



**LATIN AMERICAN AND CARIBBEAN INSTITUTE FOR  
ECONOMIC AND SOCIAL PLANNING - ILPES**

---

**INVESTMENT PROGRAMMING AND PROJECTS DIVISION**

**GUIDE FOR EDUCATION PROJECT IDENTIFICATION  
AND FORMULATION**

**INVESTMENT PROGRAMMING AND PROJECTS DIVISION**

**Distr.  
LIMITED**

**LC/IP/L.96.Rev.1  
18 March 1997**

**ENGLISH  
ORIGINAL: SPANISH**

**GUIDE FOR EDUCATION PROJECT IDENTIFICATION  
AND FORMULATION \***

\* This document has been reproduced without formal editing.

96-6-544

## **FOREWORD**

Investment in "human capital" is one of the essential foundations of economic and social development. Within this context, expenditure on education, aimed at extending its coverage and improving its quality, is crucial to improved growth and equity.

On the macroeconomic and micro-economic levels alike, education has effects of primary importance: it increases productivity, stimulates growth, boosts earning power, renders incomes less vulnerable to economic fluctuations, promotes mobility, encourages creativity and innovation, and provides the individual with his main escape route from poverty. In addition, education represents an objective asset which benefits the whole of society, so that its value in terms of the returns it brings in both the social and private spheres is indisputable.

For these reasons and because of the need for efficient and effective use of the investment resources allocated for education, ILPES has prepared this Guide, the first version of which was published in May 1994. Its purpose is to assist and facilitate the tasks involved in the effective identification and preparation of projects in the education sector.

Because of the positive reception accorded to the first edition, it was decided to prepare this new version in order to collect together the experience gained in using the guide in the courses on "Identification, Preparation, Evaluation and Management of Local Development Projects" given by the Institute. This edition incorporates some entirely new sections, while others have been revised or expanded or both, with the aim of clarifying concepts and facilitating their application. Responsibility for the Guide's preparation has been in the hands of Pamela Vera, an ILPES consultant, and Eduardo Aldunate, an expert at the Institute.

Edgar Ortégón  
Investment Programming and  
Projects Division  
ILPES





## CONTENTS

	<i>Page</i>
INTRODUCTION .....	1
1. GENERAL CONSIDERATIONS .....	2
1.1 The importance of proper identification, preparation and evaluation .....	2
1.2 Equity in projects .....	3
1.3 Project cycle .....	5
1.4 Project evaluation .....	7
1.5 Route followed by projects in the education sector .....	8
2. IDENTIFICATION OF THE PROJECT .....	11
2.1 Type of problem .....	11
2.2 Importance of correctly identifying and defining the problem .....	11
2.3 Tools and techniques for identifying projects in the education sector .....	13
2.4 Description of the problem .....	17
2.5 The "Problem Tree" .....	19
2.6 Scale of the problem .....	21
2.7 Expected impact on the problem .....	22
3. DIAGNOSTIC ASSESSMENT OF THE CURRENT SITUATION .....	23
3.1 Need for a diagnostic analysis .....	23
3.2 Identification of the study area .....	23
3.3 Determination of the service area .....	34
3.4 Determination of current demand .....	36
3.5 Demand projection .....	43
3.6 Determination of current supply .....	45
3.7 Educational indicators .....	52
3.8 Assessing deficit .....	52
4. IDENTIFICATION AND DEFINITION OF POSSIBLE SOLUTIONS .....	56
4.1 Optimization of the current situation .....	56
4.2 Identification of alternatives .....	58
4.3 How to incorporate the notion of equity when defining alternatives .....	66
4.4 Description of the options .....	68
5. EVALUATION OF PROJECT OPTIONS .....	70
5.1 Identification and quantification of the benefits yielded by each option .....	71
5.2 Identification and quantification of the costs of each option .....	78
5.3 Criteria for the selection of options .....	101
5.4 Sensitivity analysis .....	107
6. PRESENTATION OF THE CHOSEN ALTERNATIVE .....	111
BIBLIOGRAPHY .....	116

## CONTENTS (continued)

Page

### Annexes

1	EDUCATIONAL INDICATORS .....	118
2	GUIDELINES FOR SIZING EDUCATION ESTABLISHMENTS .....	124
3	SPECIMEN FORMATS FOR EDUCATION PROJECT BUDGETS .....	140

### Figures

Figure 1:	Profitability and accumulation of capital .....	2
Figure 2:	The cost of certainty .....	6
Figure 3:	Stage, phase and type of evaluation .....	7
Figure 4:	Project cycle for education projects .....	9
Figure 5:	Geographical limits .....	26
Figure 6:	Administrative limits .....	27
Figure 7:	Other limits .....	27
Figure 8:	Map of the study area .....	33
Figure 9:	Classification of the population .....	37
Figure 10:	Map of the service area .....	38
Figure 11:	Location map and features of supply .....	47

### Tables

Table I:	Breakdown of student roll in the establishment .....	42
Table II:	Current and projected demand .....	45
Table III:	Features of the establishment .....	51
Table IV:	Assessment of deficit .....	53
Table V:	Usual problems in the education sector .....	61
Table VI:	Most frequent causes of problems in the education sector .....	62
Table VII:	Solutions to problems in the education sector .....	63
Table VIII:	Indicators of benefits .....	75
Table IX:	Indicators of benefits (cont. of Table VIII)	
Table X:	Education project costs 86 .....	76

### Boxes

Box 1:	The basic needs approach .....	3
Box 2:	Equity in access to education .....	4
Box 3:	The CAS File .....	15
Box 4:	The CASEN survey .....	16
Box 5:	SISBEN (Colombia) .....	16
Box 6:	SICEM (Mexico) .....	18
Box 7:	SIMCE (Chile) .....	18
Box 8:	The REDATAM+ Programme .....	30
Box 9:	The concept of "focusing" .....	39
Box 10:	Benefits of education projects .....	71

# CONTENTS (continued)

Page

## Examples

Example 1:	Outline versus prefeasibility study . . . . .	10
Example 2:	A problem has been detected in an establishment . . . . .	11
Example 3:	A service-starved area has been identified . . . . .	11
Example 4:	Importance of identifying the principal cause of the problem . . . . .	12
Example 5:	Policy objectives and project identification . . . . .	13
Example 6:	Use of REDATAM (Retrieval of data for small areas by microcomputer) and SIG (Geographic Information Systems) in identifying projects . . . . .	14
Example 7:	Effects Tree . . . . .	20
Example 8:	Causes tree . . . . .	20
Example 9:	Problem tree . . . . .	21
Example 10:	Use of educational indicators . . . . .	22
Example 11:	Urgency of the problem . . . . .	22
Example 12:	Use of enrolment statistics in identifying the education network . . . . .	24
Example 13:	Use of community statistics to identify the education network . . . . .	25
Example 14:	Use of interviews with the community . . . . .	25
Example 15:	Use of statistics from the Ministry of Education . . . . .	26
Example 16:	Accessibility determined by the condition of the roads . . . . .	28
Example 17:	Accessibility determined by available means of transport . . . . .	28
Example 18:	Accessibility determined by transport costs . . . . .	29
Example 19:	Accessibility restricted by a low level of public safety . . . . .	29
Example 20:	Changes in demand due to changes in the regional economy . . . . .	30
Example 22:	Importance of cultural factors . . . . .	31
Example 23:	Importance of the type of administration . . . . .	32
Example 24:	Location of the affected population and determination of the service area . . . . .	34
Example 25:	Accessibility and determination of the service area . . . . .	35
Example 26:	Level of instruction and determination of the service area . . . . .	35
Example 27:	Administrative limits and determination of the service area . . . . .	36
Example 28:	Reference population, potential population, population in need and target population . . . . .	39
Example 29:	Target population . . . . .	40
Example 30:	Demand and characteristics of the population . . . . .	41
Example 31:	Demand and characteristics of the area . . . . .	41
Example 32:	Importance of analysing the student roll . . . . .	42
Example 33:	Determination of year one . . . . .	43
Example 34:	Calculation of the population growth rate . . . . .	44
Example 35:	Population projection . . . . .	44
Example 36:	Need to adjust the projections in certain cases . . . . .	45
Example 37:	Features of the population and supply to be considered . . . . .	46
Example 38:	Supply restricted by access conditions . . . . .	48
Example 39:	Original purpose of the building and acceptable supply . . . . .	49
Example 40:	Problems caused by weak administration . . . . .	50
Example 41:	Assessment of the deficit . . . . .	54
Example 42:	Envisaging a number of possible solutions . . . . .	56
Example 43:	Optimization of the current situation 1 . . . . .	57
Example 44:	Optimization of the current situation 2 . . . . .	57
Example 45:	Objectives tree . . . . .	59
Example 46:	Formulation of actions . . . . .	59

## CONTENTS (continued)

### Page

Example 47: Formulation of options . . . . .	60
Example 48: Need to attack the cause of the problem . . . . .	61
Example 49: Changing the school calendar . . . . .	67
Example 50: Provision of pre-school education to promote equality of opportunity . . . . .	68
Example 51: Quantification and evaluation of benefits . . . . .	70
Example 52: Options generating equal benefits . . . . .	70
Example 53: Education is not an end but a means . . . . .	71
Example 54: Benefits depend on the use made of the education received . . . . .	72
Example 56: Use of variables close to the benefits . . . . .	73
Example 57: Benefits depend on the services actually offered . . . . .	74
Example 58: Doubling the size of the project does not mean doubling its benefits . . . . .	74
Example 59: Reduced costs through the amalgamation of two schools . . . . .	77
Example 60: Valuation of land . . . . .	79
Example 61: Construction costs . . . . .	80
Example 62: Equipment costs . . . . .	80
Example 63: Advertising costs . . . . .	81
Example 64: Staff costs . . . . .	82
Example 65: Cost of inputs . . . . .	82
Example 66: Additional costs of utilities . . . . .	83
Example 67: Transport costs . . . . .	84
Example 68: Drawing on experience gained elsewhere . . . . .	87
Example 69: Identification of the costs of a training programme . . . . .	87
Example 70: Quantification of costs . . . . .	89
Example 71: Alternative cost . . . . .	89
Example 72: Treatment of taxes . . . . .	90
Example 73: Impact of inflation . . . . .	91
Example 74: Adjustment of prices to take account of inflation . . . . .	91
Example 75: Social cost adjustment . . . . .	92
Example 76: Valuation of land . . . . .	93
Example 77: Residual value of land . . . . .	94
Example 78: Cost of inputs . . . . .	97
Example 79: Calculation of the total cost of board and lodging . . . . .	97
Example 80: Prices which depend on volume . . . . .	98
Example 81: Prices whose pattern of variation differs from other prices . . . . .	99
Example 82: Project implementation budget . . . . .	99
Example 83: Project evaluation budget . . . . .	100
Example 84: Calculation of NPV in a training project . . . . .	102
Example 85: Calculation of the NPV of the amalgamation of two schools . . . . .	103
Example 86: Calculation of the IRR . . . . .	104
Example 87: Calculation of the present value of costs . . . . .	105
Example 88: Calculation of equivalent annual cost . . . . .	106
Example 89: An inadequate sensitivity analysis . . . . .	108
Example 90: A good sensitivity analysis . . . . .	108
Example 91: Calculation of coverage . . . . .	119
Example 92: Calculation of average level of schooling . . . . .	120
Example 93: Calculation of illiteracy rate for intercensal years . . . . .	122

## INTRODUCTION

Since time immemorial man has had to satisfy his needs and has required goods and services to do so. The production of the goods and services for man's consumption necessitates production resources, which are limited in relation to human needs. Resources are therefore scarce, and it is necessary to work out how they can best be utilized to achieve the highest possible level of well-being.

Satisfying needs helps to improve the living standards of the members of society, which in turn generates increased demand through the use of production resources to satisfy the needs. Increased production capacity is achieved through investment. Moreover, the quality of the investment made is directly linked to the correct allocation of the available resources, and the correct allocation of resources depends, among other things, on the availability of carefully prepared and evaluated projects.

A country's economic growth and development, however, do not depend merely on greater investment, but also on the quality of the labour force and on technological development connected with production processes. Consequently, investment in and expenditure on science and technology, education and health are prerequisites for the development of any country in a spirit of social equity.

Identifying and implementing good projects which will have a substantial impact on a target population is thus becoming an ever-more pressing need as time passes and an important challenge for national social welfare authorities. The availability of projects which actually have the desired impact depends, to a large extent, on good project identification, preparation and evaluation.

This document sets out to assist in this task by providing guidance for the identification and preparation of projects in the education sector, indicating the basic aspects to be considered at each stage. The specific objectives of this guide are as follows:

- (a) To provide practical guidance and tools for identifying and preparing education projects;
- (b) To indicate the basic stages through which education projects should pass and the content of each stage;
- (c) To propose a format to assist in presenting education projects.

In designing this guide particular thought has been given to those involved in formulating education projects at the local level, that is to say, the administrators of education systems, managers of institutions and teaching staff with some knowledge of how to prepare and evaluate projects.

The guide is divided into six chapters and three annexes. The first chapter covers general concepts regarding the importance of the proper identification and presentation of projects, the stages in a project's life cycle and the stages through which education projects generally pass.

The second chapter deals with the importance of clearly identifying the problem that gave rise to the project and provides some guidelines for facilitating and assisting that task. The third chapter examines the most important points to be considered in making an accurate diagnostic analysis of the current situation aimed at pinpointing the education deficit in the area under examination.

On the basis of the points made in the third chapter, the fourth indicates how to identify possible solutions (options) to the problem detected and gives guidance on quantifying each option. The fifth chapter indicates ways of assessing the costs and benefits of each option. It also describes some methods for evaluating the alternatives and selecting the best one. Finally, the sixth chapter sets out guidelines for use in producing a project outline.

The annexes at the end of the guide furnish useful additional information for the preparation of an educational infrastructure project, in particular guidelines for the sizing of educational establishments and examples of the preparation of budgets for education projects. There is also a detailed description of useful educational indicators for a thorough diagnostic analysis of the state of the educational system in a given area.

## 1. GENERAL CONSIDERATIONS

*This chapter presents basic concepts which provide a general framework for the guide and make it easier to understand the issues dealt with later. It examines the importance of project preparation and evaluation and the concept of equity as applied to the education sector. It looks at the life cycle of projects and the special features of education projects.*

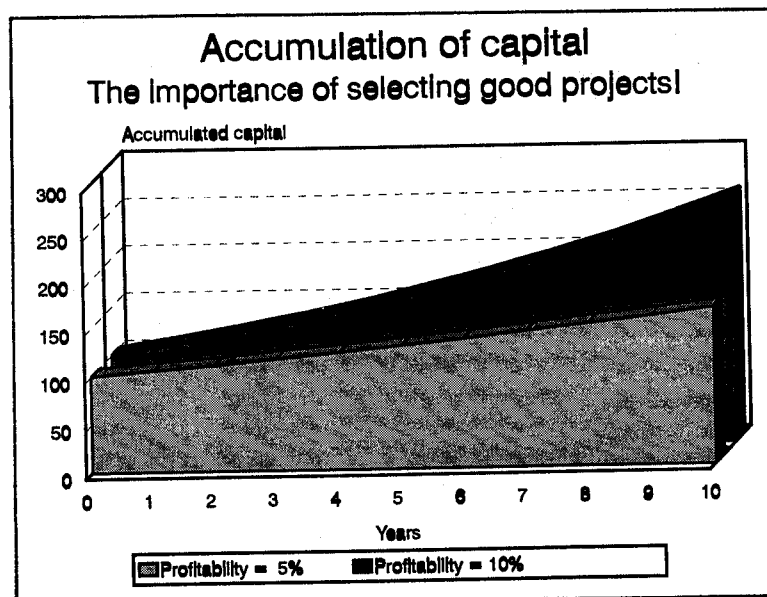
### 1.1 The importance of proper identification, preparation and evaluation

As already mentioned, a country's development is closely bound up with the quantity and quality of the investment made in it. In practice, this means the effectiveness and efficiency with which the objectives fixed for the investment programme are achieved. An investment is effective if it makes it possible to attain the desired objectives. It will also be efficient if it attains those objectives at the lowest possible cost.

The quality of the investment necessarily depends on the proper allocation of resources. It is thus essential to identify the best projects, that is to say those that make the greatest contribution to development. This is precisely where project evaluation plays such a very important role, since it makes it possible to measure the contribution made by a particular project to the development process.

The importance of selecting the most profitable projects is shown in figure 1. This hypothetical case assumes that investment is made in projects which pay back the capital invested within a year plus a certain profit (percentage profitability) and that the resources are entirely reinvested the following year in projects with the same features. At the end of 10 years, with a profitability rate of 5 per cent, the capital will have increased by 63 per cent. However, in the case of investments in projects with a profitability of 10 per cent per annum, the capital will increase by 159 per cent in ten years, making the investor 59 per cent richer than he was before.

**Figure 1: Profitability and accumulation of capital**



The aim of the social evaluation of projects is to identify and assess how a particular project promotes the development of the country. The point is to identify the impact on society as a whole. If the benefits that society derives from a project are greater than the costs incurred in implementing it, then the project can be said to be profitable.<sup>1</sup> However, it is very difficult to express in monetary terms the benefits that society derives from projects of a social nature, such as education, health, housing, and so forth.

As a rule, the nature of social projects is such that consensus arises spontaneously as to their necessity and importance. The value of carrying them out is immediately apparent. Nevertheless, even when it is widely held that they should be implemented, it is extremely important to analyse and evaluate them, since such analysis provides answers to a number of fundamental questions in connection with their execution and implementation.

Although it is clear that, in general, the profitability of such projects is beyond dispute, this does not mean that they should be undertaken without further study. A thorough knowledge of the problem and of all the possible solutions is vital. This will provide answers to questions as to, for example, whether the solution will be infrastructure-based or achieved through other means, where the project will be located, who the beneficiaries will be and how long the project will last.

---

**Box 1: The basic needs approach**

---

The basic needs approach, proposed by Harnold Harberger in 1984, argues that people are prepared to pay (for example, taxes) so that other people may receive goods or services that are considered essential for a decent standard of living or for their development as individuals. This category includes programmes for nutrition, health, education and basic housing for the poorest sector.

If we apply this approach, then where there is consensus regarding the need to carry out a social project, this means that society is prepared to pay so that a specific group, considered poor, may be provided with a service that they are unable to acquire for themselves. In other words, society believes that it receives a benefit which is greater than the payment it makes.

---

Proper project preparation is a prerequisite for finding answers to these questions. The process of identification and preparation brings together information which is crucial in reaching better-informed decisions on the steps to be taken. It is therefore very important to examine, investigate and analyse until there is an absolute conviction that the best project option has been identified and that the most efficient way of achieving the desired objective will therefore be selected.

## **1.2. Equity in projects**

*"Social equity means equality of opportunity to participate in securing well-being, social status and material assets. It requires the elimination of discrimination and privileges established within the various systems, both those founded on the legal system and those based on economic, social and political structures."*

---

<sup>1</sup> When the benefits and costs of a project occur in different years, they must be adjusted to the same reference date for the purpose of comparison. Chapter 5 examines how this is done.

*Type of employment, level of income, educational attainments, family type, urban or rural location and political influence are among the factors that have a decisive impact on life's opportunities. If the differences in these areas are too great, there will also be a marked inequality of opportunity.*"<sup>2</sup>

In addition to investment in "machinery", the most up-to-date approaches to economic growth attribute a very important role to investment in "people". In this context, there is now clear acknowledgement of the role of education in a country's development. It is the task of the education system to promote skills and abilities for use in development. Efforts to enhance educational systems aimed at improving their results, tailoring them to modern requirements and ensuring equitable coverage are thus an important part of the development process.

Investment in people as a means of increasing the human capital of a country is a necessary factor in development. Nevertheless, if the country's growth is to benefit society as a whole and not just the few, there must be equality of opportunity. This equality of opportunity depends to a great extent on the education of the individual. Hence, the importance of making the education system as fair as possible.

*"Social equity is linked to access to education, i.e. to equal enrolment opportunities and to the distribution of chances for obtaining a quality education. In other words, it concerns opportunities for similar treatment and results in education."*<sup>3</sup>

Seen in this light, human resource training must be provided by a system made up of establishments which are genuinely alike in their basic features and offer similar conditions. Only in this way will they be able to achieve the performance required of the system.

This means examining those areas in which there is inequality, providing equipment and creating conditions conducive to equality of opportunity, strengthening educational capabilities in the most isolated and backward areas, and so forth.

## **Box 2: Equity in access to education**

---

### **Conditions required to achieve equity in access to education**

- Adequate investment in education infrastructure to generate the necessary capacity to serve everyone who seeks an education.
  - Fair distribution of resources for education, giving priority to education required by the poorest (more resources for elementary and technical education).
  - Provision of subsidies or credits for those who are unable to afford education.
  - Access to information on educational opportunities and the quality of those opportunities.
  - Legal framework to encourage parents to provide their children with a minimum level of education and to discourage the employment of school-age children.
  - Removal of barriers to education, access being provided without regard for race, religion, sex or social or ethnic origin.
- 

---

<sup>2</sup> ECLAC (1991), *La Equidad en el Panorama Social de América Latina durante los años ochenta*. (Equity in the social panorama of Latin America during the 1980s.)

<sup>3</sup> ECLAC-UNESCO, (1992) *Educación y Conocimiento: Eje de la Transformación Productiva con Equidad*. (Education and knowledge: basic pillars of changing production patterns with social equity.)



### 1.3 Project cycle

An **investment project** is a form of decision, one that concerns the use of resources with the aim of increasing, enhancing or maintaining the production of goods or the provision of services and/or increasing, enhancing, maintaining or restoring the capacity of a human or physical resource to generate benefits. The decision may result in physical construction work and/or a specific initiative.

In the education sector, if the objective is to produce goods or to provide services, the projects will be concerned with the infrastructure of educational establishments, usually with regard to the coverage provided by the education system. If, however, the objective is to generate benefits, the projects will be concerned with the quality of the education system.

Where this guide refers to projects it does so in general terms, with reference both to investment in infrastructure and to investment in quality. Where the two types of project call for distinct treatment, this is indicated.

Each project follows a route which leads, as already mentioned, either to construction work or to the implementation of a specific initiative. The process of converting simple investment ideas into implementation or execution is known as the project cycle. Each stage in this conversion process requires human, material, financial, information and other resources which progressively add value to the ideas. Although in practice there are undoubtedly subtle differences in the way this process is applied in each case, it is nevertheless possible to discern some common features permitting a degree of generalization.

There are three successive stages in a project's route: **pre-investment, investment and operation**. The pre-investment stage embraces the whole process of identifying a programme or need, formulating the project and evaluating the initiative to ascertain whether or not it is advisable to implement it. If a decision is taken to execute it, the project goes forward to the investment stage, in which the detailed engineering plan or design and/or the detailed timetable of activities is produced, and the construction is built or the activities are carried out. Finally, the operational stage sees the start-up of the finished construction or the specific plan to be followed. This is when the benefits envisaged at the pre-investment stage begin to materialize.

#### 1.3.1 Pre-investment stage

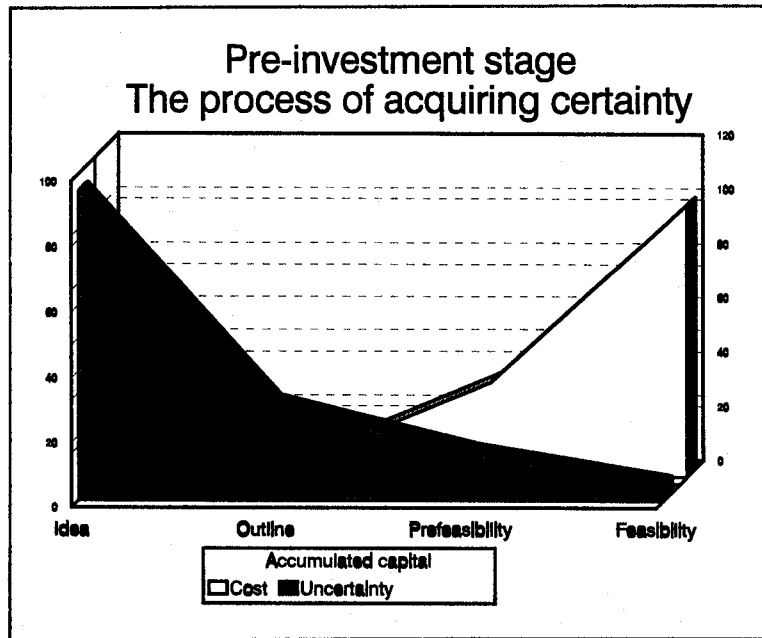
There are a number of stages involved in selecting the option that will become the project and deciding whether it should be implemented. The degree of complexity of pre-investment studies depends on the particular stage reached and the general complexity and cost of the project.

The process can be divided into the following steps:

- Generation and analysis of the project **idea**
- Preparation of the project **outline**
- Performance of the **prefeasibility** study
- Performance of the **feasibility** study

Each step may involve choices such as: whether to move on to a more advanced stage, temporarily halt the study at the stage reached or conclude the studies because sufficient information has been collected to take the decision to implement the project or to abandon it entirely. Each step sheds more light on the problem to be solved, the goods or services to be provided, the most appropriate technical alternatives and their costs and benefits. The steps therefore constitute a gradual process of "buying" certainty, the more complex the projects, the greater the outlay required on detailed and thorough studies.

Figure 2: The cost of certainty



**(a) Generation and analysis of the idea**

This stage, which is the product of preliminary analysis or, in some cases, community pressure, identifies the problem to be resolved, the range of possible beneficiaries, the geographical location and the desired objectives of the project. Lastly, it generates a choice of possible solutions.

**(b) Preparation of the project outline**

This stage is used to incorporate additional information and to refine information from the preceding stage. The outline must include a preliminary analysis of the technical aspects, the market and the benefits and costs, and also a preliminary evaluation. It must make use of the data and information available, without incurring additional costs. The outline will be used to analyse the technical and economic viability of the various alternatives proposed, those that are not feasible being discarded.

It is worth stressing that this stage cuts out much of the uncertainty at a fairly low cost. The preparation of good project outlines is thus extremely important since it can forestall costly studies of projects which are not viable.

**(c) Prefeasibility study**

During this stage the information provided by the outline is further refined and additional information is incorporated in order to discard some options and provide a clearer picture of those remaining. The pre-selected options are subjected to technical and economic evaluation to establish which is the best and to discard the rest.

**(d) Feasibility study**

This must focus on an in-depth examination of the option that came out on top in the preceding stage, which means concentrating efforts on measuring and evaluating the benefits and costs of that option as accurately as possible. Special attention must be paid to any variables that have an impact on the project.

Once the project has been defined and characterized, it is necessary to optimize all aspects concerning the physical construction work, the capital expenditure schedule, the execution programme, start-up and operation, in order to make the entire process more efficient.

### 1.3.2 Investment stage

This stage involves the physical implementation of the project in accordance with the estimates made at the pre-investment stage. The investment stage has two phases:

- **Design** of the project or scheduling of activities;
- **Implementation** of the project or activity.

#### (a) Design

It is here that the detailed architectural plans and/or engineering studies are made in the case of an infrastructure project (coverage). In the case of a project connected with the quality of the system, the design stage is intended for preparing the schedule of activities to be carried out, on the basis of the requirements highlighted by the study.

#### (b) Implementation

The construction works are executed or the scheduled activities are implemented at this stage.

### 1.3.3 Operation stage

This is the project start-up stage. It is here that the benefits forecast at the pre-investment stage begin to become apparent. In some cases, within the operation stage the start-up of the full operation stage constitutes a distinct phase in itself.

## 1.4 Project evaluation

As the project progresses through the different stages, it is evaluated in various ways (see figure 3). The pre-investment stage is accompanied by *ex ante* evaluations of the project (in connection with the outline or the prefeasibility or feasibility study). The implementation stage includes material and financial monitoring of the project to check that it is progressing according to plan. Lastly, the operation stage may include project monitoring for the purposes of an *ex post* evaluation of the project.

**Figure 3: Stage, phase and type of evaluation**

Stage	Phase	Type of evaluation
Pre-Investment	Idea	<i>Ex ante</i> evaluation
	Outline	
	Prefeasibility	
	Feasibility	
Investment	Design	Material and financial evaluation
	Implementation	
Operation	Operation	Monitoring of operation <i>ex post</i> evaluation

The ***ex ante* evaluation** is the comparison, numerical or otherwise, of the costs and benefits that the project is expected to generate if implemented. If this comparison is made from the point of view of the enterprise or agency that carries out the project, it will be a **financial evaluation**. However, if it is made from the standpoint of society as a whole, it will be an **economic evaluation**.<sup>4</sup>

Lastly, the **technical evaluation** of the project examines whether the chosen alternative is technically viable.

The **material and financial monitoring** refers to the monitoring of the project carried out during the implementation stage with reference to progress in the construction works or activities (volume of works, services rendered), and the timetable and resources used. Its aim is to detect any deviations from the initial project programme caused by implementation problems or poor planning. It provides an opportunity for the timely adoption of measures to offset the effects (additional costs or delays) of any problems arising.

The ***ex post* evaluation** is designed to determine, systematically and objectively, the relevance, efficiency, effectiveness and impact of all the activities carried out in the light of the pre-established objectives. It is an organizational process aimed at enhancing activities in progress and assisting the project administrators in planning, programming and future decision-taking.

In order to close the project cycle and reinforce the entire process retroactively, it is advisable, during the investment and operation stages, to provide for **periodic monitoring** of those variables that may be decisive, in a subsequent evaluation, in assessing whether the project or programme is indeed achieving (or has achieved) the objectives set in the *ex ante* evaluation.

As already mentioned, in the design and implementation phases monitoring essentially relates to the costs of the project and the time needed to complete it. This information, along with a description of the problems detected, the solution applied and the results achieved, must be set out in an **end-of-project report**. This must contain all the information required to evaluate the efficiency and effectiveness with which the project was implemented. It must also suggest the variables that ought to be monitored in the operation stage so that an *ex post* evaluation of the project may be made later.<sup>5</sup>

## 1.5 Route followed by projects in the education sector

At the pre-investment stage, a project in the education sector is generally formulated as an outline. This is because such projects are not sufficiently complete to warrant greater outlay (human and financial resources) on more detailed studies (prefeasibility, feasibility). A good outline should provide an adequate level of certainty to decide whether to go on to the project design phase or—if it is inadvisable to implement the project—to abandon or postpone it (see figure 4).

All the information required for the decision on whether or not to invest is usually available to the management of the establishment (if any) covered by the project, the municipality, the departments for education, the ministry of education, local or district organizations, or other such entities. Furthermore,

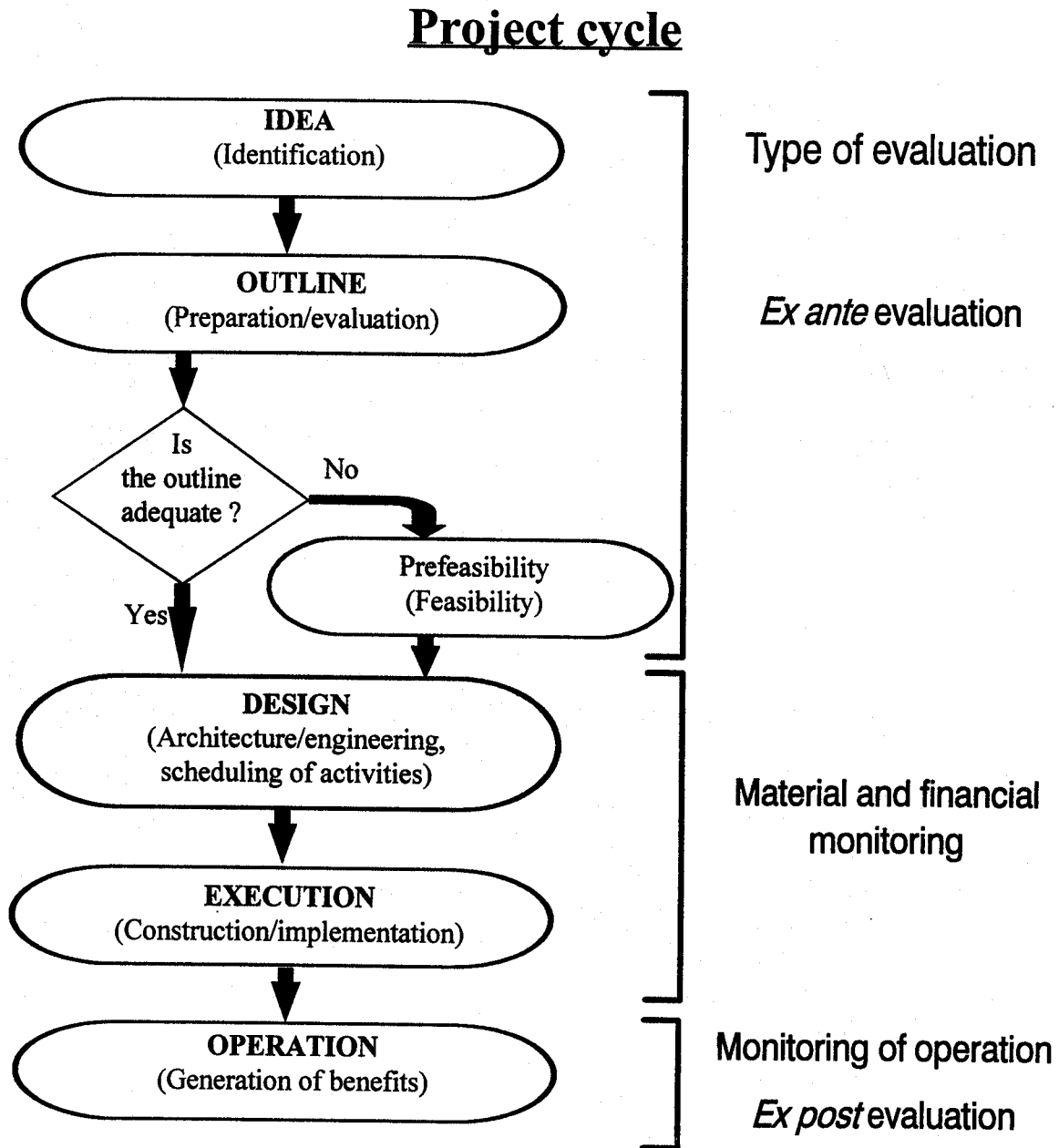
---

<sup>4</sup> The economic evaluation is also known as the social evaluation. The terms are used interchangeably in this document. Nevertheless, it should be mentioned that some writers use the term “economic evaluation” with the meaning described, but reserve the term “social evaluation” to refer to an economic evaluation that has been weighted to take account of income distribution.

<sup>5</sup> For further information on this subject please refer to ILPES, (1993): “Propuesta metodológica para la evaluación *ex post* y el informe de término de los proyectos de inversión”. (Methodological proposal for the *ex post* evaluation and end-of-project report for investment projects.)

collection, processing and analysis of this information do not require specific studies. Only in very special cases, if the complexity of the project and the scale of the investment so require, will it be necessary to conduct prefeasibility and/or feasibility studies.

**Figure 4: Project cycle for education projects**



### **Example 1: Outline versus prefeasibility study**

---

*A project envisages the construction of a high-technology education centre to satisfy a need identified at the regional level.*

*The potential benefits of the project have been examined in an outline study, including an initial analysis of the regional labour market for the various specialist skills and of the technical aspects of pursuing the project, as well as an evaluation based on estimated figures. The study concluded that the idea was a good one and that it seemed technically and economically viable.*

*Nevertheless, because the project involves an establishment specializing in the technical side of vocational education and is therefore highly complex, particularly with regard to equipment, it will be necessary to conduct a prefeasibility study. This will have to go further into areas such as the labour market for specialist skills; technology (equipment), size and location of the establishment; relevant legal and administrative aspects; and costs of investment, operation and maintenance, etc.*

*The results of the prefeasibility study will provide the basis for recommending execution of the project, its postponement, further studies or abandonment of the project if it is not considered advisable.*

---

## 2. IDENTIFICATION OF THE PROJECT

*This chapter emphasizes the importance of accurately identifying the problem and pinpointing its principal cause. It offers some tools and techniques for use in identification. Finally, it indicates how to describe the problem, how to gauge its dimensions and how to monitor the progress forecast.*

### 2.1 Type of problem

For the purposes of this guide, a distinction will be made between two situations which influence how the problem is dealt with and analysed, namely:

- There is an educational establishment in the area where the problem was detected;
- There is no education establishment in the area.

In the first situation an existing educational establishment is the subject of the project, but the service it provides is inadequate to fulfil the requirements set by the education system. In other words, education is being provided, but not in the best possible conditions. There is a deficiency in the quality of the service, which may be due to lack of materials, inadequate training of teachers, substandard infrastructure, or other factors.

#### **Example 2: A problem has been detected in an establishment**

*Drop-out rates among children at a particular school have risen considerably in the last three years. Preliminary studies seem to indicate that this situation is due to the fact that the education service being provided contains deficiencies which cause an increasing number of children to leave school in search of other education possibilities. In this case, therefore, there is an establishment that is the focus of the problem.*

In the second situation the area has no educational establishment to satisfy the requirements of the system. In other words, a geographical area or a section of the population is deprived and does not have access to education in accordance with the objectives set for the education sector. This means that there is deficient coverage, which may be due to inadequate infrastructure or capacity to provide the service.

