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IMPACT EVALUATION METHODOLOGY FOR INFRASTRUCTURE PROJECTS */

*/ This document was prepared by the ECLAC/UNCHS Joint Unit on Human Settlements as part of a larger document on "Project preparation guidelines", however, it can be read in isolation as a self-contained document.

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CONTENTS

SUMMARY

This document was originally conceived as part of a larger document on "Project preparation guidelines", currently being prepared by the ECLAC/UNCHS Joint Unit on Human Settlements. The main envisaged users of this document are those community members, groups and local authorities involved in the promotion and formulation of infrastructure projects. Accordingly, the document has been structured in such a way that it can be understood by the intended target group. However, the concepts presented in the document can also be utilized to develop more sophisticated research studies, or to assist central government and funding agencies in designing project appraisal and evaluation methodologies. It is believed that the less complicated these methodologies are, the more reliable and easier will be their application.

It is realized that under the present circumstances of the scarce resources available for social development projects, it is necessary to equip promoters and participants in infrastructure projects with adequate instruments to present their cases for investment in the sector. Thus, two criteria for project funding become of primary importance: a) evaluation of the benefits of investing in a specific project, and b) maximization of the positive effects of a project and minimization of its negative impacts.

The present document aims to provide a methodology for evaluating the impact of infrastructure projects (water supply, sanitation, solid waste disposal, roads and footpaths, and energy) on the socio-economic characteristics of the communities involved.

The document describes the main impact evaluation research methods currently applied. It also indicates some project variables and impact indicators that can be used in the application of the quasi-experimental research method. It is expected that this document, in conjunction with basic knowledge on statistics and the design of surveys and questionnaires, can assist in the execution of adequate impact evaluation studies.

/I. AREAS

I. AREAS TO BE COVERED

The present methodology intends to focus on the impact produced on the serviced (beneficiary) population by the provision of physical infrastructure services through a particular project. Physical infrastructure services, as considered here, include roads, footpaths, water supply, sanitation, solid waste disposal and energy distribution. As a complement to the above, public infrastructure services would include schools, health services, transportation and markets. The intention of this document is not to present a project evaluation methodology, that is, a method for seeing if the objectives of a particular project were met or not (e.g., how many public latrines were constructed). Neither is it intended to evaluate the improvement in the level of provision of a service through the execution of a project. Although such studies are also necessary to administer and promote projects in the sector, it is felt that they are already well covered by existing literature.

II. THE NEED TO MEASURE PROJECT IMPACTS

Under the present circumstances, where each sector is competing for funds to satisfy some of the basic needs of the population, two criteria for project funding become of primary importance:

a) the evaluation of the benefits (social and economic return) of investing in a specific project;
b) maximization of the positive effects of a project and minimization of its negative impacts.

In this regard, it is necessary to equip the promoters and participants in infrastructure projects with adequate instruments to present their cases for investment in the sector and to administer ongoing projects. Apart from political and unmanageable institutional factors, these instruments should be able to present in a qualitative (and optimistically quantitative) manner the probable positive impacts of a project, that is, the probable benefits likely to accrue to the beneficiary population and ultimately the nation as a whole through the project implementation.

The second consideration for obtaining useful data on project impacts is based on the need of government and funding agencies to appraise on a continuous basis the positive and/or negative effects of their investments in the sector, in order to introduce necessary corrective measures in the same project or in the design and implementation of future projects. In this respect, the aim of the present methodology is the introduction of impact studies as a regular component of project implementation, generating data also applicable to future projects.

/III. METHODOLOGY

III. METHODOLOGY FOR IMPACT EVALUATION STUDIES

The study is concerned with project impacts on the socio-economic circumstances of the communities involved. Impacts in other areas, such as the environment, macro-economy and technology, are not considered.

The main objective of impact studies is to evaluate the degree of change in the qualitative or quantitative characteristics of certain indicators after their exposure to some project variables. The indicators are specially chosen characteristics of a given communal situation (e.g. income, cost of land, health, etc.) that are thought to be especially responsive to variables introduced by the project. Project variables are inputs provided by the project, originally with the aim of improving the general conditions of the community. These project variables can be physical (e.g. construction of a road), or non-physical (e.g. setting up a credit union, organizing a training programme, mobilizing the community, etc.). Here, we are concerned primarily with physical project variables, and especially with physical infrastructure services in human settlements.

