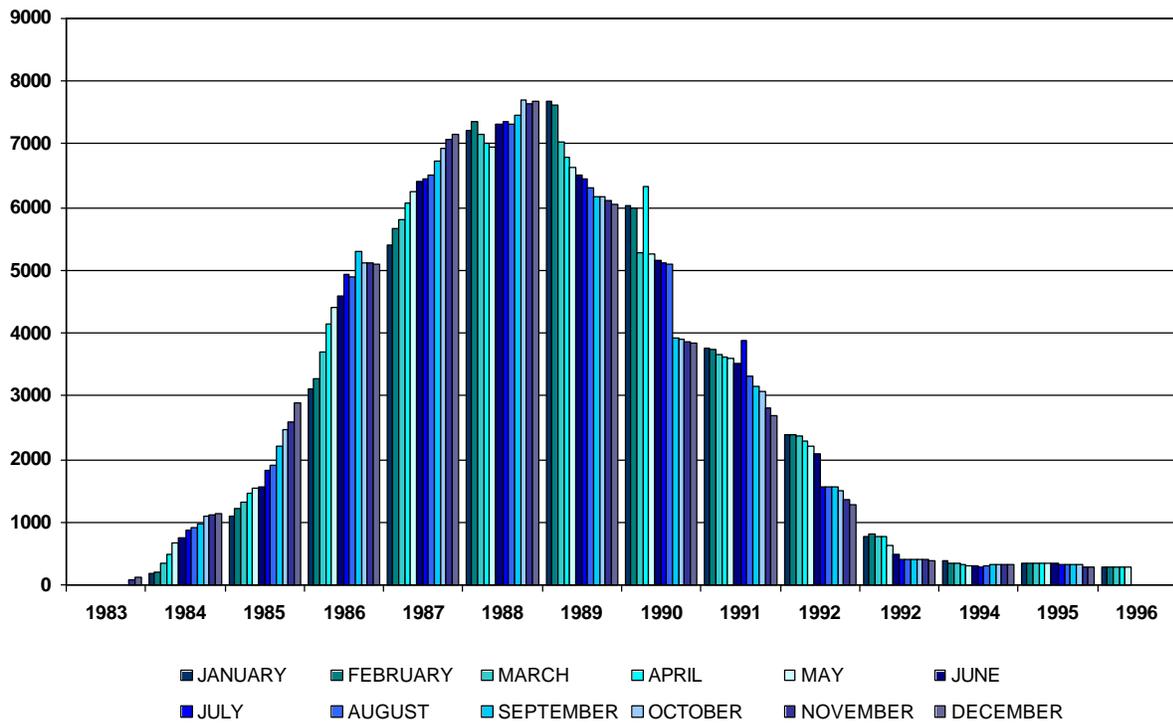
The rapid assessment included extensive fieldwork and intensive discussions, both in Ankara and the project area, with staff members from the GAP Administration and from other different planning and implementing institutions, especially the General Directorate of State Hydraulic Works (DSI), State Planning Organisation, General Directorate of Rural Affairs, etc. The interviews included national and international institutions from within and outside the region, numerous representatives of the affected population at different locations, concerned private sector institutions and NGOs. The members of the local population were selected at random.

Employment Generation from the Construction of Atatürk Dam, Hydropower Plant and Deviation Tunnels

Employment opportunities in the GAP region have been historically limited because of limited economic development. With the beginning of the construction of the Atatürk Dam and the associated hydraulic infrastructure, the area became a magnet for people seeking employment, from both within and outside the region. The private sector companies that carried out all the construction suddenly opened a new vista for employment for skilled and non-skilled personnel.

The contractor for the construction of the Atatürk Dam and HP was ATA Insaat Sanayi ve Ticaret AS. On the basis of information collected from the ATA Construction Company, the construction of the Dam started in November 1983 with only 89 workers. The total number of workers employed during the construction of the Dam was 16 431, of whom 466 were technical staff, and the rest skilled and unskilled workers (nearly 1000 of them sub-contracted). Between November 1983 and May 1996, there was an average of 3100 persons/month of work (Figure 1).

