Education policies and strategies 3

Educational planning through computer simulation

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U N E S C O

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Preface

This is the third volume of the "Education Policies and Strategies" series launched by the Division of Educational Policies and Strategies of UNESCO. Far from excessive theorisation, it is, first of all, a compendium of good professional practices. With the themes it covers and the form of its content, it aims to share field experiences, not only with education planners, but also with the wider group of people who are interested in the elaboration and the implementation of education policies and strategies.

Devoted to the subject of *Educational planning through computer simulation*, this issue is addressed to specialists in this field as well as to policy-makers and education ministry officials concerned with improving their knowledge of the methods and tools which allow the setting-up of development plans. The Dakar Framework for Action recommends all countries to prepare National Action Plans for Education For All by 2002 at the latest.

Many countries have remained dependent on external technical assistance in the field of simulation model designing. This paper aims to make a generic model available to them which they can adapt to their own education systems. More than providing an operational tool to facilitate the preparation of their action plans, it can also be used as training or self-training material by planners involved in the preparation process of such plans.

The recourse to computer simulation has become indispensable. To prepare their development plans, ministries of education need: (i) to collect and analyse the data concerning the education sector; (ii) to formulate development hypotheses in the form of parameters, i.e. translate the policy principles and orientations into quantified objectives; (iii) to assess and determine, by combining the baseline data and the retained parameters, the consequences of the education policy adopted, in terms of human, pedagogical, physical, and financial resources; and (iv) to promote a true dialogue between different

stakeholders, on the education policy and the problem of mobilising the necessary resources to implement this policy.

The application of simulation through computers allows from the start of the planning process to see the gaps of the information system, and to fill them in eventually. It then contributes to testing the feasibility of the sector's development policy, by providing objective information for the appraisal of possible options. In doing so, the decision-making on education policies and strategies becomes easier. Finally, it makes it possible to evaluate the costs and provide the indispensable macro-economic and financial information which confers on the national action plan all its credibility.

The role of education and its development is at the heart of present debates, such as sustainable human development, poverty reduction, the promotion of universal human values and tolerance, and the challenge of new information and communication technologies. We hope that this paper will serve as a useful tool in the elaboration and the implementation of national action plans that take into consideration these issues, and are in conformity with the recommendations of the Dakar World Education Forum.

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1. Introduction

Until the beginning of the 1980s, the work of planners was mainly that of forecasting and managing the quantitative growth of educational systems in many countries. This meant that the social demand for education would be met to the extent that the financial capacity of the State allowed it to ensure the expansion of education at all levels.

Since the 1980s, many countries have encountered economic and financial difficulties, making the implementation of development plans more and more subject to economic and budgetary hazards and uncertainties. As a consequence, many countries have given up long-term planning in favour of short-term programming in the form of fragmented development projects and initiatives. In the face of the mitigated impact of a large number of these sub-sector projects, developing countries, often spurred on by their multilateral and bilateral partner agencies, have opted for a programme approach with the view of obtaining a better effectiveness in their investments.

The search for alternative solutions of financing and rationalisation of resources have led the countries to adopt sector-wide approaches and policies allowing the re-allocation of resources within the framework of a systemic approach to educational development. It is in this context that a certain number of developing countries have designed simulation applications (also called simulation models) as supporting tools for the preparation of coherent education sector development plans and programmes.

The use of computers as a tool for education policy simulation and planning has been going on for around twenty years. Until the beginning of the 1980s, planners used simple calculators, which were followed by programmable ones. These were capable of performing a limited series of repetitive

calculations, as for example those resulting from the application of the flow rates to the number of students of a given education level.

When they began to use the first-generation PCs, the performance of these computers permitted the programming of this type of calculations by including more and more variables covering much longer periods. But given the then PCs' limited capacity of memory and application programmes, the calculations did not reach beyond certain parts of the long sequence which is needed for the quantitative forecasting of the development in the education sector.

The personal computers that appeared afterwards had the capacity to process more data and information but only capable of forecasting, in one single operation, school enrolments by level of education, or determining the needs for teachers at this level. The planners programmed and processed the sequences of forecast by component and, in so doing, could measure the financial consequences of the schooling options only after several months of working by trial and error.

The next-generation computers have had larger memory capacity, and high-speed data processing CPUs combined with the growing performance of spreadsheet applications (mainly Lotus 123 and MS Excel). Educational planners have then been able to progressively develop what they call "simulation models". They succeeded in joining end to end the components of the sequences of calculation, which started by demographic data and ended with educational expenditures, going through the flow patterns in school enrolments, teachers and other categories of personnel, as well as the corresponding needs in infrastructure and in investment and recurrent resources.

In fact, simulation results from the construction of the sequential chain of calculations with spreadsheet applications, where worksheets are organized in such a way that the structure of a given educational system is reproduced. Taking into account the data which are specific to a given country as well as the parameters resulting from the scenarios retained for its development can allow the simulation of the flow of the enrolments and their consequences on the needs in human, physical and financial resources, in the coming years.