There are several ways or methods of executing impact studies:

- natural development studies
- ex-post evaluation studies
- linear evaluation studies
- continuous monitoring and evaluation studies
- quasi-experimental studies.

In the natural development type of studies, the evaluating agent builds up a conceptual model of the interaction between the various programme/project variables and the indicators that serve to gauge the change in the community characteristics under study. Thus, within the project, it would be possible to compare the changes produced by the introduction of certain project variables with the situation in which no project variables are introduced at all. This system would involve something similar to carrying out a case study for each project, and it has in its favour its relative simplicity of application, at the cost of sacrifices in precision. The last is due to the difficulty of controlling external factors. Also, it is not yet clear as to how to integrate all the information obtained within systems to study sectoral trends.

Ex-post evaluation studies consist of the assessment of the changes in the community which is the subject of a project after the completion of the same. This assessment can be done through the direct appraisal of the conditions in the community, or through some kind of community feedback, that is, formal or informal interviews with the beneficiary population.

Linear evaluation studies normally carry out an assessment of the community characteristics before the initiation or at the beginning of the project. These results are later compared with a similar study executed after the completion of the project.

/The basic

The basic principle of the continuous monitoring and evaluation studies is similar to that of linear evaluation studies. However, here the evaluations are carried out in a more frequent and systematic manner at the beginning of the project, throughout its implementation, and after its completion. It is clear that in the last two cases the methodology for collection of information has to be designed in such a way as to ensure the adequate comparison of the data obtained at different stages of the project. The main drawback of the methods above described is that they concentrate their work on the community under study only, and have only limited capacity to identify and control external factors affecting the community.

Quasi-experimental studies are so called because they are the closest approximation to "bench" experimental studies. In an ideal experimental study it is possible to evaluate, under absolute control of internal and external factors, the changes produced in a certain element of the subject under study by the introduction of a variable or input. In real life situations, the subject of the study --the community-- is an ever-changing element continuously influenced by external variables. Under these circumstances it is almost impossible, in practical terms, to control or exclude the effects of "non-project" variables that can also have an influence on the chosen indicators. Because the quasi-experimental studies try to exclude, as far as possible, some of the effects of external factors, thus trying to come near to the ideal experimental study, they will be the base for the present methodology.

IV. DESCRIPTION OF REQUISITES

Before proceeding, it is worth remembering that what the impact studies are intended to achieve is not only pure research results but also reliable empirical data that can be extrapolated to projects with similar conditions to that studied.

In order to achieve the best approximation to an experimental study when dealing with infrastructure projects, the following conditions should be fulfilled, or at least met as closely as possible:

a) Selection of two groups which have similar characteristics and are as homogeneous as possible. One group, the study group, will be exposed to the project variables and the other will serve as a control group;

b) The size of the groups, or of the group samples, utilized in the study should ensure the statistical significance of the results obtained;

c) Each unit of the study group should be exposed to an equal intensity (or amount) of project variable. Since this condition is rarely met in an infrastructure project, it is necessary to measure the degree of exposure of each unit to a given project variable;

d) The study and control groups should remain with minimum changes (or should not suffer statistically significant changes) throughout the duration of the study;

e) Provision should be made in the study for evaluating the influence of uncontrollable or unpredictable external factors;

f) There should be a confirmed causal relationship between the project variables and the selected indicators.

/As may

As may be seen, the above-mentioned requisites are difficult to meet in a typical infrastructure provision project, which normally consists of:

a) provision of infrastructure to unserviced areas (rural and urban);
b) slum upgrading or squatter improvement projects;
c) site and services projects;
d) housing projects.

