

SOCIO-ECONOMIC ANALYSIS OF WATER STRUCTURES PROJECTS CASE STUDY: NEW NAGA HAMMADI BARRAGE IN EGYPT

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ABSTRACT

This paper focuses on socio-economic issues related to sustainable development and management of great water resources projects in Egypt. A survey was carried out in order to obtain information necessary for development of details of land acquisition and compensation program. The right bank of the Nile and Dom Island were selected as socio-economic survey areas. Statistical and qualitative analysis of the socio-economic survey findings are presented, and followed by analysis of key issues arising from this survey. Monitoring indicators for vulnerability and impact were proposed. Recognizing the importance of avoiding negative environmental impacts, the implementation of the various mitigation measures and implementation of the environmental management plans are overseen. Main sources of income and the number of households dependent upon different types of economic activity were identified. Key crops and whether are cultivated for subsistence, cash, or other purposes are identified by ranking exercises.

INTRODUCTION

The New Naga Hammadi Barrage and Hydropower Plant are planned as a replacement for the existing Naga Hammadi Barrage located near the town of Naga Hammadi. The existing barrage was constructed during the period 1927 to 1930 to provide water for irrigation, and also to facilitate navigation in the reach of Naga Hammadi. The Government of Egypt intends to replace the existing barrage with a new structure incorporating a hydropower plant. After studying various alternatives, the Egyptian government decided to construct a multipurpose barrage to guarantee the supply of irrigation, to generate hydropower, and to increase the navigation capacity for river traffic. It consists of a sluiceway to evacuate emergency flood release, a hydropower plant, a double navigation lock and a road bridge.

The information and data of the socio-economic baseline survey could be used to define and initiate a Monitoring and Evaluation Program. As categories of impact indicators, the vulnerability, economic and social indicators should be applied including gender aspects. This is regarded as necessary in order to monitor and evaluate the impacts of the New Naga Hammadi Barrage and Hydropower Plant for families' areas affected by the project.

The New Naga Hammadi Barrage project can cause potentially significant changes in many features of the socio-economic environment. In some cases, the changes may be beneficial; in others they may be detrimental. Accordingly, environmental impact studies must systematically identify, quantify, and appropriately interpret the significance of these anticipated changes. Several illustrations of socio-economic impacts can be noted. For example, large-scale relocations of people may be required for major water resources projects.

A socio-economic survey was thus due to be undertaken to obtain information necessary for development of details of the land acquisition and compensation program. The specific objectives of the socio-economic survey were to:

- Gather data on sources and levels of income and asset ownership,
- Identify key concerns to help design appropriate compensation and support measures,
- Identify project potential to restore the ability of affected persons to make a good living,
- Clarify project affected persons' expectations vis-à-vis the project,
- Identify especially vulnerable households,
- Establish a baseline for subsequent impact evaluation,
- Suggest indicators for monitoring social impacts during project implementation.

The objectives of this paper were thus to present the statistical information obtained from the socio-economic survey. It also aims to report on issues concerning project affected families and propose criteria of "vulnerability" to identify households meeting those criteria. A framework of monitoring and impact indicators is also one of the objectives.

SOCIO-ECONOMIC SURVEY

Dom Island and the Right Bank of the Nile at the project site were selected as socio-economic survey areas. The reasons for choosing the two sites were:

- Some families will lose their houses and lands, and will thus need relocation.
- The areas include families dependent on fishing for a livelihood, which may be affected.
- No houses or other buildings will be affected on the Left Bank.

The socio-economic survey was undertaken in April, because it is peak harvest time for sugar cane, when the highest presence of people could be expected. The need for both qualitative and quantitative information was recognized. A combination of Rapid Rural Appraisal (RRA) tools and questionnaire was used, and a three week socio-economic survey program was drawn up. RRA tools included: wealth ranking; priority ranking; key information; mapping; group discussion; and direct observation.