Once the simulation model is designed for a given educational system, PCs' processing capacity and the growing performance of spreadsheet applications can make it possible to measure simultaneously the impact of any

changes of parameters on the educational resources to be mobilised for multiannual periods.

2. The use of computer simulation

Before the use of computer simulation, it was difficult to test a sufficient number of simulations so as to measure the impact of numerous decisions on the likelihood of an education system, and in particular their financial consequences. Moreover, the simulations were limited, often by lack of means, to subsectoral scenarios. As a result, the issues of educational development, at the time, could only be partially appraised.

Computerised simulation has contributed a great deal to the preparation of educational policies and strategies and to the technical quality of education development plans. With this tool, the planners have been able to raise to a higher degree the conceptual coherence of these plans and the appraisal of their feasibility.

The simulation models have become an indispensable tool in ensuring coherence in the development of educational sub-sectors, and a better understanding of the implications of their objectives, by facilitating the identification of pedagogical and institutional inputs, as well as the financial resources which these imply. The usefulness of a simulation model culminates in the construction of education development scenarios, in the sense that it allows to appraise the feasibility of chosen options and the measurement of their consequences, in real time, before their final adoption.

Three stages or types of application of a simulation model are described below, i.e. *educational policy formation, medium-term planning,* and *budgeting*.

2.1 Educational policy formation

The simulation exercise can contribute to the formation of educational policies, which is complex by nature. The complexity owes not only to the fact that education is a sector where it is difficult to identify the underpinnings and their effects to be foreseen in planning, but also to the diversity of interests that education represents for the different actors in society.

Compared to other socio-economic sectors, educational development involves more difficult and multidimensional problems. Faced with financial constraints, governments are not able to meet the broad social demands without adopting restrictive measures within the education sector in order to rationalise the use of allocated resources. In the dynamics of educational management of student flows, as well as that of public finance, they have to make difficult decisions to regulate the utilisation of resources, without in any way leading to serious disruptions and dysfunctions. Because there are too many actors, variables and the interrelations between these, it is necessary to have not only a reliable information system but also an objective forecasting tool to facilitate policy consultations regarding financial constraints and their consequences on educational options.

A computer simulation model can contribute useful information to policy dialogue. At the first stage of its use, the computer simulation is at the beginning of the formulation process of the main lines of educational policy. It is used as a tool for testing the feasibility of reform or development options of the sector. It allows, at the preliminary planning stage, to know the pedagogical, physical and financial implications of the goals and objectives retained for long-term periods. At this stage, the simulation is an invaluable tool in designing educational policies and strategies by highlighting required background information which will facilitate the consultation and the dialogue between national partners, and, in the event of external financing, between them and their international partners. In this way, the simulation contributes to consensus building by providing the information on the possible evolution and probable consequences of the fundamental development options of the sector.

The *"freewill"* goals and objectives, or those addressing the ambitious social demands, are defined in terms of parameters and evaluated according to their budgetary implications. The simulation makes it possible to demonstrate the feasibility or impossibility of these objectives within the country's socio-economic context. Several development scenarios are then designed and demonstrated. The stakeholders can discuss arguments to support or not policy

objectives and options, examine other alternative scenarios, and evaluate the advantages and disadvantages of each one of them on the basis of relatively reliable estimates.

2.2 Medium-term sectoral planning

The second application of the simulation model is in the preparation of medium-term action plans. It is used as a forecasting tool following the adoption of sector reform and/or development options. It makes it possible to determine the pedagogical, physical and financial implications of educational objectives for precise periods.

To prepare an action plan credible to all the actors concerned, including external partners, it is desirable for each country to develop a simulation model that is specific to its education system.

The purpose of the action plan is to first express in operational terms the national orientations which were defined at the formulation stage of the sector's general policy. The action plan must include the financial estimates of recurrent and investment requirements to achieve the goals of education and training. It must also specify the actions and activities that educational authorities intend to implement in a co-ordinated and coherent way during the planned period.

Adapted to the national context, a simulation model could contribute immensely to the development of a sectoral action plan. As a systemic forecasting tool, it helps in considering the dynamics of the educational system and the detection of the interrelations of a number of parameters which influence the operation and the improvement of educational services. [1] In particular, it provides the information on the *necessary educational inputs* and *the monitoring and evaluation indicators* on planned actions.

[1] As a system, education and its development can only be designed as a whole, comprised of sub-sectors and the organic interrelations between them. The sector-wide approach makes it possible to guide the balanced development of the sub-sectors which depend on the system. In other words, an education sub-sector, with all the dimensions it implies, should not be treated in a sub-sector manner. Its planning must be integrated in a systemic and interdisciplinary approach.

2.2.1 Educational inputs requirements

Educational inputs needs are estimated on the basis of the quantitative and qualitative objectives expressed in operational terms. The simulation model makes it possible to determine the nature and scale of these inputs per year for the period considered. It provides indicative information on school enrolments as well as the human, physical and financial means to mobilise, in order to carry out development actions. Presented below are some categories of requirements in educational resources whose evaluation is carried out thanks to computer simulation.