V. PROJECT IMPACTS

The general objective of most development projects is defined as "improving the living conditions /that is, the socio-economic conditions/ of the population". From this starting-point, a set of specific objectives and outputs will follow, e.g. providing sanitation facilities to a number of families, setting up a training programme, etc. It is clear from the above that impact evaluation studies, as defined in this document, must first select those characteristics of the community (indicators) that are an indication of its "living conditions", and that are also expected to improve with the execution of the project. For infrastructure projects, these characteristics could be classified in the following arbitrary groups:

a) income
b) demography
c) housing
d) access to services
e) health
f) consumption patterns
g) community participation and motivation.

The number of possible indicators to be included in each of these groups could be numerous. However, there are restrictions on the selection and use of too many indicators:

a) Only a few indicators have a consistent causal relationship with project variables in projects where external factors can be reasonably controlled;

b) Few indicators have a readily recognizable and useful socio-cultural meaning, especially to politicians and decision makers, when taken in isolation. For example, "family income" is a term understood and used in all the sectors of national development and can be compared with similar data and income ranges established in the country. On the other hand, the indicator "number of people working in the formal sector" suffers from many limitations. First of all, the concept of "formal sector" has to be defined and standardized. Secondly, the "value difference" between working in the formal and informal sector has to be established. Finally, the conclusions as regards possible changes in the pattern of formal employment due to a project (road construction, for example) could be difficult to extrapolate to other projects;

c) There are normally limitations of personnel and facilities at the field level which hinder the execution of extensive impact evaluation studies;

/d) The

d) The chosen indicator should be as far as possible compatible with other data collected through national surveys or other sectoral and secondary surveys. Ideally, all the activities of survey design and data collection for community development studies should be compatible and regulated by a co-ordinating organization.

Apart from the above conditions that should assist in the selection of indicators, these should also have the property of being subject to measurement and of being sensitive to changes in the project variables.

Some indicators that could be used in the evaluation of infrastructure projects are given below:

A. Income

1. Total family income

It is assumed that the income level of the participants in infrastructure projects will increase due to:

a) A greater motivation of project families to obtain employment and develop income-generating activities, inside and outside the project area, as a result of improved environmental conditions and legal stability;

b) An increased income from rents. House-owners will benefit from the increased value of their properties as result of the improved services. This value will be transferred to non-owners in the form of increased rents;

c) An increased motivation to improve housing conditions, thus encouraging the transfer of income from outside (family and other relations) to the project community;

d) The physical activities of the project itself, which will help to promote employment and certain economic activities in the community.

B. Demography

1. Demographic stability

It is expected that improved household and environmental conditions will increase the satisfaction of house-owners with their place of residence, encouraging them to remain in the same location. On the other hand, non-owners will tend to move out due to increased rents.

2. House size

Improved infrastructure services will make houses more attractive for sub-division and renting. It will also encourage the relations of house-owners to move into the same premises.

/C. Housing

C. Housing

1. Land value

The value of the land provided with infrastructure services will increase in relation to unserviced land.

2. House value

The value of the houses provided with services will increase in relation to unserviced houses.

D. Access to services

Here is a set of indicators which could be considered at the same time as project variables. For example, the provision of household water connections (project variable) will result in access to increased quantities of drinking water and increased satisfaction with this service. The specific indicators would be:

1.	Water supply	- water consumption - satisfaction with water services - time spent on water collection
2.	Sanitation	- access to sanitation/laundry/washing facilities (communal/household) - satisfaction with sanitation services - additional time spent on use of communal sanitation facilities
3.	Solid waste	- access to formal collection systems - satisfaction with collection systems
4.	Roads and footpaths	- access to paved (all-weather) roads and footpaths - satisfaction with roads and footpaths - time spent on reaching transportation network
5.	Energy	- access to household energy supply - energy consumption - satisfaction with energy supply service.

E. Health

The impact of infrastructure projects on health is more noticeable in those projects whose main components are the provision of water supply and sanitation services, and to a lesser extent solid waste collection and disposal. Thus, the indicators below mentioned are more relevant in this type of projects. However, care should be taken, when designing impact studies, to take account of external factors, such as improved diet or improved health services, that also have a direct impact on health indicators.

1. Infant mortality rate

It is expected that the infant mortality rates due to enteric diseases will decrease with the improvement of water supply and sanitation services.