All households on Dom Island and the Right Bank area were surveyed. Existing information indicated a total of approximately 40-45 households in the socio-economic survey areas. Interviews were carried out in the following order:

1. households living in buildings which will be permanently affected on Dom Island,
2. households living in buildings which will be temporary affected on Dom Island,
3. households living in buildings which will be permanently affected on the Right Bank,
4. other families living in areas not directly affected by the project.

A working list of all households on Dom Island and on the Right Bank with their probable residency status was drawn up and cross-checked with the assistance of key informants. The socio-economic survey team then visited every building on Dom Island and the Right Bank area; each household was given a number, and every household head was interviewed.

Four categories of households were identified:

Persons (a) whose permanent residence (house) and/or livelihood are on land required by the Project (Project Affected Area);
(b) are totally dependent upon local resources for livelihood. These households will be critically affected by the project.

Persons (a) seasonally resident within the PAA;
(b) dependent upon Dom Island and Right Bank resources during peak production times. These households will also be critically affected by the project.

Persons who own houses in the PAA, but are not resident, will be affected by the project.

Persons not living on Dom Island, but visiting on a daily or occasional basis, sometimes staying overnight.

Not everyone was truthful as to whether they are permanently resident, or seasonally resident. Some people pretended to live in empty buildings in order to qualify for as much compensation as possible. A cross-check is recommended to authenticate whether houses are seasonally and/or permanently occupied. Data from the socio-economic survey of Dom Island and the Right Bank have been tabulated. This database includes households permanently or seasonally resident and affected through loss of their only or primary residence.

FINDINGS OF THE SOCIO ECONOMIC SURVEY

In order to present the findings, the following terms are used.

• **Family:** Those persons living with each other and related by blood or marriage in the first degree, i.e. spouses, father/mother, son/daughter, brother/sister.

• **Joint Family:** Those persons living in one building, cooking and eating together, using common facilities, and who jointly own property and/or income.

- **Household:** All those persons living permanently in one building.
- **Kin Group:** Those persons living separately, but related by blood or marriage, including those related in the first and second degree and beyond, i.e. brothers and their families, sons and their families, uncles, aunts, nephews, nieces, cousins.
- **Clan:** Families belonging to a named group, which identifies itself by geographical origins, occupation, or descent from a common ancestor, and which maintains its identity by marriage regulations.
- **Feeder Canal:** Canals fed by pumping stations or Eastern Canal (Right Bank) and located in agricultural fields (*gennaya*).

As for the **Population and Housing Data**, there are a number of differences between the spatial and social distribution of households on Dom Island and the Right Bank. On Dom Island, household clusters are based either on the extended family or on kin groups. On the Right Bank, household clusters are based on the extended family, with several brothers, or father and sons, living in adjacent but separate houses. Resources and facilities, e.g. hand-pumps, are regularly shared in the extended family, or between households living in a cluster.

On Dom Island, the socio-economic survey team visited 84 buildings to interview the occupants. About 20 houses in the central part of the island (which will not be affected by the project) were abandoned some 7-10 years ago, due to declaration of a blood feud between clans. A preliminary identification of residency is given in Table 1. Most people interviewed claimed to own their houses, with a small number acknowledging ownership of alternative accommodation elsewhere. One-third of houses are said to be owned by more than one family member. The standard of house construction is basic. Almost all buildings on Dom Island are made of mud mixed with chopped straw. There are only 3 tired-brick structures, one of which is an unroofed animal pen. Roofing is mostly of dried palm leaves, with some houses having a combination of palm leaves, maize stalks and wood. All houses have beaten earth floors, except for 3 with tiled flooring.