Personnel

The model makes it possible to estimate the number of teaching and non-teaching personnel required (managerial and supervisory staff, administrative and service personnel, technical and maintenance workers, etc.) and to foresee recruitment needs (per year, per region, and by education level) while allowing for staff attrition. It also enables the evaluation of the training needs of these personnel, both at pre-service and in-service training level. The new requirements for teachers for a given year will indicate to the national educational authorities the need to take adequate measures many years in advance (this varies according to countries) in order to forecast projected training periods for the various categories of teachers.

School buildings

On the basis of the number of students and the parameters of pedagogical management, the simulation model has the potential to evaluate the number of buildings to build, on a given time-horizon. It also indicates the expenditures necessary for the purchase of necessary equipments and maintenance expenses of all kinds. The required number of classrooms and other spaces as well as the needs for new buildings are provided by the model per year and by region for all levels of teaching.

Teaching and learning materials

With the inventory of the stock of textbooks and other teaching aids available, a simulation model can allow to estimate the future needs for these books and to indicate the requirements for the production and the distribution of

these materials, in accordance with the national policy in this field. It can also aid to foresee necessary actions to acquire and/or renew the materials, so as to meet the curricular reform and to evaluate the recurrent costs resulting from this.

2.2.2 Quantified means of verification

Faced with economic and financial difficulties, the ministries of education of many countries are under pressure from financial services (be they national or international) to prove that the resources they were provided are being used effectively. These pressures have contributed to the introduction of new approaches to accountability-based programming and management. In the recipient countries, the external bilateral and multilateral agencies are increasingly requiring programming of development actions to be more accountable and results-based.

This new approach changes the way agencies work with recipient countries in the preparation of development plans and programmes in the education sector. These plans should now include explicitly the results expected of development actions in order to measure, in advance, the educational policy's potential to achieve their objectives – thereby ensuring the wish for efficiency of external investments. The objectives and actions of development plans are thus formulated by integrating the indicators of monitoring and evaluation.

The simulation models can easily provide these means of verification in the form of quantified indicators relating to the educational system's organization and operation. These indicators are provided per year for a reasonably long period according to the planned programme, by region and for all the levels of education and training which are examined in the simulation. [2]

2.3 Financing and budgeting

As early as the plan's preparation phase, the simulation can make it possible to establish an upstream forecast of recurrent expenditures and investments for the education sector in accordance with educational policy orientations. The government, as a result, can have advance information on the

[2] It is worth noting at this point that the adjustments made at the level of decision parameters could lead to changes in results. These adjusted parameters and variables are used to update the indicators of monitoring and evaluation at the time of the implementation of development plans and programmes.

annual costs required to implement its reform and development plan, foresee the budgetary gap in relation to the possibility of State financing in a given period, and identify the fields for which additional investments should be sought from the national private sector and/or from external partners.

The computer simulation facilitates the setting up of annual and multiannual budgets resulting from the educational development plan, that is to say the short-term technical and financial programming of administrative and financial actions. The formulation of short-term objectives – one or two years – is carried out on the basis of achievements and forecasts of the action plan. The simulation makes it possible to specify new expected achievements and their costs, which facilitate the programming of investment and recurrent expenditures.

The annual estimated expenditures are provided at the national scale by level of education and by category of expenditures. According to the level of deconcentration and decentralisation, they can be available, in disaggregated form by region, by education level and type and by categories of expenditures. The national authorities, taking into account the objectives and the potential for development of each region, can take corrective measures necessary to balance the budgetary programming.

In considering these forecasts at the time of short-term budgeting, it is necessary for the simulation model to take into account the significant parameters [3] which have an impact on the cost of education, such as inflation, salary increases and the cost of educational goods and services.

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[3] A simulation model is a tool which can help foresee the *probable* evolution of an education system in the more or less distant future by means of a more or less limited number of baseline data and hypotheses of development. The simulated results will be probable, but *not sure*, because the future of a system also depends on unforeseen hazards and uncertainties which have an impact on the evolution of

phenomena. This explains the need to update the baseline data and the parameters as the implementation of the development programme advances. The baseline data and the hypotheses retained for the development of the simulation model are inevitably in limited numbers and consequently can not take into account all the parameters, be they identified or not, which regulate the evolution of an educational system.

3. Designing computer simulation

3.1 Some conceptual considerations

Since the 1970s, the specialised services of UNESCO, the World Bank and the educational planning units of a certain number of countries started to develop different simulation models for the purpose of forecasting.

For quite a long time, the use of these models remained limited to some specialists until UNESCO published the first booklet on the subject, accompanied by a series of demonstration diskettes entitled "*A simulation model for education development*" (Duvieusart, 1991). UNESCO, in accordance with its vocation to promote methodological tools and educational planning techniques has contributed to the popularisation of the "demographic" simulation model among the planners.

Although UNESCO, through its specialised services, has contributed a great deal to the dissemination of simulation applications among national services, their use is not as widespread as one would believe or wish it to be. In fact, even if they have already been installed by experts in the computers of the planning services of the ministries of education, especially at the implementation of projects to support the preparation of development plans, they are not sufficiently mastered on the conceptual and the technical level by the national planners.