#### **Example 3: A service-starved area has been identified**

*Let us suppose that, under Ministry of Education policy, all elementary schools (primary level) are required to provide pre-school facilities. A regional study has identified an area of the country in which there is no school providing pre-school facilities (kindergarten). In this case, there is no establishment in the area to cover a need that must be satisfied. The education system is depriving children at this level and is thus failing to fulfil an objective set for the sector.*

### 2.2 Importance of correctly identifying and defining the problem

Any project for investment in education which is implemented should help achieve the objectives set for the sector. At the same time, each project should have the immediate objective of solving specific and clearly identified problems which to some extent prevent the sector from fully achieving its general objectives.

Normally, initial analysis sheds more light on the **effects** of the problem than on its **causes**. An effect is understood to be the observable manifestation of a problem. Causes are the combination of interrelated factors which produce or generate the problem, whether in a particular school, the larger school network or the community as a whole.

The project must always be formulated in such a way as to eliminate the causes of the problem detected. Consequently, proper identification of the basic problem, in which its **principal cause** is pinpointed, is essential in defining the precise concept of the project. If the principal cause of the problem is not properly identified, the project formulated will most probably fail to achieve the desired result.

The importance of clearly defining the problem or need therefore lies in the fact that this definition will be the basis on which the project designed to solve the problem is established. Defining the activities to be undertaken, deciding to carry them out and implementing the plans made will thus depend on the accuracy and clarity with which the problem has been identified.

#### **Example 4: Importance of identifying the principal cause of the problem**

---

*A school is rapidly approaching saturation of its installed capacity. Any of the following reasons could be the cause:*

- (a) Some children who have recently entered the school have transferred from another education establishment with serious access difficulties (public transport service discontinued).*
- (b) The population in the sector has increased faster than expected owing to the fact that a number of new housing estates have been built in the past year.*
- (c) The primary level of the closest alternative establishment was closed because of a lack of teaching staff. The children who used to go there now have to be shared among the neighbouring establishments.*

*It is clear that, depending on the principal cause, different solutions will need to be adopted to deal with the problem of overcrowding. Possible solutions corresponding to each of the causes could be:*

- (a) Improving access to the other establishment by reinstating the public transport service.*
  - (b) Enlarging the existing establishment or building a new one to absorb part of the demand.*
  - (c) Providing the other establishment with the necessary teaching staff to offer classes at the primary level.*
-



## 2.3 Tools and techniques for identifying projects in the education sector

We shall now look at some techniques and tools which make the task of detecting problems in the education sector easier and more efficient. Some of the tools mentioned are complicated and expensive and therefore available in only a few countries of the region. Nevertheless, the benefits they bring far outweigh the costs they entail and their use is therefore highly recommended. Therefore, in cases in which more than one tool is available to define the problem, it is very helpful to carry out a complementary analysis, superimposing the information in order to identify areas of interest.

### 2.3.1 Objectives and policies in the sector

An important starting point in identifying a problem is to situate it within the general framework formed by the objectives, policies and approaches in the education sector. To do this, it is very important to be aware of the priorities in the sector at national level and the strategies developed by the different regions to implement the policies. It is also necessary to keep abreast of the new features that are being incorporated or proposed for incorporation in education in the country. Hence, by comparing the situation which it is hoped to achieve in the sector in a particular locality or region with the model indicated by the objectives and policies, it is possible to detect obstacles to the attainment of the desired targets.

#### Example 5: Policy objectives and project identification

---

*Let us suppose that the main objective of policy in the education sector is to improve standards of education. Since this is a very complex and wide-ranging subject, emphasis tends to be placed on particular variables which urgently need to be tackled. The important thing then is to know which variables have been selected and how they are to be dealt with. This is precisely the area in which there will be new contributions, ideas and indications to help ascertain whether the education system is functioning in accordance with the new approaches, conditions and parameters established.*

*One variable, for example, could be that each establishment should have its own mini-library to encourage reading. If establishments in a region only have a central library in the regional capital, it is clearly necessary to provide libraries for as many establishments as possible in the region if the objectives set for the sector are to be achieved.*

---

### 2.3.2 Information with reference to the establishment

One of the easiest ways to detect a local problem is to look at the requests made by the management of an educational establishment or a community organization. Such requests normally relate to problems such as coverage, overcrowding and saturation of installed capacity. In order to ascertain whether an insufficiency actually exists, it is necessary, if possible, to visit the establishment to check the situation and identify the possible causes.

Another invaluable source of information at the local level is to be found in the statistics employed by the administrators of the education system. For instance, if the student roll of an establishment is steadily declining or student drop-out rates have increased appreciably, this indicates that there is something in the system that is not working properly. As a rule, these indications are examined together with the management of the establishment, the parents or guardians, and the community.

### 2.3.3 Location maps

Location maps for the education system can be used to pinpoint gaps in coverage and/or problems connected with the location of the establishments. They are simply maps of specific geographical areas which indicate the different establishments providing education, specify the type and level of the education offered and the installed capacity and student roll of each establishment. The most detailed maps also indicate the type of establishment, year of construction and general state of the infrastructure.

#### **Example 6: Use of REDATAM (Retrieval of data for small areas by microcomputer) and SIG (Geographic Information Systems) in identifying projects**

---

*A recent survey conducted by ILPES for the Government of Chile showed that the REDATAM PLUS programme (see box 8), developed by the Latin American Demographic Centre (CELADE), could be used in identifying projects at the local level. The survey produced a methodology for the use of census data which, supplemented from other sources of statistics and assisted by the REDATAM system, is utilized in a Geographical Information System to produce local maps for pinpointing households and pockets of the population that are not receiving some basic services.*

*In the case of the education sector, census data on the location and age distribution of the student population can be compared with the availability of educational establishments in the area, so that unfulfilled needs in each socio-economic group can be easily identified.*

---

### 2.3.4 Surveys

There are other more sophisticated tools, such as questionnaires or surveys, which can be used, among other things, to pinpoint areas that the education system or another service fails to reach or could reach more effectively. These tools can also be used to focus the benefits on the project target group, to check how expenditure is being distributed and to indicate how people view the project in terms of the benefits they are receiving from it.

Examples of such tools are the CAS File and the National Socio-Economic Survey (CASEN) (see boxes 3 and 4), currently being used in Chile, and SISBEN in Colombia (box 5). The information generated by these systems is used by all sectors. Specifically, it is used by the education sector to select projects to promote the neediest groups and to analyse the channelling of resources, the allocation of scholarships, additional sources of funding and other matters.

### **Box 3: The CAS File**

---

#### **The CAS file**

The CAS File is a tool designed to permit the socio-economic classification of households, which is used to identify population groups living in extreme poverty in order to direct the benefits of the social welfare network and social programmes to those most in need. It is designed to select the poorest people as beneficiaries and is applied at the municipal level.

The first version of the system (CAS-1) was used to collect data on 14 items, which gave some indication of poverty. The items included dwelling type, sanitary facilities, household equipment, overcrowding, fuel consumption, literacy and length of schooling of the head of the household and his or her spouse, activity or work of the person responsible for maintaining the home, location of the dwelling according to region, and the urban or rural character of the location. The different items were combined to produce an aggregate index known as the CAS score ("index"). This index determines eligibility for a specific subsidy or programme.

As a number of problems had become apparent in connection with the use of the CAS-1 File, it was redesigned as CAS-2. This has been in use since June 1987 and differs from CAS-1 in the following ways: it includes items connected with the amount and source of family income; it has redefined items already included in CAS-1, eliminating contradictions and ambiguities; it gives a precise definition of the home as a unit to be examined, and incorporates the family variable, which can subsequently be used to identify related families (cohabitation); it expresses the socio-economic situation of the family as a continuous score; it permits variable weighting of the items, establishing differential weighting for urban and rural areas; finally, the weightings are less "visible" for the user in CAS-2, making it harder to manipulate the data. (MIDEPLAN 1990, the CAS File as a tool for the allocation of subsidies.)

---

#### **Box 4: The CASEN survey**

---

##### **The CASEN Survey**

CASEN (the National Socio-Economic Survey) is designed as a tool for planning social policy by measuring and assessing the impact of the redistribution of social expenditure. It is useful in monitoring and assessing social programmes and designing and developing corrective measures and actions for current programmes.

The survey's main objective is to quantify and determine the situation of the poorest families and to give those families access to social programmes and financial subsidies, as well as bringing them into the labour market. It is also designed to monitor the distribution of social expenditure among the population in the country and to quantify what proportion is received by the most needy sectors.

In the specific case of the education sector, the following indicators are analysed: average level of schooling, illiteracy rate, coverage at the various educational levels and school-attendance rates by age-group. It examines these indicators for each region, area, sex and per capita income level; it also describes the main features of the school-age population covered by the formal education system and the main reasons for this situation. (MIDEPLAN-CASEN 1990, Concerning population, education, housing, health, employment and poverty.)

---

#### **Box 5: SISBEN (Colombia)**

---

##### **SISBEN**

The System for Selection of Beneficiaries of Social Programmes (SISBEN) comprises a set of rules, standards and procedures for obtaining reliable and up-to-date socio-economic data in order to focus social expenditure. It is a basic tool for assisting the technical, objective, standardized and fair selection of beneficiaries of social programmes in accordance with their socio-economic status, as represented by an aggregate standard-of-living indicator.

The variables used to construct the aggregate indicator are determined using data obtained in a **socio-economic survey** of 25,000 families throughout the country conducted in mid-1993. These data were used to rank every Colombian family according to its level of poverty, on the basis of a set of socio-economic features, including those of relevance at the regional, departmental and rural levels.

One of the main results of SISBEN is a database with valid, reliable and up-to-date information. This database has details of current or possible beneficiaries of social programmes in the areas of health, education and social welfare, among others, thus facilitating inter-institutional coordination and the analysis and monitoring of the programme impact.

The database must be updated periodically and used by all agencies in charge of social programmes, both in the departments and in the districts and municipalities, so that greater uniformity can be achieved in the criteria used to identify and select beneficiaries.

---

### 2.3.5 Systems for measuring the quality of education

One of the most complex and recurrent themes in the education sector is quality, in the sense of the system's capacity for generating the benefits expected of it.

As stated in a document prepared by the Chilean Ministry of Education,<sup>6</sup> *"when one speaks of good quality education one is making an overall judgement on the relevance of the results of education and on the education process: in other words, whether what education succeeds in inculcating is consistent with a given outline of the needs of individuals and society, either in terms of personal development (including emotional or moral development) or in terms of cultural, social, economic and political usefulness."*

It is not only the general approach to be adopted in examining the quality of education that raises difficulties but also its measurement. Normally, problems relating to the quality of education are analysed and considered at higher levels by the sectoral authorities.

Nevertheless, there are tools, such as **SICEM** in Mexico or **SIMCE** in Chile (see boxes 5 and 6), which provide regular information for those involved in education (primarily headteachers, teachers' associations and parents' groups) on the quality of the education that students receive in the establishments they attend. This information can be used by each establishment to assess the quality of the education it provides, to compare the results with those obtained by establishments of a similar type, to look for factors that account for the results and, subsequently, to evaluate the effect of any measures adopted.

Furthermore, the sectoral authorities can use this information to focus their policies and to direct them towards improving the quality of education and reducing the gap between the more successful and the less successful establishments.

## 2.4 Description of the problem

Once the problem affecting a given area or establishment has been determined, the situation must be described in the greatest possible detail to the extent permitted by the depth of analysis attained. The aim is to identify the causes and effects clearly. The description must include at least the following aspects:

- (a) All the possible causes so that the **principal cause** of the situation to be rectified may be defined.
- (b) The definition, a priori, of whether the problem is **quantitative** or **qualitative**, i.e., whether it lies in one or more existing establishments or whether it involves an area in which the system is not providing any service.

---

<sup>6</sup> Ministry of Education (Chile), MECE Programme, (1993) "Nuestra futura educación media. Temas para los grupos de discusión". (Our secondary education of the future—topics for discussion groups.)

---

**Box 6: SICEM (Mexico)**

---

### **SICEM**

The **Information System on the Quality of Mexican Education (SICEM)** has been widely used since 1988. It is applied periodically and systematically in the fourth and sixth grades in primary school and sets out to measure four types of specific variables:

- Formative factors;
- The teaching/learning process;
- Operational support for the education system;
- Response of education to socio-economic development.

To carry out this task, SICEM uses a methodology devised to assess the extent to which the teachers pursue specific educational objectives, based on their personal evaluation. In addition, in order to corroborate particular variables and make a deeper analysis of the more subjective factors, a detailed study is performed on a sample group of teachers and pupils. In 1988 this method was applied to 5,500 students and 420 teachers.

---

---

**Box 7: SIMCE (Chile)**

---

### **SIMCE**

In Chile the **System for Measuring the Quality of Education (SIMCE)** is currently being used for the systematic collection in the country's educational establishments of objective and reliable information on the performance of students and other aspects of their education. The information is processed and passed on to all the parties involved in the education process. In order to measure the quality of education, SIMCE uses the following indicators:

**Personal development:** This indicator provides information on the pupil's perception of himself in various aspects of school life, such as: self-image (how a pupil sees himself), self-esteem (degree of satisfaction with his image) and self-ideal (how he would like to be). Each of these variables is related to four factors in the child's development: physical maturity, school performance, interaction with peers and adaptation to school.

**Acceptance of educational efforts:** This is based on opinion polls conducted among pupils, their parents or guardians, and a sample group of teachers, which are used to measure their satisfaction with regard to the educational service provided by the school.

**Achievement of academic objectives:** This indicator refers to pupils' command of basic areas of knowledge included in the official curriculum. It is measured by testing in mathematics and Spanish (including a written test), history and geography and the natural sciences.

**School efficiency:** This indicator is based on figures obtained regarding promotion to higher classes, repeated classes and withdrawals, as well as the average number of years pupils remain at the stage of education in question. The data are drawn from the information filed by the Ministry of Education in connection with its normal procedures and statistical work.

---

(c) The **geographical location** of the problem noted. This location may initially be only approximative; its boundaries will be defined more clearly as a result of the progressive levels of analysis.

(d) Details of **how the problem was detected**. In this regard, it will be necessary to check whether the information is reliable and to ascertain its source, how up-to-date it is, how often it is generated, and so forth.

(e) An indication of **how long the problem has been in existence**. If the situation is not a recent one, it will be necessary to estimate how long it has persisted and to check whether it has been the subject of a previous initiative. If action has already been taken to deal with the situation, it will be important to know when that action was taken, whether there is any information on the results achieved and what the results were. It is most likely, if any action has been taken in the last five years, that it will have been a partial solution or will have dealt with the immediate problem or, in the worst case, that it will have been a poor solution. It is important to learn from the experience of those who identified, designed and implemented the solution and the diagnostic analyses or studies carried out at the time.

(f) Finally, in order to describe and outline the problem it is very useful to **place it in its immediate context**, i.e. to give a brief indication of the socio-economic and cultural features of the population, geographical factors, and so forth.

## 2.5 The "Problem Tree"<sup>7</sup>

The "problem tree", or causes and effects tree, is a simple but excellent tool for identifying the chain of effects of the problem and the causes that trigger it. It is a diagrammatic representation, from the bottom up, of the effects identified as being the result of the problem (**EFFECTS TREE**) and, from the top down, of the causes seen as the source of the problem (**CAUSES TREE**).

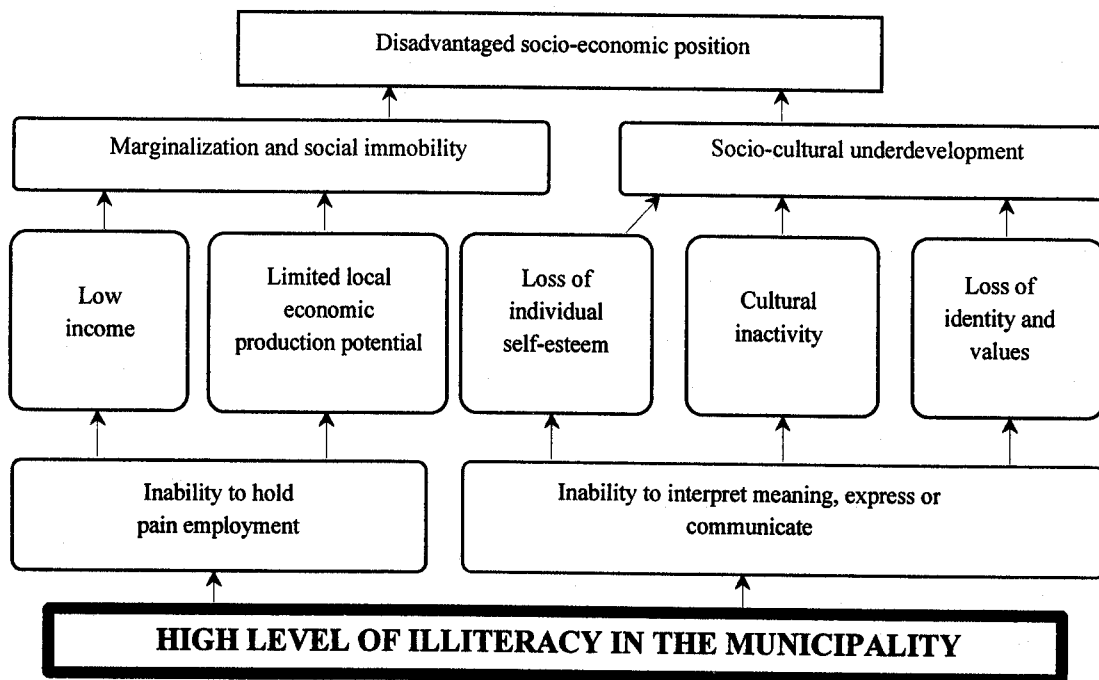
The following instructions can be followed to construct an effects tree:

- (i) Draw a box for the description of the problem identified.
- (ii) Right above this, indicate the direct or immediate effects of the problem. Each effect arises from the problem, and this relationship is represented by an arrow from the problem to each immediate effect.
- (iii) For each "first level" effect indicate any important further effects that may derive from it. Represent these as a second level, with arrows going up to them from the first-level effect that is their cause. If an effect is caused by another first-level effect that has already been indicated, show this interdependence by means of an arrow.
- (iv) Continue in the same manner, for successive levels, up to what is considered the highest level in the institutional sphere in which we have competence or have scope for taking action.

---

<sup>7</sup> This point is adapted from a section of Sanin (1992).

### Example 7: Effects Tree

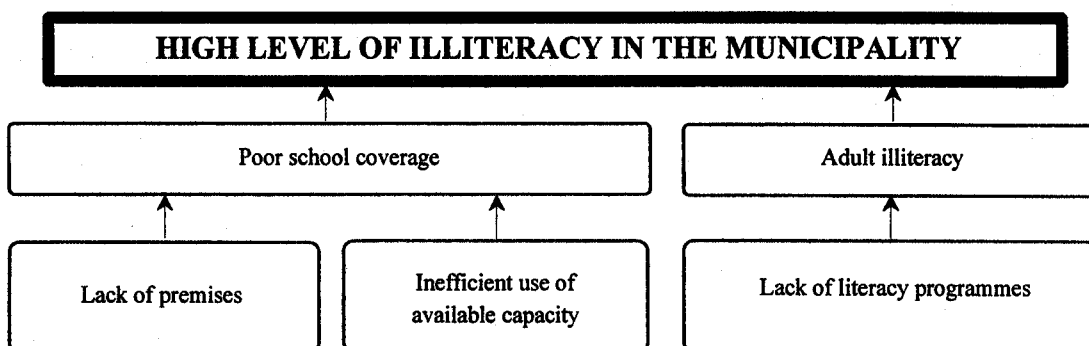


Clearly, this is a problem of cardinal importance for the municipality and one whose solution warrants the investment of efforts and resources.

A causes tree is constructed by representing, from the bottom up, the possible causes of the central problem. We then look for the causes of the causes, thus building an interlinked tree.

In principle, creativity should be given free rein. A good definition of the problem, in which its causes are examined without prior restriction, will increase the likelihood of finding successful solutions.

### Example 8: Causes tree



If we combine the "effects tree" with the "causes tree" we produce a "Problem Tree" (see example 9).



## 2.6 Scale of the problem

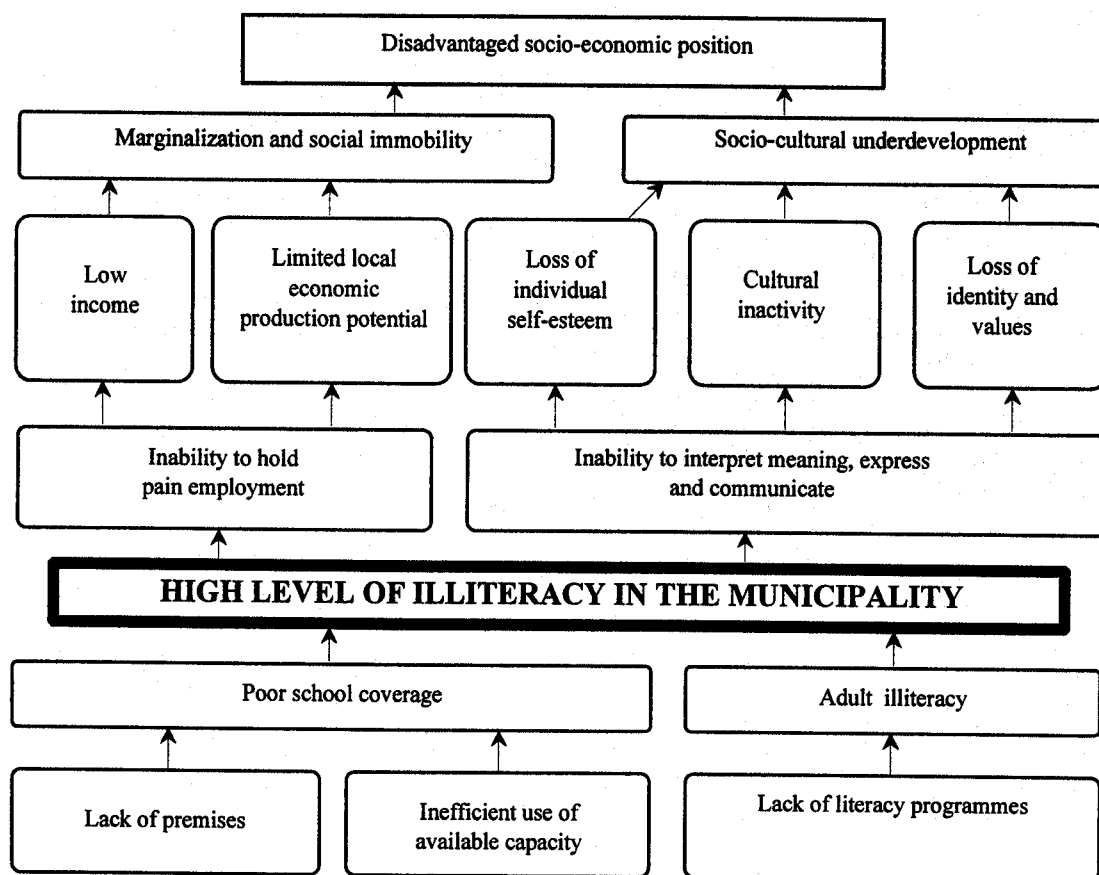
Establishing the scale of the problem identified is a fundamental factor in demonstrating the urgency of a particular situation. The following basic issues need to be settled:

(a) There must be a clear idea of **who detected the problem**. Normally, when a problem has been raised by the population directly affected, it is because the situation has not been dealt with at a higher level and its consequences are being clearly felt. If the situation in question has been identified by other agencies, it is important to know how it is perceived by those directly affected, e.g. teachers, parents or guardians, neighbours, etc., in order to gain a view of the situation from within the system.

(b) There must be a priori determination of the sector of the **population affected** and its socio-economic and cultural features.

(c) If relevant, the indicators that reveal the existence of a problem **should be compared with parameters**, whether they be international, national, regional and/or local.

### Example 9: Problem tree



#### **Example 10: Use of educational indicators**

---

*If an urban community has an average level of illiteracy among young people of 9.9 per cent, whereas the illiteracy rate for the population in the region is 6.7 per cent and the national rate is 5.4 per cent, there is clearly a problem that needs to be tackled.*

*If, in addition, this situation were corroborated by a social survey showing that illiteracy is a problem affecting the rural population in particular, with greatest impact on women and low-income and older age groups, the problem would be even more serious.*

---

(d) A calculation must be made of **how long the problem has existed** and an estimate of how much longer things can be allowed to continue as they are. This will indicate the urgency or otherwise of finding a solution to the problem noted.

#### **Example 11: Urgency of the problem**

---

*Cases of typhoid fever are noted periodically in a school. The public health authority found that the main cause of the infection lay in the poor sanitary conditions in the establishment. It therefore decided that the kitchen and toilets should be relocated as a matter of urgency.*

*It is clear that this is a problem that should be resolved with the urgency indicated by the authority, but the cases of illness continue to occur. The health service could even shut down the establishment on the grounds that it fails to fulfil the minimum conditions for its continued operation.*

---

### **2.7 Expected impact on the problem**

The essential issue here is to forecast what would happen if action to solve the problem were not taken. It is important to consider the following points:

(a) The **education services which will not be provided**, those which are being provided but not under the best conditions, and/or those which will have to be suspended in the short term if the project is not implemented.

(b) A comparison should be made between the currently affected population sector and the **sector that could be affected** if no action is taken. Such a comparison is normally made with the help of experts or by consulting existing technical reports.

### 3. DIAGNOSTIC ASSESSMENT OF THE CURRENT SITUATION

*The objective of this chapter is to set out the guidelines for making accurate diagnostic analysis. It offers some principles for identifying the area providing the framework for the analysis. It explains how to determine and analyse the demand for education in the service area of and the coverage provided by the education system. Finally, it shows how to ascertain the education deficit in the area analysed.*

#### 3.1 Need for a diagnostic analysis

The preparation of any project designed to solve a problem in the education sector should begin with a geographical and socio-cultural diagnostic analysis of the area in which the project is to be implemented. This is a detailed analysis of the situation in the education sector in the area affected by the problem. The purpose of such an analysis is to acquire an overview of the situation, and the findings should provide an outline of the problem.

Its importance lies in the fact that the analysis will either corroborate or not corroborate the problem identified a priori, and the findings will help quantify the problem and establish its scale. Finally, possible alternative solutions to the problem will be developed on the basis of the findings.

**It is essential that the diagnostic analysis be carried out by a multidisciplinary team and with the participation of the body directly concerned by the problem, the administrators of the education system in the study area, experts (if necessary) and the affected community.** This will make for a more complete, extensive and accurate view of the problem. It will also assist and enhance the development of project options.

In general terms, development of the diagnostic analysis involves the following stages:

- Identification of the study area;
- Determination of the service area;
- Determination of current demand;
- Prediction of demand;
- Determination of current supply;
- Determination of education indicators;
- Calculation and prediction of the deficit.

#### 3.2 Identification of the study area

The following sections (3.2 and 3.3) explain how to identify the geographical areas to which analysis of the problem will be confined. For this purpose, two levels of analysis are defined; the first is called the study area and the second, the service area.

It is important to distinguish between these two levels of analysis because the first (the study area) is broader in scope, and establishes the reference boundaries within which the problem has a direct or indirect effect. The study area is therefore the geographical area that acts as a reference to put the problem in context, establishes the limits for analysis and facilitates implementation.

The service area, on the other hand, is more specific and generally narrows these reference boundaries down to the area where the problem has a direct effect on the population and where the possible solution should be implemented. Thus, the service area will generally be a part of the study area, although situations can arise where the two levels of analysis are equal, i.e. the study area is the same as the service area.

This section sets out the basic principles for defining the study area. First, the factors to be considered when identifying the area are analysed and, second, guidelines are given for drawing a map of the area clearly indicating the study area and its main features.

### 3.2.1 Characterizing, demarcating and defining the study area

A clear definition of the study area greatly facilitates accurate diagnostic assessment. This is the area which, in the first instance, specifies the geographical boundaries for establishing the size and scale of the problem under study.

If there is no educational establishment, the area that is not being served by the education system will be the reference point for identifying the study area. The study area will encompass all the establishments to which the beneficiaries in this area may or might have access.

If the problem lies in an educational establishment, this will be taken as the reference point to identify the study area. In this case, the study area will be the area in which alternative establishments are situated and the reference point will be the establishment causing the problem. The fact that an establishment may be considered an alternative means that the beneficiary population has or may have access to it.

In order to demarcate and define the study area, it is advisable to take into account the following points:

- Network of existing establishments;
- Relevant limits;
- Degree of accessibility;
- General characteristics of the study area;
- Administrative characteristics of the education system.

#### (a) Network of existing establishments

This network comprises all those establishments providing some kind of educational service in the area analysed, regardless of the way in which they are administered and financed. If there is an establishment that is causing the problem, this will also form part of the network and will be the focal point of the analysis; the study area will thus include the area affected by this establishment. However, if the problem is more general and has an effect on more than one establishment or specific area, the study area must be large enough to encompass the entire area affected by the network of establishments.

Some sources of information that help to identify the set of establishments concerned are as follows:

##### (i) *Statistics concerning the establishment central to the problem:*

When the problem is to be found in an establishment, statistics on student enrolment over recent years, information on the former establishment attended by new pupils and the pupils' home addresses are among the types of information of particular use in identifying the problem and alternative establishments.

#### **Example 12: Use of enrolment statistics in identifying the education network**

---

*A secondary school is severely overcrowded because all the available space has been used (A). An analysis shows that enrolment has increased significantly in the previous two years. A study of the background of the pupils who joined over that period shows that the great majority come from another secondary school (B) located nearby. It will therefore be necessary to study in detail the situation with regard to school (B), since the overcrowding in school (A) may be due to problems in the infrastructure of school (B) or the poor quality of teaching in that school.*

---

(ii) *Community statistics:*

Statistics at the community level, such as those from the most recent census or information on enrolment at educational establishments in the community, will help to identify which establishments may be considered part of the network.

**Example 13: Use of community statistics to identify the education network**

---

*In the previous example, a study of enrolment at all the secondary schools in the community shows that two further schools, one private and the other public, have also significantly increased their student numbers over the last two years. They should therefore be considered part of the network as the increase may be due to pupils who have transferred from school (B) or to the fact that school (A) is overcrowded. In other words, they are alternative establishments.*

---

(iii) *Interviews with the community:*

Where there are no other sources of information, or in order to supplement and verify existing data, surveys or interviews with community representatives may be used. These will endeavour to ascertain how the community perceives the problem and how it is being dealt with. This will not only help to identify the establishments to be included in the network, but will also generate ideas for possible solutions.

**Example 14: Use of interviews with the community**

---

*Interviews with the parents of pupils enrolled in the overcrowded school (A) over the last two years show that they moved their children because the level of teaching in the other school (B) was poor and there was no preparatory programme for university entrance examinations. This was reflected in the significantly lower percentage of university entrants from this establishment than from other secondary schools in the community.*

---

(iv) *Information at the regional level:*

When the education sector is administered at the regional level, or there are entities responsible for coordination at this level, it is helpful to check the information with that available in the region. This may be particularly useful with regard to problems which go beyond local or community bounds, as in the case of special education projects (specialized or technical education).

(v) *Statistics from the Ministry of Education:*

The Ministry of Education often has detailed information on enrolment at the country's establishments, including private establishments in several cases. This information may be particularly useful in identifying the private establishments that could be considered alternatives to public establishments in the study area, or in identifying the problem more precisely.

### Example 15: Use of statistics from the Ministry of Education

---

*Review of teacher training statistics filed by the Ministry of Education shows that teachers at the school with a large number of pupils who transferred to another school (B) have not participated in training programmes in recent years. This could be one reason for the poor quality of teaching in this school.*

---

#### (b) Relevant limits

Once all the establishments that make up the network of the study area have been identified, the relevant limits of the network should be set. These may be determined according to:

##### (i) *Geographical limits:*

Geographical features (lakes, rivers, ravines, hill ranges, etc.) in the study area may make access to the existing educational establishment(s) from a particular locality impossible (or too dangerous). In such cases, these geographical features will therefore determine the limit(s) of the study area.

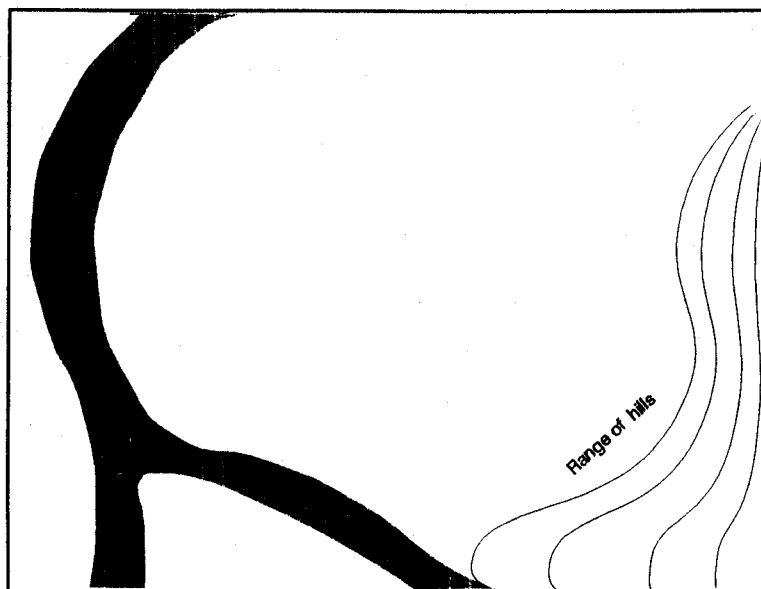
##### (ii) *Administrative limits:*

If the administration of the education system is decentralized, the community and/or regional limits will, to a large extent, determine the possibilities open to the education authorities to find a solution to the problems posed. These limits will also be important when, in accordance with ministerial guidelines, the population is required to attend establishments within its administrative area. However in this case, one project option might be to propose changes to the guidelines in force so as to improve utilization of the infrastructure or existing services in surrounding administrative areas.

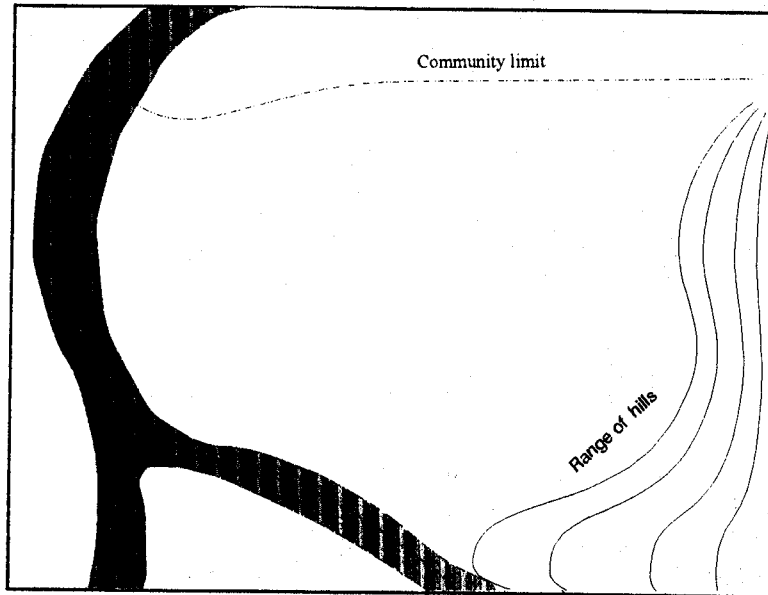
##### (iii) *Other limits:*

A busy highway, railway line, canal, airport, large enclosed property, etc. may limit the study area if they are very difficult or dangerous to cross. However, as in the previous case, a project option may still be found, namely a proposal to construct a bridge or walkway facilitating access to alternative establishments. In this case, the study area would extend beyond the geographical feature or obstacle.

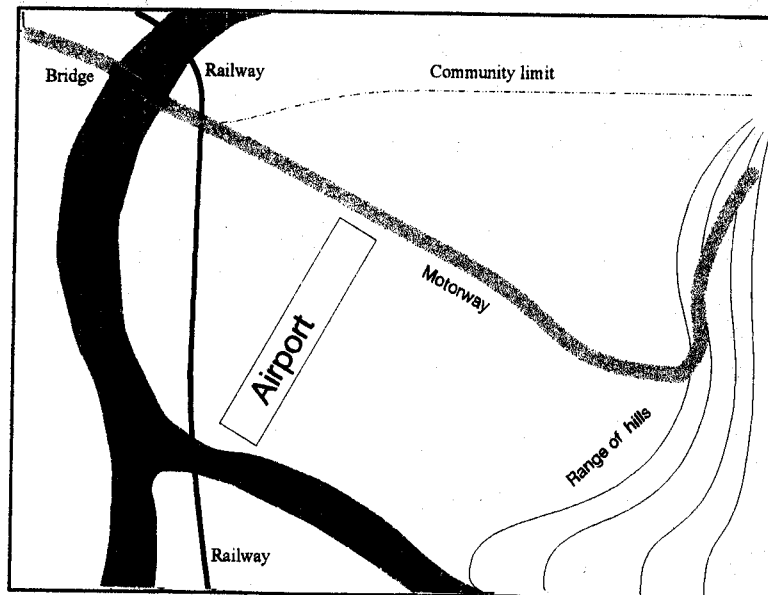
**Figure 5: Geographical limits**



**Figure 6: Administrative limits**



**Figure 7: Other limits**



**(c) Accessibility**

It is necessary to establish the accessibility conditions throughout the study area and, in particular, to note where there are difficulties. Accessibility is determined by the existing means of transport and the operation of the transport system in general. As a rule, accessibility is determined by:

**(i) *The existence and condition of access roads:***

This may be an extremely important factor, particularly in projects situated in rural areas where, even when the physical distances are relatively small, there may not be any communication routes or, if there are, they may be in such a poor condition that they are not fit for use.