/2. Morbidity

2. Morbidity related to main types of enteric and skin diseases

As above, it is expected that the family morbidity rates due to enteric and skin diseases will decrease as a result of improved water supply and sanitation services.

3. Expenditure on medical attention

It is expected that the family expenditure on medical services and/or the frequency of use of medical services will decrease due to improvements in water supply and sanitation services.

F. Consumption patterns

The change in the composition, or "mix", of family expenditure is a good indicator of the family's priorities. It also shows which elements of the family budget are positively modified by the execution of a project, notwithstanding that the information thus obtained must be checked for consistency. For example, a road improvement project facilitates the access of a given community to transportation. This might produce an increase in the expenditure on transportation, but it might also show an increase in access to employment (increased income) and increased school attendance. The provision of water supply services can mean, in certain cases, an increase in the family's expenditure to cover new water tariffs where previously the water supply was free, regardless of its quality. On the other hand, and especially in urban areas, water supply projects might decrease the beneficiaries' expenditure on water if, before the project, families had to buy water at a premium from private vendors.

The information obtained on consumption/expenditure patterns has the additional value that it acts as a consistency check on the data on income.

While the "consumption/expenditure pattern" is in itself an indicator, the information to be obtained might be separated as follows:

1. Expenditure on:
   - housing
   - food
   - clothing
   - education
   - transportation
   - health
   - energy
   - water/sanitation.

2. Savings

G. Community participation and motivation

The evaluation of the community's motivation and participation in infrastructure provision projects is crucial when designing and implementing projects in low-income communities. The participation of the community is necessary in order to select adequate technologies and service levels and to profit from their physical and

/material contributions

material contributions to project construction, operation and maintenance. The indicators given below attempt to evaluate the real and potential degree of community participation.

1. Participation in self-help programmes

It is assumed that as a result of project implementation the degree of community participation in self-help activities will increase, both as a direct component of the project under study and in other communal improvement/upgrading activities not directly related to the project.

2. Satisfaction within the community

Project implementation will help to increase the satisfaction of the community with its present conditions and motivate them to improve these conditions further, thus generating savings and investments to be located in the community. It will also encourage the community to develop co-operative work for settlement improvement.

3. Membership of community organizations

As a result of improved living conditions through project execution, community members will tend to form and join community organizations to develop different social and cultural activities, and also settlement improvement activities.

VI. EVALUATION OF PROJECT IMPACTS

A. Methodology for measurement

In order to evaluate the impacts of a specific project, and to obtain results capable of being compared with those of other projects or used for further planning, it is necessary to develop a type of measurement or ranking mechanism. Certain impact indicators are easily evaluated by numerical instruments: for example, income, house value, water consumption and infant mortality. Other indicators cannot be measured in a numerical manner, however, this being the case of "satisfaction with water services", "access to transportation", "participation in self-help programmes", etc.

For convenience in handling the data, it would be desirable to reduce all the obtained information to numerical data. Thus, the possible answers to a question (related to an indicator) such as: "are you satisfied with your economic situation?", could be given values as follows:

satisfied	5
indifferent	3
unsatisfied	1

After this first step is taken, it is then necessary to relate the numerical data thus obtained to:

/a) the

a) the several project variables considered for a particular study (e.g. water supply and energy); and
b) other project indicators, when it is desired to establish a project ranking system.

1. Relation to project variables

Let us assume that an infrastructure project consists of the provision of water supply and energy distribution services. These two project variables will have a certain impact on the indicators chosen for study. Let us now consider their impact on "Total family income". After the execution of the project, the situation in the community could be described as follows:

$$a + (\text{water supply}_1)b_1 + (\text{energy distribution}_1)b_2 = \text{Total family income}$$

where:

- a - Total family income when both project variables (that is, the measurement of exposure to the project variables) are nil.
- b_1 - Coefficient that indicates the variation in total family income per unit of change in the exposure to water supply services (exposure coefficient).
- b_2 - Coefficient that indicates the variation in total family income per unit of change in the exposure to energy distribution services (exposure coefficient).
- Water supply_1 - the degree of exposure (quantitative or qualitative but numerically expressed) to water supply services after the execution of the project.
- Energy distribution_1 - the degree of exposure (quantitative or qualitative but numerically expressed) to energy distribution services.