This document is designed to address this problem and serve as a guide to those who wish to acquire or improve their know-how in this field.

3.1.1 Different types of simulation

For a better understanding of the subject, explained below are two categories of approaches which have prevailed in the design of simulation models. These classifications do not exclude the existence of a number of variants and subcategories which were designed by countries according to their specific needs.

- **Generic model and country-specific model**

The development agencies which have recommended the application of simulation models have used two types of models (or approaches) for programming educational development: the **generic models** which are sometimes called "ready-to-use" models and **country-specific models**, also called "tailor-made" models.

The first so-called generic approach is used in designing a simulation model which contains components common to a majority of education systems. It does not correspond therefore to any system or to any given country but represents a virtual education system. Adapted in a limited way, this model makes it possible to approximately indicate the pedagogical, physical, and financial consequences of main policy orientations. It is particularly useful at the stage of pre-designing education policy options and in facilitating consensus building on the main educational development goals and orientations.

The second approach is the development of specific simulation applications. Its use is generally adopted to define more or less detailed educational development options, in particular at the preparation stage of development programmes or action plans. The application designed at this stage of post-definition of educational policy takes into account the structure and specificities of a given country's education system. Adapted to a given country, this kind of model cannot be used by another without a major reorganization and meticulous adaptation.

The generic model has the advantage of being operational as soon as the baseline data and main objectives are available, but has a limited power as a detailed programming tool. In contrast, a "tailor-made" simulation model,

designed on the basis of a close collaboration between decision-makers and specialists reflects the specificities of a country's situation and its educational policy, but this requires a much longer time of preparation and verification.

- **Budgetary model and demographic model**

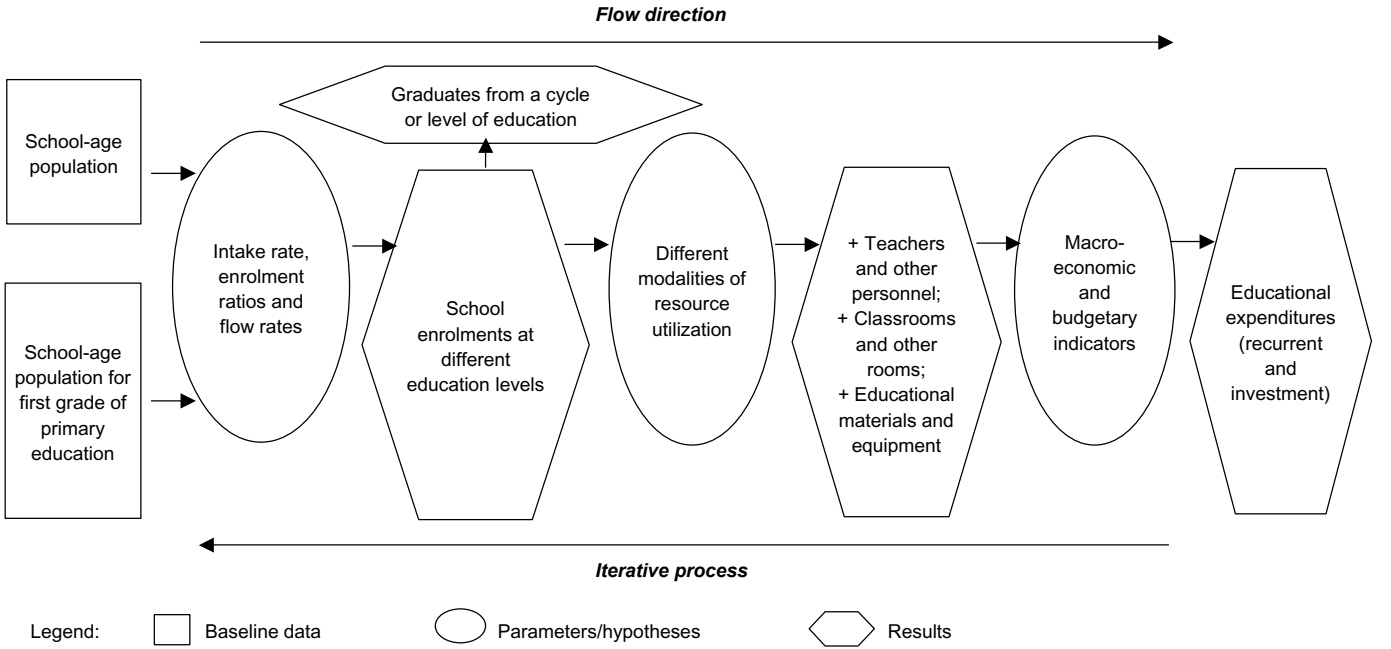
Another classification relates to two types of models which the planners call "budgetary" model and "demographic" model, with their multiple variants. These two types of models are designed according to two different methodological approaches: one which uses the national budget for education as the decision variable, and another, where educational expenditures are but the results of the simulation.