Figure 1. Number of People Employed/Month at Ataturk Dam, 1983 - 1996



The technical and skilled staff came to the region from the other parts of Turkey, as local people had neither the knowledge nor the skill to construct such a large and complex structure. Most of the skilled workers who migrated to the dam site had gained their knowledge and experience during the construction of other similar structures such as the Keban, Karakaya and Altintas Dams. Local people represented 95% of all the workers employed, but all of them were initially recruited as unskilled employees. The Directorate of Machinery trained many unskilled personnel, who later worked as drivers, machinery operators (light, medium and heavy), carpenters, turners, metal workers, etc.

The number of people working on the construction of the dam increased steadily with time. As noted earlier, the number of employees in November 1983, when the construction started was 89 but a year later, by October 1984, the number had increased to more than 1000 workers. At the peak of construction, which was reached in October 1988, the number of workers was 7688. The number started to decline steadily thereafter, and had decreased by half in about two years. By May 1996, the number had reduced to only 281 workers.

The contractor for the construction of the diversion tunnels of the Atatürk Dam was Dogus Insaat ve Ticaret AS. The construction started in October 1981, and the diversion of water through the tunnels started in June 1986. The filling of the reservoir began in June 1986 and was completed in August 1990. The normal operational level of the reservoir is 526.0 m.

Akpinar Construction Co. was one of the sub-contractors for the construction of the diversion tunnels. According to its records, 66 skilled and unskilled workers were employed directly by the company in January 1985; peak employment was 186 of reached in August 1991, and it then declined to 70 by September 1997. Based on interviews carried out with the Akpinar Construction Co., payments were based on minimum wages. Unfortunately, the information available from this company does not make any distinction between the salaries paid to skilled and unskilled workers; there is just one gross average wage per person per month for the entire staff. Furthermore, the records indicate that employees of the Akpinar Construction Co. were earning only about one-third that of the ATA Construction Co. However, as detailed employment records are no longer available, it was not possible to make any comparison between the salaries paid by the two companies to their skilled and unskilled workers.

The estimated number of people hired during the construction of the Atatürk Dam was 16 400. If this number is multiplied by a factor of 7 (average number of persons per family in southeast Turkey), some 114 800 people living in the region were sustained by the income generated by the employment created during construction of the Atatürk Dam.

The benefits that accrued to the local people (100% men) who worked during construction of the Atatürk Dam, at least in the case of ATA Construction Co., went far beyond the higher salaries paid to them. As noted earlier, thousands of local unskilled workers received training from the Directorate of Machinery in different activities, thus gaining knowledge, experience and skills in different areas. This training gave many workers, who were unskilled and mostly unemployed earlier, marketable skills and thus an opportunity to get both permanent and seasonal jobs in various construction companies after the work on the Atatürk Dam was completed. Furthermore, since the construction of the dam continued over several years, many employees were entitled to retirement pensions. The workers received additional social benefits as well during the time they worked for ATA Construction Co., including social insurance for both the employees and their families, as well as health services. ATA Construction Co. employed four doctors and five nurses, and had four ambulances to provide health services to the workers and their families, as well as to the local people. These were important social and health benefits which were basically unavailable to the local people before construction began. Clearly these developments had beneficial impacts on the lifestyle of the local population.

ATA Construction Co. noted that of the hundreds of students who were trained at the Sanliurfa Vocational School of Industry, many were hired by the company after their graduation. The Manager of the ATA Construction Co. estimated that approximately 25% of the skilled people working in the Atatürk Dam were hired later for other construction projects.

New economic Activities Due to the Construction of the Atatürk Dam and Reservoir

It was natural that several new economic activities were generated during the construction and operation of the Atatürk Dam and the associated hydraulic infrastructures. Among these activities were fishing and fishing-related industry (boat-building, fish-net construction and repair, fish processing and marketing, etc.); agricultural production through pumped irrigation directly from the reservoir; transportation through ferry boats in the reservoir, tourism (new hotels and restaurants); developments in the agro-industrial and industrial sectors, etc.

Fishing and Fishing-related Industries

The south-east region of Turkey is semi-arid to arid. Accordingly, most of the agriculture practised is still rain-fed, and fishing and fishing-related activities were basically unknown to most people before the construction of the dam and the reservoir. The GAP Administration and DSI are aware of the economic, social and environmental impacts, both positive and negative, that may directly occur as a result of the construction of water projects in general. One of the important tasks of DSI as a planning and implementing agency is to advise the local populations as to how best to take advantage of the newly available water resources for their own benefits as well as for the benefit of the communities concerned. These include income-generating activities, use of new varieties of food that were not locally available earlier, improvements in water supply and sanitation facilities, crop diversification and increase in agricultural yields, promotion of fishery, etc. DSI is also the institution that is responsible for carrying out activities related to water conservation and maximising the economic benefits from the water projects.