**Example 16: Accessibility determined by the condition of the roads**

---

*A rural school serves pupils in a valley through which a river passes. The local inhabitants have built a footbridge to cross the river. However, every time the river swells heavily it damages or carries away the footbridge, preventing many pupils from going to school. As a result, the level of absenteeism in the school is significantly higher than the regional average.*

---

**(ii) *Public transport:***

In both rural and urban projects public transport may not be extensive or frequent enough to meet the needs of the school-age population. It may limit the study area or lead to the consideration of a project option aimed at improving the transport service. In this case, the limits of the study area will be extended as far as access can be reasonably assured.

**Example 17: Accessibility determined by available means of transport**

---

*The local authorities in a small rural town found out, through contact with the community, that there was a high level of drug addiction among the young people going to the secondary school (centre of secondary education) situated 60 kilometres away in the provincial capital. As the town did not have its own secondary school, the students had to travel to the provincial capital every day.*

*However, the public transport service made only one daily journey to the provincial capital at dawn, returning at dusk. The secondary school was open for lessons in the mornings, but was shut in the afternoons. As a result, pupils from the rural town wandered the streets in the provincial capital every afternoon, which made them particularly vulnerable to drugs and other behavioural problems.*

---

**(iii) *Public transport fares:***

In some cases, although a sufficiently extensive and frequent public transport system exists, the fares charged may prevent poorer groups of the population from using it. In this case, if it is not possible to reduce the fares, the study area will be confined to that area which is accessible with the means of transport used by the target population (for example, foot, horseback or bicycle).



(iv) *Climatic conditions:*

When studying accessibility conditions, the effect of the climate should be taken into account. Bitter cold, snow, high water levels, flood areas, and other such factors may cause accessibility to vary significantly from one season to another. If phenomena such as these occur often and there is no opportunity to avoid them or reduce their impact, it will be necessary to restrict study area to areas sufficiently accessible throughout the year or during the period of project implementation when specific initiatives (such as a literacy campaign) are planned. However, it may also be appropriate to consider the option of altering the school calendar to take greater advantage of periods of mild weather.

**Example 18: Accessibility determined by transport costs**

---

*In a South American capital there was a mixed public transport system where the buses were operated by private companies and the underground railway was operated by the public sector. Primary schoolchildren did not have to pay their bus fare, while secondary schoolchildren and university students paid a reduced fare. However, the underground did not offer discounts to students so that the safer and faster means of transport was only used by a minority of students. The vast majority had to use overground transport, where they were ill-treated by the drivers. As a result, the access of pupils living in the suburbs to secondary schools in the centre was limited as many parents chose not to put the safety of their children at risk by sending them on the bus and could not afford other forms of transport. Setting a reduced underground fare for students increased the demand for schools in the centre, some of which had spare capacity.*

---

(v) *Level of public safety:*

In some cases, the journey to a particular educational establishment or locality involves a high risk of attack or generally unsafe conditions for the pupils. In this case, if improving the level of public safety is not a viable option, the problem areas may have an effect on the limits of the study area.

**Example 19: Accessibility restricted by a low level of public safety**

---

*A secondary school in a city trouble spot had a high drop-out rate. Interviews with the parents of those pupils who had left the school indicated that the frequent attacks on students and teachers in the vicinity of the premises was the main reason for their decision. The problem was solved by greater police presence in the area, with the result that the school's catchment area was enlarged.*

---

(d) **General characteristics of the study area**

Knowledge of the characteristics of the area and population is necessary in order to accurately define the study area. Some characteristics that should be specified are:

(i) *Type of zone:*

It is necessary to specify whether the zone in question is urban, rural or mixed. Whatever the case may be, the population density in the area should be indicated, sector by sector if necessary.

### **Example 20: Changes in demand due to changes in the regional economy**

---

*A sharp drop was registered in the enrolment of new pupils at an agricultural school. Studies performed showed that a powerful wave of industrialization had swept across the whole zone, transforming vast swathes of farm land into industrial estates and housing. Thus, the area went from being rural to urban, with a consequent reduction in demand for instruction in subjects relating to agriculture.*

---

#### **(ii) Socio-economic status of the population:**

When specifying the socio-economic status of the population in the study area, factors such as income brackets, housing conditions, levels of schooling by age group and family composition should be taken into account. In general, all of these factors may influence or determine identification of the area. In this connection, information from socio-economic surveys or censuses is useful.

### **Box 8: The REDATAM+ Programme**

---

#### **REDATAM+**

The REDATAM+ Programme (REtrieval of DATa for small Areas by Microcomputer) was developed by CELADE (Latin American Demographic Centre) in response to countries' requests to access information quickly and cheaply on population and housing in small geographical areas.

REDATAM+ may be defined as an interactive and user-friendly computational system, based on microcomputers, which permits access to statistical files organized according to geographical area. These statistical files generally relate to country censuses or large files of demographic surveys or other types of socio-economic survey. The programme's main purpose is to organize and keep up these extensive files as far as possible with the limited capacity of a microcomputer so that statistics can be generated in tabular or other form for geographical units as small as cities, districts or blocks, or any grouping of such units.

The potential of REDATAM+ derives largely from the fact that it can be linked up with Geographical Information Systems. The alphanumeric information obtained may thus be expressed in map form, showing, in territorial terms, the most relevant socio-economic characteristics of a community or factors pertaining to its physical infrastructure.

---

#### **(iii) Location of the population according to socio-economic group:**

Even where there are no geographical limits or physical obstacles that help to define a study area, the area may be limited by the location of the population whose problem is to be solved. It is important to know the population distribution according to socio-economic group in the study area and to define homogeneous areas accordingly, indicating the number of inhabitants in each case. At all events, this dimension of the problem should be considered in conjunction with accessibility, since some of the population in need may be excluded owing to their lack of access.

### **Example 21: Changes in demand due to shifts in the location of a population**

---

*A State school built thirty years ago to serve extremely poor groups in a riverside community had serious infrastructural defects, and funding was requested for their repair. However, a study of the socio-economic characteristics of the population showed that the extremely poor inhabitants had disappeared three years previously and families with medium-high and high incomes were now living in the area. The pupils no longer came from the riverside community, but from new settlements several kilometres away. Consequently, the project was scrapped, the school grounds were sold and the proceeds were used to build a new school in the area where the pupils actually lived.*

---

#### **(iv) Infrastructure of the zone:**

It is also appropriate to ascertain the state of the area's infrastructure. Factors such as the availability of drinking water or sewerage systems will affect public health, while street lighting and police and fire stations will have an effect on public safety. All this will influence access to the establishment and the quality of the service provided.

#### **(v) Cultural aspects:**

It is important to analyse customs and other local aspects of culture that may influence the limits of the area analysed. Traditional costume, local dialect or language, the question of whether mixed classes are possible, the relationship of parents and pupils with teachers, and other such factors are considerations which should be studied, particularly when the problem perceived is to be found in or extends over areas with ethnic groups other than the nationally predominant group.

### **Example 22: Importance of cultural factors**

---

*In a supplementary school meals programme, students in a high plateau zone were given school lunches. The diet was based on recommendations issued by the central authority and included meats, vegetables, dairy products and fruit widely consumed in the rest of the country. However staple foods in the diet of the inhabitants of high plateau villages such as llama meat, "quinua" and corn were not included. Consequently the pupils got used to a diet which their parents could not afford to give them. They rejected the staple foods offered at home and, as a result, showed signs of malnutrition. Some families actually stopped sending their children to school because of the effect on their sons and daughters. The problem was solved by including traditional food in the menu on a regular basis.*

---

#### **(e) Administrative characteristics**

Finally, it is necessary to know the way in which the network of establishments in the area is administered (central or decentralized government administration, private corporations, parents' associations, etc.). It is also useful to know how each establishment is funded. These considerations may have a significant effect on the feasibility of the possible solutions put forward to solve the problem.

### **Example 23: Importance of the type of administration**

---

*The importance of the type of administration and financing of an establishment is illustrated in the following real-life cases:*

**Case 1:** *In a Latin American country with a completely centralized education system, a school in a border area received the panes of glass requested five years previously to replace missing windows in the school. However, this school had been burnt down two years earlier and had been replaced by a new school.*

**Case 2:** *An association of industrialists in a highly industrialized working-class community were successful in their application to manage the technical training centre in the community. It was very run down and student numbers were low. As a result of the combined efforts of the association, the local authorities and the community, it is now one of the most modern in the country. All the places are filled and the students are virtually assured of jobs in local industry.*

---

#### **3.2.2 Map of the study area**

Once the aforementioned points have been analysed, all the information should be put on a map of the study area. This does not have to be cartographically accurate; a good drawing showing the following information will be sufficient:

**(a) The limits of the study area:**

Each limit identified should be indicated and the type of limit should be specified (geographical feature, administrative boundary, city boundary, etc.).

**(b) Location of the establishments comprising the education network:**

Each establishment in the education network identified should be indicated. The type of instruction given (pre-school, primary, secondary, academic courses or technical vocational training, etc.) at each establishment (State system, private, mixed, etc.) should be indicated and, where possible, the distances between establishments in terms of the travel time should also be recorded.

**(c) Location of the population:**

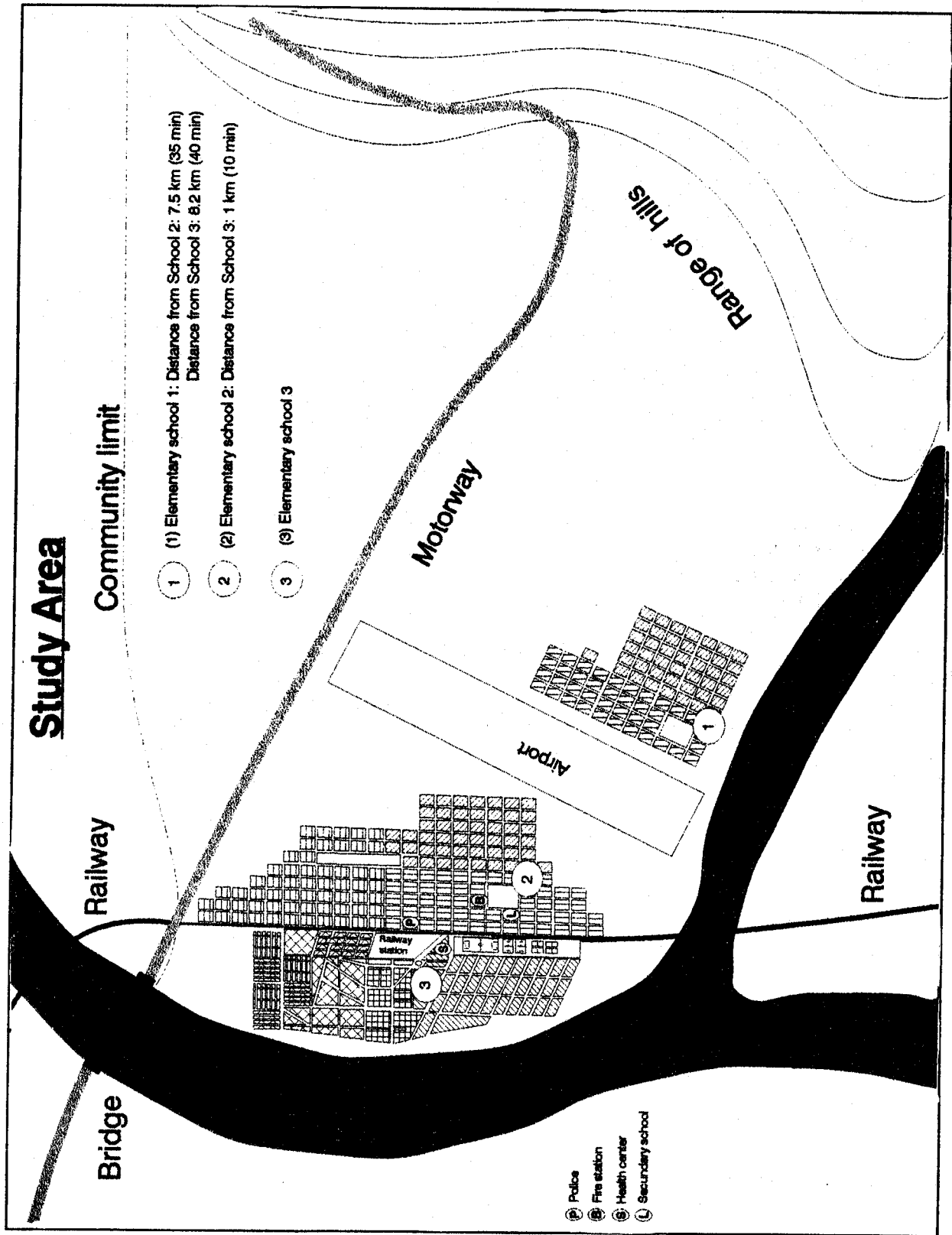
The location of the various population groups identified should be indicated together with the socio-economic classification, if possible. This may be done for blocks, residential units or other types of localities.

**(d) Access:**

The major communication routes used by the various population groups affected by the problem should be indicated. Where appropriate, their condition and the extent to which they are passable according to the climatic conditions or time of year should be noted.

Figure 8 gives an example of how a map for the study area might look.

Figure 8: Map of the study area



### 3.3 Determination of the service area

The service area of an education project is the same as the geographical area encompassing the network of establishments to which the beneficiaries have, or might have, access. In order to determine the limits of this area, some of the most relevant features of the educational service to be provided should be identified a priori, in accordance with the problem. In this regard, the fact that the beneficiaries actually have access means that the area identified meets the minimum requirements to enable the population to derive, without great difficulty, the benefits that the educational system seeks to offer, in accordance with the recommendations of the education authorities and the type of problem identified. Thus, the service area may be the same as the study area, or may be only a part of it, depending on the limits set for each.

As in the section on defining the study area, this section contains information to facilitate identification and definition of the service area. First, some of the factors to be considered when identifying the service area are enumerated; second, the way of indicating the service area on the map showing the location of the study area is explained.

#### 3.3.1 Determination of the service area

It is important to define the service area clearly, since this sets the boundaries within which a project may afford a **real solution** for the population affected by the problem. In order to identify this area, the following factors should be taken into account:

- Location of the affected population;
- Accessibility;
- Socio-economic status;
- Level and type of instruction;
- Administrative characteristics.

##### (a) Location of the affected population

It is necessary to know the geographical location of the population indirectly and directly affected by the problem. This information, taken together with the conditions affecting accessibility, will have a bearing on possible project locations.

---

#### **Example 24: Location of the affected population and determination of the service area**

---

*In the example of the school that was overcrowded after receiving pupils from another school (example 12, page 24), those directly affected were the people served by the school with the poor standard of teaching. Those indirectly affected were those who had access to the educational service in the overcrowded school before the problem arose. In this case, the location of those who were directly and indirectly affected will significantly influence the choice of possible solution (for example, to increase the capacity of the overcrowded school or to improve the quality of the educational service provided in the other school).*

---

##### (b) Accessibility

The service area of a project should, as far as possible, cover a homogenous geographical area with good access conditions at any point. If these conditions are not met, attention should be given to the question of whether access can be facilitated to prevent this factor from affecting the educational service. Furthermore, the service area should have limits within which all those in the area identified have equal access.

### **Example 25: Accessibility and determination of the service area**

---

*The map in figure 8 (page 33) shows that the railway line bisects the city and makes travel between the two sectors difficult. However, this problem can be solved by constructing new crossings. The airport, on the other hand, leaves one part of the city completely isolated with no possibility of easy access. Thus, the service area of elementary schools (2) and (3) could extend beyond the railway line, but only as far as the airport.*

---

#### **(c) Socio-economic status of the affected population**

The service area should cover an area where the affected population has a uniform socio-economic status. This means that the levels of income of the majority of the population should be similar (within a specified range). This is to ensure that the proposed service is tailored to the needs of the people with this level of income.

#### **(d) Level of instruction to be given**

One factor possibly worth considering when defining the service area has to do with the different levels of study or subjects offered by the educational establishment, should the latter be identified as the source of the problem. It is also closely linked to the age of the population served.

### **Example 26: Level of instruction and determination of the service area**

---

*If an establishment is offering primary or elementary education, the age of those taught at this level will range from approximately 5 to 15 years. In this case, the area is normally established taking a travel time of 15 to 20 minutes as a point of reference, provided that the area is easily accessible (taking into account all possible ways of enabling and facilitating access). This presupposes that children of this age cannot easily travel from one place to another on their own, and that when they do so it is only very short distances that are involved. On the other hand, if the beneficiaries are pupils between 13 to 18 years of age in secondary education, the service area could be a locality, a community and even the entire region, depending on the type of instruction to be given and the geographical conditions of the area.*

---

#### **(e) Type of instruction to be given**

The type of instruction to be given is an important factor in defining the service area, particularly where special or non-traditional education is concerned, i.e., when the service offered relates to adult education, technical vocational training or special education (for people with learning difficulties, mentally retarded people or those at risk in their social environment, etc.).

In view of the fact that these are special cases in the education system, the percentage of the population requiring this type of attention is small. Therefore, attention is focused on a smaller number of establishments, which means that the service area is, in general, broader than that for an establishment providing normal education. In these cases, the service area normally covers one or more communities and, in some cases, a province or region. It all depends on the number of alternative establishments in the surrounding areas and the demand estimated a priori for the service.

**(f) Administrative characteristics**

When the study area is not the same as the service area and, particularly when the latter has different administrative characteristics, it will be essential to consider the scope of administrative action in order to establish the service area of the project. This may arise in cases where administration of the education system has been decentralized.

**Example 27: Administrative limits and determination of the service area**

---

*In some Latin American countries, administration of the education system has passed to the municipalities as a result of decentralization. In this case it will be important to take into consideration the limits within which the administrative authority responsible for the project will have direct influence when identifying the service area.*

---

**3.2.2 Map of the service area**

In order to identify the service area of the project on the map of the study area that has been drawn, the following are necessary:

(a) As previously mentioned, some characteristics of the educational service to be provided through the project should be defined a priori, in accordance with the problem detected. These usually include defining the target population and the age of this population, the type of instruction to be given and the method to be employed, etc.

(b) The geographical area corresponding to the service area to be covered in accordance with the facts established under the previous point should be indicated on the map of the study area.

(c) Checks should be made to ensure that the area identified in paragraph (b) is easily accessible throughout the area so that the whole of the target population can travel easily to the establishment in question. If this is not the case, the conditions to be improved to make the target population's access practical and possible should be identified.

All of the information from the three previous paragraphs should be shown on the map of the service area, which should clearly identify the geographical limits, access roads, educational establishments (of whatever type) and the distances in time between the establishments or between the establishments and the area in which they are lacking (see figure 10).

**3.4 Determination of current demand**

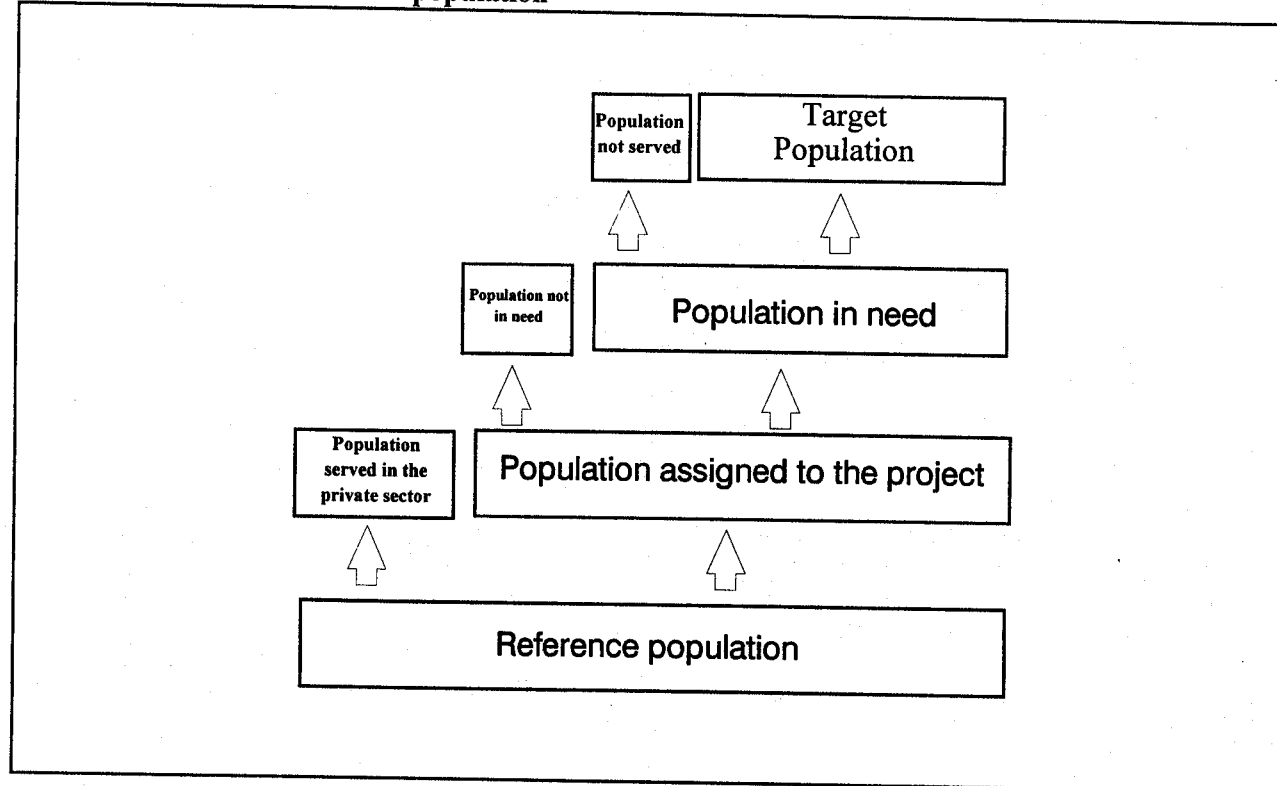
In the case of the education sector, demand is understood to be the total population requesting the educational service. In this connection, a distinction should be drawn between the following concepts:

(a) **The reference population:** The entire population in the service area. Establishing and predicting the size of this population are the basis for determining population subgroups defined below.

(b) **The potential population:** The subgroup of the reference population displaying the minimum characteristics rendering them eligible to request the type of educational service that is to be provided by the project.



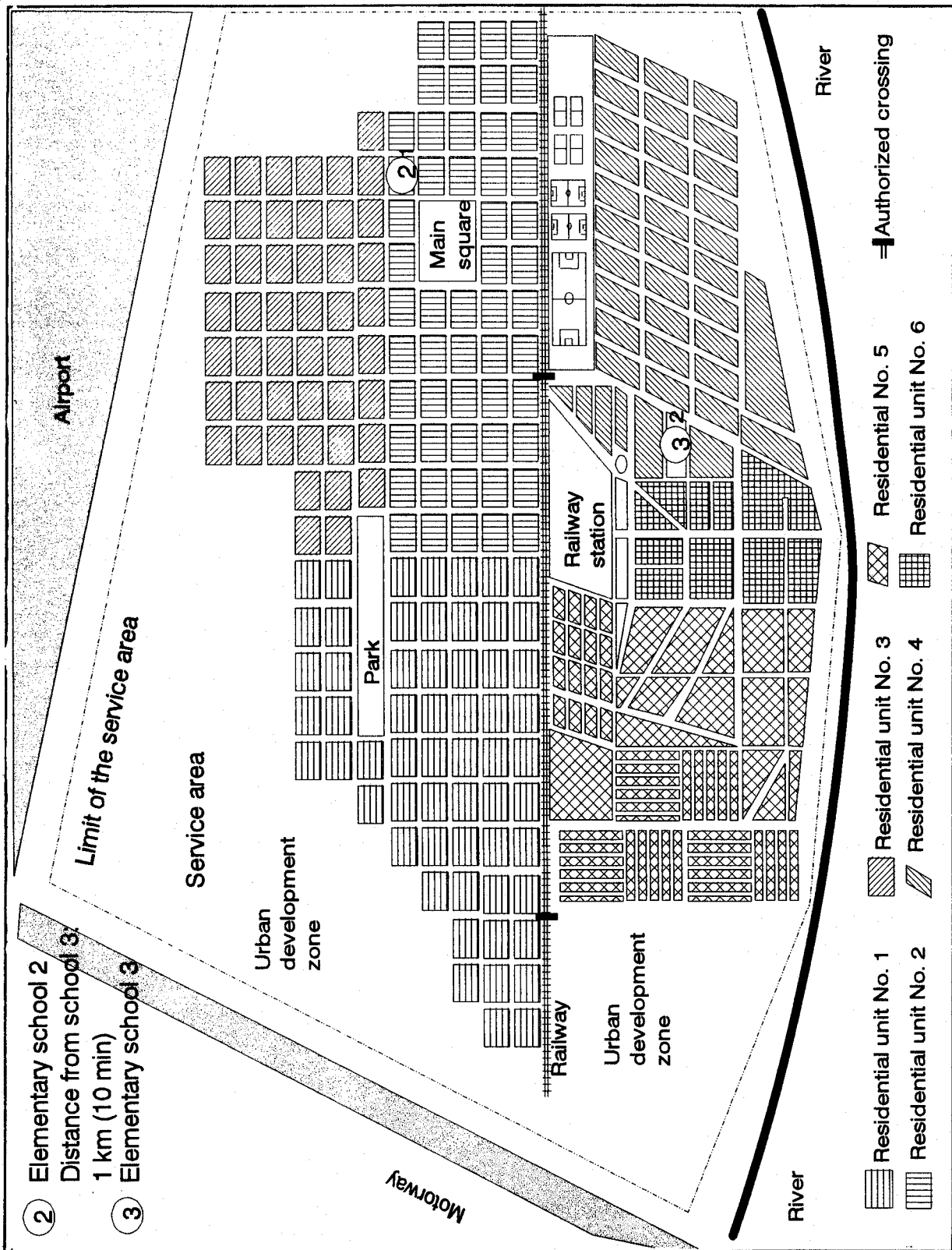
**Figure 9: Classification of the population**



(c) **The population in need:** Within the potential population, the population affected by the problem (population in need) may be distinguished from the population not affected by the problem (population not in need).

(d) **The target population:** The target population is obtained from the potential population affected by the problem. Thus, the target population is the group whose problem it is, ultimately, that needs to be resolved. The policies pursued by the Government in channelling social expenditure are an important factor to be considered in determining the target population. They will indicate Government priorities, relative amounts to be allocated to different sectors of the population and the target groups requiring special treatment (children in extreme poverty, the disabled, etc.). The current policies determining government spending on social programmes may lead to the target population being narrowed down to that part of the population in need whose needs can actually be met (see example 28).

Figure 10: Map of the service area



### **Box 9: The concept of “focusing”**

---

#### **FOCUSING**

By “focusing” we mean identifying as precisely as possible the population group intended to benefit from a project and ensuring that this is the group that actually receives the benefits. This is not always easy, particularly when information is limited. In focusing social expenditure, one of the three following approaches is normally taken.

**Individual profiles:** The authorities use pre-established criteria to classify each member of the population as “poor” or “not poor”, only the poor being eligible for the benefits of a project (see box 3, page 15, CAS File).

**Focusing by group:** Specific population groups identified according to geographical location, sex, age, ethnic origin or other general characteristics are defined as poor (or in need) and considered the target population of the project.

**Self-focusing:** This is an approach whereby the project is designed to bring about the self-selection of beneficiaries, such that the poor have access to the services while the better-off groups have no desire to use them because of their pride, the time involved or the inferior quality of the products compared with what is available on the market.

---

Some of the factors to be considered in order to determine demand are discussed below.

#### **3.4.1 When there is no education establishment**

As mentioned above, the fact that a need has been identified means that there is a gap that is not being filled by the education system. Either there are no education establishments, or there are subjects that are not being offered by the sector, or the network of existing establishments does not meet all needs. In these cases, the basic points to be considered in the study aimed at establishing project demand are as follows:

- Population in the service area and its location;
- Characteristics of the population;
- Characteristics of the area.

#### **Example 28: Reference population, potential population, population in need and target population**

---

*Let us suppose that the State elementary school in a small village has been found to be overcrowded and unable to accept new pupils. The study and service areas are the village and the surrounding rural area. There is only one alternative establishment, a private fee-paying school, which is also full. In this case the **reference population** will be all the inhabitants of the village and the surrounding rural area. The **potential population** will be the children of primary school age. The **population in need** will be those children who cannot enter the educational system because of the lack of places in the schools. Finally, the **target population** could be the children who are not being served by the system and are defined as poor.*

---

**(a) Population in the service area**

In this section the total population in the service area of the project is quantified. Analysis of this information will indicate the "potential" beneficiary population, i.e. those who meet the requirements rendering them eligible for the type and level of education to be provided by the project.

**Example 29: Target population**

---

*In some countries the State has a constitutional obligation to provide elementary education to the entire school-age population. The aim, therefore, is to achieve 100 per cent coverage at the elementary education level. Thus, when there are no State or private schools in an area, the target population will be the same as the population in need and the same as the potential population.*

---

In order to determine the potential population, it is necessary to:

- Break down the population into age groups;
- Select from the total population the group meeting the minimum requirements to enter the educational services (for example, an age group);
- Establish the percentage that is not served, i.e. the population in need;
- Establish areas for attention, in accordance with the objectives set by the sector for different levels and subjects.

**(b) Characteristics of the population**

In the service area, characteristics of the population are examined as these enable the group of potential beneficiaries of the project to be further narrowed down, according to the conditions and requirements of the type of educational service and subjects to be dealt with. Socio-economic status is one of the features most commonly used to assess demand. In particular, level of income is normally used to classify the population.

The socio-economic level of the population is one of a number of indicators which are important for:

- Assessing the real prospects for the population of gaining access to educational services other than those to which they currently have access;
- Exploring different possible sources of funding (public, private, mixed, etc.);
- Identifying the means of transport used or to be used by the beneficiaries in order to travel to the educational service;
- Defining the form of support to be given to special programmes and the emphasis to be given to the education service.

Furthermore, as has already been mentioned, it is important to have a good knowledge of the cultural fabric of the population, particularly when there are a significant number of minority cultures in the country. This will help in identifying viable and sustainable project options (see example 30).

**(c) Characteristics of the area**

The characteristics of the area corresponding to the service area of the project are another important factor to be studied. One variable to be taken into account is accessibility, which, as mentioned earlier, may be affected by the existence and condition of access roads and means of transport. The economic geography of the zone should also be taken into account.

### **Example 30: Demand and characteristics of the population**

---

*It has been established that a significant percentage of young people in the rural part of a region are of a suitable age to enter technical vocational education. In order to meet this need, plans are made to extend the existing education establishment in the regional capital. However, a study of the demand shows that the majority of the potential population live in extreme poverty and could not afford the daily return travel to the establishment, let alone the cost of the children's stay each day in the city. Furthermore, it is customary in the region for young people to help with agricultural work, and parents attach little value to formal education. Consequently, were these factors to be disregarded when developing the project, the actual demand would very likely be practically zero.*

---

### **Example 31: Demand and characteristics of the area**

---

*Plans are made to increase the capacity of an elementary school in a mining village. Many classrooms had to be shut owing to the damaged infrastructure and the rest, which are in good condition, are almost full. The population in the area basically depends on work from the mine, which reached its maximum production level two years ago. A gradual reduction in the volume of ore processed is predicted with the mine reaching depletion point within five years. This indicates that the demand for elementary education will also be reduced and that repair of the damaged classrooms is therefore not justified.*

---

#### **3.4.2 Where an education establishment exists**

In order to determine demand in the case of an establishment with certain shortcomings with regard to the service provided, the basic factors to be considered are as follows:

- Total enrolment at the establishment presenting the problem;
- Characteristics of the enrolled students;
- Geographical provenance of enrolled students;
- School-age population in the service area;

#### **(a) Total number of pupils in the establishment presenting the problem**

The total number of pupils should be broken down according to grades, the number of subjects offered at each grade, the number of school days and the number of teachers per grade. Special attention should be given to ascertain whether the problem has had the effect of reducing the number of pupils at the establishment over recent years or whether, owing to the problem, the rate of growth of the enrolment has been less than the actual growth in demand.

Where it is suspected that the problem has indeed affected enrolment at the establishment, it is important to analyse enrolment at those establishments that may be considered alternatives to the establishment where the problem exists. In order to record the composition of the roll in the establishment, it is suggested that a table such as that given in table I should be filled out for each period of the school day (morning, afternoon and evening).

**Table I: Breakdown of student roll in the establishment**

Establishment:		Day:	
Grade	No. of courses	Roll	No. of teachers
Total:			

**(b) Geographical provenance of students**

It will be necessary to pinpoint the location of the establishment presenting the problem, on a map of the service area, and to indicate where the students enrolled in the establishment come from. This is designed to provide a clearer picture of the population and to enable accessibility to be assessed. It is also relevant to the choice of possible solutions.

**(c) Analysis of the student roll**

It is necessary to look at the socio-economic background of the students currently enrolled in the educational establishment, the educational level of the parents and/or guardians and dominant cultural features. This will help to define the conditions that the project should fulfil in order to solve the problem or to satisfy the need that has been noted, as well as to guarantee viability and sustainability.

**Example 32: Importance of analysing the student roll**

---

*It has been noted that the pupils of a school located in an economically disadvantaged area have obtained very poor results in national tests to monitor educational standards. A diagnostic analysis reveals that most of the parents of the children in question are illiterate, live in extreme poverty and do not return home until late at night. This means that the pupils tend to wander the streets in the afternoons. On top of this, those pupils who wish to do their schoolwork tend not to do it properly since they have no support. Consequently, any solution put forward to improve educational standards must incorporate ways of supporting the children in doing their homework.*

---

**(d) School population in the service area**

It is important to link the analysis to the rest of the school population in the service area, which essentially means the population of the age group under examination. The important factors are the size of the population, its location and where it is currently being served.

(e) **Other aspects to be considered**

It is also advisable to analyse, in general terms, each of the factors indicated in point 3.4.1 in order to build up an overview of the features of the area in which the establishment targeted by the project is located.

**3.5 Demand projection**

Projecting demand simply means estimating what will happen in the future with regard to the project's target population. In general, the information used to project demand covers a ten-year period, the length of time for which it is considered that a projection can be made with some confidence.<sup>8</sup>

For the purpose of projecting demand, current demand is understood to be the existing demand when the study is carried out. Demand at year one is taken to be the demand that will theoretically occur after one year of operation of the project.

In order to determine year one it is necessary to consider all stages through which the project has to pass, from formulation to implementation, with an estimate of the time required for each stage. The estimated year of implementation of the project is obtained by adding these time periods to the current date.

**Example 33: Determination of year one**

---

<i>Formulation of outline:</i>	<i>3 months</i>
<i>Project approval:</i>	<i>4 months</i>
<i>Architectural plans:</i>	<i>2 months</i>
<i>Engineering design:</i>	<i>2 months</i>
<i>Funding application:</i>	<i>6 months</i>
<i>Tendering of work:</i>	<i>2 months</i>
<i>Execution of work:</i>	<i>18 months</i>
<i>Equipment and provisions:</i>	<i>2 months</i>
<b>Total:</b>	<b>39 months</b>

*In this case, if we assume that we are currently in the last quarter of 1994, year one will correspond to 1998. This assumes that there are no fixed periods for items such as the applications for project approval or funding. Where such periods have been established, it will be advisable to indicate the probable start and finish dates for each stage in line with the periods set.*

---

Estimates are made for years one and ten of project operation, as follows:

(a) It is necessary to indicate the calendar years corresponding to the year in which the study is carried out, the year in which the project will begin to operate (year one) and the year corresponding to the tenth year of operation of the project (year 10).