In the budgetary model, the planner is first concerned with determining an acceptable budget ceiling in proportion to the State's general budget. The computer carries out calculations backwards to obtain enrolment targets. In the case of the demographic model, the opposite logic is the one developed. Regarded as independent variables, the enrolment targets are laid down *a priori* and the computer calculates their corresponding financial budgets as a consequence.

One can say that the budgetary model responds to the necessity to control education expenditures, in particular following structural adjustment policies advocated by external donors, while the demographic model places the right to education and the satisfaction of social demand at the centre of education policy, i.e. at the first level of government consideration. At the country level, it is usually the latter model which prevails, not only for political considerations, but also for technical reasons relating to the logical flow of calculations.

In reality, the principal simulation parameters which are the enrolment ratios and budgets are interdependent. Whatever model is used, the options taken into account in the initial scenario undergo several changes before leading to a balanced version. The search for a scenario that corresponds to the policy, leads the planner to repeatedly test the different options concerning the two types of variables which are considered both as causes and consequences. The final decision is made by considering the implications of each parameter, and the scenario to be adopted finally will result from a reasoned choice of the possible variables to be applied, both upstream and downstream in the chain of the calculation process.

Graph 1. Simplified chart of the flows of a "demographic" simulation model



The demographic model was developed, most notably under the impetus of major international conferences advocating the universalisation of basic education. It has prevailed over the budgetary model in so far as the education policy that is pursued aims to improve the quality while increasing the access to and the participation in education. In this model which is constructed in the image of the structure of the education system of a country, the decision variables are principally the educational objectives and not budgetary.

Graph 1 presents the simplified diagram of the structure of the flow of a simulation model which is based on a demographic approach.

3.1.2 Definition of the simulation structure

What we mean by simulation structure is the form it takes on a spreadsheet application which takes into account the dynamics of an education system, that is to say, its organization and its operation.[4]

Several questions are involved in structuring a simulation, of which the scope of the educational fields is the most important. The solutions put forward make it possible to determine the components of the simulation, the different levels within these components, and the method by which the calculation of the simulation should be carried out. If necessary, the problem of decentralisation should also be examined to define the scope and the ramifications of the simulation model to be designed.

[4] The design of the simulation is based on the theory of organizations and systems (or systems analysis). According to this theory, an organization is considered as a unified whole composed of parts. These parts are linked with and influence one another. The systems theory stipulates that every organization is part of a greater external environment. To understand a system, it is therefore necessary to understand its environment. The laws regulating the social relationships in a country, the traditions and the socio-economic situation, all these, forming part of the external environment of the education system, have a considerable effect on the latter's development. It is therefore necessary to develop a simulation model which responds to the first goal of providing a systemic vision of educational development.

a) Field scope

Before designing a simulation model, it is important to study and identify in detail the fields it should cover to correctly determine the subject. Questions relating to the education system's structure and pedagogical aspects should be raised to determine the scope of the subject and the forecasts expected. These should specify, in particular, the following aspects:

- **Forms of education**

To date, simulation models have often covered only the types of formal education. This is explained by the fact that a formal education system lends itself, better than other forms of education, to modelling. The principal reasons for these are the following:

- The availability of formal education data which, though incomplete, exist in the majority of countries, while those relating to non-formal or informal education are poor or non-existent.

- The question of tutelage: in many countries, the ministry of education is the body responsible only for formal education, while non-formal education is managed by other socio-economic ministries and by non-governmental organizations.

- The unclear notion of the non-formal and the informal: the forms of non-formal education, while recognised as useful training, are not fully agreed on as to their value and their formal features. For example, it is quite difficult for a number of developing countries, to determine the notion and the cost of pre-school education, despite its undeniable importance.

However, under the instigation of major international conferences, such as the Jomtien Conference[5] and the Dakar World Education Forum[6], it is

[5] An international conference which took place in March 1990 at Jomtien, Thailand, in which 155 countries have participated and adopted the *World Declaration on Education for All* and *the Framework for Action to Meet Basic Learning Needs.*

[6] The World Education Forum which took place in April 2000 in Dakar, Senegal, bringing together around 1100 national leaders and heads of international organizations and non-governmental organizations, during which the *Dakar*

difficult to ignore the issue of non-formal education and not give it the importance it deserves in attaining the goals of Education for All. It is therefore more and more imperative to evaluate the physical and financial consequences of this form of education.

In fact, many countries, in particular those with low enrolment ratios, are showing increasing interest in integrating the non-formal sub-sector in the programming of educational development actions. In future, this tendency should be taken into account in the development of their simulation models.

- **Education levels and grades**

Taking into account the organic relationships involved in the development of an educational system, a simulation model should in principle cover all the levels and forms of education, from pre-school to higher education, through primary and secondary education. [7]

For example, the review of primary education must be carried out not only according to the openings offered by different forms of post-primary education, but it should also take into account the means that can be made available by other levels of education in terms of teachers and pedagogical support. On the other hand, the financial resources necessary for the development of primary education could come from the reallocation of funds within this level as well as from the re-allotment of the global education budget in its favour. This means that from a systemic point of view, even if the main object of analysis involves only a particular level of education, it is important not to limit the simulation only at this level, but to spread it to the whole system of which it forms part.