The assessment of the impacts of the reservoir included its characterisation, limnological studies, fish production, recreational activities, etc. In the case of the Atatürk Dam, the Department of Operations and Maintenance, Water Products Branch of DSI, prepared an *Assessment of Water Products and Fishing Ground in the Atatürk Dam Lake* (DSI, 1995). Among the main objectives were definition of the characteristics of the lake, study of the flora as well as any structure that would be covered by the water in the reservoir, conduct necessary limnological studies, estimation of fish production in the reservoir, including stock assessment and feeding requirements, establishment of a Water Products Station, and provision of necessary support to establish a cooperative for fishermen. The fieldwork on which the assessment was based was carried out between May 1992 and March 1993. Laboratory work was conducted between July and November 1993, and the report was completed in 1994.

Limnological studies in the dam concluded that there were no fish of economic importance in the reservoir. The stock of the existing species was very low and there were considerable problems in terms of hatching. Accordingly, it was decided to introduce large fish populations (especially carps) in the reservoir, using 5-6 cm fingerlings from the Elazığ-Keban Water Products Centre. In 1991, 200 000 carp fingerlings were released into the lake. The number of fingerlings released increased subsequently to 600 000 in 1992, and then to 2 000 000 each year in 1993 and 1994.

On the basis of data currently available, it appears that the density of fish in the Atatürk Reservoir is less than what have been observed in the Karakaya and the Keban reservoirs. This is to be expected and is primarily due to the fact that the Atatürk reservoir is new and thus the amount of nutrients available for fish production is low. On the basis of investigations carried out by DSI, the fish stock in the Atatürk Reservoir was about 850 tons/year when the assessment referred to earlier was carried out. This stock comprised of mainly varieties such as biyikli, bizir, in, sis, cultured carp, fresh water scud, and bass.

According to the DSI reports, there are many bays in Adiyaman at present in the Atatürk Reservoir. The report noted that it should be possible to establish successfully cage fishing in these bays. In fact, cage fishing is considered to be an important potential economic activity for people living near the reservoir. However, this may have some water-quality implications which need to be considered carefully. Further discussions on fishing activities are presented elsewhere (Biswas & Tortajada, 1999).

Agricultural production through pumped irrigation directly from the reservoir

Based on information available from DSI and from personal interviews conducted with people living around the reservoir area, only a limited number of people are practicing irrigation with water pumped directly from the reservoir. These are small-scale farmers. A main advantage of this type of farming has

been that it could be practiced as soon as the reservoir was ready; it was not necessary to wait for irrigation to start until all canal infrastructures were constructed.

Irrigated agriculture

Before the irrigation started, the main crops of the region were wheat and barley. In 1995, about 30 000 ha were irrigated with cotton as the main crop. By 1997, approximately 60 000 ha were cultivated with a gross agricultural output value (GAOV) of \$125 millions/year. The increase in cotton production has already spurred development in cotton-related agro-industries, such as cotton ginning, manufacture of cotton-seed oil, cloth mills, etc. Economic and social activities have further increased in Sanliurfa. An improvement in lifestyle of the farmers benefited by irrigation in the plain is already visible. Development in Sanliurfa can be defined before irrigation and after irrigation.

Industrial activities

As a direct result of developments stemming from the construction of the Atatürk Dam, industrial and commercial activities are accelerating rapidly in the region. The urban centres of the region have witnessed explosive growth in immigration because of enhanced employment potential, including self-employment. Construction activities have increased substantially, as have commercial activities for both formal and informal sectors. Transportation and communication links within the region, as well as between the region and the rest of Turkey, have opened up new potential for economic and industrial activities which simply did not exist earlier. Because of increasing demand, frequency of commercial flights between the urban centres of the GAP region and the rest of Turkey has expanded exponentially in recent years. Such increased and improved transportation and communication linkages are likely to enhance the socioeconomic development of the region at a rapid rate in the coming years.