(b) If a problem is detected in an area in which there is no educational establishment, it will be necessary to use the annual growth rate of the population in the area in question. This should be obtainable from the agencies that deal with population statistics in the country. If no specific rate exists for the service area, it will be necessary to consider the rate for a larger area that includes the area under consideration and is representative of it. If no annual population growth rate is available but only census information for certain years, the growth rate may be estimated using the following equation:

---

<sup>8</sup> The methods of projecting demand indicated here are among the easiest to apply and are usually adequate for preparing a project outline. There are far more accurate (and complicated) methods, which should be used if greater accuracy is required in the projection or if external factors may cause the projection to fluctuate strongly. Further information can be found in CELADE (1984) and CELADE/INE/CIDA (1991). A good example is the case described by Zamorano and Jorrat (1993).

$$GR = 100 * \left( \sqrt[N]{\frac{\text{Final population}}{\text{Initial population}}} - 1 \right)$$

where: N = number of years between the two sets of population data used

GR = gross rate

#### Example 34: Calculation of the population growth rate

Population in 1980: 3,500 inhabitants

Population in 1990: 4,900 inhabitants

Number of intervening years: 10

$$GR = 100 \times \left( \sqrt[10]{\frac{4900}{3500}} - 1 \right) = 3.42\%$$

If a problem is detected in a specific establishment, it is also helpful to calculate the rate of increase of student enrolment at the establishment presenting the problem. This rate may be calculated by examining the average level of enrolment in recent years. The minimum period considered is usually three years. The rate of increase may be calculated using the same method. Nevertheless, this method must not be used if the student roll has been appreciably affected by the problem. As a rule, it is used only as additional reference information.

(c) In projecting demand it will be necessary to take account of the population to be served (the population calculated in the year in which the study is conducted) and the annual growth rate of the population or the rate of increase of enrolment (if this indicates anything special).

The demand projection will be calculated in the following manner:

$$P_x = P_0 * \left( 1 + \frac{GR}{100} \right)^x$$

where:  $P_x$  = population projected for year x

$P_0$  = most recent population

GR = annual growth rate (as a percentage)

x = number of years between that corresponding to  $P_0$  and the year for which the projection is to be made.

#### Example 35: Population projection

Let us consider the following information from examples 30 and 31:

Population: 4,900 inhabitants in 1990

Annual growth rate: 3.42%

Current year: 1994

Year 1: 1998

Year 10: 2008

This will yield:

$$P_1 = 4900 \times (1 + 3.42/100)^8 = 6414$$

$$P_{10} = 4900 \times (1 + 3.42/100)^{18} = 8979$$

In other words, the population estimated for 1998 will be 6,414 inhabitants and for the year 2008 will be 8,979 inhabitants.



For the purposes of the projection, it is very important also to consider certain features of the area that may bring about an increase or reduction in demand in the future. These may include:

- Whether it is a built-up area or one with an expanding population;
- Whether the area is undergoing urban expansion;
- Whether any migration is taking place (for example, as a result of the closure or opening of any source of employment);
- Whether there are any plans to regulate the area which may establish rural, urban or other limits that may affect population growth.

**Example 36: Need to adjust the projections in certain cases**

*If the service area includes a zone designated for urban expansion, this will very likely be the focus of city growth. Consequently, the rate of population growth in the service area will be greater than the rate of population growth in the city as a whole (assuming that the service area covers only part of the city).*

*In such cases, it is advisable to consult the authorities responsible for urban development and/or housing in order to find out about any building plans in the area (number and type of dwellings). This information will make it possible to adjust the estimated growth rate or the estimated population in year one or year X (for example, year 10).*

All the information collected and the estimates made must be set out in a demand table of the kind indicated below:

**Table II: Current and projected demand**

Age group	Current population	Projected population	
		Year 1	Year X
Total			

### 3.6 Determination of current supply

The supply situation in the education system, in the service area, corresponds to the level of service provided at the time the study is carried out. This will depend on the existing infrastructure and equipment, and the available human and financial resources.

The analysis of current supply will vary, according to whether a problem has been detected in an area in which there is no educational establishment, or whether the problem is located in a specific establishment.

### 3.6.1 If there is no educational establishment

If there is no educational establishment, supply will consist of the infrastructure and the educational services that are currently being offered in the service area. In this case, it will be necessary to gather information on all the establishments in the area, regardless of type of administration and funding. The following information is needed in order to analyse supply:

- Features of the establishments in the area;
- Features of the area;
- Features of the education service.

#### (a) Features of the existing establishments

In general terms, it is necessary to have details of the physical facilities, the type of education provided and the way in which all of the establishments in the service area are administered. The purpose of this is to define the installed capacity in the area and its condition and also to ascertain the type of service that the system is providing. It will thus be possible to identify those establishments that offer real scope for solving the problem noted (see example 37).

The following information is needed for each establishment:

- (i) *Geographical location:* The location of each establishment in the service area should be indicated on the school-location map.

#### **Example 37: Features of the population and supply to be considered**

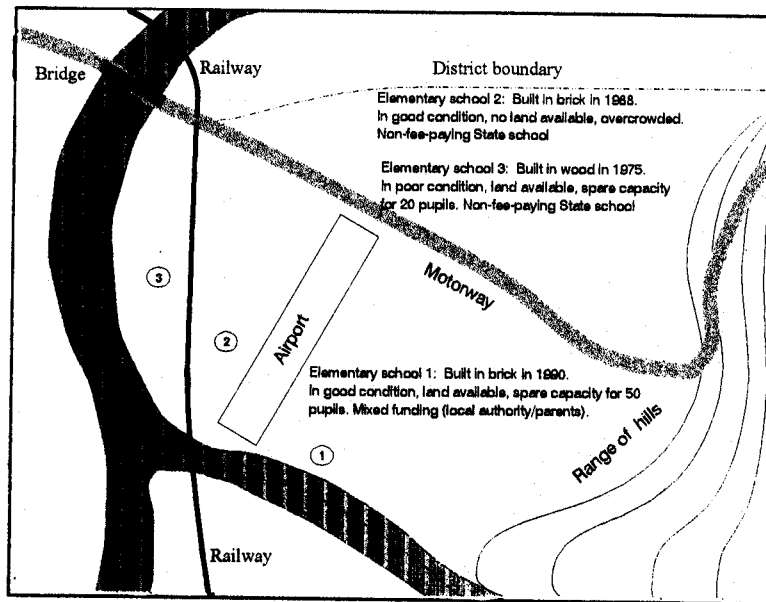
---

*In a district overspill area plans have been made to build a large volume of subsidized housing for low-income families. In this situation, it will be necessary, in investigating the current supply offered by the establishments identified as genuinely having the potential to satisfy all or part of the need detected, to identify those that are free of charge, those that have spare capacity or land available for expansion and those that are located near to the population so as to minimize the transport costs.*

---

- (ii) *Year of construction and material used:* The year in which each establishment in the area was built should be indicated and shown on the map. The material used (adobe, wood, brick, etc.) should also be indicated. If different parts of the establishment were built in different years, the surface area, features, purpose and year of construction should be indicated separately for each part. It is important to indicate the construction characteristics of the establishments, since the type of building material used will have a great impact on the installations' useful life.
- (iii) *Type of administration and funding:* The institution responsible for administering each establishment should be identified. It is also necessary to indicate whether it administers other educational establishments, together with its independence status and management capability. The type of funding (State, private or mixed) should also be indicated.
- (iv) *Existence and availability of land:* The ownership of the land currently used by the educational establishments, as well as the availability of land in those establishments for future expansion, should be investigated. It is also advisable to look into the availability of other land or buildings that could be used to increase the supply of educational services.

**Figure 11: Location map and features of supply**



- (v) *Existing surface area and general condition of the building:* The capacity of each establishment and the general condition of its infrastructure should be indicated. In addition, the installed capacity of each establishment should be compared with the number of students enrolled so that the spare capacity (or saturation level) of the service area can be estimated.

It is advisable to indicate all the features mentioned above on a plan of the establishment.

**(b) Features of the area**

The purpose of examining the features of the area in which supply is to be provided is to discover any possible present or future factors which may have an impact on the project. Among these features the following, at the very least, should be examined:

- (i) *Availability of services:* The availability of utilities, such as electricity, water, sewerage and telephone, should be examined. The existence of public services, such as health care and communications, should also be examined.
- (ii) *Public safety:* The public safety situation that may affect the supply provided by the network of establishments should be examined. For instance, inadequate assurance of public safety at night will make it impossible to use some establishments for evening classes.
- (iii) *Access:* The existence and condition of access routes in the area in question should be studied. It is also a good idea to look at the availability and characteristics of public transport and to investigate how access might be affected by climatic conditions.
- (iv) *Environmental health conditions:* It is also important to look into the existence of solid-waste (refuse) collection and disposal systems, possible carriers of disease (rats, mosquitoes), bad smells, air pollution and noise pollution. This should include sectors close to the available areas of land which could be used as alternative locations for the project, or which are located in the service area and may have a direct or indirect impact on the operation of the project in the future.

### **Example 38: Supply restricted by access conditions**

---

*In a rural area the public transport service runs twice a day, but is suspended when it rains because of the mud on the roads.*

*Since it is a high-rainfall area, the establishments that can only be reached by public transport do not provide adequate coverage to satisfy needs (and cannot do so unless a road-surfacing project is envisaged).*

---

#### **(c) Features of the education service**

The type of education provided by each establishment in the service area (pre-school, elementary, secondary (arts and sciences), secondary (technical-vocational), special, adult, etc.) should be indicated and any establishment providing non-standard, special or experimental programmes should also be specified.

##### **3.6.2 If there is an educational establishment**

If an educational establishment exists, the current supply will be that provided by the establishment presenting the problem. It will be dependent essentially on the infrastructure and services of the establishment. Here, the following factors should be considered:

- Geographical location of the establishment;
- Features of the physical facilities of the existing establishment;
- Administrative features of the establishment;
- Type of education it provides;
- Features of the immediate vicinity.

#### **(a) Geographical location of the establishment**

The location of the establishment presenting the problem should be indicated on the map of the service area. This is important because it provides a point of reference for the location of the educational service in relation to the population affected by the problem that has arisen in this locality. It also makes it possible to gauge whether the location of the establishment has any impact on the problem noted.

- Location of the problem;
- Access route and means of transport.

#### **(b) Features of the physical facilities**

The following information (where relevant), at least, should be indicated with regard to the physical facilities of the establishment presenting the problem:

- (i) *Year in which the establishment was built and the material used:* An indication should be given of the year in which the main building of the educational establishment was built and the subsequent years in which appreciable investment was made in the building. For each sector, the type of construction material should be specified.
- (ii) *Original purpose of the building:* If the building occupied by the establishment was not originally built for its present purpose, it will be necessary to indicate the current functional features of the building.

### **Example 39: Original purpose of the building and acceptable supply**

---

*An elementary school operates in a building originally designed as a residential property and its use is therefore limited by the shortcomings of the building. The school therefore lacks adequate ventilation or lighting in conformity with current standards, has inadequate sanitary facilities and has balconies which are a serious hazard to small children. Consequently, it could not be said that the establishment provides adequate coverage satisfying the needs of the community.*

---

- (iii) *Installed capacity of the building:* It is necessary to indicate the total area of the building and to indicate each of its sections, specifying its current use and surface area in square metres.
- (iv) *General condition of the building:* The state of repair of each part of the establishment should be graded as "good", "average" or "poor". These terms denote the following:
  - *Good physical condition:* This applies if the section in question only requires maintenance, e.g. paintwork in poor condition, blocked drains, broken window panes, etc.
  - *Average physical condition:* This applies if the damage or wear to the building can be put right with minor work, e.g. poor condition of the electricity supply system, worn floors, leaky roof, etc.
  - *Poor physical condition:* This applies if the damage to the building is irreparable, if there is damage to the structure of the building or if major work is required, e.g. walls collapsed or broken, roof about to fall in or incomplete, etc.

It is a good idea to seek the advice of a specialist in order to arrive at a correct description of each of the sections of the building. As a rule, this job can be done by the local public works department or by specialists within the education authorities.

- (v) *Equipment:* It is necessary to indicate the equipment in detail, specifying the type and number of the items (furniture, blackboards, heating units, etc.) and whether they are in good, average or poor condition.
- (vi) *Availability of utilities:* It is necessary to indicate whether the establishment is connected to electricity, drinking water and sewers. If it is not connected to the public mains, the alternative system used should be indicated, together with the prospects for future connection.
- (vii) *Features of the site:* The total surface area of the site and whether there is any scope for future expansion should be indicated. It should be specified whether the land on which the establishment is built is publicly or privately owned, rented, loaned for use, etc. The legal status of the land (registration, prohibitions, contracts, etc.) should also be specified.

#### **(c) Administrative features**

It is important to examine at least the following aspects of the administration of the establishment presenting the problem:

- (i) *Responsibility for administration:* The institution or organization that has responsibility for administering the establishment should be indicated. It is also important to describe the most important features of the administration, if possible ranking those features for comparison

purposes, e.g. by classifying the administration of the establishment as weak, average or strong. The rankings used in these classifications may be fixed by the sectoral authority for the country, region or district. It is important to stress the critical points of the administration of the establishment.

#### **Example 40: Problems caused by weak administration**

---

*An elementary school has a larger teaching staff than it needs to cope with the number of pupils. Nevertheless, it provides no extracurricular activities and the results achieved by the pupils in the tests for monitoring national education standards are poor.*

*Furthermore, there is no community participation in the school's activities and its operating costs are higher than those of comparable schools. It is therefore clear that the administrative capability of the management of this establishment can be classified as weak.*

---

- (ii) *Type of funding:* The type of funding available to the establishment should be specified, indicating whether it is public, private or mixed. If it is mixed, the funds should be broken down with some indication of whether they can be used freely or are pre-assigned for specific purposes.
- (iii) *Staff:* It is necessary to indicate the staffing of the establishment, according to the categories of teaching staff (teachers), administrative staff (secretaries, accountant, administrator, etc.) and ancillary staff.

#### **(d) Type of education**

The type of education currently provided by the establishment presenting the problem should be indicated. It is also advisable to specify whether any educational or other programme is being provided to support the traditional role of the establishment. Special emphasis should be placed on non-conventional initiatives, indicating any community involvement, target beneficiaries, and so forth.

#### **(e) Features of the immediate vicinity**

If any feature of the immediate vicinity affects the operation of the establishment, the feature and its impact must be specified. For instance, it is important to mention whether the establishment is located next to a factory that causes noise or air pollution, in a border area with restricted access, in an area with special cultural features, or the like.

Finally, information relating to the establishment, its equipment and its staff should be summarized in a table similar to table III.

**Table III: Features of the establishment**

Establishment:		Date:
Buildings		
Premises	Current surface area	Condition
Administrative area		
Teaching area		
Service area		
Covered passageways		
Open areas		
<b>Total</b>		

Equipment			
Premises	Type of equipment	Number of items in good condition	Number of items in poor condition
Administrative area			
Teaching area			
Service area			
Other			

Personnel	
Type	Number
Teaching	
Administrative	
Ancillary	

**(f) Other features to be considered**

It is also advisable to consider, in general terms, each of the factors mentioned in 3.6.1, so as to have an overview of the features of the area in which the establishment targeted by the project is located.

### **3.7. Educational indicators**

Educational indicators are values that are representative of a set of variables indicating features of a population, such as its educational, social, psychological and physical characteristics, which are of interest to the education sector.

By analysing the weighting assigned to specific indicators or groups of related indicators, it is possible to identify and quantify problems of coverage, efficiency and effectiveness in the education system in the service area. This is not always a straightforward calculation and, in some cases, it may be difficult to gather the required information. Nevertheless, the usefulness of certain indicators in a proper diagnostic analysis makes the effort worthwhile.

Annex 1 sets out different indicators that are widely used, including examples to help calculate some of them. Some indicators, such as coverage, average length of schooling of the population and the illiteracy rate, provide information on the overall educational situation in the area in question. Other indicators, such as increased cost, poor student performance and retention rate, are more useful in producing a diagnostic analysis of the situation in a particular establishment.

In order to interpret the indicators more accurately, it is advisable to have sets of values or indicators for other areas or establishments. If there is a set of values for a specific indicator, it will be possible to determine whether the problem is getting worse, is being solved or is unchanged. Similarly, if values for an indicator relating to other establishments or areas are available, it will be possible to assess the relative scale of the problem examined, in comparison with the other establishments or areas.

### **3.8. Assessing deficit**

The main method of assessing deficit is to compare the demand (current and projected) with the supply provided by the existing education system in the service area and that required on the basis of the prevailing standards set by the sectoral authorities.

If the system offers less than or fails to cover what is required under the existing standards, there is said to be a deficit. Conversely, if the system offers more than what is demanded, there is said to be a surplus. For the purposes of this guide, whenever a comparison is made between supply and demand, reference will be made in general terms to a deficit. Whenever the difference is positive (surplus) this distinction will be made specifically.

When calculating the deficit, the basis used is what the system is currently offering in terms of infrastructure, equipment, teaching, administrative and ancillary staff, quality, etc., and the actual or projected demand made by the population, taking as a reference for calculation purposes the standards and conditions established by the sectoral authority for each of the supply components. This calculation may indicate two types of deficit.

- Deficit in the infrastructure coverage of the education system;
- Deficit in the quality of the education system.

#### **3.8.1 Deficit connected with the infrastructure of the education system**

There are two sorts of deficit in education infrastructure:

- Deficit in coverage;
- Deficit due to the poor condition of infrastructure or equipment.



**(a) Deficit in coverage**

If a comparison between the population requiring education and the proportion of the population actually covered by some kind of service offered by the system indicates population groups which are not being absorbed by the system, then there is a deficit in coverage.

**(b) Deficit due to the poor condition of infrastructure or equipment**

If the diagnostic analysis indicates that some or all of the population is being served by the education system but is receiving an inadequate service, compared with the minimum standards required by the sector, there is a deficit due to poor service.

If there is a standard regarding the surface area and equipment required to provide an education service, the basis used will be the target population in the service area. This population will be used to calculate the infrastructure, equipment and teaching staff needed to provide service to the established standard. If there is a discrepancy between these requirements (see annex 2) and the existing infrastructure, equipment and staff, the deficit should be calculated.

The results noted must be reflected in tables similar to table IV. Example 41 shows how to use a table of this kind for an establishment that has a service deficit.

**Table IV: Assessment of deficit**

Establishment:				Date:		
<b>Buildings</b>						
Premises	Current surface area		Required surface area	Coverage deficit	Service deficit	
	In good condition	In poor condition				
Administrative area						
Teaching area						
Service area						
Covered passageways						
Open areas						
<b>Total</b>						
<b>Equipment</b>						
Premises	Type of equipment	Existing		Requirement	Deficit	Deficit due to poor condition
		Good condition	Poor condition			
Administrative area						
Teaching area						

Service area						
Other						

Staff			
Type	Current number	Required number	Deficit
Teaching			
Administrative			
Ancillary			

#### Example 41: Assessment of the deficit

*Let us suppose that a problem has been detected in an establishment where the roll has increased considerably in recent years. The roll currently comprises 780 children who are taught in two groups (shifts). It is estimated that the roll will rise to 840 children in the next two years and level off at that number.*

Infrastructure of the establishment (areas in m <sup>2</sup> )				
Premises	Area in good condition	Area in poor condition	Required area	Deficit
<b>Administrative area</b>	21		59	38
Headmaster's office	12		15	3
Secretary's office	6		9	3
Room for teaching staff			30	30
Reception	3		5	2
<b>Teaching area</b>	394	36	666	272
Technological teaching laboratory	10		12	2
Classroom for 30 pupils		1x36 = 36	2x36 = 72	72
Classroom for 45 pupils	6x54 = 324		8x54 = 432	108
Library			70	70
Covered terrace/cafeteria	60		80	20
<b>Service area</b>	55		150	95
Kitchen			20	20
Sanitary facilities	51		68	17
Sanitary facilities for pupils				
Sanitary facilities for teaching staff	4		6	2
Sanitary facilities for ancillary staff			5	5
Caretaker's quarters			36	20
Storeroom			15	15
<b>Total premises</b>	470	36	875	405

<b>Infrastructure of the establishment (areas in m<sup>2</sup>)</b>				
<b>Premises</b>	<b>Area in good condition</b>	<b>Area in poor condition</b>	<b>Required area</b>	<b>Deficit</b>
Covered ways	102		263	161
<b>Total buildings</b>	572	36	1138	566
<b>Open area</b>	1500		2100	6000

- (1) For the purposes of the example it was assumed that under the regulations in force classrooms for 30 and 45 pupils required a surface area of 36 m<sup>2</sup> and 54 m<sup>2</sup> respectively.
- (2) A deficit of two 36 m<sup>2</sup> rooms was calculated because, even though one such room is available, it is in such poor condition that it should no longer be used in its present state.
- (3) A 30 per cent requirement was assumed for the area of the passageways in relation to the total surface area of the premises.
- (4) A requirement of 5 m<sup>2</sup> of outdoor space per pupil was assumed.

### **3.8.2 Deficit connected with the quality of the education service**

All the deficiencies found in the system that are not connected with infrastructure, equipment or staffing in the area in question or in the existing establishment fall into this category.

The problems are generally attributed a priori to lack of infrastructure, its poor condition, its unfavourable location, and other such factors. However, these causes are frequently not the most important in determining the problem or need, even though they may have some effect on it. The most well-known and easily detected causes include: inadequate management of human resources and/or material and financial resources, lack of staff training and the absence of special programmes to promote community involvement.

It is normally no easy matter to detect these causes at first sight and it is therefore advisable, when one "has a feeling" that the problem is not simply a matter of infrastructure, to seek the advice of specialists to pinpoint the real cause.

An objective way of detecting this kind of deficit is to look at the educational indicators of the educational establishment in relation to the indicators for the district, region or country, where applicable.

#### 4. IDENTIFICATION AND DEFINITION OF POSSIBLE SOLUTIONS

*The aim of this chapter is to present ways of identifying and examining possible solutions. It discusses the concept of the optimized base situation and its importance. It also suggests ways of bringing the notion of equity into the development of possible solutions.*

By means of the diagnostic analysis it has been possible to identify the problem affecting the educational system in the study area and to gauge its dimensions. This process usually generates ideas for possible solutions. Moreover, it is not unusual, once the problem has been pinpointed, for some of the protagonists involved to put forward and promote a project option.

Hence, in order to solve the problem identified in the diagnostic analysis, the first step is to produce a set of possible options, each with specific features, costs and benefits that should be taken into account when selecting one of them. The options must be systematically described and analysed, without any of them being discarded a priori. In addition, the project should not be restricted to a single option; an effort must be made to generate different approaches to solving the problem. This is the only way to ensure greater efficiency in the use of resources.

##### **Example 42: Envisaging a number of possible solutions**

---

*A boarding school that used to serve the population of an enormous and sparsely populated rural area was destroyed by fire. It was proposed that the school be rebuilt, since this is seen as the only education alternative for the children in the area.*

*Although this would seem to be the only solution, consideration could also be given, for instance, to:*

- (a) The use of a distance learning method, using the post, television or microcomputers.*
  - (b) The transfer of the pupils to another, more distant boarding school.*
  - (c) The rebuilding of the school in a location different from the one it occupied before the fire.*
- 

The following points should be borne in mind when defining possible solutions:

- Optimization of the current situation;
- Identification of possible project options;
- Incorporation of the concept of equity when defining options;
- Description of options.

##### **4.1 Optimization of the current situation**

The first and most important step in identifying possible solutions is to optimize the current situation. This involves exploring measures which, with the least outlay of resources, would enable the existing educational system to operate in the best possible manner.

To this end, once the problem has been identified, it is necessary to examine the administrative or managerial changes that would improve the current situation. These changes may significantly reduce the cost of the current situation and hence the benefits of the project. As a rule, such changes require only minor expenditure.

#### **Example 43: Optimization of the current situation 1**

---

*Let us suppose that the only elementary education establishment in a locality has been found to be seriously overcrowded because the number of pupils has increased beyond the capacity of the physical infrastructure. Nevertheless, the equipment and the number of teaching staff are sufficient to cope with demand.*

*In this case, the optimization of the current situation could include the following measures:*

- (a) Exploring the possibility of introducing two shifts, if the establishment only has one at present;*
  - (b) Looking into the availability of other premises that could be used, with minor improvements, as classroom accommodation.*
- 

The importance of this point lies in the fact that the benefits and the costs applied in examining the project are derived from comparing the benefits and costs of each option with the current situation. If the current situation is aggravated by poor administration, for example, there is a tendency to overestimate the benefits of the options proposed to solve the problem.

#### **Example 44: Optimization of the current situation 2**

---

*An educational establishment does not have sufficient rooms to cope with all the pupils enrolled for the coming school year. A suggested solution is to expand the educational establishment by building a unit with four classrooms. However, the school has three classrooms that are only used as storerooms for equipment that has not been distributed. In this case, the optimization of the current situation must include the installation of the stored equipment. Only then will it be possible to assess the extent of the actual infrastructure deficit.*

---

The current situation can usually be improved in the following ways:

- (i) Optimizing utilization of the existing infrastructure*

If the problem is due to the poor condition or inadequacy of the existing infrastructure, it is useful to consider how it might be better utilized. It may be helpful to increase the number of shifts (from one to two, for example), to change the use to which the premises are put, to upgrade existing premises and to seek alternative infrastructure that could be used cheaply. If the area in question has a number of establishments, it might also be helpful to consider the possibility of transferring pupils from overcrowded schools to others with spare capacity.

- (ii) Optimizing human resource utilization*

If the problem is due to the inadequacy or lack of staff training, the optimization of the current situation could involve measures such as swapping staff between establishments (strengthening a weak establishment and/or giving some teachers on-the-job training in another establishment), seeking voluntary

staff who could take on some of the workload or organizing a different shift system so that existing staff may be better utilized.

### (iii) *Optimizing equipment utilization*

If the problem is due to the poor condition or inadequacy of equipment, the current situation could be improved, without large-scale investment, through more intensive use of existing equipment achieved by means of changes in the daily schedule, or through assistance furnished by private firms or individuals, or even pupils, who could be involved in its repair and maintenance.

## 4.2 Identification of alternatives

If optimizing the current situation fails to provide a complete solution to the problem, it is necessary to identify the options making for a full or more complete solution.

If the principal cause of the problem is seen to relate essentially to the existing infrastructure in the service area, then the possible solutions will be provided by a project relating to the infrastructure of the education system. However, if the principal cause lies in other factors not directly connected with the infrastructure, the possible solutions will be provided by a project relating to the quality of the education.

In some instances, it could happen that the principal causes of the problem lie in a combination of these two (infrastructure and other factors). It is important to stress that each solution must set out to solve specific causes of a problem, making it necessary to deal with each of these causes in separate projects which ought, logically, to complement each other.

### 4.2.1 The objectives tree<sup>9</sup>

A simple and useful tool for visualizing solutions to a problem is the “objectives tree” or “means and ends tree”. In the same way that the problem tree (section 2.5, page 19) was a bottom-up sequence of causes and effects, the objectives tree is an interdependent chain of means and ends.

In order to construct an objectives tree, one simply “inverts” each of the causes and effects in the problem tree. Hence, if the problem was **deficiency** the solution will be **sufficiency**. It is as though the problem tree were the “negative” of the film and its opposite manifestation the “positive” or developed film, that is to say the “objectives tree” (see example 45).

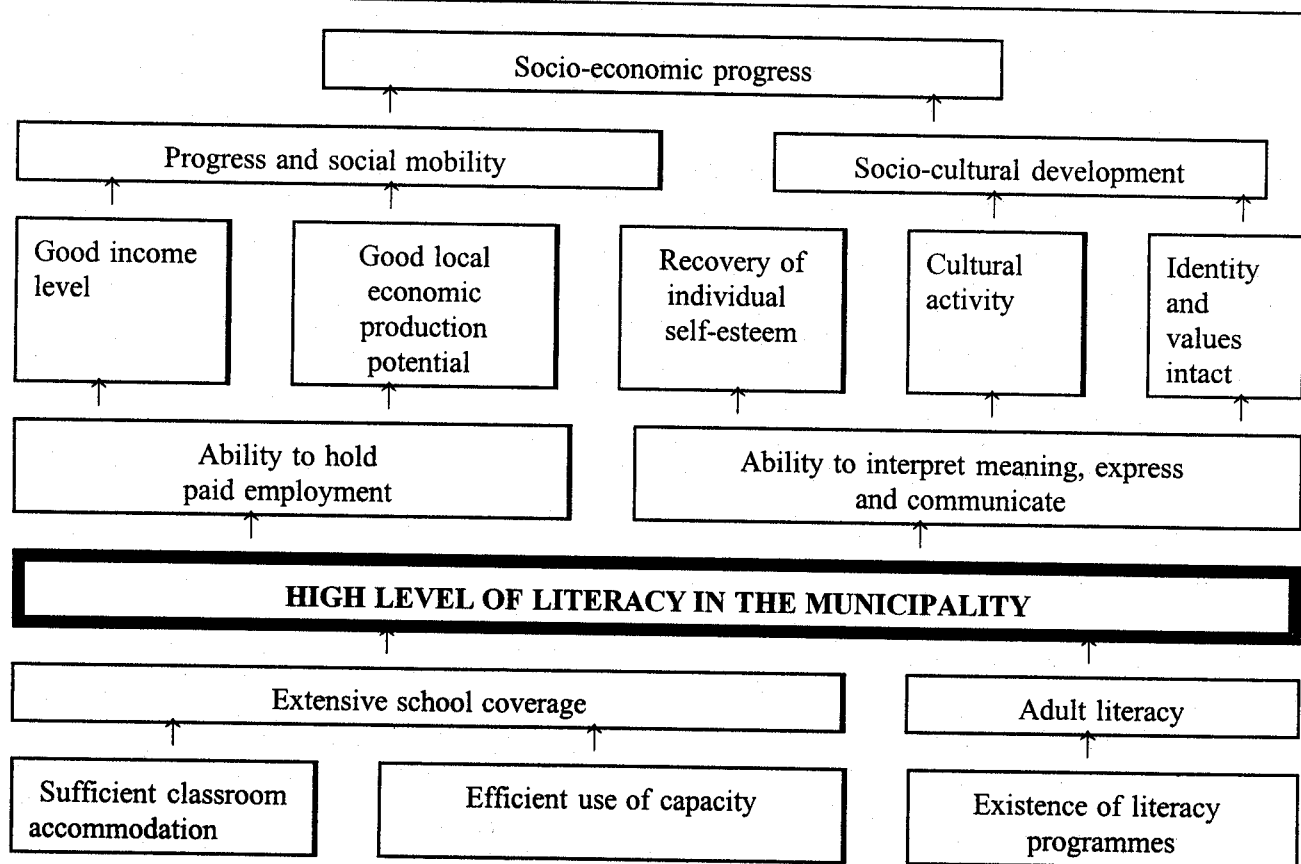
Once the logic and relevance of the objectives tree have been established, we have adequate points of reference to seek and develop possible solutions to the problem. The “fundamental means” are those at the bottom level: they are the “roots” of the tree and they should, in turn, generate the solutions.<sup>10</sup>

---

<sup>9</sup> This is adapted from Sanin (1992).

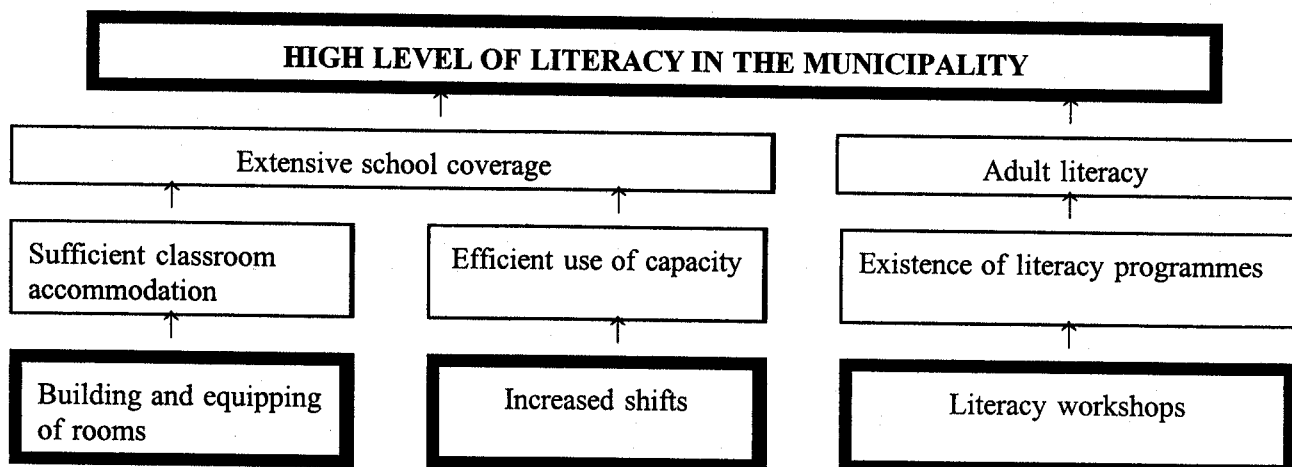
<sup>10</sup> It should be remembered that these “fundamental means” correspond to the basic causes in the problem tree. By seeking measures to put the fundamental means into practice, we will be solving the principal (basic) cause or causes of the problem.

**Example 45: Objectives tree**



For each base of the objectives tree (fundamental means) creative solutions need to be sought to translate these means into reality. The aim is to answer the question: which strategies or actions make the lower means of the objectives tree possible? (See example 46.)

**Example 46: Formulation of actions**



Each action proposed must then be examined according to the following points:

- (i) How successful will it be in solving the problem? Priority should be accorded to actions whose envisaged impact is greatest.
- (ii) A preliminary feasibility assessment (from the material, technical, budgetary, institutional and cultural points of view) of the actions proposed should be made.
- (iii) Examine any interdependence among the actions proposed and group together those that are complementary. Each group of complementary actions will comprise an option. If, when we look at the impact, we find that two strategies proposed as options are not mutually exclusive, then it is quite likely that they will enhance each other in achieving the desired result. They should therefore be considered as complementary components of the envisaged option.

It is necessary to bear in mind that the process of analysis is iterative or open to feedback: no door is ever closed and it must always be possible to incorporate fresh options or to combine a number of options that may still be regarded as complementary components of the solution.

#### **Example 47: Formulation of options**

---

*In the preceding example there may be two options:*

*OPTION A: Building and equipping of new rooms to deal with the school population overflow (action 1) and development of an adult literacy workshop programme (action 3).*

*OPTION B: More efficient use of existing capacity through an increased number of school shifts (action 2) and development of an adult literacy workshop programme. (This option presupposes that the existing number of rooms is adequate to deal with the existing deficit and that the problem lies in the inadequate use of existing capacity.)*

*In practice, these options are considered mutually exclusive: either A or B. Actions 1 and 2 are considered, in the example, to be mutually exclusive for the objective of achieving school literacy. Action 3 is the only strategy proposed for the objective of achieving adult literacy and will therefore be a common component of both options.*

---

#### **4.2.2. Project options**

It is advisable to take account of the following when seeking to generate project options:

- The relationship between the problem and its causes;
- The most common types of education project.

##### **(a) Relationship between the problem and its causes**

The precise relationship between the problem and its causes ought to have come to light as a result of the diagnostic analysis (section 2.5). As already mentioned, it is important for the solution options envisaged to deal with the root causes of the problem. If this is not the case, the project may be mere “camouflage” and before long the situation prevailing before the project will re-establish itself (see example 48).

The possible causes of problems in the education sector are innumerable and their potential effects even more so. Each situation must be studied in depth to identify the project option that best solves the problem



by removing its root cause or causes. Consequently, there can be no cure-all approach or standardized method for finding suitable project alternatives. Tables V, VI and VII below therefore describe, by way of illustration only, some frequently noted problems in the education sector, their usual causes and possible solutions.

#### **Example 48: Need to attack the cause of the problem**

*In an elementary education establishment it has been found that pupils have poor results in mathematics in the standard tests, while many of them have to repeat the class because of their substandard mathematics instruction.*

*In order to solve this problem, a project was formulated to improve the quality of the education provided by means of workshops in which the pupils applied their knowledge of mathematics to subjects of interest to them, such as sports statistics or personal finances. The project will last for two years and will be targeted at pupils in the final three grades of elementary education.*

*The project is bound to stimulate a greater interest in mathematics among pupils attending the workshops. Furthermore, it is likely that their mathematics performance will be significantly improved.*

*Nevertheless, it is also very probable that, as soon as the workshops cease, mathematics performance will return to the levels noted before the project. This will happen if the cause of the problem remains, for example, poor mathematics teaching in the first grades of elementary education due to a deficient study programme.*

*Hence, even though the project has yielded a benefit, it will not have solved the existing problem because it did not attack its principal cause.*

**Table V: Usual problems in the education sector**

<b>Usual Problems</b>	<b>Most frequent causes (see table VII)</b>
School-age population not served	1, 3, 4, 5, 6, 7, 8, 11, 14
School-age population poorly served	1, 2, 8, 9, 10, 11, 12, 15, 16
Saturation of installed capacity	1, 3, 4, 5, 7
Reduced enrolment at an educational establishment	2, 6, 7, 8, 9, 10, 15, 16
High illiteracy rates	1, 3, 5, 8, 12, 14
Increase in drop-out rate	15, 16
High absenteeism rates	16, 17, 18
High class-repetition rates	8, 9, 10, 11, 12, 15, 16, 18
Excessive length of time spent in the system	8, 9, 10, 11, 12, 15, 18
Low success rate with regard to envisaged objectives	8, 9, 10, 11, 12, 15, 18

Usual Problems	Most frequent causes (see table VII)
Reduced school performance	8, 9, 10, 11, 12, 15, 18
Low level of participation by the education community	12, 13, 14, 16
Poor pupil performance in some areas of the curriculum	8, 9, 10, 11, 15
Lack of interest and motivation among pupils with regard to course content	9, 12, 13, 15, 18
Repeated violent behaviour by pupils	13, 18

**Table VI: Most frequent causes of problems in the education sector**

Most frequent causes	Possible solutions (see table VIII)
1. Inadequate infrastructure	1, 3
2. Existing infrastructure in poor condition	1, 2, 4, 5, 9
3. Existing infrastructure unsuitable for purpose	1, 2, 4
4. Increased population in the service area	1, 3
5. Closure of establishments in the service area	5
6. Termination of public transport service	15, 16
7. Shift in demand (migration)	1, 3, 5
8. Lack of teaching staff	5, 16, 17
9. Poor training of teaching staff	7, 17
10. Equipment in poor condition	18, 19
11. Lack of equipment	9, 18, 19
12. Lack of special programmes to support conventional education	20
13. No extracurricular activities for the school community	21
14. Geographical isolation of demand	1, 15
15. Inappropriate curricula	11
16. School schedule clashes with local practices, customs and/or employment opportunities	10
17. Poor health care	13
18. Alcoholism/drug addiction	12, 20, 21

**Table VII: Solutions to problems in the education sector**

Options	
1.	Building of education establishments
2.	Partial renovation of the establishment
3.	Expansion of the establishment
4.	Repair of the establishment
5.	Amalgamation of two or more establishments in the area in question
6.	Literacy courses for pupils' parents
7.	Teacher training
8.	Community extension activities
9.	Establishment of workshops and/or laboratories
10.	Tailoring of school schedule to local conditions
11.	Tailoring of curricula to local socio-cultural features
12.	Prevention of drug and alcohol consumption
13.	Health education of pupils
14.	Inclusion of supplementary foods in the establishment's meals
15.	Provision or improvement of means of transport
16.	Reassignment of the school population to other establishments
17.	Recruitment of new teachers
18.	Purchase of new equipment
19.	Repair of existing equipment
20.	Establishment of special programmes to support conventional education
21.	Establishment of extracurricular activities

**(b) Most common project types**

The following are the most common types of project in the education sector:

**(i) Literacy:**

Literacy projects have the specific objective of teaching the illiterate population to read and write.