By solving the above equation (through methods such as multiple regression analysis) for the data obtained in the surveys and field work, it is possible to determine the values of a, b_1 and b_2. Once these constants are known, it is possible to determine with some reliability the total family income for other households where there is information on the existing levels of service. In order to evaluate the project impact on total family income, it will be necessary to compare these values with the data obtained before the execution of the project for the same sample of households. Both sets of values thus obtained would have to be correlated with the values obtained for the control group, in order to assess the possible effects on the indicators of uncontrolled external factors.

This type of equation allows the calculation of the exposure coefficients and constants in projects having many variables (in the case of infrastructure, including all the elements subject of this document: water supply, sanitation, solid waste disposal, roads and footpaths and energy distribution) or in projects having only one physical variable (for example, a project on the provision of sanitation services only). The handling of the data obtained and the mathematical solution of the resulting equations is a relatively simple task for which there is plenty of information available in standard text books. This can also be

/facilitated by

facilitated by the use of personal and micro-computers, which are now a regular feature even in developing countries.

Before proceeding, it should be remembered that the results thus obtained are an "indication" of a causal relationship between the project variables and the impact indicators, and the values obtained represent an order of magnitude rather than precise values. As explained before, these are the best type of results that can be obtained with the indicated study methodology, and the analysis of the results should consider these limitations.

2. Ranking among indicators

Government or other project implementing agencies have different sectoral interests or goals for developing infrastructure projects. Thus, when evaluating the impact of projects, and comparing projects among themselves, they have to establish a scoring system to bring all the impact indicators under study to homogeneous measuring quantities. They also have to establish a ranking system among the various project indicators, giving greater specific weight to those indicators which reflect their criteria of "project success". With the two elements above described, an agency can compare the total scores of different projects on an equal basis. The scoring and ranking systems might not be the same for different agencies, however. As an example, let us take two agencies which use the same indicators for evaluation, the same scoring scales but different ranking systems:

a) A Ministry of Agriculture, when evaluating rural development projects with a specific component on water supply, might give more relative importance to the impacts on "total family income" and "land value". This is because they perceive that the above indicators reflect progress or deterioration in the development of the rural sector, according to their criteria of economic development. Thus, a given project could be ranked as follows:

Indicator of impact a/	According to M. of Agriculture - Project "X"		
	Score (from 1 to 5)	Ranking coefficient (from 1 to 5)	Total score
Total family income	1	5	5
Household size	1	1	1
Land value	3	5	15
Water consumption	4	1	4
Infant mortality rate	2	2	4
Participation in self-help programmes	2	3	6
Total	13		35b/

a/ Only a few impact indicators have been taken, by way of example.
b/ The maximum possible score is 150.

/b) In

b) In the evaluation of the same water supply project by the Rural Environmental Sanitation programme of a Ministry of Health, greater emphasis would be laid on impact indicators such as "water consumption" and "infant mortality rate". Accordingly, they would rank Project "X" as follows:

Indicator of impact a/	According to M. of Health - Project "X"		
	Score (from 1 to 5)	Ranking coefficient (from 1 to 5)	Total score
Total family income	1	1	1
Household size	1	2	2
Land value	3	1	3
Water consumption	4	5	20
Infant mortality rate	2	5	10
Participation in self-help programmes	2	3	6
Total	13		42b/

a/ Only a few impact indicators have been taken, by way of example.
b/ The maximum possible score is 150.

As may be seen from the above tables, the same project can have two completely different evaluations of its success or impact, according to the expectations of the two implementing agencies. In one case, the project might be considered as a failure, and in the second case as a successful activity. In the present context of project implementation, it would be difficult to develop scoring and ranking instruments that could be standardized for all the agencies (from different sectors executing a particular type of project (for example, road construction). Thus, it could only be reasonably recommended that if project ranking systems are adopted they should be standardized within the sector and made as compatible as possible with other ranking systems established outside the sector, in order to be able to use and correlate information obtained outside the sector.