A good example of industrial and commercial development is Sanliurfa. The city has already established an industrial zone which is now almost full, as a result of which a second zone of about 11 000 decares is now being developed. A free zone for exports and imports would be developed in this second zone. The first zone is mainly occupied by agro-industrial activities that are cotton-related, e.g. cotton ginning, textiles, cotton-seed oil, etc. Prior to the construction of the Atatürk Dam, such activities were extremely limited. These agro-industries are not only generating employment that is improving the living conditions of many people but also are providing a major value-added service products which were not available earlier. In the process, they are buying the raw materials from the farmers, which further boosts the economy of the region. A secondary benefit of the new agro-industrial development is the workers employed need housing, markets, and other services which further are boosting further the employment conditions of the region. The Atatürk Dam has thus directly contributed to a 'win-win' situation, whose socioeconomic benefits now encompass not only the GAP region but also the rest of the country through a variety of direct and indirect to pathways.

The GAP region is now at an early phase of industrial development. The levels of education and training that are now prevalent in the region are still significantly below national average, though in recent years the gaps between the two have been closing. While at present a very significant number of unskilled labourers can be absorbed in the labour force, the region will increasingly need more and more skilled labour, if the sustainability of the employment generation conditions is to be ensured. On the basis of the available evidence, it is clear that many of the unskilled labourers are progressive learning new skills, which increases their salaries and employment opportunities. Both of these are of course strong incentives to learn new skills.

In spite of these advances, however, it is now clear that the region is already suffering from a shortage of skilled workers. As new industries are established and existing ones are modernised, demand for skilled labour will accelerate. This demand can be met by increasing the training facilities available in the region and by migration of skilled workers from other parts of Turkey to the region. This is likely to put inflationary pressures on wages for skilled labour, which could reduce one of the important economic advantages the country has at present. Equally, dependence on skilled workers from outside the region will assure that the workers in the region will be increasingly restricted to low-paid and undesirable jobs. This could create social tension between the low-paid local workers and highly paid employees coming from outside the region. Thus, viewed from any direction, the best solution would be to take appropriate and timely steps to increase the education and skills of the local workers.

While increasing industrialisation has ensured many benefits for the people of the region, it also is bringing in its wake certain social and environmental costs. The main concern at present is the negative environmental and social impacts of wastewater management practices. Proper wastewater treatment by any industry is now a rare exception rather than the norm. The situation is serious for the industrial zone in Sanliurfa because of the high concentration of the industrial activities in the area.

Even though the Sanliurfa industrial estate is 15 km away from the city, the continuation of indiscriminate discharge of wastewater could have major social and health costs in the coming years for a variety of reasons. First, even though Sanliurfa is at a reasonable distance from the industrial estate, groundwater in the area may become contaminated with industrial waste products over the years. Depending on the gradient of the flow, the region's groundwater may become contaminated by industrial waste products, not just in Sanliurfa but in the different cities where industrial development is being encouraged.

Second, the industrial estate may be 15 km away from Sanliurfa, but it is located near some villages and a nearby stream, which serves as a source of water for some people. The people and the ecosystems of the nearby villages are likely to bear the first adverse health and environmental impacts of the existing wastewater discharges.

In the near term, monitoring of the quality of wastewater discharges and groundwater near the estate is necessary. Over the short to medium term, it is necessary to prepare and then implement a plan for wastewater treatment for the industrial zone. There was not time to analyse the wastewater situation in any depth. However, even if there had been, this would not still have been possible because of absence of data on the quantity and quality of wastewater generated. However, *prima facie*, there appears to be a good case to construct a communal wastewater plant for the industrial estate. Some discussions have already taken place with the World Bank and the Islamic Development Bank for a possible loan to construct a wastewater treatment plant.

A strategy for wastewater management for the industrial estate of Sanliurfa should now received priority attention. This is because a second zone is in the process of establishment, which is likely to increase the magnitude of the overall problem. The experience with the Sanliurfa industrial zone project indicates that any new similar project of the region must consider a wastewater and solid waste management plan from the very beginning of the planning process.

Resettlement and Rehabilitation

In Turkey, as in most countries, expropriation of land and the subsequent resettlement and rehabilitation activities are regulated by law. For water and land development projects, the designated executing agencies are DSI for expropriation, and the General Directorate of Rural Affairs for resettlement and rehabilitation.