**(ii) Purchase of premises:**

Projects in this category are directed towards the purchase of buildings for use in providing an education. It is very important to stress that such projects relate not only to the purchase of the building, but

also to any conversion work necessary to ensure that the building is in the best possible condition to provide the service.

(iii) *Expansion:*

Projects of this kind are designed to add to the installed capacity of the service, while preserving the existing capacity intact. The expansion may relate to an increase in the theoretical or the actual installed capacity. The theoretical installed capacity is said to be increased when the establishment suffers from overcrowding before the project and has greater physical space afterwards, which does not necessarily mean that the establishment's pupil roll will be increased. An increase in the actual installed capacity is deemed to occur if the project makes it possible to increase the pupil roll of the establishment being expanded.

(iv) *Training:*

Training projects set out to prepare individuals to carry on specific activities.

(v) *Construction:*

This category is concerned with the practical manifestation of a project that does not exist as yet. It includes all projects involving the creation of an establishment to provide education services not provided previously by the system in the area.

(vi) *Dissemination:*

These are projects designed to publicize or disseminate any specific idea, information, subject or activity carried out in an educational establishment.

(vii) *Equipment:*

Projects under this heading involve the purchase and/or installation of the necessary items to enable an establishment to operate as well as possible. An equipment project is understood to be one involving the purchase and/or installation of new items in an existing project, since the prerequisites for the operation of the establishment should have been considered and included in the original project. It is possible that a project may involve the upgrading of equipment, which entails the renewal of existing equipment, a situation that may also lead to an increase in the number of items of equipment.

(viii) *Amalgamation:*

Projects of this kind involve the physical and administrative merging of two or more existing establishments for the purpose of optimizing the use of resources by means of their redistribution and reorganization. As a rule, amalgamation is the course chosen in the following circumstances: when two or more establishments located close together have good conditions of access, deal with the same target population and have underutilized human resources and/or installed capacity. It may also happen that some of the premises are substandard in terms of infrastructure or equipment.

(ix) *Remodelling:*

Projects of this nature are designed to make a functional building out of premises that are unsuitable and unusable. This includes projects for remodelling and/or repairing existing premises in order to turn them into buildings capable of providing an education service.

(x) *Improvement of educational standards:*

These projects channel initiatives designed to enhance the efficiency, quality, equity and relevance of the education provided.

(xi) *Standardization:*

This means the modification of an existing establishment to bring it into line with the standards established by the sectoral authorities. This category includes all projects involving the functional reorganization of an establishment that is already in operation. Thus, a project to standardize the physical premises of an education establishment is designed to leave the school in operation, ensuring that all its units are of suitable size (minimum surface areas in conformity with requirements) and well located, and that they have proper ventilation and lighting, adequate passageways, and so forth.

(xii) *Prevention:*

This category includes projects relating to the advance preparation of the school-age population in order to avoid a specific risk.

(xiii) *Restoration:*

These projects are designed to ensure that a given education service or situation once again complies with the minimum standards required by the system after having failed to do so for a period.

(xiv) *Repair:*

This category includes projects to repair the occasional damage suffered by an existing establishment and includes all work required to enable the establishment to go on providing a good service. A distinction can be drawn between two types of repair:

- *Major repairs:* These are large-scale repairs which necessitate the assistance of a specialist to assess their extent and to carry out their work: for example, mending roofs, replacing floors, repairing heating systems, and so forth;
- *Minor repairs:* These are not straightforward repairs such as fitting new window panes, plumbing jobs, changing water taps, and the like.

(xv) *Upgrading:*

This is the complete or partial renovation of an existing project, which may or may not include changes in the installed capacity and/or quality of service. The difference between construction and upgrading is essentially as follows: in the first case, the system was such that it failed to provide education in the service area whereas, in the second case, education was provided but not in accordance with the standards fixed for the sector. Consequently, the upgrading of an education establishment is not a "creation", even if the project involves fresh construction work.

(xvi) *Relocation:*

This category encompasses projects designed to change the location of the establishment providing the same education service and serving the same population, even though the relocation may involve changes in the quality and/or installed capacity of the establishment. The aim of relocation is generally to bring the service closer to the target population.

### 4.3 How to incorporate the notion of equity when defining alternatives

As already mentioned, equity has to do with access to education, that is to say equality of opportunity to enter the educational system and obtain a good education. In other words, the educational system will be equitable if it provides similar opportunities in terms of the service offered and results achievable.

Since equity is closely tied up with access, it is limited by the disparate opportunities available for education. From this standpoint, the concept of equity embraces elements such as:

- The chance to enter a school (opportunity);
- The possibility of remaining in a school (participation);
- The quality of the education offered.

Normally the first two elements can be dealt with more easily by means of specific projects, even though they may involve marginal activities. The question of quality is very closely linked to the other two points, but is generally approached through broader projects and policies, although this does not preclude specific projects designed to improve the situation.

We shall now look at some factors which frequently work against equity in the education system and can be dealt with more readily than others, and we shall offer some suggestions as to how they may be included in the process of defining possible solutions. The most frequently encountered factors include the following:

- Distance;
- Poverty;
- Disability;
- Special needs.

#### (a) Distance

This factor is directly dependent on geographical conditions. The population groups most seriously affected are those living in rural areas that are isolated because of some topographical feature, or areas where access is difficult (inadequate or infrequent transport, etc.) and those with no educational establishment in their vicinity or one providing education only up to a certain level (in such areas education tends to be provided at elementary level only).

In these circumstances, pupils have to travel for hours to reach the educational establishment and do not have enough time for schoolwork. If transport is infrequent, it may be necessary to wait for much of the day to return home. All this has a great impact on individuals' learning capabilities and causes them to leave the system early.

Moreover, if the area suffers from poor climatic conditions for a large part of the school year, it is likely that the school population will come to school only when the weather permits.

Here are some steps that could be considered, when examining alternatives, to reduce the inequities for the groups concerned:

- When the population in question is located a short distance from a locality that has an education establishment and when access conditions permit, it might be possible to establish a system of school transport to carry the school population both ways between their homes and the establishment.

- Building of boarding schools in the area closest to the population affected where an education establishment already exists<sup>11</sup> or in an area that would enable the people affected in different localities to reach the education establishment without great difficulty.
- If the people are affected by poor climatic conditions, one way of enabling them to complete the school year is to introduce a different school calendar and/or to change the daily timetable.

#### **Example 49: Changing the school calendar**

---

*In one South American country, the normal calendar for the school year runs from March to December. There are areas in the country where winter is very harsh and the school population does not attend the education establishment regularly during this time (June to August). In order to permit these people normal access to the education system, the school year was changed in those areas to provide for education between September and May.*

---

#### **(b) Poverty**

Another important factor responsible for inequity in the educational system is poverty. The most common effect of poverty is to prevent members of the school population from travelling to the education establishment because they do not have money for the journey, malnutrition among the school population and high drop-out rates because of the opportunity cost for poor people (normally the cost of attending an education establishment is that the person is not employed and brings no money into the home, with the result that the option of staying in the system is very often rejected).

The most common measures that can be adopted in project options aimed at improving opportunities for poor people are:

- Provision of nutritional programmes in schools;
- Inclusion of vocational training in the curriculum to motivate people to stay longer in the system (reduction of drop-out rates);
- Provision of facilities to assist travel, e.g. by establishing a school transport system.

#### **(c) Disability**

Here we are referring to physical disability. Generally, the proportion of the school population with this sort of problem is very small and educational establishments are therefore not designed to assist their integration within the system.

To give disabled persons better access to the education system it is advisable to include the following features when defining options:

---

<sup>11</sup> For the purposes of this study, it is assumed that the school establishments chosen to implement such measures have the necessary capability to absorb the population in question, as mentioned above.

- Special equipment and infrastructural features. For instance, the architectural design of the building should facilitate the movement of disabled individuals, such as the provision of wheelchair ramps and sanitary facilities accessible to disabled persons;
- Curricula should be flexible to provide for such individuals' needs.

---

**Example 50: Provision of pre-school education to promote equality of opportunity**

---

*Surveys carried out in a developing country revealed high class-repetition rates among children from extremely poor families. Closer examination of the causes indicated that, when they entered the school system (at the age of six), they were very backward in their intellectual and physical/motor development. This was due to poor nutrition and lack of stimulation.*

*In order to give such pupils a better opportunity in life, a programme involving open centres was established. The centres received children from families living in extreme poverty at pre-school age, providing them with breakfast and lunch and with stimulation designed to encourage their development. The programme considerably improved the children's development and reduced their failure rate in the education system.*

---

**(d) Special needs**

Individuals with special needs are those with learning problems, mental deficiency, problems of motor coordination, and so forth.

The most common ways of giving such individuals equal access to education are:

- To include rooms for special education purposes in the architectural design of the building and to equip them with the requisite facilities;
- To include teachers trained in special education in the staff of the establishment.

**4.4 Description of the options**

Once the options have been identified they must be designed so as to provide a full or partial solution to the pre-assessed deficit.

It is important to bear in mind that a problem posed in general terms can very often be divided up into specific problems that may or may not have independent solutions. It will therefore be necessary to define options aimed at solving each of the specific problems and also to work on them separately, with their respective costs, benefits and indicators.

Before the options identified are set out in depth, it will be necessary to discard those shown by preliminary analysis not to be feasible under current conditions. The conditions in question may be, for example, legal, administrative or economic.

For each of the options identified, the following points must be discussed in general terms:



- How and to what extent it solves the problem;
- Number and characteristics of the beneficiaries of the solution;
- Costs and benefits associated with the option;
- How the option will be implemented;
- Method of operation;
- Institutional matters to be considered;
- Legal issues raised by the option;
- Schedule for implementation and attainment of objectives;
- Acceptance of the solution by the community;
- Funding available for execution and operation;
- Possible restrictions on implementation and/or operation.

## 5. EVALUATION OF PROJECT OPTIONS

*This chapter aims to present the benefits and costs associated with projects in the education sector. The difficulties inherent in quantifying and evaluating such benefits are discussed. Methods are described for identifying and, where possible, quantifying them. The types of costs that need to be taken into account are indicated, together with procedures for estimating them. Finally, methods are indicated for evaluating project options.*

As in any capital investment project, projects in the education sector yield benefits and imply costs. Broadly speaking, a project will be useful to society if its expected benefits are greater than the costs incurred in its implementation. It is often difficult, however, to forecast all the benefits likely to be generated by a project and even more difficult to quantify them. Finally, evaluating such benefits in financial terms is even more complicated, especially in the education sector.

In the majority of cases of projects in the education sector, the evaluation of benefits is a matter of such complexity that the tendency is to adopt an approach whereby education is regarded as a necessity which has to be provided for by the State. Thus, the task of identifying and quantifying benefits is carried out (in the case of quantification, wherever it is possible to do so), and it is assumed that the value attached to such benefits is greater than the costs incurred in their achievement.

### **Example 51: Quantification and evaluation of benefits**

---

*Let us suppose that a project consists in furnishing a secondary educational institution with a library. Among the potential benefits yielded by this project are the following: (a) higher standard of preparatory work performed by the teachers; (b) improved academic results on the part of the pupils; (c) income obtained by loaning books to persons other than pupils. How are these benefits to be quantified?: (a) quantification is very difficult; (b) on the basis of results obtained in schools with and without a library in standardized tests; (c) on the basis of the experience of other school libraries and the size of the population. How can these latter two factors be evaluated? (b) evaluation in this case is very difficult; (c) by multiplying the estimated number of books available for loan by the fee to be charged.*

---

Both costs and benefits will be associated with each project option. Consequently, in order to choose the best option the costs and benefits of each one will need to be studied. In some cases, however, it may be assumed that all the project options will yield the same or at least similar benefits. In such cases, the best option will be the cheapest.

### **Example 52: Options generating equal benefits**

---

*Let us assume that the problem to be solved is to rectify the poor infrastructural state of an existing school which does not pose problems of capacity. Two possible solutions have been identified: either to renovate the present building or to build a new building with the same specifications on a neighbouring plot of land (relocation). It can be assumed in this case that both options will yield the same benefits, since it is unlikely that the quality of the educational service will depend on whether it is provided in a new building or an old one which has been suitably renovated. The main difference between the two options will lie in their costs.*

---

## 5.1 Identification and quantification of the benefits yielded by each option

The benefits yielded by education projects are many and various. They are generally difficult to quantify, however, and only in very special cases are they amenable to evaluation in financial terms.

One factor that should always be borne in mind regarding the benefits of an education project is the purpose of education. A person is not educated simply for the sake of being educated, but because it is hoped that the education received will enable him to improve his circumstances and to function better within society. Education is not an end in itself but a means to the achievement of other objectives.

### Example 53: Education is not an end but a means

---

*If the above statement seems doubtful, let us attempt to quantify, or at least identify, the benefits of teaching Greek to a peasant living in a remote rural area of South America (assuming that the same peasant has no wish to emigrate). Or we might try to gauge the benefits of teaching goat farming to families living on a Caribbean island where there is a ban on introducing goats because of the environmental damage they might cause.*

---

This is where the extreme difficulty arises when it comes to attempting to quantify the benefits of projects in the education sector. In practice, such benefits depend on the use that the person makes of the education received. If it does not bring about any change in the person's life he will not derive any benefit from it (assuming that the person has not attained greater personal fulfilment simply through knowing more).

### Box 10: Benefits of education projects

---

#### The benefits of education projects

(Extract from the "Methodological Manual for Identifying, Preparing and Evaluating Educational Infrastructure Projects", DNP/BID/ILPES Agreement, Bogotá, Colombia, 1990)

In terms of the benefits yielded, education may be regarded as falling simultaneously within the categories of consumer goods and capital goods. As a consumer good, education fulfils the desires of the consumer. The benefits consist in the satisfaction obtained in attending the educational establishment and in the access gained to written information, cultural centres, and so forth.

As a capital good, education can yield the following types of benefit: (a) the improved education obtained offers a combination of knowledge and skills which makes the individual more productive in his work, thereby yielding a benefit for the country (which produces more) and also for the individual who has obtained a better education (receives a higher level of income for his work); (b) the individual who receives the education gains access to even more education or, in other words, can obtain access to higher levels of education enabling him to achieve even greater productivity; (c) generally speaking, a better education makes it easier to find work, which results in higher productivity for the country.

Education also yields benefits for persons other than the individual receiving the education. Children's attendance at school, for example, makes more time available for mothers; an individual with a higher level of knowledge generally makes the work of those around him more productive, and so forth.

The benefits of education are difficult to gauge, especially as the private demand for education does not reflect such benefits in their entirety either because people do not value the benefits derived from education or else do not have sufficient purchasing power to pay its full cost. In other words, the user's willingness to pay is not an adequate criterion for gauging the benefits of education.

Certain benefits, however, can be evaluated by indirect means. For example, benefits which result in higher productivity on the part of the individual can be estimated in terms of the differences between the levels of income attained by individuals who have reached successively higher levels of education in the course of their lives.

Evaluations carried out in various countries show that the income received by an individual depends on his level of education, his working experience, his innate abilities and other variables such as family and social relationships, training in the workplace, and so forth.

The conclusions reached can be summarized as follows: (a) an individual without any education will still receive some sort of income; (b) as his level of education increases, so his level of income from employment will also increase; (c) the level of income increases with age, although it may peak and start to decrease again at a certain age.

Estimates of income for individuals with varying levels of education are meaningful in a market economy, in which the amount paid per unit of work represents the productivity of that unit (or, in other words, the value of the additional output obtained through the use of that unit).

On the basis of these considerations, the benefits of obtaining additional education are normally estimated by taking the income differentials for the individual's entire life, i.e., the income which he would obtain with additional education minus the income he would obtain without it, all values being duly adjusted.

The benefits thus calculated are compared with the costs of providing the additional education. If the benefits exceed those costs, there can be no doubt that the "additional education" project is good for the country, especially as one may assume that there will be other benefits which have not been quantified.

This methodological approach is usually difficult to apply to specific projects for a number of reasons, the most significant being: (a) it is not easy to obtain information on the incomes of persons with differing levels of education for each age bracket and for a particular place or area where a specific educational project is carried out; (b) the procedure involves extensive estimates and calculations, implying relatively high costs in relation to the benefits yielded by obtaining better information.

The benefits of education as a consumer good, however, are even more difficult to gauge, as are the benefits derived by persons other than the individual receiving the education.

---

#### **Example 54: Benefits depend on the use made of the education received**

---

*Let us take the case of two illiterate individuals who are being taught how to read. The first, a young woman, uses her newly acquired knowledge to find a steady job in a post office. She also takes evening courses, which enable her to make further progress and to gain promotion within the administration. The second, a peasant, continues with her usual activities and after a short while dies without having applied the knowledge gained.*

*Even if the two women in question learned to read with equal facility, can it be asserted that the benefits yielded by the literacy project were equal in each case?*

---

In order to gauge the benefits generated by an education project, therefore, it is necessary to investigate how the project alters the circumstances of the individuals receiving the education (for example, by comparing their situation with that of a similar group that has not received the education offered to the first).<sup>12</sup> This is no simple task, but even more difficult is the task of estimating these same benefits for a project at the pre-investment stage. In addition, the cost and effort involved in obtaining an accurate estimate of the benefits yielded by an education project may prove in many cases to be greater than the cost and effort necessary to implement the project.

Given this situation, the usual approach adopted in evaluating education projects is the basic necessities approach formulated by Harberger.<sup>13</sup> In other words, it is assumed that society assigns to the benefits of education projects a value which is higher than the costs of providing the education. However, this applies only to specific groups and up to a certain limit (see example 55).

Consequently, even where the benefits of education projects cannot be evaluated, it is none the less important to identify and quantify them and to determine who the beneficiaries are. Normally, an education project will have the following benefits:

- Increased productivity on the part of the beneficiaries and, hence, higher income levels for the beneficiaries and the employers hiring them;
- Greater personal satisfaction resulting from the knowledge required;
- Enhanced integration of the beneficiaries within society, thanks to their greater access to new services and a lower incidence of anti-social behaviour.

Unfortunately, there is no easy way of quantifying such benefits. It is therefore necessary to apply parameters which, while not being benefits themselves, none the less bear a direct relationship to the benefits in question. In other words, since it is difficult to gauge the benefit *per se*, we measure one or two variables which we hope bear a direct relationship to the actual benefits of the projects. It is assumed—although this is not always the case—that if the project impinges on those variables, the expected benefits will materialize (whether this actually happens in the specific instance can only be determined through proper monitoring of the project, followed by its evaluation on completion).

#### **Example 56: Use of variables close to the benefits**

---

*Let us take the example of a project which proposes to improve the management of a region's educational establishments by providing a training in administrative techniques to the directors of those establishments. It is hoped that this will result in improved utilization of the available resources and enable a higher standard of education to be provided to the students.*

*In this instance, it is not possible to gauge the impact that the project will have on the students' future circumstances, nor is it possible to measure the increased personal satisfaction gained by the directors who receive training and those working with them.*

*Furthermore, it is extremely difficult to estimate the savings permitted as a result of improved management of the establishment. Nor can we even evaluate a priori how and to what extent the management of each establishment will improve. All we can know for sure is how many directors are to be trained.*

---

<sup>12</sup> A study of this type was carried out by the World Bank in Kenya. See Thias and Carnoy (1972).

<sup>13</sup> See A. Harberger (1984) or H. Gutierrez (1993).

*Thus, the variable "numbers of directors trained" is accepted as being closely related or "close" to the actual benefits of the project in the hope that the project has been well designed and that if more directors are trained the benefits obtained in future will be that much greater.*

---

In general, it is assumed that the benefits of each project option will be adequately represented by all the additional services provided as a result of its implementation. It should be stressed that only those services that the option will actually provide should be taken into account and not those which it is theoretically capable of providing from the point of view of its specifications. What this means is that we have to evaluate the services which will be received by the beneficiaries and not those that the project option is capable of producing. This might seem obvious, but in practice confusion between these two notions often leads to errors in quantifying the benefits of education projects.

---

**Example 57: Benefits depend on the services actually offered**

---

*Will the same benefit be yielded by a primary school accommodating 200 pupils as one designed to accommodate 400? The intuitive response to this question is that the second school will yield twice the benefit of the first.*

*However, let us suppose that: (a) the school-age population in the catchment area of the new school is only 150 children, a gradual increase to 200 children being forecast over the next 20 years; (b) the useful life of the two schools is estimated at 20 years since they are to be built out of wood.*

*In this instance, the two schools will yield identical benefits, although the second will do so at a much higher cost.*

---

---

**Example 58: Doubling the size of the project does not mean doubling its benefits**

---

*A project to improve educational standards proposes to furnish urban schools in the region (50 per cent of the total number of schools) with computer rooms.*

*A suggestion is made to double the number of computers purchased in order to furnish all the region's schools (urban and rural) with computers and thus double the benefits yielded. Is it true that this second option will yield twice the benefit? Yes, but only if the schools included in the project:*

- (a) Have approximately the same number of pupils;*
  - (b) Have teaching staff trained in the use of the new equipment;*
  - (c) Have a stable electricity supply;*
  - (d) Are able to allocate resources for maintaining the equipment;*
  - (e) Provide instruction of a similar type and level; and*
  - (f) The pupils decide, on leaving school, to pursue higher studies or work in similar proportions and in similar fields.*
-

Tables VIII and IX list possible indicators (variables "close" to the benefits) for different categories of project. This is not an exhaustive list, either in terms of the categories of project or the indicators which may be applied.

**Table VIII: Indicators of benefits**

<b>Project type</b>	<b>Indicators of benefits</b>
Construction	- Expected enrolment broken down by age and socio-economic level of the beneficiaries of education
Replacement	- Current and forecast attendance by age and socio-economic level (if the project does not affect the installed capacity of the establishment) - Current and forecast attendance plus additional attendance by year and socio-economic level of the beneficiaries (if the project increases the installed capacity of the establishment) - Savings on operating and maintenance costs
Expansion	- Additional enrolment by year and socio-economic level (if the project increases the actual capacity of the institution) - Current and forecast attendance by year and socio-economic level of the beneficiaries (if the project increases the theoretical capacity of the institution)
Repairs	- Current and forecast enrolment by year and socio-economic level - Expected savings per annum where the purpose of the repair work is to achieve savings
Equipment	- Number of pupils or students using the equipment according to socio-economic level - Expected savings per annum in the case of equipment replaced for the purpose of cutting operating costs - Number of additional activities which will consequently be permitted in the institution
Development	- Additional enrolment by year and socio-economic level (if actual capacity is increased) - Current and forecast enrolment by socio-economic level (if the project is designed to solve a problem of overcrowding)
Remodelling	- Current and forecast enrolment by socio-economic level
Improvement	- Current and forecast enrolment by socio-economic level - Savings on operating costs per annum where this is the purpose of the project
Standardization	- Current and forecast enrolment by socio-economic level
Purchase of premises	- Expected enrolment by year and socio-economic level of the beneficiaries - Savings in cases where the purchase is designed to replace rented premises or premises with high running costs

**Table IX: Indicators of benefits** (cont. of Table VIII)

Project type	Indicators of benefits
Re-siting	<ul style="list-style-type: none"> <li>- Current and forecast enrolment by socio-economic level (if the re-siting does not increase the installed capacity of the institution)</li> <li>- Current and forecast additional enrolment by socio-economic level (if the re-siting increases the installed capacity of the institution)</li> <li>- Savings in general transport costs (fares and time) of students and teachers, where such costs can be calculated</li> </ul>
Amalgamation	<ul style="list-style-type: none"> <li>- Current and forecast enrolment by socio-economic level (if the amalgamation does not increase the installed capacity of the institutions concerned)</li> <li>- Current enrolment plus forecast additional enrolment by socio-economic level (if the amalgamation increases the installed capacity of the institutions)</li> <li>- Savings on maintenance and operating costs resulting from the amalgamation</li> <li>- Savings in general transport costs of students and teachers, where such costs can be calculated</li> </ul>
Literacy	<ul style="list-style-type: none"> <li>- Number of beneficiaries by socio-economic level</li> <li>- Decrease in actual illiteracy rates</li> </ul>
Training	<ul style="list-style-type: none"> <li>- Number and socio-economic characteristics of the beneficiaries</li> <li>- Number of trained individuals joining the labour force each year</li> </ul>
Information campaign	<ul style="list-style-type: none"> <li>- Number and socio-economic characteristics of persons targeted by the information campaign</li> </ul>
Prevention	<ul style="list-style-type: none"> <li>- Number of persons targeted and their socio-economic characteristics</li> <li>- Where possible, estimated number of cases (illness, accident, criminal offenses, errors, etc.) avoided each year and type of beneficiary</li> </ul>
Recovery	<ul style="list-style-type: none"> <li>- Number and socio-economic characteristics of estimated beneficiaries per year</li> </ul>

A special category is formed by those projects which do not affect the quantity or quality of the educational service provided but none the less permit savings in providing that service. In such cases, the benefits of the project can be clearly identified, quantified and evaluated. This category includes, *inter alia*, the following project types:

(a) Replacement of any existing institution by another with the same capacity and characteristics, provided, however, that the former institution would have been able to continue to offer the educational service at the standard set for the sector, but with high operating and/or maintenance costs.

(b) Amalgamation of neighbouring institutions with similar characteristics, provided the quality of the educational service offered is not affected. Furthermore, it is important in this case to take account of any differences in overall transport costs (fares and time) of the students and teachers moving to the institution which absorbs the other one.

(c) Improvement of internal utility and/or system networks (such as water, electricity and fuel for heating) for the purpose of preventing waste and/or reducing maintenance costs. Such projects also include the purchase of equipment designed to reduce the institution's operating costs (for example, a new heater).

(d) Administrative measures aimed at achieving more efficient utilization of the human resources of one or more institutions. For example, an additional teacher might be engaged in order to reduce overtime paid to other teachers at a higher rate than normal working hours.



(e) Minor or major repairs designed to reduce maintenance costs, provided that such repairs do not affect the quality of the educational service provided. For example, woodwork might be varnished with some kind of waterproofing preservative in order to extend its useful life.

(f) Projects aimed at cutting transport costs and time to and from the institution for students and/or teachers, assuming that the time saved does not result in better academic results.

(g) Other projects exclusively aimed at reducing the maintenance and operating costs of one or more institutions.

In these cases, the benefits of the project option under consideration are calculated on the basis of the difference between the costs associated with the base situation after optimization and those corresponding to the project option in question. For this purpose, it is important to use the optimized base situation as a reference point since it may be possible to achieve savings simply by means of minimal administrative measures or investments.

In addition, the cost comparison should be made on the basis of adjusted values, i.e., all the costs must be expressed in current currency from the same year.<sup>14</sup>

#### **Example 59: Reduced costs through the amalgamation of two schools**

*Let us consider a project which proposes to amalgamate two elementary schools whose capacity is under-utilized. For this purpose, it is necessary to carry out repairs on the school to be maintained (A) and to extend it at a total cost of \$42,000,000. The grounds and buildings of the school to be closed (B) are to be sold, the income from the sale being estimated at \$30,500,000. The annual costs of running and maintaining the two current schools and the school resulting from the amalgamation process (A') are set out in the following table:*

Cost item	School A	School B	School A'	Saving
Teaching staff salaries	9,500,000	7,400,000	14,500,000	2,400,000
Ancillary staff salaries	3,250,000	2,930,000	4,300,000	1,880,000
Utilities:				
Electricity	450,000	395,000	750,000	95,000
Water	120,000	80,000	200,000	0
Gas	345,000	257,000	430,000	172,000
Periodic maintenance	1,200,000	900,000	1,400,000	700,000
<b>Totals</b>	<b>14,865,000</b>	<b>11,962,000</b>	<b>21,580,000</b>	<b>5,247,000</b>

<sup>14</sup> For a detailed explanation of the method of calculating the discounted value of a series of costs (or benefits), the reader is referred to Fontaine (1992) or MIDEPLAN (1991).

*As can be seen, the project yields an estimated total annual saving of \$5,247,000. In order to determine whether its implementation would be worthwhile, we have to compare these annual savings with the net cost of implementation, which is estimated at \$11,500,000.*

*It is further assumed that amalgamation of the two schools will produce equal or greater non-financial benefits compared with the current situation and that the pupils will not have higher transport costs. A method for performing this calculation is explained in example 85 (page 103).*

---

## **5.2 Identification and quantification of the costs of each option**

The cost items associated with each option will depend on the type of project and its characteristics. As already pointed out, we shall distinguish essentially between two types of projects: those which aim to increase or improve the infrastructure required for providing the educational service; and those which are a service in themselves or else seek to improve the quality of the service already provided. For each of these two project types, the cost items to be considered and their treatment will be similar, irrespective of the project option chosen.

### **5.2.1 Identification of the costs of each option**

The costs associated with each education project option can be classified under the following headings:

- Capital costs;
- Operating costs;
- Transport costs.

#### **(a) Capital costs**

Capital costs are those arising from the beginning of project implementation until the project is ready to enter into operation. They therefore encompass all those costs incurred from the moment a decision is taken to implement a project until the project reaches the stage of being able to offer the envisaged services.

Generally speaking, the following capital costs are incurred in connection with education projects:

##### **(i) Land:**

This item refers to the cost of the physical space required to execute the works specified by the project. In order to size the land, it is recommended that account be taken of the area required for the works, the open spaces, the scope for future expansion, and other such factors (see the guidelines for sizing set out in annex 2).

A valuation of the land should be made in cases where the land has been purchased, where it already belongs to the institution or where it has been donated or loaned for use. Such a valuation is necessary because its use for the school implies a cost for society, since it would invariably have been possible to use the land for some other purpose. However, this cost should be taken into account exclusively for the purpose of the financial evaluation and should not be included in the budget prepared for the purpose of funding the project, except in cases where it is in fact necessary to purchase the land.

In cases where the land is to be purchased for the project, the total cost of the purchase is to be taken into account, including the price to be paid for the land and all other costs relating to the transaction (such as notarial fees, conveyancing costs, etc.). In cases where the land is already available or where it is donated

or loaned for use, the value assigned to it will correspond to the market value (the value for which it could be sold, assuming no impediment to its sale).

It is also necessary to take into account any costs associated with the work of preparing the land, such as clearance, drainage, levelling and enclosure operations. If the land is not connected to basic utilities (such as electricity, drinking water and sewerage), the cost of establishing these connections must also be included, together with the costs of any feasibility study required for that purpose.

Any cost arising from a tax (such as tax on property conveyance) should be reflected in the project budget, but should not be taken into account for the purposes of the evaluation.

#### **Example 60: Valuation of land**

---

*Let us consider the case described in example 41, page 54. The analysis performed revealed a deficit of 566 m<sup>2</sup> in the buildings and 600 m<sup>2</sup> in the grounds.*

*Let us assume that there are two unoccupied plots of land next to the school, each with an area of 600 m<sup>2</sup>. The first plot, belonging to the municipality, is offered to the school in the form of a loan for use for a period of 100 years. The second—privately owned land—is for sale at the price of \$22,500,000.*

*In this example, for the purposes of the project evaluation, the cost of the land will be set at \$45,000,000. This is because it would be necessary to pay \$22,500,000 for the private land and because the municipal land, despite being loaned free of charge, has to be valued at the market price, which is represented by the sale price of the other plot of land.*

*In the budget prepared for the implementation of the project, however, the only cost entered as the cost of the land is \$22,500,000, which corresponds to the purchase price for the private land.*

---

#### **(ii) Construction:**

The cost of construction corresponds to the value of the buildings and other physical works necessary for implementing the project option. It includes the cost of materials, their transport, labour, site supervision, expert advice and any other items necessary for completion of the construction works.

In this section, construction has a broad meaning, potentially embracing construction work, repairs, remodelling, and other related activities. The important point is that the valuation should be based on the cost per m<sup>2</sup> of “construction”, with the rate being differentiated according to the type of work involved, i.e. whether it is construction, remodelling, repair work, etc. In addition, the construction costs should also include the costs of architects’ drawings and engineering studies, where appropriate.

Finally, as in the case of land, the valuation of construction work should also take account of any contribution of work and/or other inputs required for the construction, valued at their respective market prices.

### Example 61: Construction costs

---

*Continuing with example 41, page 54, let us suppose that a private firm has offered to donate two classrooms accommodating 45 pupils and that the community has undertaken to supply the labour necessary for developing the outdoor space.*

*This being so, the works budget will have to reflect the cost of construction of an area of 530 m<sup>2</sup> (38 m<sup>2</sup> administrative area, 95 m<sup>2</sup> services area, 161 m<sup>2</sup> covered passageways and only 128 m<sup>2</sup> teaching area [666-394-36-2x54]).*

*The cost of restoration or repair will also be included, at the rate corresponding to a room of 36 m<sup>2</sup>.*

*For the purposes of the project evaluation, however, the following should be added to the aforementioned costs: construction costs for 108 m<sup>2</sup> and labour costs for the development of 670 m<sup>2</sup> of outdoor space (only 600 m<sup>2</sup> are actually required, but if the building takes up 530 m<sup>2</sup> out of a total of 1,200 m<sup>2</sup>, then 670 m<sup>2</sup> are left over).*

---

#### (iii) Equipment:

This item corresponds to the value of movables and other items necessary for the practical functioning of the project. Such items might include, for example, chairs, tables, desks, blackboards, and such like. The cost of equipment should also include the cost of its installation, where appropriate.

Items of equipment are valued at their market price for the purposes of the project budget, but taxes are discounted for the project evaluation. Donated equipment is also valued at market price (minus taxes) for the purpose of the evaluation.

### Example 62: Equipment costs

---

*In the case of the project described in example 41 and assuming that the institution's existing equipment is in good repair, the cost of the following should be taken into account:*

- (a) Furniture for the staff room;*
  - (b) Furniture and blackboard for a classroom accommodating 36 pupils;*
  - (c) Furniture and blackboard for two classrooms accommodating 45 pupils;*
  - (d) Furniture and books for the library;*
  - (e) Furniture and equipment for the kitchen;*
  - (f) Furniture for the caretaker's living quarters;*
  - (g) Items necessary for the areas to be extended (such as the refectory).*
- 

#### (iv) Advertising:

In the case of projects designed to provide a particular service (for example, a literacy campaign), it is necessary to take account of the costs of advertising which is essential for the project's success. These costs

may include the printing of pamphlets and posters, radio and television campaigns, advertising consultants' fees, etc.

### **Example 63: Advertising costs**

---

*A programme to improve primary education standards envisages a competitive system for the selection of projects. The directors and/or teaching staff of educational institutions may prepare projects aimed at improving the quality of the education provided. These projects compete for funding, the best ones being selected.*

*Resources have been allocated for advertising the programme to the public at large (television spots) and to the teachers and directors (pamphlets, posters and literature giving details of particular projects). Consequently, it is a matter of public concern for the community and of personal interest for the teachers that projects be submitted for funding through the programme.*

---

#### **(b) Operating costs**

Operating costs cover all costs that the institution will have to incur in order to provide the normal educational service. It should be pointed out, however, that the costs to be considered in this regard are those **additional to the current costs** of implementing any of the options. Such costs are usually quantified for a period of one year.

In the case of education projects, operating costs generally include the following items:

##### **(i) Salaries and wages:**

This item pertains to the cost of the human resources necessary for provision of the educational service. It includes salary costs in respect of teaching, administrative and ancillary staff, including social security benefits, bonuses, and so forth.