Framework for Action, Education for All: Meeting Our Collective Commitments was adopted.

[7] In an organization as vast as an education system, the interrelation of different components is as important to consider as the sum of the components taken individually. The flow of transition between different levels which form the education system has as much impact as that of the graduation produced within a single level. A simulation model, as a sectoral programming tool *par excellence*, is an instrument of systemic analysis in so far as the levels of education constitute as many sub-systems of the education sector.

b) Scope of objectives pursued

To respond to the diversity of educational needs and sometimes at the instigation of external partners, the objectives are defined, more than ever, by taking into account the problems of equality and socio-cultural considerations. The simulation should therefore take into account these problems, which, in their own time, will increase the complexity of its structure.

The baseline data and the parameters should be disaggregated by status of education (public and private), area (urban and rural, capital and regions, etc.) and gender (male and female) with the view of reducing existing disparities. The different types of education (general, technical, professional education, etc.) can be studied distinctively in order to identify alternative modalities of education and to evaluate their future consequences in technical and financial terms, and their dynamic links with training and employment.

Another challenge is the problem of deconcentration and decentralisation. The new tendency to share responsibilities and to favour the decentralisation of the education system requires the development of a more refined simulation model. Often limited to national level, most simulations must now be reconsidered in a decentralised perspective to allow actors at different levels of educational responsibility, to programme and plan their development actions.

3.2 Principal stages of computer simulation

Presented in this Section are three principal stages to follow in the process of simulation on educational development. These are: the organization of the baseline data to be projected, the definition of hypotheses to be related to the baseline data, and the production of results as the consequence of "cross-tabulation" between hypotheses and baseline data. [8]

[8] The construction of a simulation model follows a logical order. This can involve several stages of development depending on the national context, on the basis of which it is being constructed. However, the three logical stages which are the constitution of the base data, the preparation of parameters (or the quantifying of policy goals and objectives) and the projection of results are the three key moments in the construction of a simulation. Furthermore, these three logical stages correspond to the three chronological phases in the preparation of an education development plan or programme.

Figure 1 presents three stages of simulation construction as well as the different terms used to describe them. It is worth noting that in designing the different stages, some terms, called related terms, have at times been used indiscriminately in this document.

Figure 1. Terms used for the three logical stages of simulation

	Stage 1	**Stage 2**	**Stage 3**
	Baseline data	***Hypotheses***	***Results***
Definition	The raw data and the initial values of parameters at the base year	The education policy options and choices, expressed as benchmark and flow parameters in a given time horizon	The forecasts produced from the baseline data and the hypotheses or simulation parameters
Other related terms used	Diagnosis; Analysis of current situation; Initial values of parameters	Education policy; Goals/Objectives; Targets; Hypotheses; Parameters; Decision variable	Result projections; Result variable; End result; Forecast; Consequences; Implications

In developing a simulation model, each stage can be conveniently presented on a worksheet of the spreadsheet application (MS Excel for example) in order to facilitate the data entry, the verification and the monitoring of related information at each stage of the simulation. Figure 2, apparently similar to Figure 1, gives an example of how the different stages of simulation may be arranged on the spreadsheet.

Figure 2. Arrangement of simulation stages on a spreadsheet application

Sheet 1	**Sheet 2**	**Sheet 3**
Baseline data	***Parameters-objectives***	***Results***
i.e. all the initial values of the parameters at the base year	i.e. the intermediate or final values of the goals/objectives to reach in a given time-horizon	i.e. the projections in human, physical and financial terms; results of the targets-parameters in relation to the baseline data

The details of the three simulation stages are explained below in terms of content and function.

3.2.1 Identification of baseline data

The first stage of simulation consists in establishing and arranging the data of the education sector and those on the macro-economic frame. These can be school, pedagogical, macro-economic or budgetary data. In other words: data on the school-age population, access to and participation in education, the teaching and non-teaching personnel, the pedagogical orientations, the school facilities, the economic development situation, the national education expenditures, etc.

The sources of these past and present data may or may not be found in education. Population data, for example, are to be obtained from another governmental department. Most often, they are not accurate and detailed enough for the purpose of educational planning. One can neglect to verify their reliability at the time of planning for education development, whereas they constitute crucial information for the design of the simulation. The quality-related data which can be considered within the field of educationists, are indispensable in constructing a simulation which is both credible to the public and relevant in the eyes of policy-makers. Very often they are inaccessible and their quantified interpretation is not easy for the needs of the simulation.

The baseline data, most of which are retrieved from the information system, are those of the base year (the most recent year). They will serve as the baseline for the simulation in setting up the forecasts according to the defined quantitative policy objectives.

The degree of refinement and reliability of a simulation will depend mostly on the quality of these baseline data. If these indispensable data for the construction of a simulation are non-existent or not fully reliable, additional research should be carried out. In consultation with all the persons and institutions concerned, the planner should establish a checklist which includes all the necessary data on the education system and other data which may have an impact on education. He should make it a point that at least the essential data are included on this list. These data are in turn regrouped on a worksheet of the spreadsheet application (see figure 2).