For involuntary resettlement, as was the case for the Atatürk Dam, the Government is responsible for resettling those people who are entitled to this process. The compensation for the population who have to be resettled depends on many factors, including the size of the plots that were inundated. The amount of the compensation is decided by an independent valuation commission, and DSI transfers the amount needed to a Special Resettlement Fund that is managed by the General Directorate of Rural Affairs. When the values of the expropriated properties exceed the costs of resettlement, the difference is paid back to the owners. However, when it is the opposite, the owners are given a five-year moratorium on the debt, followed by a 20-year interest free repayment period. People have the option to decide whether they would like to be resettled in a rural or in an urban area. For those families who opt for rural development, each household is entitled to housing, farmland, credit for animal husbandry, farm land, etc. The law further stipulates that the farmers who are to be resettled must receive from the Government training on new agricultural production methods. All rural resettlements need to be provided with a health centre, a doctor, a nurse, and a midwife. For urban resettlement, the people receive a house and needed commercial facilities, as well as credits for commercial activities.

According to the State Government Organization, many of the people who request financial assistance from the Government for resettlement are generally landless or poor. In many cases, major landowners with large properties prefer to receive cash compensation, and then use the compensation received to establish small industries or commercial activities in the cities. In many instances, it is fairly common to find that part of a family whose land has been expropriated moves to the city, but the rest prefer to stay on the land. Experience indicates that the second generation of the families that decided to resettle in the cities and invested their money successfully, became entrepreneurs.

Overall, the main problem for relocation of populations is the scarcity of land where a group of people could be resettled, and not of money. Experiences from different water development projects from other parts of Turkey indicate that many people prefer to take the appropriate financial compensations and then organise their own resettlement in an area of their choice. The GAP region was no exception to this preference. People from the rural areas, often non-skilled and unfamiliar with the various investment opportunities, have not managed the expropriation funds received properly. Accordingly, they have used the funds received unwisely and have ended up with no house, no land, no job, and no money. Thus, within a limited period of time, they have become destitute, with economic and living conditions significantly worse than before because of poor investment decisions and inappropriate financial management. This is an important problem for Turkey in terms of the efficiency and social acceptability of resettlement practices. This is a national problem, not limited to the GAP region, for which proper solutions have to be found which could enhance the social and economic conditions of the people who are to be resettled.

For the current rapid assessment, the information on resettlement was collected from different sources. The XVI Regional Directorate of DSI had provided information to the staff of GAP Administration on the status of urban and rural resettlement as of 1993, and also the status of expropriation as of 1996. DSI did not have data on resettlement after 1993 because of an absence of requests from those who are to be resettled.

The Directorate of Rural Affairs has estimated that 1129 families had to be displaced because of the Atatürk Dam project during the period 1988 to 1997. Out of this number, 44% were to be resettled in rural areas, and the balance of 56% in urban areas. When the study was undertaken, 100% of the population had been fully compensated, but only 30% of the population had been resettled (344 families), and 70% still had to be resettled (369 families in rural areas, and 416 families in urban areas). It is estimated that an average family consists of 10 persons. However, the records of DSI do not include the total number of families that have to be resettled. This records note only that the number of families that were involuntarily resettled from 1988 to July 2000 was 344 (133 in rural areas, and 211 in urban areas), and that the number of families waiting to be resettled in rural areas was 333. The families to be resettled in urban areas were not included.

In order to obtain a clearer picture of the efficacy of the resettlement process from the perspective of the people who had to be resettled, there were extensive series of discussions with the project-affected persons in Adiyaman and Sanliurfa, provinces. People interviewed were selected at random. In addition, collective meetings with those people who were to be resettled were organised in a few selected villages. The three villages that were rapidly studied were New Samsat, Akpınar and Kizilcapınar. The local populations pointed out that the infrastructure facilities for roads, energy, water, and communication in the new towns were excellent. This unquestionably is a significant improvement to what the population had access to earlier. In addition, their new houses were built with cement, and people generally had televisions, refrigerators, telephones, and washing machines in their houses, which earlier were considered to be luxury items. People also now have running water, electrical connections and better sanitation facilities in their houses. The new towns now have doctors in the town on a permanent basis and also small hospitals, as well as more schools (both primary, and high schools) compared with previously.

Interestingly, but perhaps not surprisingly, the overall benefits and costs of the dam were viewed differently depending upon whether the people were from Adiyaman or Sanliurfa. In Adiyaman people did not have access to water for irrigation purposes, and thus could not benefit from irrigation. In contrast, the people living in Sanliurfa appeared to have a much positive attitude towards the dam and the reservoir.