All staffing requirements need to be enumerated and categorized according to type of staff: professional, technical, secretarial, temporary assistance, etc. In addition, it should be stated whether there will be a need to engage staff specializing in a particular subject (an international expert, for example).

In order to identify costs relating to this item, it is necessary to take account of all personnel involving additional expenditure for the agency in charge of implementing the project. This means that the cost of existing staff who will be continuing their work independently of the project should not be taken into consideration. In the case of voluntary staff, and then only for the purposes of evaluating the project, the cost of hiring personnel to perform the same work as the voluntary staff should be included in the estimate.

A point worth mentioning is that, in the case of projects designed to provide a specific educational service, salaries and wages usually constitute the biggest cost item (depending on the type of activities undertaken).

#### **Example 64: Staff costs**

---

*In the case of the project described in example 41, page 54, it is probable that the extension of the premises will necessitate engaging the following additional staff:*

- *Teachers for the three new classrooms;*
  - *A cook and kitchen staff;*
  - *A caretaker;*
  - *More cleaning staff.*
- 

#### **(ii) Inputs:**

This heading corresponds to the value of the items necessary for the educational institution's efficient functioning. It covers, for example, cleaning materials, clothing, fuel, stationery, general stocks and supplies, etc. As in the previous categories, account should only be taken of the additional costs attributable to implementation of the project option. Where the project option involves the replacement of specific current inputs by new ones, only the net additional cost should be taken into account. In other words, the cost of the new inputs is calculated, discounting the costs of those that have been replaced.

#### **Example 65: Cost of inputs**

---

*Let us suppose that as part of the project to renovate the equipment of an educational institution, it is proposed to buy a ventilator system. In this instance, the cost of the inputs will correspond to the fuel required for the new system.*

*However, fewer of the traditional fans will be needed. Consequently, the net annual cost to be taken into account will be equal to the estimated fuel cost minus the costs that would have been incurred in buying the traditional fans.*

---

#### **(iii) Basic utilities:**

This item refers to the cost of the utilities essential for the functioning of the educational institution. Such services include, for example, water, electric light and, in some cases, fuel for heating. It is important to bear in mind that, as in the preceding case, only those costs implied by implementation of the project should be taken into account (see example 66).

#### **(iv) Maintenance:**

This refers to the cost of maintaining the capacity of movable and immovable property to yield benefits by preventing their premature deterioration or breakdown. In other words, under this heading come costs such as painting or minor repairs to buildings, regular servicing of vehicles and equipment, repairs and varnishing of furniture, etc.

### **Example 66: Additional costs of utilities**

---

*Let us suppose that in the case of the extension and renovation described in example 41, page 54, the institution currently has annual heating costs of \$325,000. As a result of the project, the area of the premises will increase by 608 m<sup>2</sup> to 1,138 m<sup>2</sup>. Let us suppose that this entire area will have to be heated and that (a) the efficiency of the heating system will not be affected by the project; (b) fuel prices do not vary to any significant degree; and (c) the indicated cost pertains to a year which can be considered representative of a normal year.*

*This being so, it can be calculated that the additional annual heating cost attributable to the project will be approximately \$283,206. In order to arrive at this figure, we first of all calculate the current heating cost per m<sup>2</sup>:*

$$\$325,000/608 \text{ m}^2 = 534.54 \text{ \$/m}^2$$

*Then, on the basis of this figure, we calculate the heating cost for the additional area gained by the institution:*

$$534.54 \text{ \$/m}^2 \times 530 \text{ m}^2 = \$283,206$$

---

Generally speaking, this value is estimated as a percentage of the value of the property requiring maintenance (approximately two or three per cent annually, depending on the type of property, the use to which it is put and the maintenance required).

#### **(v) Rental costs:**

This item refers to the payment of rental for buildings, land, vehicles and/or equipment required for the operation of the project. The figure to be entered here must be the total cost of rentals, including commissions, but, for the purposes of the evaluation, excluding any tax. If a deposit has to be paid, this should be considered a cost at the time of payment and a receipt at the time of its recovery.

In estimating rental costs, it is helpful to take as a basis the cost incurred under the same budgetary item in similar projects undertaken recently or, alternatively, to seek quotations from possible suppliers. The rental rate can also be estimated as a percentage of the value of the object rented.

#### **(vi) Other operating costs:**

Under this heading all the other operating costs necessary for the functioning of the educational institution may be itemized. These include: communications, printed matter and publications, insurance, banking and financial costs, etc. Only the additional costs due to the implementation of the project are considered, taxes being deducted for the purposes of the evaluation.

#### **(c) Transport costs**

In many cases the implementation of a project option entails daily travel for the school population or a change in its current travel pattern. Both in the case where a project option is designed to provide the transport service itself and that where the travel times and distances are affected by the project, the transport costs need to be calculated.

(i) *Travel time and cost:*

If the project option significantly changes the distances, travel times or travel costs for the pupils or students, it is recommended that these costs be calculated. This may prove to be the case where the purpose of the project is to build new premises, move out of the existing premises, close the existing premises, amalgamate institutions, and so forth.

In order to estimate such costs it is advisable to consult a map of the catchment area and to identify one or more points that can be considered representative of the location of the target population. The travel time and costs are then estimated on the basis of the means of transport used by most of the pupils or students—from each point marked to the educational institution—both for the situation assuming implementation of the project and that in which it is not implemented. These costs and times are then multiplied by the figure established for the size of the school population for each point and by the annual number of journeys to be made in order to obtain the total travel cost and time (see example 67). In the case of children needing to be accompanied to the institution, the costs incurred by the persons accompanying them must also be factored in.

(ii) *Transport of pupils and/or teachers:*

If the project option proposes to provide a transport service, the figure to be employed is the total cost of providing the service, including drivers' wages, fuel and lubricants, maintenance and servicing of the vehicles, the financial cost of capital invested in vehicles, etc.

A further figure to be calculated is the additional cost (or saving) entailed by the journey for the pupils and/or teachers. To arrive at this figure, it is necessary to calculate the overall average cost of travel, i.e. including fares and time, as explained in the following example.

---

**Example 67: Transport costs**

---

*Let us suppose that a project aims to relocate an educational institution. From a map of the service area it is established that most of the school population, 300 children, live in a poor district in the immediate vicinity of the institution in question. The new school building is to be located 30 "cuadras" (approximately 3.75 kilometres) from the centre of this district, so that the pupils will have to take a bus to get to school. The fare is \$100 and the average travel time is 15 minutes. There are 180 days of classes each year. Since the institution in question is a secondary school, the pupils are able to travel alone.*

*Using these data, it is possible to calculate that the project will mean that the pupils make 108,000 journeys per year ( $180 \times 2 \times 300$ ), which they do not have to make at present. The cost of travel will amount to \$10,800,000 per year ( $108,000 \times \$100$ ).*

*Furthermore, if at present their average journey to school takes five minutes, the travel time will increase by a total of 18,000 hours per year ( $[15-5] \times 180 \times 2 \times 300/60$ ).*

*In view of these higher transport costs, it is clear that other, extremely compelling reasons will be required to justify the change in the school's location.*

---



As a summary of these points, table X sets out the most usual costs according to whether the project in question pertains to educational infrastructure, the quality of the educational service or the provision of a one-off educational service.

### 5.2.2 Quantification of the costs of each option

Irrespective of the type of project or option concerned, similar methods need to be applied in quantifying the associated costs. Basically, the method to be employed consists of the following steps:

- Identification of all inputs required for implementation and operation;
- Quantification of the inputs required;
- Estimation of the price of each individual input;
- Calculation of the total annual costs of each input;
- Preparation of a table summarizing the costs of the particular option.

**Table X: Education project costs**

Type of cost	Projects relating to educational infrastructure	Projects providing educational services or improving standards
<b>Capital costs:</b> (Valued at the market price, minus tax. Based on similar recent project proposals and/or quotations)		
Land	Valued at market price, whether purchased or not	None
Construction	Based on cost per m <sup>2</sup> for similar works or works budgets	Arising in exceptional cases in small amounts (e.g. development of school grounds)
Equipment	Estimated as a % of construction or based on quotations	Quotations must be sought
<b>Operating costs:</b> (Only additional costs due to implementation of the project to be considered, without exception)		
Salaries and wages	Total cost to be considered, including social security benefits, of additional teaching and administrative staff, directors and ancillary staff	Total cost to be considered, including social security benefits, in respect of additional teaching, administrative and ancillary staff
Utilities	Additional costs of water, electricity, heating, refuse collection, etc. to be estimated	Normally included in the rental cost of the existing premises. Insignificant
Inputs	Teaching aids, cleaning materials, food supplies, etc.	Teaching aids
Maintenance	Painting and varnishing, minor repairs, servicing of vehicles and/or equipment, etc.	Generally non-existent

Type of cost	Projects relating to educational infrastructure	Projects providing educational services or improving standards
Rental costs	Rare, but there may be rent to pay on equipment or vehicles	Rent for facilities, vehicles, equipment, etc. to be taken into account
<b>Transport costs:</b> (To be included in the estimate only if the project relates to transport or significantly affects the pupils' or students' travel)		
Transport of pupils	May arise if it is planned to transfer the school population to another institution	The cost of providing the service and additional (or reduced) travel time for the users should be considered
Travel cost and time	The cost of (or savings in) fares and time of the pupils and any accompanying persons should be considered	Normally insignificant. Where they arise, fares and travel time should be estimated
<b>Other costs:</b> (Depending on the project, assignable either to the investment or operation stage)		
Advertising	Do not generally arise	To be based on similar projects or estimated as a % of the total cost of the project
Expert advice	May be required for complex projects, especially at the planning stage. Fees and costs of travel and subsistence should be included, where appropriate	Normally arise at the stage of project planning and implementation. Fees and costs of travel and subsistence should be included where appropriate
Traineeships	Do not generally arise	May be an important factor in projects to improve management. Costs of travel, subsistence and tuition fees to be taken into account

**(a) Identification of inputs**

The first step in estimating the cost of a project option is to identify all the inputs that will be required for its implementation and operation. It is important to bear in mind that all the inputs need to be identified, regardless of whether it is believed at the outset that some of them will not involve any cost for the agency setting up the project and/or running it when it is in operation.

In order to perform this task, it is advisable to seek out and study similar projects implemented in recent years. If no such experience is available in the education sector, similar projects may be sought in other sectors. If in the country as a whole there is no experience available of possible relevance to the project option, it is advisable to consult or engage an expert on the subject.

**Example 68: Drawing on experience gained elsewhere**

---

*Let us suppose that a project to improve educational standards envisages the organization of courses in modern administrative methods for the directors of primary education institutions. These courses will be organized on the basis of a contract with the faculty of administration of a university, which will provide the instruction.*

*The Ministry of Education has no experience in this area. However, a similar project has been implemented in recent years in the health sector, with the sponsorship of the Ministry of Health, for directors of hospital institutions. In addition, a very similar project is known to have been implemented by the faculties of administration and educational science of a well-respected North American university. Therefore, in order to determine the inputs required to implement the project it would be extremely helpful to contact the Ministry of Health and the university in question.*

---

At this stage it is sufficient to draw up a list of all cost items that can be predicted, to classify them according to the above-mentioned categories (capital costs, operating costs, travel costs) and to give a brief description of the cost item and the intervals at which it is likely to arise (see example 69).

**(b) Quantification of inputs**

The next step consists in determining what quantity of each of the identified inputs will be required. For the operating and travel cost items, the annual requirement should be stated if the project is scheduled to run for a number of years, or else the monthly, weekly or daily requirements if it is planned to run for less than one year.

**Example 69: Identification of the costs of a training programme**

---

*Continuing with the previous example, let us suppose that directors from all over the country will be participating in the courses, which will have a duration of eight weeks. The participants are to be selected on a competitive basis according to their background and qualifications. Each course will include field trips for the purpose of gaining familiarity with successful experience acquired in introducing modern administrative methods in educational institutions.*

*Each of the three courses to be held will cater for 25 directors. The venue will be a room made available by a local educational institution in return for its repair. Against this background, and after having contacted the Ministry of Health and the university, a preliminary list has been prepared of the cost items, as set out in the following table:*

Type of cost	Description
<i>Capital costs</i>	
Repair of room	The room needs to be painted and some window panes have to be replaced.
Equipment	It is necessary to buy a liquid crystal display for the presentations since there is none available for rent.
Advertising	Pamphlets and posters have to be printed to be distributed to all the country's educational institutions. The university has also suggested a radio campaign to raise awareness within the community of the importance of sound administration of educational institutions.
<i>Operating costs</i>	
Salaries and wages	The course instructors will be provided by the university, but the cost of the contract needs to be reflected. In addition, the Ministry of Health has suggested that it might be advisable to have a permanent secretariat set up to support the courses, composed of one administrator and two secretaries.
Utilities	The cost of utilities for the classroom will be covered by the establishment making it available, but should be taken into account for the purposes of project evaluation. The course secretariat will be set up in a building next door to the institution, and the utilities for these premises will be included in the rent.
Materials	On the basis of the experience available to the Ministry of Health, the usefulness will be gauged of providing each director with a folder of course materials, including notebooks, pencils and a calculator. Photocopying paper, acetates for transparencies, disks, blackboard markers and identity badges for teachers and participants will also be needed.
Rental costs	It will be necessary to rent an overhead projector and offices for the course secretariat.
Other operating costs	The costs of board and lodging for directors coming from other regions will need to be covered, along with the cost of lunch for those living in the area where the project is based.
<i>Travel costs</i>	
Transport of participants	The fares of directors coming from other regions will have to be covered, and transport will also be needed for the field trips.

In the case of projects relating to infrastructure, it is recommended that the estimate of construction costs be based on the standards stipulated by the competent authority for the sector (see annex 2 for an example of such standards). Using these as a basis, it is possible to establish the total area required to meet the identified need. Furthermore, it is helpful at this stage to refer to other similar projects implemented

recently, whether in the education sector or outside it. It is also recommended that the opinion of experts be sought, if only to validate the estimates made.

### **Example 70: Quantification of costs**

---

*Let us consider the board and lodging costs of the participants in the courses to be held under the project envisaged in the two preceding examples. On the basis of the number of institutions existing in the various regions of the country, it is estimated that 80 per cent of the participants will be coming from regions or areas outside the area where the project is based. These participants will require lodging and three meals per day (breakfast, lunch and dinner). Participants living in the vicinity of the project headquarters will only be provided with lunch during course days.*

*It is therefore possible to estimate that for each course there will be 20 participants from other areas ( $25 \times 0.8$ ) and 5 from the vicinity of the project headquarters. Thus, given that the classes will be held from Monday to Saturday, a weekly total of 140 breakfasts and dinners ( $20 \times 7$ ) and 170 lunches ( $20 \times 7 + 5 \times 6$ ) will be required. In addition, 140 nights of accommodation will be needed per week.*

---

### **(c) Estimation of the cost of inputs**

The next step is to assign a value to each of the inputs required to implement the project option. In performing this task it is important to bear in mind the following points:

#### **(i) All the inputs have to be assigned a value**

As already stated above, even where some projects inputs are the property of the agency implementing the project or have been donated or loaned free of charge, they must still be assessed in terms of value. The reason for this is that from society's point of view, any input into the project could potentially be used for a different activity. Thus, when it is used for the project society can no longer receive the benefits which it would have gained from the input in a different project or activity (see example 71).

#### **(ii) Taxes should be entered separately**

From society's point of view, the taxes associated with the inputs into the project do not constitute a cost. Even where taxes have to be paid in order to implement the project or where they fall due in the course of its operation, they are used for other works. In other words, it is assumed that the resources withdrawn from the project in the form of taxes will be used by the Government (whether national, regional or local) in other projects yielding similar returns. As far as society is concerned, therefore, taxes on project inputs can be seen as the equivalent of taking money out of one purse to put it in another.

### **Example 71: Alternative cost**

---

*Let us take the case of the classroom mentioned in the example elaborated upon in the previous paragraphs. The room is to be made available in return for a number of minor repairs. However, for the purpose of the evaluation, we need to take account of the costs implied by having available a room of this type. Let us consider the following two situations:*

**Case A:**

*In the locality of the project headquarters, a room with similar specifications can be rented for \$25,000 per day or \$120,000 per week for a minimum of two weeks, including utilities and without the need to carry out repairs. No charges or taxes are payable.*

*In order to evaluate the cost to society of using the room for the course we can assume that, if repaired, its cost would be similar to that of the alternative room. However, as it needs repair work, we shall have to deduct the cost of the repairs from the possible rental income.*

*The project will require occupation of the room for 24 weeks (3 eight-week courses), which would amount to a cost of \$2,880,000 in the case of the alternative classroom.*

*Let us also suppose that the cost of the repairs is estimated at \$1,150,000. The initial cost in respect of rental for the room can then be calculated as \$1,730,000, or \$216,250 per week. In addition, if we adopt this value for the room there is no need to calculate a cost for utilities, since these are already included in the cost indicated.*

**Case B:**

*The institution has had an offer from a company wishing to use the room as a storeroom for a period of one year. It has offered to pay \$1,200,000 in order to do so.*

*In this case, the alternative cost of using the room is yielded by the amount that the institution would obtain by renting it out. Assuming that the price offered by the enterprise corresponds to the market value, it can be taken that the alternative cost for the use of the room is \$100,000 per month.*

*In both cases, the total social cost to be assigned to the use of the room will be the same as the calculated alternative cost plus the cost of the repairs.*

---

Consequently, in the case of inputs which are liable to taxation, it will be necessary to indicate the cost with and without tax. The value minus tax will be used for the project option evaluation. The value plus tax will be used in drawing up the project budget to be employed in establishing the funding needs.

**Example 72: Treatment of taxes**

---

*One of the inputs identified in the case of the project implemented in the previous examples was a liquid crystal display (LCD). This is used in conjunction with an overhead projector to project images from a computer onto a screen. It was stated that it was necessary to purchase this equipment since it was not available for rent. Let us suppose that the total cost is \$499,990 and that a sales tax of 10 per cent is applicable in the country in question.*

*The cost of the equipment, net of tax, will then be \$454,536 ( $\$499,990/1.1$ ) and the tax will amount to \$45,454. Consequently, for the purpose of the economic evaluation of this project alternative we shall assign a cost of \$454,536 to the LCD screen. However, if this is the option selected, the cost assigned to the screen will be \$499,990 when it comes to preparing the budget with a view to seeking funding for the project.*

---

(iii) *All prices must be established in currency of the same date*

Where there is inflation in a country, especially where it has run into double figures, in order for it to make any sense to add up the costs assigned to different inputs it will be necessary to ensure that these costs are expressed in currency of the same purchasing power, or, put another way, in currency of the same date.

### **Example 73: Impact of inflation**

---

*If you have any doubt as to whether it really is necessary to use a currency rate fixed on a particular date, think for a moment how many things you can buy with your salary this month. Then imagine that because of budgetary constraints you are paid the same amount of money but six months later. In six months' time would you be able to buy everything that you can buy with your salary today? Obviously not, unless prices remain the same, i.e. unless there is no inflation.*

---

In order to establish the costs of inputs for the same date the procedure described below is followed:

- A coefficient is chosen for the purpose of adjusting the prices; this is normally the consumer price index (CPI) or the price index, whichever is higher;
- The values are established of the index which correspond to the dates of the prices known to us for each input;
- A date is selected for the purpose of expressing all the costs and the corresponding index value is determined;
- The adjusted prices or costs are calculated, i.e. expressed in currency at the rate established for the date chosen (see example 74) by means of the following formula:

$$\text{Adjusted price} = \text{Known price} \times \frac{\text{Index}_{\text{Adjusted price}}}{\text{Index}_{\text{Known price}}} \quad (6)$$

### **Example 74: Adjustment of prices to take account of inflation**

---

*Returning to the advertising cost item envisaged for the project described in examples 68 and 69 (pages 87 and 87-88), let us assume that an estimate for the printing of pamphlets and posters has been obtained for \$2,459,000, dated January 1994. In addition, it is known that a radio campaign similar to the one contemplated cost the Ministry of Health \$3,600,000 in June 1993. The information sought is the cost of advertising for July 1994, the date on which the project is scheduled to begin.*

*It is decided to use the consumer price index published each month by the country's national statistical office. This gives the following values:*

June 1993: CPI = 115.34

January 1994: CPI = 157.25

*In addition, the Ministry of Housing has transmitted to all interested agencies a table showing the expected CPI values for the year, which indicates that in July 1994 the value of the index will be 185.00.*

*On the basis of these data, we may calculate the estimated costs at the currency rate for July 1994 as follows:*

*Pamphlets and posters:  $\$2,459,000 \times (185/157.25) = \$2,892,941$*

*Radio campaign:  $\$3,600,000 \times (185/115.34) = \$5,774,233$*

*Thus, the total estimated cost for advertising will be  $\$8,667,174$ .*

---

(iv) *Calculating the social cost where appropriate*

The purpose of deducting taxes from the price of inputs is to arrive at the real cost for society for the purposes of the project evaluation. However, in many cases this is not the only adjustment that needs to be made. Other market distortions which are quite distinct from taxes entail adjusting the private rate for input prices by an adjustment coefficient in order to obtain the real cost for society. These adjustment coefficients are known as social costs, the most commonly used being the social cost of labour and that of foreign currency. These are normally calculated annually by the national body responsible for planning and the economy, and are circulated to the various agencies concerned with project evaluation. The procedure to be followed consists in multiplying the private rate for the input by the adjustment coefficient (social cost), thereby yielding the real cost of the input for society.

---

**Example 75: Social cost adjustment**

---

*Let us suppose that a social cost for skilled non-professional labour of 0.8 has been officially quoted. It will also be recalled that in example 66 (page 83) the need to engage two secretaries was identified. In order to cover the three courses to be held—their preparation, the intervening periods and the final evaluation—these secretaries will have to be engaged for a period of 10 months. Let us also suppose that the market rate for the secretarial salaries in question is \$150,000 per month. On the basis of these data it is possible to calculate the total cost in respect of the secretaries. For the purpose of the project budget, this will be \$3,000,000 ( $2 \times 10 \times 150,000$ ). However, for the purpose of the project evaluation, this cost will have to be adjusted by the aforementioned social cost. Thus, the social cost of the secretaries will be \$2,400,000 ( $2 \times 10 \times 150,000 \times 0.8$ ).*

---

In the light of the points made in the foregoing paragraphs, prices have to be assigned to each of the identified inputs. Some suggestions are given below for performing this task.

(i) *Land:*

What is referred to here is the cost of the physical space required to carry out the construction works. In order to size the land it is necessary to employ the established national architectural standards applicable



to the type of institution in question.<sup>15</sup> It is recommended that account be taken of the area required for the works, and also open spaces, scope for future expansion, and so forth.

The valuation of the land will be based on the market price and is necessary in all cases in which the land is to be purchased, is the property of the institution, or is being donated or loaned for use. Such a valuation is necessary because the use of the land for the educational institution implies a cost for society, since it would invariably have been possible to use the land for some other purpose. However, this cost should be considered exclusively for the purpose of the evaluation and should not be included in the budget prepared for the purpose of funding the project, except in cases where it is in fact necessary to purchase the land.

In cases where the land is to be purchased for the project, the total cost of the purchase is to be taken into account, including the price to be paid for the land and all other costs relating to the transaction (such as notarial fees, conveyancing costs, etc.). In cases where the land is already owned by the institution or where it is donated or loaned for use, the value assigned to it will correspond to the market value (the value for which it could be sold, assuming no impediment to its sale).

In estimating the market price of land, it is helpful to look at the prices commanded by similar plots of land in the same locality. Adverts in the press of land for sale are normally a good source of information, while estate agents may also be worth consulting.

It is also necessary to take into account any costs associated with the work of preparing the land, such as clearance, drainage, levelling and enclosure operations. If the land is not connected to utilities (such as electricity, drinking water and sewerage), the cost of establishing these connections must also be included, together with the cost of any feasibility study required for that purpose.

Any cost arising from tax (such as tax on property conveyance) should be reflected in the project budget, but not taken into account for the purposes of the evaluation.

In addition to the cost of purchasing the land, the project evaluation should also take account of its residual value. This corresponds to the price at which it is estimated that the land could be sold at the end of the project's useful life. In general, land does not lose its value but actually increases in value over the years. Thus, a conservative estimate would be that at the end of the infrastructure's useful life it will be possible to sell the land for the same price as the original purchase price.

#### **Example 76: Valuation of land**

---

*Let us suppose that it is necessary to extend a school by 1,000 m<sup>2</sup> and that there are two unoccupied plots of land next to the school, each with an area of 550 m<sup>2</sup>. One of these is municipal property and has been offered to the school in the form of a loan for use for a period of 100 years. The second—privately owned land—is for sale at the price of \$22,500,000. In addition, a transfer tax of 5 per cent of the value will be payable.*

*In this case, for the purpose of the project evaluation, the cost of the land will be set at \$45,000,000. This is because it would be necessary to pay \$22,500,000 for the private land and because the municipal land, despite being loaned free of charge, has to be valued at the market price, which is represented by the sale price of the other plot of land. The transfer tax is not taken into account in the evaluation of the social cost.*

---

<sup>15</sup> See, for example, annex 2, tables III to VII, which detail the recommendations in effect in Chile.

*In the budget prepared for the implementation of the project, however, the only cost entered as the cost of the land is \$23,625,000, which corresponds to the purchase price for the private land (\$22,500,000) plus the transfer tax (\$1,125,000).*

---

#### **Example 77: Residual value of land**

---

*Continuing with the previous example, let us suppose that the estimated useful life of the infrastructure to be built is 30 years.*

*It is therefore assumed that after 30 years the school extension will cease to function. The land loaned for use will have to be returned to the municipality on the grounds that it does not yield any income. The purchased land, on the other hand, can be sold, thus bringing in an income (in the year 30) of \$22,500,000 (assuming that the transfer tax is paid by the buyer).*

---

#### **(ii) Construction costs.<sup>16</sup>**

The cost of construction corresponds to the value of the buildings and other physical works necessary for implementing the project option. It includes the cost of purchasing materials and their transport, labour, site supervision, expert advice and any other items necessary for completion of the physical works.

It is recommended that the evaluation be based on the cost per m<sup>2</sup>, the rate being differentiated according to the type of work involved, i.e. whether it is construction, remodelling, repair work, etc. It is suggested that, for the sake of comparison, reference be made to the construction cost per m<sup>2</sup> recorded for the most recent educational projects undertaken in the area under study (a cost which will normally include all costs incurred by the building firm in carrying out the works). If no such projects have been undertaken in the area, the construction costs of other buildings may be taken as a point of reference, providing their specifications are similar to those of the proposed education project. If there is no project available to serve as a point of reference, a detailed budget of the construction works will have to be prepared. For this purpose, it is worth seeking the expert advice of a professional in the field of construction who is also acquainted with the particular locality.

For the social evaluation of the project, it may be necessary to adjust some of the input costs in order to establish the social costs. This adjustment will involve eliminating any taxes and possibly, making an adjustment for market distortions.<sup>17</sup>

Also, at the end of the project's useful life it will be necessary to take account of the residual value of the buildings. This will correspond to the estimated potential selling price of the buildings to be constructed, minus the cost of the land, which has already been taken into consideration.

---

<sup>16</sup> In this section the term "construction" is given a broad meaning covering repairs, remodelling, and so forth, as well as construction proper.

<sup>17</sup> For this purpose the so-called "social costs" are applied, the most common of these being the social cost of labour and the social cost of currency.

Finally, as in the case of land, the valuation should also take account of any contribution of work and/or other inputs required for the construction, valued at their respective market prices. These are considered for the purpose of the evaluation, but not for that of the construction works budget.

(iii) *Equipment:*

This corresponds to the value of furniture and any other items necessary for the practical functioning of the project. Such items may include, for example, chairs, desks, blackboards, etc. The cost of equipment should also include the cost of its installation, where appropriate.

In the case of a new building or a renovation project involving new construction works, the value generally assigned to this item ranges between 3 and 5 per cent of the total construction cost, depending on whether it is a partial or total renovation, or whether an entire building is being constructed.

It should be borne in mind that in the case of an extension or renovation of a building, only the equipment that is lacking should be considered and not the full list of equipment that might be required.

In the case of more sophisticated equipment (as might be needed, for example, for the purposes of courses in technology) it is recommended that a detailed list be drawn up of the equipment required, with an indication of its respective technical specifications, and that two or three estimates be sought from different companies.

The equipment is valued at its market price for the purpose of the project budget, but taxes are deducted for the purpose of the project evaluation. Any donated equipment is also valued at its market price for the project evaluation. Also, in some cases it may be necessary to adjust the market prices of the equipment in order to obtain its social costs. For example, the price of imported equipment will have to be adjusted by applying the social cost of currency.

One cost that should not be forgotten is that of replacing equipment, since the useful life of furniture and equipment is normally shorter than that of the building infrastructure. Consequently, during the time period covered by the evaluation, some items of equipment will need to be replaced every so often. Since different items of equipment have a different useful life, depending on their type, it will be necessary to estimate how often each type of equipment will need to be replaced. This cost will have to be entered in the project's cash flow for the year during which it is estimated it will arise.

Lastly, some items of equipment may, at the end of their useful life, have a residual value, which should be entered as income for the year in which they are replaced.

(iv) *Salaries and wages:*

The estimate of the cost of salaries and wages should specify the number of persons required according to their level of qualification (directors, teachers, administrative and ancillary staff). The monthly salaries for each of these categories are then established, including all additional costs for social security benefits, allowances, bonuses, and so forth.

In order to identify costs belonging under this heading, account must be taken of all staff involving additional expenditure for the agency in charge of implementing the project. In other words, it is not necessary to include the costs of existing staff who will continue to discharge their duties independently of the implementation of the project. In the case of voluntary staff, and then only for the purposes of evaluating the project, the cost entered should be the estimated cost of hiring personnel to perform the same work as the voluntary staff.

With regard to the estimation of the salaries and additional benefits corresponding to each category, there are two situations which obtain:

- (i) *Where there is a single salary scale* established at the national, regional or local level for salaries in the education sector, as a reference point salaries are taken from this scale which are felt to be representative of each category (teachers, ancillary staff, etc.). For this purpose, and given that in this system salaries will generally depend on the person's years of experience, it will be necessary to calculate an average level of experience for each category.
- (ii) *If salary levels are determined by the market*, it will be necessary to establish the average level of salaries in the area, according to level of qualifications. In the case of ancillary and administrative staff, it may be worth consulting job adverts in the press, employment agencies and other local bodies. This is because personnel of this kind do not normally have specialized training relating to the education sector, whereas directors and teaching staff do have such specialized training. Accordingly, in order to establish representative salaries, it will be necessary to refer to other types of establishment in the local area or other areas with similar characteristics.

In both of these two cases it will be necessary, for the social evaluation of the project, to adjust the cost of salaries by the social cost of labour. And for this purpose it is sufficient to multiply the estimated cost, possibly differentiated according to level of qualification, by the corresponding adjustment factor issued by the institution responsible for its calculation (usually the ministry of planning or the ministry of the economy).

(v) *Utilities:*

This item refers to the cost of the services necessary to ensure the functioning of the educational institution. Such services include, for example, water, electricity, telephone and, in some cases, fuel for heating and/or air conditioning. It is important to bear in mind that, as in the preceding case, only the additional costs implied by the implementation of the project should be taken into account.

In order to determine the price to be paid for basic services it is normally sufficient to contact the firm supplying those services in order to find out what they cost. If this is not possible and if any of the utilities has to be provided by the project itself (by means of an electrical power generator, for example), it will be necessary to consult entities which obtain the utility by the same method as that proposed in the project in order to ascertain what cost it represents.

(vi) *Inputs:*

This corresponds to the value of the items necessary for the educational institution's efficient functioning. It covers, for example, cleaning materials, stationery, pencils, chalk, and the like.

As in the previous categories, account should only be taken of the additional costs attributable to implementation of the project option. Where the project option involves the replacement of current inputs by new ones, only the net additional cost should be taken into account. In other words, the cost of the new inputs is calculated, the costs being deducted of those inputs that have been replaced.

The cost of the inputs required for the project can be estimated on the basis of experience gained by other institutions or projects developed in the sector. However, more exact and up-to-date prices are normally obtained by drawing up a list of the inputs required and ascertaining the current market prices by obtaining quotations.

These prices must include the costs of transport to the project site. Any taxes to which inputs might be liable should also be indicated separately.

#### **Example 78: Cost of inputs**

---

*Let us suppose that as part of a project to renovate the equipment of an educational institution, it is proposed to buy a floor cleaning and polishing machine. In this case, the cost of the input will correspond to the electricity, detergent and polish consumed by the machine.*

*However, it will not be necessary to buy any more brushes or manual floor cleaners, or conventional detergents. The annual net cost to be entered, therefore, will correspond to the difference between the cost of the present inputs and that of the estimated inputs used by the new machine.*

---

#### **(ii) Maintenance:**

Maintenance costs are usually estimated as a percentage of the value of the real estate, vehicles or equipment to be maintained. The values established for this percentage usually vary between 2 and 3 per cent per year for the real estate and equipment.

#### **(iii) Rental costs:**

In order to estimate rental costs for real estate, vehicles and/or equipment, the rental rates charged locally for property or items of the same or a similar type to that required should be investigated. For this purpose, the recommended approach is either to look at adverts in the press or to obtain quotations.

#### **(d) Calculating the total cost of each input**

The final step in estimating the project costs is to calculate the total cost of each input required. For this purpose, it is sufficient to multiply the quantity of the input by its price in order to obtain the total cost (see example 79).

This procedure is not entirely straightforward, however. Some of the most common difficulties encountered and ways of dealing with them are described below.

#### **Example 79: Calculation of the total cost of board and lodging**

---

*Let us consider the board and lodging costs for the participants in the courses organized in connection with the project envisaged in examples 69 and 70 (pages 87 and 89). Two hotels in the immediate vicinity of the institution where the project is to be implemented indicate, in response to enquiries, that they charge a rate of \$15,000 per person per night, including breakfast. A basic lunch or dinner in a local restaurant costs around \$3,000 on average.*

*It will be recalled from example 70 that it was calculated that a weekly total of 140 breakfasts, 170 lunches, 140 dinners and 140 nights of accommodation would be required. Thus, the cost for these items per course week will be as follows:*

*Breakfasts: no cost, included in hotel costs;*

*Lunches:  $\$3,000 \times 170 = \$510,000$ ;*

*Dinners:  $\$3,000 \times 140 = \$420,000$ ;*

*Accommodation:  $\$15,000 \times 140 = \$2,100,000$ .*

*Consequently, the total cost per course week for the board and lodging of the participants will be \$3,030,000. Since 3 eight-week courses are to be held, the total cost under this heading will be \$72,720,000.*

---

(i) *Costs which depend on the quantity purchased:*

The cost of an input will often depend on the quantity purchased. In other words, the trader will charge a certain standard rate, but may offer discounts which increase in proportion to the amount purchased. In such cases the rate corresponding to the amount purchased should be selected and multiplied by the quantity purchased.

Caution should be exercised in the case of perishable inputs or where the space available for their storage is inadequate. If this is the situation, it will be necessary to check whether the same rate will be payable for a number of smaller purchases during the calculation period (usually one year) or whether the rate corresponding to the volume of each purchase will be applied (see example 80).

(ii) *Prices with a significantly different pattern of variation from those of other inputs:*

There are various inputs whose price may vary in real terms (i.e., as expressed in currency of the same date) in a very different way from other market prices. In other words, there are cases in which the Consumer Price Index (or other price index of general application) is of no use in estimating variations in the price of the goods in question.

---

**Example 80: Prices which depend on volume**

---

*Prices which depend on the volume purchased are a factor when, for example, it is necessary to transport the inputs. Total transport costs, after all, will be approximately the same whether a vehicle is half or fully loaded. Consequently, the unit price of the inputs will be higher when the vehicle is only half loaded.*

*Let us consider the case of a programme aimed at supplying rural schools with textbooks.*

*Let us suppose that the cost of a van's journey from the town to a particular school is \$80,000. Five hundred mathematics textbooks and 500 history textbooks are to be supplied, all purchased from the same supplier for \$1,000 per book. The cost of the books delivered to the school, therefore, is \$1,080 each. However, if only 100 textbooks of each type are purchased, the unit cost of books delivered to the school will be \$1,400.*

---

In such cases it will be necessary to estimate the price in real terms for each occasion that the input is purchased. This is not a straightforward process and a discussion of how to deal with it lies beyond the scope of this document.<sup>18</sup>

---

**Example 81: Prices whose pattern of variation differs from other prices**

---

*Let us suppose that a project to raise standards of secondary education aims, inter alia, to gradually introduce computers into the classroom. In this case, a careful analysis should be made of the costs associated with the purchase of computers.*

*While it is probable that all other prices will gradually increase in step with the national rate of inflation, technological progress has the effect of depressing computer prices or at least keeping them stable. Thus, this cost cannot be dealt with in the same way as the other project costs.*

---

**(e) Table summarizing the costs of the option**

Lastly, it is worthwhile summarizing all the information brought together in the preceding sections in a table which indicates for each input the quantity required, its price and the estimated total cost. Two versions of this table should be prepared.

The first will include all taxes, but will exclude inputs which are donated or provided free of charge to the project. In addition, in view of the fact that this budget will be used in seeking funding for the project, it is a good idea to add an item covering unforeseen costs.