B. Units of measurement

The net intrinsic value of an impact indicator at a determined moment, and its change as a result of its exposure to a project variable(s), can be measured in a qualitative or quantitative manner. Some measurement units that could be used for the indicators described in section V are given below:

1. Total family income: Units of currency per unit of time (e.g.: US$ 200 per year).

Notes:

1.1 Account should be taken of exchange rates, the real market value of the money and rates of inflation at a given time, in order to allow comparison between values obtained at different periods of time. This observation applies to all measurement units where currency is involved.

/1.2 The

1.2 The information obtained should cover the family's regular income, as well as any other additional income that is normally not recorded, such as family transfers, earnings by children, and the product of handicraft work by women.
1.3 Income information obtained through questionnaires and household visual surveys should be cross-checked with data on expenditure.
1.4 Elements which are external to the project but have possible effects on this indicator should be identified and evaluated. They include such elements as overall national improvement in employment and economic conditions, and the setting up of new centres of economic activity near the project area.

2. Demographic stability: Rate of population movement
(e.g.: 5% of the surveyed population per year)

Notes:
2.1 Obtaining this data involves following the development of the households included in the sample throughout the study period.
2.2 Due to normal research limitations, it might be difficult to obtain frequent (say, annual) data. In this case, the time elapsed between surveys must be specified.
2.3 Elements external to the project which have possible effects on this indicator should be identified: for example, sudden improvement in the development conditions of the project area, or of a neighbouring area, that might encourage abnormal immigration.

3. Household size: Number of persons per household
(e.g.: 6 persons per household)

Notes:
3.1 A precise and clear definition of the term "household" should be made to ensure consistency among different surveys.
3.2 The sample size should be big enough to allow for statistically reliable data, even if a number of the families (households) initially surveyed move out of the project area.
3.3 Elements external to the project which have possible effects on this indicator should be identified: for example, overall changes in family composition and decreases in fertility.

4. Land value: Units of currency per unit of area
(e.g.: US$ 50 per square metre of land)

Notes: (See note 1.1)
4.1 Care should be taken to identify possible elements outside the project that might have an effect on land value, such as reforms in land tax, development of adjacent land and the setting up of economic activities near the project area. Differential improvement or deterioration of the land values within the project area can also arise due to the introduction of external elements in a specific location of the project area. This effect should be considered when estimating average land values for the whole project area.

/5. House

5. House value: Units of currency per unit of built area
(e.g.: US$ 30 per square metre of horizontal built area)

Notes: (See note 1.1)
5.1 The survey of house values should also allow, as far as possible, for differentiation in quality of construction and building materials.
5.2 Elements external to the project which have possible effects on this indicator, such as reforms in taxation, should be identified. It is possible, despite the difficulty of establishing causal relationships, that external elements such as that mentioned in note 4.1 could have an effect on the intrinsic value of the house, considered separately from the land.

6. Water supply

a) Water consumption: Units of volume per person per unit of time
(e.g.: 70 litres per person per day)
b) Satisfaction with water services: Percentage of families (persons) in each level of satisfaction
(e.g.: 15% of families not satisfied with service)
c) Time spent on water collection (normally applied to areas with communal water points): Time spent on collection per unit of time per family
(e.g.: 25 minutes per day per family)

Notes:
6.1 Care should be taken to evaluate the possible effect on the above indicators of the cost of services and tariffs.

7. Sanitation

a) Access to sanitation - laundry/washing facilities: Percentage of families which have access to sanitation services
(e.g.: 85% of the families have access to adequate toilet facilities; 20% of the families have access to adequate laundry points)
b) Satisfaction with sanitation services: Percentage of families in each level of satisfaction
(e.g.: 30% of families are satisfied with service)
c) Additional time spent on use of communal sanitation facilities: Time spent walking to and from sanitation point per unit of time per family
(e.g.: 120 minutes per day per family)

Notes: (See note 6.1)
7.1 The term "adequate sanitation" should be properly defined in each case.