- **Demographic data**

The demographic data, in particular those of the school-age population which need to be forecast, should be available. These data are available in many countries, but in most cases, they are incomplete and relatively old, sometimes going back more than 10 years. They usually are available in the form of national aggregates by age group, and therefore not detailed enough to meet the information needs of education planners.

The more recent and detailed the data, the more reliable the forecast in a given period will be. It is therefore essential for the planner to collect the most recent and reliable data possible which are provided by the services in charge of population statistics. In case the data are available by age group of five-years, one can use other instruments to disaggregate them, of which the most commonly used are the *Sprague* multipliers.

In an extreme situation where the data are non-existent or unreliable, particularly in countries that have gone through periods of war and significant population movements, the education authorities have to organize in collaboration with the relevant services, a population census or at least a survey on the school-age population in order to produce relatively exhaustive and reliable demographic data. Without these data, it will not be possible to develop a valid simulation model.

- **Macro-economic and budgetary frame**

In the field of education, macro-economic framing consists of analysing the foreseeable evolution of the macro-economic indicators likely to have an impact on educational development.

The indicators most usually used and most indispensable are the data on the GDP (or GNP depending on the country), the share of the current educational expenditures (recurrent and investment) in proportion to the GDP and to the national budget (for the recent years as well as the previsions for the coming years), the average annual growth rate of the GDP and the national budget, as well as the maximal share of education expenditures in relation to the budget that a country would be able to afford.

Taking into account the multidisciplinary nature of the problems to be solved in the education sector, other socio-cultural indicators, specific to

national or regional situations, can be examined and integrated in the development of simulation models.

- **Data on students flows**

The simulation presupposes the existence of an education management and information system, as explained in detail in section 4.3. The information system provides the data on the basis of which the forecasts are calculated. Other information components necessary to the construction of a simulation, the qualitative data in particular, are provided thanks to thematic or sub-sector studies, or through analyses of the whole education sector.

The data essential to the construction of the simulation are those of the student flows of the base year (or the average rates observed during the recent school years), namely: intake rate in first grade of primary education, the promotion, repetition and drop-out rates, transition rate from one cycle to another, as well as the graduation rate from the different education cycles.

These are the baseline data which will be subject to forecasting in the development of the education system, in accordance with the objectives defined during the various national consultations.

- **Pedagogical options in education**

Educational planning is within the framework defined by the country's education policy, and includes the pedagogical choices, the organization and management methods of educational services. These pedagogical orientations include, for example, the regulation of student flows (automatic promotion or selection by competition, etc.), the timetables and the use of education personnel, classroom management, the curricula, etc.

In general, the information on education policy options are identified and/or refined during the diagnosis stage of the education sector, that is at the moment of the education sector analysis. This stage, carried out before designing the simulation model, should therefore provide all the information on these parameter-setting elements. If certain information are missing at the time of the construction of the simulation, an additional investigation should be carried out to identify them.

Certain data relating to pedagogical orientations can be generated thanks to in-depth thematic studies. For example, the data on the factors

influencing the schooling and learning achievement can make it possible for the system to regulate the internal efficiency and thereby allow it to consider the construction of several scenarios for sector development.

Table 1. A sample of baseline data for simulation

1. Social and macro-economic framework
   - 1.1. Demographic data
     - 1.1.1 Population (general data)
     - 1.1.2 School-age population (by age, at least for primary education)
     - 1.1.3 Annual growth rate of school-age population
   - 1.2. Economic data
     - 1.2.1 Gross national product (GNP) or gross domestic product (GDP)
     - 1.2.2 Total budget (national and, where possible, regional)
     - 1.2.3 Educational expenditures and their share in the total budget
   - 1.3. Socio-cultural data (to be identified according to country)
2. Data on political, administrative, and institutional aspects of the country
   - 2.1 Structures of the education system (formal and non-formal)
   - 2.2 Organization of education services (deconcentration, decentralisation, etc.)
   - 2.3 Responsibilities (Ministries, other organizing agencies, etc.)
3. Data on school enrolments and their flows
   - 3.1. Data on access to and participation in education
     - 3.1.1 New entrants in first grade of each cycle and type of education
     - 3.1.2 School enrolments at different levels of education
     - 3.1.3 Transition from one cycle to another
   - 3.2. Student flows (promotion, repetition, drop-out)
   - 3.3. Data on the disparities in education (by gender, region, etc.)
4. Data on the quality of pedagogical aspects
   - 4.1. Data on the teaching personnel
     - 4.1.1 Number of the different categories of teaching and non-teaching personnel
     - 4.1.2 Workload
     - 4.1.3 Turnover, training and attrition of teachers
   - 4.2. Pedagogical organization (size of classes, multigrade classes, double shift etc.)
   - 4.3. Pedagogical aids and materials
   - 4.4. Curricula and teaching methods
5. School facilities
   - 5.1. Turnover of classrooms
   - 5.2. Turnover of other rooms
6. Cost and financing of education
   - 6.1. Budgetary allocation by level of education and type of expenditures
   - 6.2. Financing by local government and other agencies
   - 6.3. Financing by households and the private sector
   - 6.4. External financing

Table 1 presents the types of baseline data which should be available to design the simulation. This list can be longer depending on the national context which includes socio-cultural data.