**Example 82: Project implementation budget**

---

*Budget for the implementation of the project described in example 68: \$113,606,597*

Type of cost	Quantity	Price	Total cost
<b>Capital costs</b>			22,316,759
University contract	Aggregate		12,000,000
Repair of room	Aggregate		1,150,000
LCD screen	1	499,990	499,990
Advertising			
Pamphlets and posters:	Aggregate		2,892,536
Radio campaign:	Aggregate		5,774,233

---

<sup>18</sup> For a detailed discussion of this problem see Weston and Brigham (1980), page 443.

Type of cost	Quantity	Price	Total cost
<b>Operating costs</b>			80,960,000
Salaries and wages			
Administrative:	1 x 10 months	250,000/month	2,500,000
Secretaries:	2 x 10 months each	150,000/month	3,000,000
Utilities	Included in the loan of the room with no additional charge		
Inputs			
Students' folders:	75	7,000	525,000
Teachers' materials:	Aggregate		125,000
Rental costs			
Overhead projector:	1 x 6 months	15,000/month	90,000
Office premises:	50 m <sup>2</sup> x 10 months	4,000/m <sup>2</sup> /month	2,000,000
Board and lodging			
Board + breakfast:	3,360	15,000/hotel night	50,400,000
Lunches:	4,080	3,000 each	12,240,000
Dinners:	3,360	3,000 each	10,080,000
<b>Travel costs</b>			4,920,000
Transport of students			
Fares:	60 return fares	50,000/fare	3,000,000
Field trips:	24 coach days	80,000/coach day	1,920,000
<b>Unforeseen (5% of total cost)</b>			5,409,838

The second table will exclude taxes and include any input donated or provided free of charge to the project, valued at its market price. This budget will be used for the purpose of the project evaluation (see example 83).

### Example 83: Project evaluation budget

*Budget for the evaluation of the project described in example 68: \$100,662,090*

Type of cost	Quantity	Price	Total cost
<b>Capital costs</b>			21,483,417
University contract	Aggregate		12,000,000
Repair of room	Aggregate		1,150,000
LCD screen <sup>(1)</sup>	1	454,536	454,536
Advertising			
Pamphlets and posters: <sup>(1)</sup>	Aggregate		2,629,578
Radio campaign: <sup>(1)</sup>	Aggregate		5,249,303



Type of cost	Quantity	Price	Total cost
<b>Operating costs</b>			74,531,400
Salaries and wages			
Administrative:	1 x 10 months	250,000/month	2,500,000
Secretaries: <sup>(2)</sup>	2 x 10 months each	120,000/month	2,400,000
Utilities <sup>(3)</sup>			
Electricity:	6 months	5,500/month	33,000
Water:	6 months	1,400/month	8,400
Inputs			
Students' folders: <sup>(1)</sup>	75	6,364	477,273
Teachers' materials: <sup>(1)</sup>	Aggregate		113,636
Rental costs			
Alternative cost of room: <sup>(4)</sup>	8 months	100,000/month	800,000
Overhead projector:	1 x 6 months	15,000/month	90,000
Office premises:	50 m <sup>2</sup> x 10 months	4,000 m <sup>2</sup> /month	2,000,000
Board and lodging			
Board and breakfast: <sup>(1)</sup>	3,360	13,636,360/hotel night	45,818,182
Lunches: <sup>(1)</sup>	4,080	2,727,27 each	11,127,273
Dinners: <sup>(1)</sup>	3,360	2,727,27 each	9,163,636
<b>Travel costs</b>			4,647,273
Transport of students			
Fares: <sup>(1)</sup>	60 return fares	45,455/fare	2,727,273
Field trips:	24 coach days	80,000/coach day	1,920,000

(1): Item liable to 10 per cent sales tax.

(2): Social price of non-professional skilled labour = 0.8. See example 75.

(3): Incremental cost calculated on the basis of the area of the room as a proportion of that of the institution.

(4): Based on (b) of example 71.

### 5.3 Criteria for the selection of options

Once the costs of each project option have been identified and quantified and the variables to be adopted as being close to the benefits have been selected and estimated, the next step is to evaluate each option. This involves comparing the costs of each option with its benefits, those options being approved in which the expected benefits exceed the estimated costs.

This is not always easy or even possible, however. As already mentioned above, with a few exceptions the benefits of projects in the education sector cannot be estimated in financial terms, which means that other methods have to be employed. As the purpose of this guide is essentially to provide guidance in identifying and formulating education projects, detailed description of every single method used lies outside its remit.

We have therefore confined ourselves to describing briefly below the most common techniques employed in project evaluation.<sup>19</sup>

Broadly speaking, the methods applied in the education sector for evaluating options fall into two categories: **cost-benefit methods** and **cost-efficiency methods**.

### 5.3.1 Cost-benefit methods

Cost-benefit methods are applied in cases where both the costs and the benefits can be expressed in financial terms. There are various indicators that may be calculated once the costs and benefits have been identified and established. These include the cost-benefit ratio, the capital recovery period, the net present value (NPV) and the internal rate of return (IRR). Of these, the most frequently used are the NPV and the IRR.

#### (a) Net present value

The net present value (NPV) is a means of measuring how much additional wealth is yielded for the agency implementing a project, measured in terms of current wealth. This is achieved by applying the following formula:

$$NPV = \sum_{i=0}^{i=n} \frac{B_i - C_i}{(1 + r)^i}$$

Where  $B_i$  = Benefits yielded by the project in the year  $i$   
 $C_i$  = Costs of the project in the year  $i$   
 $r$  = Discount rate

#### Example 84: Calculation of NPV in a training project

*Let us suppose that a company specializing in training decides to offer a course in project preparation and evaluation. The preparation of the course will take two months and the cost of preparing it (drafting of manuals, materials, etc.) is \$3,000,000, payable in advance. The same course will be held three years running, the first course being held 12 months after course preparation begins.*

*The annual operating cost (teachers, premises) is \$4,250,000, payable at the beginning of each course. The course fees, also payable at the beginning of the course, amount to \$450,000 per participant. It is estimated that 15 participants will register for each course. The course materials will cost \$50,000 per participant.*

---

<sup>19</sup> For more detailed information on the evaluation of social projects, see Gutierrez (1993), MIDEPLAN (1991), Fontaine (1992) or Londero (1991).

What will the company's profit be, in current terms, if it undertakes the course? Let us also assume that the relevant discount rate for the company is 12 per cent.

On the basis of these data we can draw up the following table of flows (values in thousands of \$):

Year	Benefits	Costs
0	0	3,000
1	$450 \times 15 = 6,750$	$4250 + 15 \times 50 = 5,000$
2	$450 \times 15 = 6,750$	$4250 + 15 \times 50 = 5,000$
3	$450 \times 15 = 6,750$	$4250 + 15 \times 50 = 5,000$

Each of the values of  $i$  to be added together ( $i=0$  to  $i=3$ ) is then calculated:

$$i = 0: (0-3000)/(1 + 0.12)^0 = -3,000$$

$$i = 1: (6750-5000)/(1 + 0.12)^1 = 1,563$$

$$i = 2: (6750-5000)/(1 + 0.12)^2 = 1,395$$

$$i = 3: (6750-5000)/(1 + 0.12)^3 = 1,246$$

Which, added together, yield: NPV = \$1,204 (thousands)

In other words, the enterprise will make a profit in current terms of \$1,204,000.

---

#### **Example 85: Calculation of the NPV of the amalgamation of two schools**

---

Let us return to example 59 on page 77. Let us suppose that the cost of extending school A is payable at the end of the first year and that in the same month the proceeds from the sale of the land occupied by school B are also due. The amalgamated school starts to operate at the beginning of year 2 and the savings are yielded at the end of the year. The useful life of school A is estimated at 20 years and the discount rate to be applied is 12 per cent. On the basis of these data we can compare the cost of amalgamating the schools with the saving yielded in the operating costs.

For the sake of simplicity, it may be observed that in the NPV formula it is possible to separate the benefits from the costs and to discount the two elements separately. This yields (values in thousands of \$):

Discounted cost of amalgamation:

$$42,000/1.12 = 37,500$$

Discounted proceeds from sale of land:

$$30,500/1.12 = 27,232$$

In order to calculate the discounted value of a constant series, representing the values at the end of each year over a period of 20 years, either a present value table, a financial calculator or a computer spreadsheet programme may be used. For example, for a 20-year series and a rate

of 12 per cent, a present value table will indicate a factor of 7.4694. Thus, the value of the savings, discounted at the beginning of the second year (given that the table assumes that the first flow occurs at the end of the first year), will be:

$$5,247 \times 7.4694 = 39,192.$$

In order to attach this value to the same date as the previous ones, it has to be discounted to the beginning of the first year:

$$39,192/1.12 = 34,993$$

Finally, the discounted proceeds from the sale of the land and from the operating costs savings are added together, and the cost of the amalgamation deducted. Thus, the NPV for the project is as follows:

$$NPV = 27,232 + 34,993 - 37,500 = \$24,725,000$$

---

### (b) Internal rate of return

The internal rate of return (IRR) corresponds to the discount rate which reduces the NPV of a project to zero. Using the same formula as above, the IRR will correspond to the rate at which:

$$0 = \sum_{i=0}^{i=n} \frac{B_i - C_i}{(1 + IRR)^i}$$

That rate is determined by means of an iterative procedure in which different values of "r" are tried out until one corresponding to the IRR is found. Fortunately, all computer spreadsheets and financial calculators have functions designed to automatically calculate the IRR of a flow of funds.

### Example 86: Calculation of the IRR

---

*If the data from example 84 are fed into a computer spreadsheet, an IRR of 34.2 per cent is obtained.*

*In order to check this value, repeat the calculation from this example is replacing r by 0.342 and see whether the NPV value obtained is zero.*

---

### 5.3.2 Cost-efficiency methods

In cases where it is not possible to express the benefits of a project in financial terms, or where the effort of doing so is unjustifiably great, cost-efficiency methods are applied. The purpose of such methods is to determine whether the project option will achieve the desired objectives at minimum cost (i.e., in the most efficient way possible).

#### (a) Minimum cost

The minimum cost method is applied in order to compare project options which yield *identical benefits*. If the benefits are equal, then the options differ only in terms of their costs, so that we can choose the option

which enables us to reach the desired objective with the least outlay of resources. However, since the costs associated with the different options may arise at different junctures, the comparison has to be made in present value. This is done by applying the following formula:

$$PVC = \sum_{i=0}^{i=n} \frac{C_i}{(1 + r)^i}$$

where, PVC = present value of costs  
C<sub>i</sub> = project costs in the year i  
r = discount rate

#### **Example 87: Calculation of the present value of costs**

*Let us suppose that a school needs a bus to transport the pupils. One option would be to buy the bus, which is valued at \$12,500,000 and has a useful life of 12 years. After the 12th year it can be assumed that the bus will have no value (residual value of zero).*

*The second option is to lease the bus for 12 years, in which case the annual cost, payable at the beginning of each year, will be \$1,500,000. In this case too, it may be assumed that the value of the bus at the end of the 12th year will be nought, so that the option of buying it will not be chosen.*

*In both cases, all the operating and maintenance costs will be the responsibility of the school and, since the same vehicle would be used in both options, it may be assumed that these costs would be identical in both cases. Whichever option is chosen, the starting date is in 12 months' time.*

*Given that the benefits of the two options are identical, we can apply the minimum cost criterion. Furthermore, the maintenance and operating costs are the same in both options, so that these can be disregarded (but only for the purposes of comparing the two options).*

*Thus, applying above the formula and assuming that the Government requires a discount rate of 12 per cent to be applied in evaluating public sector projects, the following results are obtained:*

$$PVC_{Opt.1} = \sum_{i=1}^{i=12} \frac{12.500}{1.12^i} = \$11,161,000$$

$$PVC_{Opt.2} = \sum_{i=1}^{i=12} \frac{1.500}{1.12^i} = \$9,292,000$$

**(b) Cost per beneficiary**

The minimum cost method is applicable only in cases where equal benefits are yielded by the different project options. Normally, however, different project options yield unequal benefits. Where this is the case, but the options differ basically in the “volume of benefit” generated (measured by means of a variable close to the benefits), the cost per beneficiary—or, in more general terms, the cost per “unit of benefit” yielded—may be used as a criterion for selecting project options. This is done by calculating the PVC for each option and dividing this value by the “volume of benefits” to be yielded, measured by means of a close variable, which is normally the number of beneficiaries. In other words:

$$C/B = \frac{PVC}{No. \text{ Benef.}} = \frac{\sum_{i=0}^{i=n} \frac{c_i}{(1+r)^i}}{Number \text{ of beneficiaries}}$$

where: C/B = Cost per beneficiary

**(c) Equivalent annual cost**

Another means of comparing options which yield identical benefits is the equivalent annual cost method. This consists in expressing all the project costs in terms of an annual instalment with a discounted value equal to the PVC of the project costs. It is calculated by applying the following formula:

$$EAC = PVC \times CRF$$

where: EAC = equivalent annual cost  
PVC = present value of [project] costs  
CRF = capital recovery factor, defined as follows:

$$CRF = \frac{r \times (1+r)^n}{(1+r)^n - 1}$$

where: r = discount rate  
n = number of years

**Example 88: Calculation of equivalent annual cost**

*Returning to the project for the purchase of a bus described in the preceding example, let us take a period of 12 years (n=12) and a discount rate of 12 per cent. On the basis of these data, it is possible to calculate (or look up in a table) the corresponding CRF:*

$$CRF = (0.12 \times (1+0.12)^{12}) / ((1+0.12)^{12} - 1) = 0.1614$$

Using this CRF, the following values of the EAC are obtained for the options described:

$$EAC_{Opt.1} = 0.1614 \times 11.161 = M\$ 1,802,000$$

$$EAC_{Opt.2} = 0.1614 \times 9.292 = M\$ 1,500,000$$

*Note: It should come as no surprise that the EAC in the second option is equal to the annual lease instalment, since the latter is also a stable value payable over the same period. In practice, we have simply repeated the previous calculation in reverse.*

---

#### (d) Equivalent annual cost per beneficiary

In the same way as for the minimum cost, it is possible to express the equivalent annual cost in terms of cost per beneficiary (or per unit of the variable closely related to the benefits). For this purpose it is sufficient to divide the equivalent annual cost by the number of beneficiaries of the project option or, in general terms, by the number of units to be yielded of the variable chosen as being close to the benefits (such as the number of beneficiaries, for example). In other words:

$$EAC/B = \frac{EAC}{No. \text{ Benef.}}$$

where: EAC/B = equivalent annual cost per beneficiary.

The decision as to which of these methods described above is the most appropriate will depend on the specifics of each project. Where possible it is recommended that more than one indicator be calculated, even if this yields similar information.

#### 5.4 Sensitivity analysis

Evaluation of a project on the basis of a project profile involves a high degree of uncertainty as regards the estimated costs and benefits and whether they will actually materialize as forecast. In general, the costs will have been estimated on the basis of similar projects undertaken recently (and duly discounted) or by consulting experts in the field. Similarly, the benefits expected from the project, whether expressed in financial terms or through close variables, will be based on estimates made by whomever was in charge of preparing the project and will be optimistic, by and large.

The actual costs and benefits of the project are hardly likely, therefore, to coincide precisely with the estimates made at the evaluation stage. The actual results of the project are consequently a matter of some uncertainty.

In order to tackle this problem a number of different methods have been developed. These attempt, in some cases, to estimate the probability distribution associated with the project indicators (PVC, IRR, EAC, etc.). Such methods call for detailed information on the probability distributions of the different parameters that might affect the results of the project. These distributions can be determined with the assistance of experts in the field. Some kind of mathematical procedure, such as simulation by the Monte Carlo method, is then applied in order to obtain the probability distribution associated with the project indicators.<sup>20</sup>

---

<sup>20</sup> For a detailed explanation of this method see Holloway (1979).

However, these methods are complex and difficult to apply and they require more detailed information than will normally have been collected in preparing a project outline. Consequently, a method which is more frequently used to gauge and allow for the uncertainty associated with the project profile is sensitivity analysis.

Sensitivity analysis consists in investigating how the project indicators vary as the parameters on which they depend are varied. Such analysis is normally performed in a rather mechanical fashion with attention being confined to how the PVC and IRR of the project are affected when costs rise by a certain percentage or the benefits decrease in inverse proportion.

---

**Example 89: An inadequate sensitivity analysis**

---

*Let us return to example 84 (page 102) on the project preparation and evaluation course. A crude sensitivity analysis (something which is regrettably all too common) might consist in studying, for example, how the PVC varies if the course income falls by 20 per cent, if the cost of preparing the courses increases by 20 per cent or if the cost of holding each course, including materials, increases by 20 per cent. By applying the same procedure set out in this example in order to calculate the PVC, the following results are obtained:*

*Income falls by 20 per cent (from \$6,750,000 to \$5,400,000):  $PVC = -2,039$*

*Preparation cost increases by 20 per cent (from \$3,000,000 to \$3,600,000):  $PVC = 603$*

*Cost of holding the course increases by 20 per cent (from \$5,000,000 to \$6,000,000):  $PVC = - < -1,199$*

*Clearly, even though this information indicates the need to keep checking the costs of holding the course and to pay heed to whether the actual income corresponds to the figures forecast, it does not add very much to the analysis of the project.*

---

A sensitivity analysis of the type described is of little use since it does not provide the kind of information which makes it possible to determine which variables are crucial to the success of the project and therefore require most attention. It is recommended that sensitivity analysis be performed on the basic variables giving rise to the expected costs and benefits of the project. It is then possible to establish those variables producing greater variations in the project results when they are varied within the ranges estimated as probable.

---

**Example 90: A good sensitivity analysis**

---

*Taking the previous example once again, a more useful sensitivity analysis would consist in determining how the PVC of the project varies as a function of variations in the number of course participants, in the amount of the course fees and in the various costs.*

*For this purpose it is advisable to make use of the sensitivity analysis function incorporated in most modern computer spreadsheets. Thus, for example, it is possible to draw up the following PVC tables:*



***PVC as a function of the number of participants and amount of the course fees:***

Amount of course fees (1000s of \$)	Number of participants				
	10	12	15	18	20
350	-6,002	-4,561	-2,400	-238	1,203
400	-4,801	-3,120	-598	1,924	3,605
450	-3,600	-1,679	1,203	4,085	6,007
500	-2,400	-238	3,005	6,247	8,409
550	-1,199	1,203	4,806	8,409	10,811

***PVC as a function of the cost of course preparation and the cost of holding each individual course:***

Cost of holding each course (1000s of \$)	Cost of course preparation				
	2,000	2,500	3,000	3,500	4,000
3,500	4,005	3,505	3,005	2,505	2,005
4,000	2,804	2,304	1,804	1,304	804
4,250	2,203	1,703	1,203	703	203
4,500	1,603	1,103	603	103	-397
5,000	402	-98	-598	-1,098	-1,598

*These tables show clearly that the amount of the course fees and the number of participants are the factors with greatest impact on the financial results of the course. It is not financially profitable to hold a course for 12 participants unless the course fees are considerable. For 20 participants, however, the course is profitable for any of the figures considered for the amount of the course fees.*

*Variations in costs do not have an impact of the same magnitude on the results (which does not mean that they need not be carefully monitored).*

---

Finally, a point worth mentioning is that even if sensitivity analysis is normally associated with the PVC or IRR, it can still be applied to any indicator used to gauge the advisability of a project. For example, a sensitivity analysis can be performed with regard to the EAC or EAC/Beneficiary. It is also possible to investigate the range of variation of the variables affecting the project results within which the adopted solution will continue to be the best. In short, any good project profile must include a detailed sensitivity analysis, especially in view of the high degree of uncertainty associated with estimates made in preparing such profiles.

## **6. PRESENTATION OF THE CHOSEN ALTERNATIVE**

*This chapter summarizes the basic information to be included in the outline of an education project. It indicates the sections that the outline document should have and the content of each section.*

When each of the possible options for solving the identified problem has been examined in depth and evaluated, it will be possible to select the project option to be implemented. The chosen option may become a project relating to the coverage provided by the education system or a project relating to the quality of education.

The chosen project option must be submitted to the authorities responsible for approving its implementation and/or providing funding. In some instances it may be advisable to present the chosen option to the local community, indicating why it was chosen and the associated benefits and costs. A project document should therefore be prepared along the lines indicated below.

### **Guidelines for a project outline**

#### **I. Summary and conclusions**

The project outline must begin with a careful and accurate summary of the most important considerations identified during the study. This will give the reader an overview of the problem and of the solutions suggested to solve the problem.

The summary must refer, firstly, to the problem that is to be solved, fully or in part, and the service area within whose boundaries the project is to be implemented. It is important to mention the main features of the problem and of the area analysed, with reference to both geographical and demographic conditions.

Secondly, it must reflect the results of the diagnostic analysis of the existing situation (deficit or surplus), with special reference to the population to be served by the project.

Finally, it is important to indicate the results of the project evaluation which, together with an indication of the different options examined, must highlight the most important features that led to the choice of the project option to be implemented.

#### **II. Diagnostic analysis of the current situation**

Here it is necessary to summarize the main features examined in the diagnostic analysis of the existing situation. The summary must include all relevant variables enabling a clear picture to be formed of the need or problem that has arisen.

##### **A. Service area**

It will be necessary to append a map clearly indicating the service area and its main features.

##### **B. Existing demand**

This section must contain the following information on the population seeking to be served by the education system:

(a) *If there is no education establishment*

(i) Population in the service area and its location:

- Map of the area
- Indication of the age group in question

(ii) Features of the population:

- Socio-economic characteristics
- Income level
- Cultural features

(iii) Features of the area:

- Accessibility
  - \* Existence of access roads
  - \* Condition of access roads
  - \* Means of transport
- Economic geography
- Climatic conditions

(b) *If there is an education establishment*

(i) Total number of pupils enrolled at the establishment presenting the problem:

- Breakdown by grade
- Number of classes in each grade
- Number of shifts
- Number of teachers in each grade

(ii) Provenance of pupils

The establishment should be marked on the map, together with an indication of the areas where the pupils live

(iii) Features of the school population

- Socio-economic level
- Educational level of the parents and/or guardians
- Dominant cultural features

(iv) School population in the service area

A brief analysis should be included of the remainder of the service area, essentially with reference to the age group of interest: population in that group, its location and where it is being served by the education system.

### **C. Demand projection**

Under this heading the following points should be indicated:

- Population by age group in year x
- Features of the area considered in the projection.

### **D. Existing supply**

Here a summary should be given of the background factors affecting the supply provided by the education system in the service area of the project.

#### **(a) *If there is no education establishment***

##### **(i) Features of existing establishments in the service area**

- Geographical location of each establishment
- Year in which each establishment was built and the material used
- Type of administration and funding
- Existence and availability of land
- Surface area and condition of each existing building.

##### **(ii) Features of the area**

- Availability of basic services
- Public safety
- Access

##### **(iii) Features of the education service**

- Type of education provided in the service area

#### **(b) *If there is an education establishment***

##### **(i) Geographical location of the establishment (location map)**

##### **(ii) Features of the physical premises**

- Year of construction of the building and the material used
- Original purpose of the building
- Installed capacity of the building
- General condition of the building
- Equipment
- Availability of basic services
- Features of the land.

##### **(iii) Administrative matters**

- Officer in charge of administration
- Type of funding
- Staff
- Ownership and legal status of the land

- (iv) Type of education provided
- (v) Features of the surrounding area
- (vi) Network of establishments in the area.

#### **E. Education indicators**

In this section a summary should be given of all the values assigned to the variables examined during the study.

#### **F. Deficit**

If applicable, the following should be indicated:

- (a) *Deficit relating to the infrastructure of the education system*
  - (i) Coverage deficit
  - ii. Deficit due to the poor condition of the infrastructure or equipment
- (b) *Deficit relating to the quality of the education service*

### **III. Identification and definition of solution options**

Under this heading a summary should be given of each of the options examined with a view to solving the problem noted.

**A. Optimization of the existing situation.** Where possible, indication should be given of the improvements that may be achieved, compared with the existing situation, either with regard to coverage or with regard to quality of service, through administrative and management measures (with the least possible investment).

**B. Description of each of the options examined.** A brief description should be prepared of each option examined and its main physical and operational features.

### **IV. Evaluation of the project option**

It is necessary to give a brief description of the benefits and costs associated with each option examined and the criteria and variables influencing the choice of project option to be implemented. To this end it is suggested that a summary be given of the following points:

- Identification and quantification of the benefits yielded by each option;
- Identification and quantification of the costs of each option;
- Criteria used and examined in selecting the project option.

### **V. Chosen option**

Finally, the document must refer briefly to the benefits and costs associated with the implementation and operation of the project, i.e. the chosen option.

## **A. Benefits**

Under this heading it is necessary to summarize all benefits, whether or not they can be measured, which have been identified in connection with the chosen project option. If the benefits are measurable, they must be reflected, as far as possible, by indicators of the type set out in tables VIII and IX in this text (pages 75 and 76). If the benefits cannot be expressed in terms of such indicators, they must none the less be mentioned and described in the document.

## **B. Costs**

It is necessary to mention each of the cost items connected with the chosen option, together with the corresponding units of measurement and costs. The following items must be included, as applicable:

### **(a) Capital costs**

- (i) Land
- (ii) Construction (summary of the architectural plans, indicating construction costs per m<sup>2</sup>)
- (iii) Equipment
- (iv) Publicity

### **(b) Operating costs**

- (i) Salaries
- (ii) Inputs
- (iii) Utilities
- (iv) Maintenance
- (v) Rental costs
- (vi) Other.

### **(c) Transport costs**

- (i) Travel time and costs
- (ii) Transport of pupils and/or teachers.

## **VI. Annexes**

Any document providing material that supports or explains the need for the project should be appended to the outline. The following, in particular, should be included:

- School location map prepared during the study, indicating service area, areas where the demand exists, establishments providing supply, distances, etc.;
- Architectural plans, where appropriate;
- Engineering designs, where appropriate;
- Detailed project budget;
- Certificates attesting to the legal status of the land to be occupied by the project;
- Certificate attesting to the feasibility of funding the operating costs of the project, with the backing of the competent authority;

- Community undertakings with regard to the implementation and/or operation of the project;
- Feasibility of connection to basic utilities;
- Photographs illustrating the situation as presented;
- Technical reports in support of the proposals made.

It is suggested that the format shown in the figures and tables referring to each point examined in this document be used as models for the above-mentioned annexes and also for other sections of the project document.

## BIBLIOGRAPHY

- CELADE (Latin American Demographic Centre) (1984), *Métodos para proyecciones demográficas* (LC/DEM/CR/G.05), San José, CELADE Subcentre in San José, November.
- CELADE/INE/CIDA (Latin American Demographic Centre/National Institute of Statistics/Canadian International Development Agency) (1991), *Método de proyecciones de población por componentes multiregionales: aplicación a las regiones de Chile 1980-2000* (LC/DEM/G.111), Santiago, Chile.
- Cohen, E. and R. Franco, (1988), *Evaluación de proyectos sociales*, Buenos Aires, Grupo Editor Latinoamericano.
- Colombia, National Planning Department (1992), *Planeación y desarrollo. Capital humano y política social*, Bogotá.
- ECLAC (1992): *Social Equity and Changing Production Patterns: An Integrated Approach* (LC/G.1701/Rev.1-P), Santiago, Chile. United Nations publication, Sales No. E.92.II.G.5.
- \_\_\_\_\_ (1991), *La equidad en el panorama social de América Latina durante los años ochenta* (LC/G.1686), Santiago, Chile.
- \_\_\_\_\_ (1990), *Changing Production Patterns with Social Equity: The Prime Task of Latin American and Caribbean Development in the 1990s* (LC/G.1601-P), Santiago, Chile, March. United Nations publication, Sales No. E.90.II.G.6.
- ECLAC/UNESCO (1992), Regional Office for Education in Latin America and the Caribbean, *Education and Knowledge: Basic Pillars of Changing Production Patterns with Social Equity* (LC/G.1702/Rev.1-P), Santiago, Chile. United Nations publication, Sales No. E.92.II.G.6.
- Fontaine, E. (1992), *Evaluación social de proyectos*, eighth revision, Santiago, Chile, Catholic University of Chile.
- Gutiérrez, Héctor (1993), *Fundamentos metodológicos, conceptuales y operativos del enfoque costo-eficiencia y necesidades básicas en la evaluación social de los proyectos sociales* (LC/IP/L.85), Santiago, Chile.
- Harberger, Arnold (1984), *Basic needs versus distributional weights in social cost-benefit analysis*, *Economic Development and Cultural Change*, vol. 32, No. 3, April.
- Holloway, Charles A. (1979), *Decision Making Under Uncertainty, Models and Choices*, Prentice Hall.
- ILPES (Latin American and Caribbean Institute for Economic and Social Planning) (1993a), *Propuesta metodológica para la evaluación ex-post y el informe de término de los proyectos de inversión* (LC/IP/L.84), Santiago, Chile.
- \_\_\_\_\_ (1993b), *Guía para la presentación de proyectos*, Mexico City.
- \_\_\_\_\_ (1992a), *Programa de capacitación. La ficha CAS y la focalización de los programas sociales*, Santiago, Chile.



- \_\_\_\_\_ (1992b), Manual metodológico para proyectos de infraestructura de establecimientos del sector salud del primer nivel (LC/IP/L.65), Santiago, Chile.
- \_\_\_\_\_ (1992c), Manual general de indentificación, preparación y evaluación de proyectos, (LC/IP/L.43/Rev.1), Santiago, Chile.
- \_\_\_\_\_ (1992d), Manual metodológico para la indentificación, preparación de proyectos de infraestructura educacional (LC/IP/L.064), Santiago, Chile.
- Londero, E. (1991), Las medidas de costo por unidad de servicio: el caso del costo por egresado, *Desarrollo y sociedad*, No. 27.
- MIDEPLAN (Ministry of Planning and Cooperation) (1992), Inversión pública, eficiencia y equidad, Investments Department, Santiago, Chile.
- \_\_\_\_\_ (1991), Preparación y presentación de proyectos de inversión, Santiago, Chile.
- \_\_\_\_\_ (1990a), La ficha CAS como instrumento de asignación de subsidios, Santiago, Chile.
- \_\_\_\_\_ (1990b), Población, educación, vivienda, salud, empleo y pobreza, Santiago, Chile.
- Ministry of Public Education (1993), Derecho a la educación, Santiago, Chile.
- \_\_\_\_\_ (1992), Compendio de información estadística, Planning and Budget Division, Department of Statistics, Santiago, Chile.
- \_\_\_\_\_ (1990), Programa de mejoramiento de la calidad de las escuelas básicas de sectores pobres. Evaluación de programas de educación, Santiago, Chile.
- Ministry of Public Education/MECE (1993), Manual proyectos de mejoramiento educativo 1993, Santiago, Chile.
- \_\_\_\_\_ (1992), Nuestra futura educación media. Temas para los grupos de discusión, Santiago, Chile.
- Sanin, Héctor (1992), Guía metodológica para la formulación y evaluación de proyectos, Caracas.
- SIMCE (System for Measuring the Quality of Education) (1990), Sistema de medición de calidad de la educación. Folleto técnico para profesores y directores, Santiago, Chile.
- Thias, H. and M. Carnoy (1972), Cost Benefit Analysis in Education. A Case Study of Kenya, World Bank Staff Occasional Papers, No. 14, Washington, D.C., World Bank.
- Toro, F. and A. Cox (1994), Estándares de equipamiento comunal urbano, Santiago, Chile.
- Weston, J.F. and E.F. Brigham (1980), *Managerial Finance*, seventh edition, Hinsdale, Illinois, The Dryden Press.
- Zamorano, H. and Jorrat (1993) Proyecto construcción liceo sector norte, Copiapo, Copiapo, Chile. Regional Secretariat for Planning and Coordination.

## Annex 1

### EDUCATIONAL INDICATORS

Listed below is a series of indicators,<sup>21</sup> which may be extremely helpful when performing the detailed analysis of the identified problem and, especially, when determining the type of deficit to be dealt with and its scale in relation to the performance of other districts or regions, and/or at the national level.

1. *Educational lead:*

This denotes the percentage of pupils in a given grade (class) who are younger than the normal age for that grade.

2. *Mean attendance:*

This denotes the quotient obtained from the total number of pupils enrolled at an establishment, the type of instruction or course during a given period and the number of days worked during the same period of time.

3. *Coverage:*

This denotes the percentage of the school-age population served by the educational system (see example 91).

4. *Average age:*

This denotes the weighted average of the ages of pupils in a given grade (class) or level. It is obtained by multiplying each age by the number of enrolled pupils of the respective age. The products are then added together and the result is divided by the total enrolment figure for the grade or level.

5. *Internal schooling:*

This indicator denotes the weighted average of the years of study of the pupils enrolled in the system. For calculation purposes, it is assumed that the schooling of pupils corresponds to the grade at which they are enrolled. For example, pupils in the first grade are considered to have one year of schooling, pupils in the second grade two years, and so on.

6. *Average schooling of the population:*

This indicator denotes the average number of years of actual school attendance of all the inhabitants of the country, region or town.

---

<sup>21</sup> The indicators listed are taken from MINEDUC [1992].

### Example 91: Calculation of coverage

---

*The Chilean Ministry of Education employs the following method to calculate coverage:*

*Taking the following:*

- (a) *Enrolment figures broken down according to age alone, these being obtained from the enrolment forms processed by the Ministry;*
- (b) *Population broken down by age alone, as obtained from the publications issued by the National Statistical Institute (INE).*

*Coverage is calculated at each level as follows:*

***Elementary education coverage:*** *The following formula is applied:*

---

$$\frac{\text{Total enrolment in elementary education} + \text{Total enrolment in special education}}{A + B + C + D + E - F - G}$$

---

*Where:*

- A = Population in the age bracket of 6 to 13 years*
- B = Number of children under the age of 6 years in elementary education*
- C = Number of children over the age of 13 years in elementary education*
- D = Number of children under the age of 6 years in special education*
- E = Number of children over the age of 13 years in special education*
- F = Number of children under the age of 14 years in secondary education*
- G = Number of children over the age of 5 years in nursery education*

*The numerator represents the total enrolment in elementary and special education, while the denominator represents the population of children aged from 6 to 13 years, to which is added the number of over-aged pupils enrolled (i.e., pupils over the ideal age for the grade in question, in this case over the age of 13 years for elementary education) in respect of both elementary and special education, and from which are deducted the number of pupils in secondary education aged 13 years or less and the number in nursery education aged 6 years or more on the grounds that they are included in the population between the ages of 6 and 13 years.*

***Secondary education coverage:*** *The following formula is applied:*

---

$$\frac{\text{Total number of pupils enrolled in academic and vocational secondary education}}{A + B + C - D - E - F - G}$$

---

*Where:*

- A = Population in the age bracket of 14 to 17 years*
- B = Number of children under the age of 14 years in secondary education*

- C = Number of children over the age of 17 years in secondary education*  
*D = Number of children between the ages of 14 and 17 years in elementary education*  
*E = Number of children between the ages of 14 and 17 years in special education*  
*F = Number of children between the ages of 14 and 17 years in adult education*  
*G = Number of children between the ages of 14 and 17 years in higher education*

*Here, the numerator represents the total number of pupils currently enrolled in secondary education. The denominator represents the population between the ages of 14 and 17 years, to which the number of over-aged children in secondary education should be added and the number in elementary, special, adult and higher education deducted, since the latter categories are served by other levels within the system while also falling within the 14 to 17 year age bracket.*

### **Example 92: Calculation of average level of schooling**

*The average level of schooling of the population can be obtained by means of various calculation methods, most particularly the method proposed by the CPEIP in the document "Niveles de Escolaridad de la Población Chilena 1970-1982" [Levels of Schooling of the Chilean Population 1970-1982], in Study Series No. 139, published in Lo Barnechea (Chile) in December 1984.*

*The source of the data used in the calculation was the quarterly publication of the INE "Encuesta Nacional del Empleo" [National Employment Survey]. Since 1982 to the present date, this publication has focused on the population aged 15 years and above, this being the legal age under international agreements and treaties for entering gainful employment.*

*The calculation method essentially consists in drawing up a calculation matrix into which the corresponding data from the National Employment Survey are filled in. An example of such matrix is given below, the data provided being those from the last quarter of 1990.*

**Average level of schooling calculation matrix**  
**(Average in thousands for 15 years and above)**

Illiteracy and years of study completed	(1) Average years of study	(2) Total population, male and female	(3) Product (1) x (2)	(4) Economically active population	(5) Product (1) x (4)
Illiterate	0	502.7	0	181.8	0
None	0	36.2	0	14.5	0
Unknown	0	223.3	0	95.1	0
1	1	51.7	51.7	21.8	21.8
2 - 3	2.5	601.7	1,504	267.4	668.5
4 - 6	5	1,821.8	9,109	889.2	4,446
7 - 8	7.5	1,206.7	9,050	632.4	4,743
9 - 10	9.5	1,317.1	12,512	567.2	5,388
11 - 12	11.5	2,447.7	28,149	1,294.0	14,876
13 - 15	14	247.9	3,849	129.3	1,810

Illiteracy and years of study completed	(1) Average years of study	(2) Total population, male and female	(3) Product (1) x (2)	(4) Economically active population	(5) Product (1) x (4)
16 - 18	17	438.6	7,456	330.3	5,615
19 and over	19	40.1	761.9	36.3	689.7
Total		8,962.5	72,443	4,459	38,259

Average level of schooling of total population =  $72,443/8,962.5 = 8.08$  ([Total column (3)]/[Total column (2)])

Average level of schooling of the economically active population =  $38,259/4,459 = 8.58$  ([Total column (5)]/[Total column (4)])

Source: "Encuesta nacional del empleo, Octubre-Diciembre de 1990" [National Employment Survey, October-December 1990, INE].