8. Solid waste disposal

a) Access to formal collection systems: Percentage of families served by adequate solid waste collection systems
(e.g.: 20% of the families are served by an adequate solid waste collection system)

/b) Satisfaction

b) Satisfaction with collection system: Percentage of families in each level of satisfaction
(e.g.: 70% of families are satisfied with service)

Notes:
8.1 The term "adequate solid waste collection system" should be properly defined in each case, and the persons carrying out the survey should be trained in its identification.

9. Roads and footpaths

a) Access to paved (all-weather) roads and footpaths: Percentage of families (households) with ready access to all-weather roads and footpaths
(e.g.: 5% of the households have ready access to all-weather roads and footpaths)
b) Satisfaction with roads and footpaths: Percentage of families in each level of satisfaction
(e.g.: 50% of families are satisfied with present state of roads and footpaths)
c) Time spent on reaching transportation network: Time spent in walking to the nearest point where it is possible to get public transportation, per unit of time per family
(e.g.: 20 minutes per day per family)

Notes:
9.1 The term "all-weather roads and footpaths" should be properly defined in each case.

10. Energy

a) Access to household energy supply: Percentage of families (households) served by an adequate energy supply system
(e.g.: 70% of the families (households) have electricity connection)
b) Energy consumption: Units of energy consumption per household per unit of time
(e.g.: 100 kwh per household per month)
c) Satisfaction with energy supply service: Percentage of families in each level of satisfaction
(e.g.: 90% of families are satisfied with service)

Notes:
10.1 The term "adequate energy supply" should be properly defined in each case.

11. Infant mortality rate: Number of children who die in a given age group per 1 000 live births.
(e.g.: 80 children per 1 000 die in age group 1-4 years)

/Notes:

Notes:

11.1 Care should be taken to identify possible elements outside the project that might have an effect on the infant mortality rate, such as improved economic conditions and improved diet, better primary health service, primary health education campaigns and health campaigns.

12. Morbidity related to main types of enteric and skin diseases: Number of cases of enteric and/or skin diseases per 1 000
(e.g.: 150 cases of skin infections in 1 000 persons)

Notes:

12.1 The same considerations given in note 11.1 apply in this case.

12.2 It could be determined, in a particular case, that a specific age group is a more sensitive indicator to morbidity. In this situation, the selected age group must be specified.

13. Expenditure on medical attention: Units of currency per family (household) per unit of time
(e.g.: US$ 200 per household per year)

Notes:

13.1 The same considerations given in notes 1.1, 6.1 and 11.1 apply in this case.

13.2 In addition to the above, other factors can also have an effect on medical services expenditure, such as the introduction of a policy of subsidies on medical attention and medicines.

14. Consumption patterns: Units of currency spent on each item of consumption per family (household) per unit of time
(e.g.: US$ 250 on housing per household per year)

Notes:

14.1 The items of consumption (expenditure) are those indicated in chapter V, section F.

14.2 In addition to the considerations mentioned in note 1.1, there are other external factors that might have an effect on the relative costs of each item of consumption. For example, the introduction of a policy of subsidies on food, or the elimination of national free education services, can dramatically change the pattern of household expenditure in these items.

15. Participation in self-help programmes: Percentage of the beneficiaries participating in community improvement activities
(e.g.: 9% of male adults working on road improvement activities on a voluntary basis)

Notes:

15.1 A target group (e.g. adult men or women or both) on which the self-help activities are to be evaluated should be clearly defined.

15.2 A reasonable number of self-help activities should be chosen, based on a preliminary inspection of the community under study (e.g. building materials production or laying of water pipes). When a virtually unlimited range of self-help activity is to be considered, there is a risk of obtaining unreliable data, since it would be difficult to define and limit the range of what is considered "self-help" by different people and different projects.

16. Satisfaction with the community: Percentage of families (persons) in each level of satisfaction
(e.g.: 20% of families are not satisfied with the community)

Notes:

16.1 The term "satisfaction with the community" is so general that, when obtaining information in this respect, the survey designer will have to develop more concrete questions to put to the persons interviewed, while trying at the same time to avoid introducing a bias in the answer, since it is clear that it is difficult to find a person fully satisfied with his community at any time.