On the Right Bank, the socio-economic survey identified a total of 34 households in 34 houses with a population of 328 persons. Basic demographic statistics are given in Table 1. The status of house ownership appears more complicated on the Right Bank than on Dom Island. Some of the houses are at low elevation on the banks of the flood channel and are most probably within the Nile "Management Lines", and therefore on government land. However, most people on the Right Bank have been resident for many years, have constructed their houses at their own expense, and considered themselves to be the owners. In addition, several households have been re-paying bank loans over a period of some years to the Land Improvement Department to purchase land to cultivate in the flood channel. The quality of house construction on the Right Bank is generally higher than on Darn Island, with most buildings made from sun-baked mud bricks. Roofing is palm leaf or maize stalks, in some cases interwoven with wooden slats. The flooring is beaten earth flooring.

Table 1: Preliminary Identification of Residency Status

	<i>Dom Island</i>	<i>Right Bank</i>
Permanently Resident	63	31
Seasonally Resident	4	2
Not Permanently Resident	21	not known
Visiting for Work	7	1

Literacy levels are low, the standard of literacy used being adults having completed primary school (locally known as 'prep' school). Literacy and demographic statistics are given in Table 2.

Table 2: Household Statistics

Item	<i>Dom Island</i>	<i>Right Bank</i>
Total Number of Male-Headed Households	62	31
Total Number of Female-Headed Households	5	3
Average No. of Adults per Household	5	4.1
Average No. of Children per Household	3.4	5.5
Average No. of Literate Adults per Household	0.48	0.32
Average No. of Children in School per Household	1.1	0.67

Regarding the **Livelihood Status**, it was impossible to obtain accurate information about levels of net income and expenditure. This was partly due to a natural fear that information might be submitted to the tax authorities, but also reflected a desire of households to present the most advantageous picture possible to qualify for maximum compensation. However, it was possible to identify main sources of income and the number of households dependent upon different types of economic activity. Ranking exercises identified key crops and whether these are cultivated for subsistence, cash, or other purposes.

The sources of income in Dom Island are crops and livestock, followed by fishing and wage labor. Each family draws income from several sources, which strengthens their ability to earn year-round income and limits vulnerability to seasonal factors. Of the 74 households completing the income section of the questionnaire, 58 claimed to depend on livestock for a major part of their income, 54 on crops, 42 on fishing, and 20 on wage labor. 33% of households claimed food insufficiency for more than 1 month in a year. This figure must be treated with caution as it may reflect respondents' desire to appear poorer than they actually are for purposes of compensation. Most agricultural production is for cash crops and animal fodder, not for subsistence. The most important cash crop is sugar cane, followed by fodder (lucerne, berseem) and wheat. A critical feature of the Island economy is the importance of animals in the households' economy. Almost all houses have some livestock.

Animal care is mostly the responsibility of women, assisted by children. Income from animals is an important contribution by women to the domestic economy. In some particularly poor households, poultry rising is the principal means of averting utter destitution. Buffaloes have both an economic and social importance, being a necessary purchase for men wishing to marry (as bride price). Buffaloes are an important local criterion of wealth. Lack of large livestock indicates greater poverty. Pigeons, poultry and egg production are important sources of income for women, and an essential livelihood for the poorest households. Twenty households on Dom Island have fishing as their main source of income, and a further 22 have some income from fishing. The families mainly dependent on fishing are in the poorer categories of households; income from fishing is irregular, and is earned from day-to-day.

As a source of income in the Right Bank, the overwhelming majority of households (30 out of 34) depend on cropping as their principal source of income, with livestock the second most important source. There is a higher proportion and a more even balance of households cultivating for subsistence, cash crops and animal fodder than on Dom Island. In contrast to Dom Island, wheat, maize and berseem are the most important crops cultivated rather than sugar cane. A higher proportion of households (61%) grow vegetables for sale and subsistence, and a greater importance is given to growing fruit, including mango, plum, pomegranate, peach and orange, as well as date palms. As on Dom Island, most animals are stall fed with purchased or cultivated fodder. Some families keep many sheep and goats. Fishing is much less important as a source of income for this group of households than Dom Island.