7. *Initial enrolment:*

This denotes the number of students actually enrolled on a date at the beginning of each school year specified by the educational authorities for all the establishments according to the official records of each educational unit.

8. *Final enrolment:*

This denotes the number of students enrolled at the end of the school year. It is obtained by taking the initial enrolment, adding to this the number of students entering the system after the date specified for the initial enrolment and deducting those transferred or withdrawn during the school year.

9. *Additional incurred cost:*

This denotes the ratio, expressed in percentage terms, between the length of time taken to complete a course or level and the number of grades covered by that course or level, such ratio indicating any additional time taken to complete the course or level.

10. *Educational normality:*

This denotes the percentage of pupils of normal age at a given grade.

11. *Retention:*

This is the final result of the educational evaluation conducted for each grade within the school system and is expressed in terms of the success, failure and attrition rates.

*Successful students:* This is the number of students who have performed satisfactorily during a school year according to the evaluations conducted. The term “success rate” therefore denotes the ratio between the number of successful students and the total number of students evaluated:

$$\text{Success rate} = \frac{\text{Successful students}}{\text{Total number of students}}$$

*Failed students:* This is the number of students who have not performed satisfactorily during the school year according to evaluations performed. The failure rate is the ratio between those students failing to perform satisfactorily and the total number of students:

$$\text{Failure rate} = \frac{\text{Failed students}}{\text{Total number of students}}$$

*Attrition:* This term refers to those students who, as a result of formally or informally withdrawing from the system, are not in a position to be evaluated. The *attrition rate* is the ratio between students who have withdrawn from the system and the total number of students:

$$\text{Attrition rate} = \frac{\text{Students withdrawing}}{\text{Total number of students}}$$

12. *Education lag:*

This term denotes the percentage of pupils in a given grade who are older than the normal age for that grade.

13. *Illiteracy rate:*

This is the percentage of the population aged 15 years and above who are incapable of reading or writing a short paragraph. This indicator is normally obtained from population censuses (see example 93).

**Example 93: Calculation of illiteracy rate for intercensal years**

*The following calculation method may be employed for the intervening years between censuses. The number of illiterate persons yielded by the base census is taken and from this figure are deducted the number of persons acquiring literacy each year and the number of persons deceased in the age groups to which the illiterate persons belong (in accordance with a weighted rate for the different age groups). To this figure is added the number of persons whose illiteracy is due to the discontinuation of their studies (a figure which corresponds to the percentage of pupils withdrawing from the school system between the first and third elementary grades). This*

*entire process yields the number of illiterate persons at the end of the year, a figure which is divided by the population aged 15 and above to yield the percentage of illiterate persons. This process is performed on a yearly basis.*

---

14. *Timely graduation rate:*

This is the ratio, expressed as a percentage, which is established between the number of pupils graduating within a number of years equivalent to the number of grades within a course or level and the number of pupils who entered at the first grade.

15. *Total graduation rate:*

This is the ratio, expressed as a percentage, which is established between the number of pupils graduating within a number of years greater than the period covered by the course or level and the number of pupils entering at the first grade.

16. *Retention rate:*

This is the ratio, expressed as a percentage, between the number of pupils remaining at the school at each grade and the number of pupils in the initial group which began the first grade in a given year.

17. *Graduation time:*

This is the weighted average of the number of years that a pupil remains within the system before graduating from a given grade, course or level.

Annex 2

**GUIDELINES FOR SIZING EDUCATION ESTABLISHMENTS**

**Table I: Size standards applied to elementary and secondary establishments in Latin America and the Caribbean, 1983.**

Country	Urban elementary		Urban secondary	
	Minimum capacity	Maximum capacity	Minimum capacity	Maximum capacity
Antigua	404	570	274	525
Argentina	210	630	175	875
Bolivia	320	1,280	320	960
Brazil	480	960	600	1,200
Chile	396	792	264	1,188
Colombia	200	800	240	3,000
Dominican Republic	40	1,920	45	1,920
Ecuador	120	600	150	1,000
El Salvador	20	1,440	41	2,610
Guatemala	30	360	30	360
Guyana	30	1,750	100	1,544
Mexico	100	900	300	900
Paraguay	40	480	40	480
Peru	240	720	200	1,200
Santa Lucia		400		600

*Source:* OREALC, Criterios y normas utilizados en las construcciones escolares de América Latina y El Caribe (Criteria and standards applied in school facility construction in Latin America and the Caribbean), (1983).



Table II: Size standards applied to elementary and secondary establishments in Latin America and the Caribbean, 1983

Country	Level	Number of grades or levels	Age range	School size			
				Minimum per school		Maximum per school	
				Urban	Rural	Urban	Rural
Antigua	pre-school	variable	3-5				
	elementary	7	5-11	404	72	570	530
	secondary	5	12-18	274	368	525	515
Argentina	pre-school	2	4-5	100		300	
	primary	7	6-12/14	210		630	
	secondary	5	13/15-17/19	175		875	
Bolivia	pre-school	2	4-6	180		270	
	intermediate elementary	5 3	6-10 11-13	320		1,280	
	secondary	4	14-18	320		960	
Brazil	pre-school		4-6				
	elementary	8	7-14	480	18 one teacher only	960	
	secondary	3 to 4	15-17/18	600		1,200	
Chile	pre-school		2-5				
	elementary	8	6-13	396	44	792	310
	secondary	4	14-17	264		1,188	
Colombia	pre-school	2	under 6				
	elementary	5	6-12	200	40	800	200
	secondary	6	13-19	240	80	3,000	160
Dominican Republic	pre-school	1	5-6				
	elementary	6	7-12	40	40	1,920	1,000
	secondary	6	13-18	45	45	1,920	1,000
Ecuador	pre-school	2	3-6	50	30	250	100
	elementary	6	6-12	120	60	600	200
	secondary	6	12-18	150	120	1,000	400
El Salvador	pre-school	3	4-6	20	20	973	207
	elementary	9	7-15	20	20	1,440	720
	secondary	3	16-18	41	20	2,610	161

Country	Level	Number of grades or levels	Age range	School size			
				Minimum per school		Maximum per school	
				Urban	Rural	Urban	Rural
Guatemala	pre-school	2	5-6	30		360	
	elementary	6	7-14	30	30	360	360
	secondary	5-7	12-19	30	30	360	360
Guyana	pre-school	2	3.9-5.9	30	30	243	196
	elementary	6	5.9-12	30	30	1,750	1,599
	secondary	6	12-18	100	100	1,544	1,051
Mexico	pre-school	2	5-6	70	40	360	250
	elementary	6	7-12	100	100	900	600
	secondary	3	13-15	300	150	900	600
Panama	pre-school						
	elementary	6	7-12				
	secondary	6	12-17				
Paraguay	pre-school						
	elementary	6	7-12	40	40	480	480
	secondary	6	15-17	40	40	480	480
Peru	pre-school		under 6	30	30	180	180
	elementary	6	6-11	240	240	720	480
	secondary	5	12-16	200	200	1,200	800
Santa Lucia	pre-school						
	elementary		5-15			400	400
	secondary	6	12-19			600	
Uruguay	pre-school	3	3-5	30	20	40	40
	elementary	6	6-12	35	20	45	38
	secondary (technical)	3-6	13-18	80	40	3,500	100

Source: OREALC: Criterios y normas utilizados en las construcciones escolares de América Latina y El Caribe, (Criteria and standards applied in school facility construction in Latin America and the Caribbean), (1983).

Table III: Educational facilities planning programmes for urban general elementary schools, 1987

Programme	B07	B08	B09	B10	B11	B12	B13	B14	B15	B16	B17	B18
Capacity (number of pupils)	285	330	375	420	465	510	555	600	645	690	735	780
Administrative area	M <sup>2</sup>	60	60	60	72	72	72	72	90	90	90	90
Head teacher's office	12	1	1	1	1	1	1	1	1	1	1	1
Deputy head's office A	9	1	1	1	1	1	1	1				
Deputy head's office B	12								1	1	1	1
Secretary's office/waiting room A	9	1	1	1	1	1	1	1				
Secretary's office/waiting room B	18								1	1	1	1
Archive	3	1	1	1	1	1	1	1	1	1	1	1
Teaching equipment storeroom	6	1	1	1	1	1	1	1	1	1	1	1
Staff room A	18	1	1	1								
Staff room B	30				1	1	1	1				
Staff room C	36								1	1	1	1
Porter's lodge	3	1	1	1	1	1	1	1	1	1	1	1
Teaching area	M <sup>2</sup>	582	636	690	744	840	912	966	1020	1146	1200	1254
Teaching aids unit A	12	1	1	1								
Teaching aids unit B	18				1	1	1	1	1	1	1	1
Classroom for 30 pupils	36	2	2	2	2	2	2	2	2	2	2	2
Classroom for 45 pupils	54	5	6	7	8	9	10	11	12	13	14	15
Rooms for special needs of group of 6 pupils	18	1	1	1	1	1	2	2	2	2	2	2
Multi-purpose workshop/shelving	72	1	1	1	1	1	1	1				
Multi-purpose workshop/storeroom B	84								1	1	1	1

Programme	B07	B08	B09	B10	B11	B12	B13	B14	B15	B16	B17	B18
Capacity (number of pupils)	285	330	375	420	465	510	555	600	645	690	735	780
Library/bookstore A	66	1	1	1	1	1	1	1				
Library/bookstore B	72								1	1	1	1
Covered play area/cafeteria A	72	1	1	1								
Covered play area/cafeteria B	108				1	1	1	1	1	1	1	1
Service area	M <sup>2</sup>	132	150	150	186	186	186	186	204	204	204	204
Sanitary facilities/showers A	49.5	1										
Sanitary facilities/showers B	67.5		1	1								
Sanitary facilities/showers C	85.5				1	1	1	1				
Sanitary facilities/showers D	103.5								1	1	1	1
Staff sanitary facilities	3	2	2	2	3	3	3	3	3	3	3	3
Teachers' showers	4.5	1	1	1	1	1	1	1	1	1	1	1
Sanitary facilities (auxiliary staff)	4.5	1	1	1	1	1	1	1	1	1	1	1
First aid room	6	1	1	1	1	1	1	1	1	1	1	1
Kitchen/larder A	16.5	1	1	1								
Kitchen/larder B	25.5				1	1	1	1	1	1	1	1
General storeroom A	9	1	1	1								
General storeroom B	15				1	1	1	1	1	1	1	1
Caretaker's living quarters	36	1	1	1	1	1	1	1	1	1	1	1
<b>Total area of premises</b>		774	846	900	954	1098	1170	1224	1386	1440	1494	1548

Programme		B07	B08	B09	B10	B11	B12	B13	B14	B15	B16	B17	B18
Capacity (number of pupils)													
Covered passageways	Region I to VII and metropolitan region, one floor	33%	285	330	375	420	465	510	600	645	690	735	780
	Region I to VII and metropolitan region, two or more floors	40%	255	279	297	315	362	386	422	457	475	493	511
	Region VIII to XII and metropolitan region, one floor	40%	310	338	360	382	439	468	511	554	576	598	619
	Region VIII to XII and metropolitan region, two or more floors	40%	310	338	360	382	439	468	511	544	576	598	619
	Region VIII to XII, two or more floors	45%	348	381	405	429	494	527	575	624	648	672	697
Total area of premises and m <sup>2</sup> /pupil	Region I to VII and metropolitan region, one floor		1029	1125	1197	1269	1460	1556	1700	1843	1915	1987	2059
	Region I to VII and metropolitan region, two or more floors		3.61	3.41	3.19	3.02	3.14	3.05	2.83	2.86	2.78	2.70	2.64
	Region VIII to XII, one floor		1084	1184	1260	1336	1537	1638	1714	1940	2016	2092	2167
	Region VIII to XII, two or more floors		3.80	3.59	3.36	3.18	3.31	3.21	2.98	3.01	2.92	2.85	2.78
Playground area (l)	Region VIII to XII, one floor		1084	1184	1260	1336	1537	1638	1714	1940	2016	2092	2167
	Region VIII to XII, two or more floors		3.80	3.59	3.36	3.18	3.31	3.21	2.98	3.01	2.92	2.85	2.78
	Region VIII to XII, two or more floors		1122	1227	1305	1383	1592	1697	1853	2010	2088	2166	2245
	Region VIII to XII, two or more floors		3.94	3.72	3.48	3.29	3.42	3.33	3.09	3.12	3.03	2.95	2.88
All with multi-purpose games area			712.5	825	937,5	1050	1162,5	1275	1387,5	1500	1612,5	1725	1837,5
All with multi-purpose games area			712.5	825	937,5	1050	1162,5	1275	1387,5	1500	1612,5	1725	1837,5

(1) Playground area officially fixed at 2.5m<sup>2</sup>/pupil

Source: Programmes and classification employed by la Sociedad Constructora de Establecimientos Educacionales S.A. Chile (SCEE), up to 1987.

Note: The climate in regions I to VII and the Metropolitan Region, which are administrative divisions of Chile, ranges from arid with no rainfall to temperate Mediterranean with winter rainfall. The climate in regions VIII to XII is rainy and cold with rainfall throughout most of the year.

**Table IV: Educational facilities planning programmes for academic secondary schools, 1987 - programmes and classification applied by the *sociedad constructora de establecimientos educacionales S.A.* (Chile), up to 1987**

Programme	HC 04	HC 06	HC 08	HC 10	HC 12	HC 14	HC 16	HC 18	HC 20	HC 22	HC 24	HC 26
Capacity (number of pupils)	150	240	330	420	510	600	690	780	870	960	1050	1140
Administrative area	66	66	66	111	111	111	111	144	144	144	144	144
Head teacher's office/sanitary facilities	15	1	1	1	1	1	1	1	1	1	1	1
Deputy head's office	12			1	1	1	1	1	1	1	1	1
General inspector's office	9	1	1	2	2	2	2	2	2	2	2	2
Inspectors' office	6	1	1	1	1	1	1	2	2	2	2	2
Secretary's office/waiting room A	9	1	1									
Secretary's office/waiting room B	18			1	1	1	1	1	1	1	1	1
Archive	3	1	1	1	1	1	1	1	1	1	1	1
Teaching equipment storeroom A	3	1	1									
Teaching equipment storeroom B	6			1	1	1	1	1	1	1	1	1
Staffroom A	18	1	1									
Staffroom B	27			1	1	1	1					
Staffroom C	54							1	1	1	1	1
Porter's lodge A	3	1	1									
Porter's lodge B	6			1	1	1	1	1	1	1	1	1
Teaching area	M <sup>2</sup>	354	606	714	909	1053	1251	1359	1557	1665	1854	2070
Teaching aids unit A	12	1	1									
Teaching aids unit B	18			1	1	1	1	1	1	1	1	1
Classroom for 30 pupils	36	2	2	2	2	2	2	2	2	2	2	2
Classroom for 45 pupils	54	2	4	6	8	10	12	14	16	18	22	24

[illegible]

Programme		HC 04	HC 06	HC 08	HC 10	HC 12	HC 14	HC 16	HC 18	HC 20	HC 22	HC 24	HC 26	
Capacity (number of pupils)		150	240	330	420	510	600	690	780	870	960	1050	1140	
Kitchen/larder A		13.5	1	1										
Kitchen/larder B		18			1	1	1	1	1	1				
Kitchen/larder C		27									1	1	1	
General storeroom A		9	1	1										
General storeroom B		13.5			1	1	1	1	1	1	1	1	1	
Caretaker's living quarters		36	1	1	1	1	1	1	1	1	1	1	1	
TOTAL AREA OF PREMISES			540	810	936	1206	1368	1566	1692	1926	2034	2232	2358	2484
Area of covered passageways	Regions I to VII and Metropolitan Region, one floor	33%	178	267	309	398	451	517	558	636	671	737	778	820
	Regions I to VII and Metropolitan Region, two or more floors													
	Regions VIII to XII, one floor	40%	216	324	374	482	547	626	677	770	814	893	943	994
	Regions VIII to XII, two or more floors	45%	243	365	421	543	616	705	761	867	915	1004	1061	1118



Programme	HC 04	HC 06	HC 08	HC 10	HC 12	HC 14	HC 16	HC 18	HC 20	HC 22	HC 24	HC 26
Capacity (number of pupils)	150	240	330	420	510	600	690	780	870	960	1050	1140
Regions I to VII and Metropolitan Region, one floor	718 4.19	1077 4.49	1245 3.77	1604 3.82	1819 3.57	2083 3.47	2250 3.26	2562 3.28	2705 3.11	2969 3.09	3136 2.99	3304 2.90
Regions I to VII and Metropolitan Region, two or more floors	756 5.04	1134 4.73	1310 3.97	1688 4.02	1915 3.75	2192 3.65	2369 3.43	2696 3.46	2848 3.27	3125 3.26	3301 3.14	3478 3.05
Total area of premises and m <sup>2</sup> /pupil	756 5.04	1134 4.73	1310 3.97	1688 4.02	1915 3.75	2192 3.65	2369 3.43	2696 3.46	2848 3.27	3125 3.26	3301 3.14	3478 3.05
Regions VIII to XII, two or more floors	783 5.22	1175 4.90	1357 4.11	1749 4.16	1984 3.89	2271 3.79	2453 3.56	2793 3.58	2949 3.39	3236 3.37	3419 3.26	3602 3.16
Playground area (1)	540	600	835	1050	1275	1500	1725	1950	2175	2400	2625	2850

(1) Playground area officially fixed at 2.5 m<sup>2</sup>/pupil; minimum area 18 x 30 = 540 m<sup>2</sup>.

Source: OREALC. Criterios y normas utilizados en las construcciones escolares de América Latina y El Caribe, (Criteria and standards applied in school facility construction in Latin America and the Caribbean) (1983).

**Table V: Educational facilities planning programmes for urban general elementary schools - 1993 proposal**

Programme		B9	B14	B18
Capacity (number of pupils)		375	600	780
Administrative area	M <sup>2</sup>	60	72	90
Head teacher's office	12	1	1	1
Deputy head's office A	9	1	1	1
Deputy head's office B	12			1
Secretary's office/waiting room A	9	1	1	
Secretary's office/waiting room B	18			1
Archive	3	1	1	1
Teaching equipment storeroom	6	1	1	1
Staffroom A	18	1		
Staffroom B	30		1	
Staffroom C	36			1
Porter's lodge	3	1	1	1
<b>Teaching area</b>	<b>M<sup>2</sup></b>	<b>744</b>	<b>1,092</b>	<b>1,362</b>
Teaching aids unit A	12	1		
Teaching aids unit B	18		1	1
Classroom for 30 pupils	36	2	2	2
Classroom for 45 pupils	54	7	12	16
Classroom for special needs groups (6 pupils)	18	1	2	2
Multi-purpose workshop/shelving A	72	1	1	
Multi-purpose workshop/shelving B	84			1
Library/bookstore A	66	1	1	
Library/bookstore B	72			1
<b>Teaching area</b>	<b>M<sup>2</sup></b>	<b>744</b>	<b>1,092</b>	<b>1,362</b>
Covered play area A	72	1		
Covered play area B	108		1	1
Cafeteria A	54	1		
Cafeteria B	72		1	
Cafeteria C	108			1
<b>Service area</b>	<b>M<sup>2</sup></b>	<b>150</b>	<b>186</b>	<b>204</b>
Sanitary facilities/showers A	67.5	1		
Sanitary facilities/showers B	88.5		1	
Sanitary facilities/showers C	103.5			1

Programme		B9	B14	B18	
Capacity (number of pupils)		375	600	780	
Staff sanitary facilities	3	2	3	3	
Showers	4.5	1	1	1	
Sanitary facilities for auxillary staff	4.5	1	1	1	
First aid room	6	1	1	1	
Kitchen/larder A	16.5	1			
Kitchen/larder B	25.5		1	1	
General storeroom A	9	1			
General storeroom B	15		1	1	
Caretaker's living quarters	36	1	1	1	
TOTAL AREA OF PREMISES	954	1,350	1,656		
		B9	B14	B18	
Area of covered passageways	Regions I to VI and Metropolitan Region, one floor	33%	315	446	546
	Regions I to VI and Metropolitan Region, two or more floors	40%	382	540	662
	Regions VII to XII, one floor	40%	382	540	662
	Regions VII to XII, two or more floors	45%	429	608	745
Total area of premises and m <sup>2</sup> /pupil	Regions I to VI and Metropolitan Region, one floor	1,269 3.38	1,796 2.99	2,202 2.82	
	Regions I to VI and Metropolitan Region, two or more floors	1,336 3.56	1,890 3.15	2,318 2.97	
	Regions VII to XII, one floor	1,336 3.56	1,890 3.15	2,318 2.97	
	Regions VII to XII, two or more floors	1,383 3.69	1,950 3.26	2,401 3.08	
Playground area	Must include multi-purpose games area (official requirement)	937.5	1,500	1,950	

Source: F. Toro and A. Cox. Estandares de Equipamiento Educacional Comunal Urbano (Educational facility standards for urban districts), MIDEPLAN (1993).

Table VI: Educational facilities planning programme for academic secondary schools, 1993 proposal

Programme		MHC 12	MHC 18	MHC 26
Capacity (number of pupils)		510	780	1,140
Administrative area	M <sup>2</sup>	111	144	144
Head teacher's office/sanitary services	15	1	1	1
Deputy head's office	12	1	1	1
General inspector's office	9	2	2	2
Inspectors' office	6	1	2	2
Secretary's office/waiting room	18	1	1	1
Archive	3	1	1	1
Teaching equipment storeroom	6	1	1	1
Staffroom A	27	1		
Staffroom B	54		1	1
Porter's lodge	6	1	1	1
Teaching area	M <sup>2</sup>	1,089	1,665	2,178
Teaching aids unit	18	1	1	1
Classroom for 30 pupils	36	2	2	2
Classroom for 45 pupils	54	10	16	24
Laboratory/office	81	1	2	3
Workshop/storeroom	81	2	3	3
Library/bookstore A	72	1		
Library/bookstore B	90		1	1
Covered play area A	72	1		
Covered play area B	108		1	1
Cafeteria	72	1		
Cafeteria	108		1	1

		MHC 12	MHC 18	MHC 26	
Service area	M²	186	225	270	
Sanitary facilities/ showers A	85.5	1			
Sanitary facilities/ showers B	121.5		1		
Sanitary facilities/ showers C	157.5			1	
Staff sanitary facilities	3	3	4	4	
Teachers' showers	4.5	1	1	1	
Sanitary facilities for auxiliary staff	4.5	1	1	1	
First aid room	6	1	1	1	
Pupils' recreation room	9	1	1	1	
Kitchen/larder A	18	1	1		
Kitchen/larder B	27			1	
General storeroom	13.5	1	1	1	
Caretaker's living quarters	36	1	1	1	
TOTAL AREA OF PREMISES		1,386	2,034	2,592	
Area of covered passageways	Region I to VI and Metropolitan Region, one floor	33%	457	671	855
	Region I to VI and Metropolitan Region, two or more floors	40%	554	814	1,037
	Region VII to XII, one floor	40%	554	814	1,037
	Region VII to XII, two or more floors	45%	624	915	1,166

		MHC 12	MHC 18	MHC 26
Total area of premises and m <sup>2</sup> /pupil	Region I to VI and Metropolitan Region, one floor	1,843 3.61	2,705 3.47	3,447 3.02
	Region I to VI and Metropolitan Region, two or more floors	1,940 3.80	2,848 3.65	3,629 3.18
	Region VII to XII, one floor	1,940 3.80	2,848 3.65	3,629 3.18
	Region VII to XII, two or more floors	2,010 3.94	2,949 3.78	3,758 3.30
Playground area	Must include multi-purpose games area (official requirement)	1,275	1,950	2,850

Source: F. Toro and A. Cox, Estandares de Equipamiento Educacional Comunal Urbano (Educational facility standards for urban districts), MIDEPLAN (1993).

**Table VII: Educational facilities planning programme for pre-school units to supplement general elementary school programmes, 1993 proposal**

Programme	Pre-school unit	
	M <sup>2</sup> /unit	Number of units
Activity room (32 pupils)	36	1
Toilet-training facilities (3 washbasins and 2 toilets)	9	1
Teaching equipment storeroom	4.5	1
Access	4.5	1
TOTAL AREA OF PREMISES		54
Region I to VI and Metropolitan Region, one floor	Covered passageways 33%	18
	Covered play area: 1 m <sup>2</sup> /pupil	32
Region VII to XII, one floor	Covered passageways 33%	18
	Covered play area: 1 m <sup>2</sup> /pupil	32
Total area of building and m <sup>2</sup> /pupil	Region I to VI and Metropolitan Region, one floor	72 M <sup>2</sup> 2.25 M <sup>2</sup> /pupil
	Region VII to XII, one floor	104 M <sup>2</sup> 3.25 M <sup>2</sup> /pupil
Total playground area	Article 4.5.7 of Official Instruction: 3 m <sup>2</sup> /pupil	96 M <sup>2</sup>

*Source:* F. Toro and A. Cox, Estandares de Equipamiento Educacional Comunal Urbano (Educational facility standards for urban districts), MIDEPLAN (1993).

*Note:* The pre-school unit must be located on the ground floor. The covered play area must be part of the total playground area.

**Annex 3**

**SPECIMEN FORMATS FOR EDUCATION PROJECT BUDGETS**

**I. Construction**

**School construction budget**

A. General	Unit	Quantity	Unit price	Total
1. Permits, rights and guarantees	GL			
2. Preparatory work				
2.1. Temporary enclosures	m			
2.2. Site clearance	m <sup>2</sup>			
2.3. Temporary sewerage and drinking water installations	GL			
2.4. Temporary electricity supply installations	GL			
2.5. Temporary offices and storage facilities	m <sup>2</sup>			
3. Demolition	GL			
4. Site marking and pegging out	m <sup>2</sup>			
5. Excavation	m <sup>3</sup>			
5.1. Filling with borrowed fill	m <sup>3</sup>			
6. Foundations (type B concrete)	m <sup>3</sup>			
7. Flooring 0.08 m (incl. ballast base and 0.10 polyethylene insulation)	m <sup>2</sup>			
8. Concrete				
8.1. Type B concrete with 20% aggregate	m <sup>3</sup>			
8.2. Type C reinforced concrete	m <sup>3</sup>			
9. Masonry	m <sup>2</sup>			
10. Partitions	m <sup>2</sup>			

<b>Subtotal - General</b>				
---------------------------	--	--	--	--

B. Installations	Unit	Quantity	Unit price	Total
11. Sewerage and drinking water				
11.1. Sewerage (total)	GL			
11.2. Drinking water (total)	GL			
12. Liquefied gas	GL			
13. Electricity	GL			
14. Mobile phones	GL			
15. Telephones	GL			
16. Rainwater removal	GL			

<b>Subtotal - Installations</b>				
---------------------------------	--	--	--	--



C. Finishing	Unit	Quantity	Unit price	Total
17. Waterproofing				
17.1. Bathroom floors (upper storey)				
17.2. External plastering and cladding concrete	m <sup>2</sup>			
18. Roofing	kg			
19. Roof covering	m <sup>2</sup>			
20. Heat insulation	m <sup>2</sup>			
21. Sheet metal	GL			
22. External cladding	m <sup>2</sup>			
23. Internal cladding				
23.1. Ceramic tiles in bathrooms	m <sup>2</sup>			
23.2. Ceramic tiles in kitchen	m <sup>2</sup>			
23.3. Plasterboard	m <sup>2</sup>			
23.4. Asbestos cement board	m <sup>2</sup>			
24. Ceilings				
24.1. Tiled ceiling	m <sup>2</sup>			
24.2. Matter ceiling	m <sup>2</sup>			
24.3. Cornices 3/4" x 1 1/2"	m			
25. Floors and skirting boards				
25.1. Asbestos vinyl	m <sup>2</sup>			
25.2. Paving tiles	m <sup>2</sup>			
25.3. Tiling dust coat	m <sup>2</sup>			
25.4. Dust guards 1/2"	m			
25.5. Butt joints	m			
26. Double windows 15 mm	m <sup>2</sup>			
27. Doors (including metal frame)				
27.1. 0.75 m	No.			
27.2. 0.80 m	No.			
28. Metalwork				
28.1. Door handles without keys	No.			
28.2. Door handles with keys	No.			
29. Glass				
29.1. Double transparent sheets	m <sup>2</sup>			
29.2. Blued	m <sup>2</sup>			
30. Paint				
30.1. Enamel	m <sup>2</sup>			
30.2. Corrosion proofing	m <sup>2</sup>			
30.3. Latex vinyl	m <sup>2</sup>			
30.4. Wallpaper	m <sup>2</sup>			
30.5. Waterproofing	m <sup>2</sup>			
31. Closets				

32. Sanitary fittings				
32.1. Toilet	No.			
Washbasin	No.			
Urinal	No.			
Sink	No.			
32.2. Accessories				
Roll holders	No.			
Hooks	No.			
Towel holders	No.			
33. Ducts and linings	GL			
34. Rails	m <sup>2</sup>			
35. Enclosures	m			
36. Cleaning and handover	GL			
<b>Subtotal - Finishing</b>				

<b>TOTAL</b>				
--------------	--	--	--	--

**Kindergarten construction budget**

A. General	Unit	Quantity	Unit price	Total
1. Permits, rights and guarantees	GL			
2. Preparatory work				
2.1. Temporary enclosures	m			
2.2. Site clearance	m <sup>2</sup>			
2.3. Temporary sewerage and drinking water installations	GL			
2.4. Temporary electricity supply installations	GL			
2.5. Temporary offices and storage facilities	m <sup>2</sup>			
3. Demolition	GL			
4. Site marking and pegging out	m <sup>2</sup>			
5. Excavation	m <sup>3</sup>			
5.1. Filling with borrowed fill	m <sup>3</sup>			
6. Foundation (type B concrete)	m <sup>3</sup>			
7. Flooring	m <sup>2</sup>			
10. Partitions	m <sup>2</sup>			

<b>Subtotal - General</b>	
---------------------------	--

B. Installations	Unit	Quantity	Unit price	Total
11. Sewerage and drinking water	GL			
12. Liquefied gas	GL			

13. Electricity	GL			
16. Rainwater removal	GL			

<b>Subtotal - Installations</b>	
---------------------------------	--

C. Finishing	Unit	Quantity	Unit price	Total
18. Roofing	kg			
19. Roof covering	m <sup>2</sup>			
20. Heat insulation	m <sup>2</sup>			
22. External cladding				
22.1. Asbestos-cement sheets	m <sup>2</sup>			
23. Internal coating				
23.1. Plasterboard	m <sup>2</sup>			
24. Ceilings				
24.1. Cornices 3/4" x 1 1/2"	m			
25. Floors				
25.1. Asbestos vinyl	m <sup>2</sup>			
25.2. Tiling (covered terrace)	m <sup>2</sup>			
25.3. Butt joints	m			
26. Windows	m <sup>2</sup>			
27. Doors	No.			
28. Metalwork	GL			
29. Glass	m <sup>2</sup>			
30. Paint				
30.1. Enamel	m <sup>2</sup>			
30.2. Latex vinyl	m <sup>2</sup>			
31. Pathways	m <sup>2</sup>			
32. Cleaning and handover	GL			

<b>Subtotal - Finishing</b>	
-----------------------------	--

<b>TOTAL</b>	
--------------	--

**Covered playground budget**

	Unit	Quantity	Unit price	Total
1. Site clearance	m <sup>2</sup>			
2. Site marking and pegging out	m <sup>2</sup>			
3. Excavation	m <sup>3</sup>			
4. Infill	m <sup>3</sup>			
5. Foundations	m <sup>3</sup>			
6. Reinforced concrete	m <sup>3</sup>			
7. Grading	m			
8. Flooring	m <sup>2</sup>			
9. Roofing	kg			
10. Roof covering	m <sup>2</sup>			

<b>TOTAL</b>	
--------------	--

**Summary of total budget**

Building	Overheads	Net total	Final total
School			
Kindergarten			
Covered playground			

**II. Equipment**

Location	Description	Quantity	Unit value	Total value
Administration	4-drawer filing cabinet	1		
	Flag 2×3 cm	1		
	Head teacher's desk	1		
	Head teacher's fixed chair	3		
	Upholstered chair			
Secretary's office/waiting room	Bench	1		
	Bench cushion	1		
	Typist's table	1		
	Secretary's table	1		
	Upholstered chair	2		

Location	Description	Quantity	Unit value	Total value
Staffroom	Locker with 3	3		
	double units	2		
	Library/dining table	12		
	Upholstered chair			
Special education	Teacher's desk	1		
	Lightproof shelf	1		
	unit	1		
	No.1 chair without book rest			
Infants	Teacher's desk	1		
	Lightproof shelf	1		
	unit	8		
	No.4 wooden table	1		
	No.1 chair without book rest	32		
	No.4 wooden seat			
Classrooms 6 x 6 (4)	Teacher's desk	4		
	Lightproof shelf	4		
	unit	30		
	No.1 desk	30		
	No.3 desk	4		
	No.1 chair without book rest	60		
	No.2 chair	60		
	No.3 chair			
Classrooms 6 x 9 (3)	Teacher's desk	3		
	Lightproof shelf	3		
	unit	46		
	No.1 desk	23		
	No.2 desk	3		
	No.1 chair without book rest	90		
	No.2 chair	45		
Multi-purpose workshop 36 m <sup>2</sup>	Carpenter's bench	1		
	Mechanic's bench	1		
	Teacher's desk	1		
	Lightproof shelf	1		
	unit	8		
	Laboratory/work table	46		
	No.1 chair without book rest			

Summary table - all items

Item	Total
4-drawer filing cabinet	1
Carpenter's bench	1

Item	Total
Mechanic's bench	1
Flag 2 x 3 m	1
Bench	1
Bench cushion	1
Head teacher's desk	1
Teacher's desk	10
Lightproof shelf unit	10
Double three-unit lockers	3
Library/dining table	2
Typist's table	1
Laboratory/work table	8
Secretary's table	1
No. 4 wooden table	8
No. 1 desk	46
No. 2 desk	53
No. 3 desk	30
No. 1 chair without book rest	55
No. 1 chair with book rest	90
No. 2 chair	105
No. 3 chair	60
No. 4 wooden chair	32
Head teacher's fixed chair	1
Upholstered chair	17

### III. Quality enhancement

#### Specimen budget for a quality enhancement project

Item	1994 M\$	1995 M\$	Total M\$
Inputs			
Teaching materials: posters folders manuals			
Video production and reproduction			
Intercity travel (monitors)			
Training and refresher training of teachers on general monitor duty Stage I: 70 Stage II: 50			
Training of teachers on school monitor duty Stage I Stage II			
Further training course for infants' teachers			
National regional team meeting			
Parents' workshops (district)			
Workshops for pupils on monitor duty			
Regional meeting of pupils on monitor duty			
Regional games meeting, supervision and programme follow-up			
Preparation of information, evaluation and instruction documents			
Support staff (hours)			
Secretary (hours)			
General monitors (hours) (100 persons) (incentive)			
<b>TOTAL</b>			

# INVESTMENT PROGRAMMING AND PROJECTS DIVISION

## ABSTRACT

### Introduction

#### Chapter 1: General considerations

*This chapter presents basic concepts which provide a general framework for the guide and make it easier to understand the issues dealt with later. It examines the importance of project preparation and evaluation and the concept of equity as applied to the education sector. It looks at the life cycle of projects and the special features of education projects.*

#### Chapter 2: Identification of the project

*This chapter emphasizes the importance of accurately identifying the problem and pinpointing its principal cause. It offers some tools and techniques for use in identification. Finally, it indicates how to describe the problem, how to gauge its dimensions and how to monitor the progress forecast.*

#### Chapter 3: Diagnostic assessment of the current situation

*The objective of this chapter is to set out the guidelines for making accurate diagnostic analysis. It offers some principles for identifying the area providing the framework for the analysis. It explains how to determine and analyse the demand for education in the service area of and the coverage provided by the education system. Finally, it shows how to ascertain the education deficit in the area analysed.*

#### Chapter 4: Identification and definition of possible solutions

*The aim of this chapter is to present ways of identifying and examining possible solutions. It discusses the concept of the optimized base situation and its importance. It also suggests ways of bringing the notion of equity into the development of possible solutions.*

#### Chapter 5: Evaluation of project options

*This chapter aims to present the benefits and costs associated with projects in the education sector. The difficulties inherent in quantifying and evaluating such benefits are discussed. Methods are described for identifying and, where possible, quantifying them. The types of costs that need to be taken into account are indicated, together with procedures for estimating them. Finally, methods are indicated for evaluating project options.*

#### Chapter 6: Presentation of the chosen alternative

*This chapter summarizes the basic information to be included in the outline of an education project. It indicates the sections that the outline document should have and the content of each section.*