17. Membership of community organizations: Percentage of the community members who belong to community organizations
(e.g.: 9% of women adults belong to cultural organizations)

Notes:

17.1 As with "participation in self-help programmes", when designing the research in this item care should be taken to concentrate on a few target groups and community organizations.

VII. MEASUREMENT OF PROJECT VARIABLES

A. General

An investment project on basic infrastructure has one or more physical components, according to the special characteristics of the beneficiary community and the defined scope of the project. The scope of the project is often determined by financial considerations and by sectoral limitations of the implementing agencies. Thus, some projects, such as integrated urban development projects, may cover simultaneously all the physical infrastructure elements mentioned in this document, while others will cover only one element, for example, a solid waste collection programme. In addition to the above, the present tendency in project implementation is to include more support activities, such as education, training and institutional strengthening, to ensure effective project execution, and operation and maintenance of the constructed physical units. As indicated before, the present impact evaluation methodology is mainly concerned with the execution of physical infrastructure works. However, the general principles for impact evaluation already outlined can also be applied when it is decided to evaluate the impact of support (or non-physical) activities.

/As was

As was shown in section VI.A.1 the exposure of each beneficiary of a given project to a certain physical component of the same is not always constant. For example, if a water supply project considers the installation of communal water taps, there will be families that have to walk 150 metres to collect water, while others will need to walk only 20 metres. This situation of "different exposures" to a project is also present when studying two separate projects. This gives rise to the need to try to measure the exposure of each studied family to the corresponding project variables, in order to have these data fed into the equation given in section VI.A.1.

As with the measurement of impact indicators, the project variables can be evaluated either in a quantitative (water consumption, distance to roads, etc.) or in a qualitative manner (availability of sanitation, availability of solid waste collection services, etc.). Again, for convenience in managing data, it is desirable to reduce the non-numerical information obtained to numerical data, following similar mechanisms to those used for the project impact indicators.

Some measurement units that can be used for the evaluation of the beneficiaries' exposure to project variables are given below. This information will be obtained through project reports, visual surveys and interviews (through questionnaires) with the beneficiary community.

B. Measurement units

1. Water supply

a) Type of water supply
   - communal (yes/no)
   - household (yes/no)

b) Distance to water tap (if communal)
   - metres

c) Water consumption (adequate water quality)
   - litres per person per day

2. Sanitation

a) Availability of conventional sewerage
   - yes/no

b) Availability of adequate non-conventional system
   - on-site (yes/no)
     - water borne (yes/no)
     - dry (yes/no)
   - off-site (yes/no)

c) Distance to communal sanitation facilities
   - metres

3. Solid waste disposal

a) Availability of adequate collection system
   - yes/no

/b) Frequency

b) Frequency of collection
   - days
c) Distance to collection point
   - metres
d) Availability of adequate street cleaning
   - yes/no

4. Roads and footpaths

a) Availability of all-weather roads and footpaths
   - yes/no
b) Distance to all-weather roads and footpaths
   - metres

5. Energy

a) Availability of electricity (house-connection)
   - yes/no
b) Electricity consumption
   - kwh/month
c) Availability of other type of energy (gas, wood, coal, etc.)
   - yes/no

VIII. FINAL REMARKS

It is expected that the information given in this document can assist in the designing of impact evaluation studies. It is understood that due to the broad range of activities included in infrastructure projects, and to the diversity of activities between projects, the methodology can only be general in its approach. The same considerations influenced the decision not to develop a "standard questionnaire" for the execution of surveys as part of impact studies. In addition to the above considerations, the preparation of standard questionnaires has the additional drawback that the "formulation" of the questions, and the "order" of the same within the questionnaires, must be designed for each particular socio-cultural context, in order to obtain the expected information without biases and errors.

It must also be borne in mind that infrastructure impact studies will normally be executed as part of wider research implementation exercises, and perhaps the information to be obtained will have to be compatible with nation-wide socio-cultural data. Thus, the specific survey formats for infrastructure studies will have to fit into these broader studies. There are plenty of questionnaire formats and methodologies for socio-cultural studies that, read in conjunction with this document, can assist in the correct design of infrastructure impact evaluation studies.