As for the **Household Expenditure**, the Data collected on expenditure in the questionnaires cannot be considered reliable. Nevertheless, the figures quoted did indicate the priority that households give to different types of expenditure. Fewer categories of spending, and access to limited energy sources, indicate poorer households. The single most important item of expenditure is food, followed by clothing and medicines. It is interesting to note the relative lack of indebtedness, and the importance of direct cash purchase for most items. A few households purchase food and clothing on credit, and some households receive a cash advance from merchants or the sugar cane company to purchase agricultural inputs, the cost of which is then set against the value of the harvest. The main expenditure for energy sources is for wood and kerosene. The pattern of credit and savings indicated a high level of independence and an unwillingness to be obligated to outsiders. They are very concerned about the compensation and distribution of agricultural land within the "land-for-land" approach.

Regarding the **Land Ownership**, much of the land is owned by a small number of landowners, the most of them are non-residents on Dom Island. The majority of households cultivating land grew only a single crop. The most important of which is sugar cane. Just less than 50% of the households surveyed cultivated a small patch near the house as a kitchen garden for onions, tomatoes and some herbs. On the Right Bank, the majority of households cultivated a wider variety of crops, and a higher

proportion engaged in double cropping (70%) with contrast to Dom Island (13%), Table 3.

The **Division of Labor** differed in both places. In Dom Island, all members of the household contribute extensively to the domestic economy. Tasks fall into fairly well defined gender and age patterns. Adult males are primarily responsible for the heavy tasks of land preparation and agricultural activity, though women and children take equal responsibility for fodder collection. Men and male children undertake fishing. Most activities relating to animals are the responsibility of women. The low number of children in school compared to the average number of children per household, together with the breakdown of age and gender division of labor, illustrates the importance of children to the economy and clearly defines their expected tasks.

Table 3: Land Ownership and Households

Type of land ownership and land use	<i>Dom Island</i>	<i>Right Bank</i>
Owning & cultivating irrigated land	40	25
Owning & cultivating rainfed/floodwatered land	2	1
Owning & cultivating single cropped land	35	8
Owning & cultivating double cropped land	9	24
Leaving land unused	4	5
Land owned and given out on share crop	3	1
Leasing land	0	1
Renting land	17	27
Both owning & renting land	17	13
Cultivating kitchen gardens	24	15
Share cropping	20	0

At the Right Bank, as on Dom Island, economic activities are well defined in terms of gender and age. Women, however, appear slightly less mobile and engage less in heavy agricultural work than women on the island. The sharper differentiation of gender roles was confirmed by the more marked seclusion of women from male members of the socio-economic survey team, whereas on Dom Island women interacted more freely with all team members. A high proportion of households on the Right Bank (70%) depend upon hired labor, particularly in land preparation and at harvest. This reflects the area's heavier dependence on crops, and the wider variety of crops grown. It may also reflect a relatively greater stability of household residence on the Right Bank.

The **Asset Ownership** is relatively few with cash convertibility. The single most important moveable asset owned by each household is their livestock. 76% of households surveyed owned a radio and 41% a television. The most important non-moveable assets were hand pumps for domestic water, with 47% of households having possession of their own. The remainder shares their neighbors' pump. The most important assets for fishermen were their boats and fishing equipment.

In Right Bank, a higher proportion of households own electrical items than Dom Island, though again the most important moveable asset owned by each household remains livestock. 73% of households surveyed owned a radio and 58% a television. All households except 4 own a hand pump for domestic water.

The data of the usage of **Domestic Water, Sanitation and Irrigation** were collected. In Dom Island, although 40 households stated that they owned irrigated land, only 4 of these own their own field-based pump; the remaining households purchase irrigation water from pump owners, who are also important landowners. The average cost per household for irrigation water is LE 30-40 per application per feddan. Drinking water is almost entirely drawn from hand pumps located in or near houses. Thirty-two of the households surveyed possess their own pumps, while the majority of remaining households uses that of a neighbor. Sanitation is reasonable, though could be improved. A good proportion of households surveyed (58%) recycle domestic waste by drying it and burning it as fuel.