In general, an overwhelming percentage of people from both provinces feel the construction of the dam has been beneficial to the community, although there were unemployed people who were looking for jobs. One of the benefits of having a higher income has been that the children (including girls, according to the people interviewed) are now being sent to the schools, even though most of the population of the town attended only primary school. The absence of higher education and training has meant that most of the people from the villages who worked during the construction of the dam were unskilled. However, since the construction of the Atatürk Dam extended over a period of years, it was possible for many of the villagers to be trained as drivers, motor mechanics, etc. With new skills, some of the people are now working as skilled labour on different infrastructure development projects all over the country.

As the socioeconomic and educational levels of the people who had to be resettled varied widely, it is not possible to draw uniform and universally acceptable conclusions. However, among the positive impacts were improvements in the economic conditions and lifestyle of the people who managed their expropriation funds properly. Education of children (including girls) received a significant boost, and fertility rates have started to decline. Fragmentation of families was the main adverse impact. Impoverishment was a serious issue for those who did not manage their expropriation funds properly.

CONCLUSION

Based on the studies carried out, it was evident that the magnitude and extent of the social and economic impacts generated by the Atatürk Dam and its reservoir have been overwhelmingly positive not only for the region but also for the country as a whole. The benefits that are now accruing to the country through the increased electricity generation alone are very substantial. Equally, for the population living in the project area, and especially for the majority of people living near and around the reservoir, their lifestyle has improved very significantly.

In retrospect, based on data currently available, construction of the main infrastructural project in the GAP area, the Atatürk Dam, has acted as the engine for economic growth and integrated regional development in a historically underdeveloped area. While the construction of this dam and the associated hydraulic structures has clearly contributed significantly to improving the lifestyle of the people, they also have produced some adverse direct and indirect social and environmental impacts as well, e.g. resettlement of a large number of people from the inundated area, loss of productive agricultural land, impoverishment for those who did not manage their expropriation funds properly, and increase in environmental contamination due to a higher level of economic activities.

No large-scale infrastructure development project is possible anywhere in the world that can only contribute to positive impacts. However, even though some negative impacts are unavoidable, social and environmental impacts should be looked at in an organised way so that they can be mitigated properly. Accordingly, projects must be selected where positive impacts significantly outweigh the negative ones.

In the case of the Atatürk Dam and the reservoir system, it is clear that they have changed the way of living of the local people, and very significantly increased the employment opportunities and working conditions available to the communities. Expanded economic activities have encouraged migration from rural to urban areas. The semi-urban and urban areas of the region are now facing an incoming population flux, with the attendant need for more and more housing, water, education, health services, and employment opportunities and efficient and reliable transportation systems.

If the GAP project succeeds in achieving its objectives, and all the current indications are that it will, the development requirements of the region are likely to increase very significantly. If these significant and rapid social, economic and environmental changes cannot be properly managed, environmental degradation in terms of water, soil and air pollution could become a serious problem in several urban communities, which in turn could have an adverse impact on the sustainability of the project, on the health of the people and the ecosystems. With such a multiplicity of opportunities and problems, it is important to identify the specific priorities, policies, and actions that are needed to address the most immediate and critical issues related to sustainable urban development, including the development and facilitation of appropriate social and technological infrastructures.

As a direct consequence of such a major regional development effort, and attendant intensification of agricultural and economic activities, the socioeconomic conditions in the region have already improved, and are likely to improve even further in the future, which in turn would change the area's ecological and environmental conditions, both positively and negatively. Thus, regional environmental management must become a priority consideration to ensure the success and long-term sustainability of the project.

Environmental considerations need to be integrally incorporated within the physical planning processes of the GAP project for the protection of the natural resources and the overall health of the people and the ecosystems of the region. Experiences from other parts of the world indicate that big rural and urban public investment projects, when not properly implemented and managed, can adversely affect the ecosystems, and thus could contribute to increased environmental degradation over the long term. These impacts could have serious adverse impacts on the future economic development of the region, which could increase the social costs. Accordingly, the preparation of regional strategies to manage water, land,

air and biotic resources requires the formulation, integration and implementation of appropriate land-use policies and practices for both urban and rural areas that could be affected by the development projects.

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