In Right Bank, Two-thirds (67%) of households pay a monthly charge (flat rate) of LE 10-20 for gravity irrigation supplied by the Eastern Naga Hammadi Canal. There is less dependency upon neighbors' hand pumps and most houses (29) have their own source of domestic water supply. Most households (20) dry and burn their household waste, but 52% compost waste and use it as fertilizer.

From earlier explanation, the **Social Systems and Situation** can be presented as follows:

- Social identity and personal loyalties centre on clan membership. There is a high level of distrust between clan groups, and people live in kin groups in close proximity to those on whom they depend. In Dom Island, confidence in and a sense of "belonging" to a distinct cluster of households based on kin groups has led to a greater freedom for women, who are less observant of seclusion from men than on the Right Bank. This confidence is also reflected in leaving houses unlocked and open. There are tensions within kin groups, particularly over inheritance of property and houses. On two occasions during the socio-economic survey, arguments broke out between household members as to who was the legal owner of a property, in one instance between a brother and a sister, and in the second between a father and a son.

- Despite the tensions which exist, relationships of trust based on clan membership and kin group clusters are central to economic and social stability. There is much dependency on the sharing of neighbors' resources, as can be seen by the mutual use of hand pumps, sharing of assets such as livestock, sharing of labor, and in one or two very needy cases, of single-person households being dependent upon a neighbor's charity. This inter-dependence can also be seen in the construction of houses, with separate households building on to each others' houses and the sharing of common walls. Right Bank householders do not want to be grouped together with Dom Islanders in discussing compensation with the

project. There are histories of personal vendettas between individuals on the two sites.

As for the **Housing Replacement**, clear was the following:

- The general status of house construction on Dom Island is simple sun-hardened mud mixed with straw. Only three buildings are made from fired bricks. On the Right Bank the construction is slightly better, and most houses are of sun-baked mud bricks, often coated with paint or whitewash. All households wanted house-for-house exchange, not cash for house.
- All households wanted houses ready before construction or displacement starts, so that they will not be relocated more than once. Any replacement houses need to take into consideration space for keeping animals and for stall-feeding.

Regarding the **Replacement of Land**, it is obvious that:

- All household heads interviewed (except 2) wanted land-for-land, not cash for land. They want the same level of land fertility. One household head only wanted cash for land, expressing suspicion about any reclaimed land he might be offered in the flood channel. The other was looking for a reason to quit Dom Island permanently.
- The distinction between land purchase, land tax, and land rental, needs further investigation with the affected families.

Analyzing the data clear was that **Agriculture** will be affected as follows:

- Project activities will affect at least three of the four main sources of household income in the socio-economic survey area, viz, cropping, livestock and fishing. Dom Islanders have a more diversified economic base and grow fewer crops for subsistence. Right Bank households have more diversified agricultural productivity and higher levels of indebtedness for agricultural inputs. Almost all the Right Bank households are completely dependent upon crops and cropping-related activities for income, subsistence and animal maintenance.
- Loss of land and loss of agricultural production will have a critical impact on such livelihoods. Although income from trees is not as important as other sources, trees do contribute to the diverse resource base whereby households maximize their income generation opportunities. Compensation for long-term losses of fruit-bearing trees or date palms needs to be applied within the compensation program.

As for the **Livestock**, the husbandry is as important, if not more so, than cropping or fishing, to livelihoods in both socio-economic survey sites.

- Loss of grazing lands will occur, but this may not be such a critical issue as most animals are stall-fed.
- Animals are the single most important moveable asset that families possess, and reduction in their numbers would seriously affect the well-being of households.

Regarding **Fishing**, a higher proportion of Dom Island households are dependent on fishing as their principal livelihood than on the Right Bank.

- Fishing-dependent households tend to rely more on daily wage labor or daily income from fishing, and certainly fall into the more economically vulnerable groups on Dom Island.

As can be seen from data on sources of **income and division of labor**,

- Wage labor in agriculture, fishing, operating agricultural machinery, pump maintenance and guarding, is a significant source of income particularly in Dom Island.
- Income is seasonal and itinerant, and households depending on wage labor fall into the poorest and most vulnerable categories. At the same time, it is noted that few households depend upon wage labor only, and in many cases it is one of several means of maximizing household income.

A wealth ranking exercise was conducted for Dom Island with key informants to identify local perceptions of wealth and poverty and to investigate local perceptions of wealth differences and inequalities **Vulnerable Groups**. It was also used as an introduction to discuss coping strategies, opportunities and problems, and the socioeconomic survey team has used it to investigate possible solutions. Local concepts of poverty are based on three key factors: inability to work; non-ownership of land; and not possessing larger animals (e.g. buffaloes, cows, sheep, and goats).

- Although women-headed households could be considered among the most vulnerable, there are also vulnerable male-headed households. The difference is not so much one of gender, but whether the household has adults capable of working, and whether the household is part of a wider kin or clan grouping which provides the social support (protection) from non-kin.
- Women-headed households in themselves have not been distinguished as especially vulnerable.

Affected Landowners were studied. House and property owners will be identified through the cadastral survey. Valuation of assets will be carried out by the Governorates' Compensation Committees, in accordance with a methodology in keeping with the project's principles. At present there are no formal mechanisms in place to inform Project Affected Families about the project and its impact. Sources of information have included: Staff involved in the project and Neighbors. The project must plan and implement the necessary communication campaign without further delay. The most effective information mechanism will be a personal approach, enlisting the assistance of local persons to explain and guide the communication process. This would enable the project to make information more acceptable and understandable to Project Affected Families.

The project will significantly **affect a number of households** without land. Some will be permanently resident, others seasonal. Criteria of eligibility for affected non-

landowners could include: Non-resident persons owning houses; House owners and/or persons using houses whose only place of residence is; Persons with long-term rights of land use through rental; Persons whose crops and/or trees are inside the Project Affected Area; and Persons owning pumping stations inside the Project Affected Area.

CONCLUSIONS

From the above, the following conclusions are deduced:

1. The three principal sources of income are crops, fishing, and animals. Cash and subsistence cropping are more important to households on the Right Bank, followed by livestock. More households on Dom Island are dependent upon cash cropping, followed by livestock and fishing. Households vary their sources of income as far as possible, and few families are dependent upon one livelihood only. The poorest households are those dependent on wage labor or daily income. Project affected families would be more inclined to cooperate with the project if each household was guaranteed work from the project.
2. The largest amount of land is owned by a small number of landowners, none of whom live in the area covered by the socio-economic survey. More than 60% of households on Dom Island and approx. 75% of households on the Right Bank claimed to own land in the area covered by the socio-economic survey. The legal status of land ownership if purchased from Land Improvement Department must be clarified.
3. Families without land, larger animals, and either unable to work or dependent upon daily wages, are among the most vulnerable. Some households will be more vulnerable if relocated as single households, rather than as kin group clusters.

RECOMMENDATION

Baseline data collected by this socio-economic survey can be used to develop a full monitoring framework to determine project impact on Project Affected Families over time. This can be undertaken whether households are relocated as a kin group, clan cluster, or individual family. Sampling procedures for impact evaluation will depend upon whether households are relocated individually or in clusters. A questionnaire has now been completed for nearly all families who might be affected. Thus, impact evaluation could be conducted by family if necessary. Three categories of impact indicators are proposed as Special vulnerability; Economic indicators; and Social indicators. Within these three categories, gender considerations must be included, so that impact on men as well as women can be differentiated. Each impact indicator can draw on existing baseline data from the socio-economic survey. A monitoring and evaluation program is required to establish the parameters and timing for assessing project impact on both the project affected area and project affected families.

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