Often forgotten during the simulation design is the collection and processing of data on economic and budgetary projections. It is desirable on the part of the planner to obtain these macro-economic data from the departments in charge of economic planning and development, in order to foresee the national financing potential for education.

3.2.2 Definition of policy objectives

Now that the baseline data resulting from the situation analysis are available, the next stage is to assemble all the policy goals, objectives and options likely to influence educational development in order to translate them into hypotheses parameters. This means the pedagogical, policy, organizational and even macro-economic options and choices which constitute the parameters influencing the operation and the development of education.

Although the planner contributes to the definition of policy goals and objectives, it does not *a priori* originate from him. It falls within the competence of policy-makers who set the education targets according to a process in use in a given national context. The formulation of education policy takes place within a process that begins with the analysis of the actual situation, and which proceeds and is completed through policy dialogue (cf. Jallade, Radi et Cuenin, 2001).

The stage of policy definition can be subdivided into two chronological phases: the pre-definition phase, and that of its adoption. The pre-definition of educational policy is a stage during which the policy-makers, in consultation with major decision-makers, set the general educational development orientations.

The quantitative objectives most frequently used are the enrolment ratios, intake and flow rates, the supervision ratios (for example, that of pupils:teachers), the turnover of the education buildings and the share of education in the national budget. In brief, all the independent variables which have an impact on the operation and development of education.

Similar to the phase of baseline data identification and orgarnization, the empirical experience shows the need to prepare a list against which the

planner should check that all essential forecasting parameters have been identified and reassembled, before regrouping them on the worksheet of the simulation model. The changes made on these parameters will later make it possible, when utilising the results of the simulation model, to produce the alternative scenarios for the development of an education system.

These parameters which can be called education policy hypotheses, are in general widely scattered in policy declarations, legislative texts, sector orientation notes and economic and social development plans. [9] Table 2 presents some categories of objectives by level of education. As in the case of Table 1, the list of parameters presented in the table is not exhaustive and should be completed after a careful analysis of the education policy of the country concerned.

Table 2. A sample of parameters for the simulation [10]

Category	Primary	Secondary	Higher	Non-formal
Intake and or transition rates	X	X	X	X
Enrolment ratios	X	X		X
Flow rate	X	X	X	X
Rate of students by subject, etc.		X	X	
Ratio of manuals per student and guides per teacher	X	X		X
Students-class ratio and/or students-teacher ratio	X	X	X	X
Mandatory teaching hours		X	X	
Turnover of teaching and non-teaching personnel	X	X	X	X
GDP growth rate	X	X	X	X
Percentage of the budget in proportion to GDP	X	X	X	X
Share of education in the budget	X	X	X	X

[9] The planner will consult the policy-makers and the services involved, and will translate the orientations in quantified hypotheses. These hypotheses are called, in simulation practice, objectives, parameters, target indicators or (independent or dependent) variables. What is important is to assemble all the information needed concerning the options retained by the policy-makers and to translate them in organized and quantified terms for entry.

[10] The crosses (X) were put at the intersection of the levels of education and the corresponding parameters which have to be identified and defined.

Once assembled and regrouped by categories, the goals/objectives will be classified into decision (independent) variables and result (dependent) variables. Some of them will be used as indicators, to ensure, in the course of plan execution, the follow-up of the yearly evolution of the education system.

In a simulation model, the parameters-hypotheses number at least a hundred and can take different forms. They can be temporal parameters (years or all other periods), percentage indicators or absolute figures. Table 3 presents, as an example, a juxtaposition of decision parameters and results. The decision variables are the hypotheses of the simulation while the dependent variables are the results of the simulation.

Table 3: Type of parameters in primary education for the simulation model

Independent (decision) variables	**Dependent (result) variables**
Category "students"	
1. Intake rate in first grade 2. Flow rate 3. Pupils-class ratio 4. Proportion of multigrade classes 5. Proportion of double shift classes	1. New entrants in first grade 2. Number of pupils 3. Gross enrolment ratios 4. Number of classes/classrooms 5. Number of multigrade and/or double shift classes
Category "Teaching and non-teaching personnel"	
6. Turnover 7. Attrition rate 8. Supervision rate 9. Proportion of non-teaching personnel	6. Needed teachers and new requirements 7. Other personnel and new requirements 8. Training and recruitment needs 9. Annual attrition of personnel
Category "Cost and Financing"	
10. Initial index value 11. Salary scale and other emoluments 12. Budgetary allocations 13. Macro-economic indicators	10. Salary expenses 11. Recurrent expenditures 12. Investment expenditures 13. Evolution of education expenditures

3.2.3 Results analysis and construction of scenarios

a) Verification and use of results

The forecasts are the results of the simulation of development hypotheses in relation to the baseline data. On a worksheet of a spreadsheet application, the planner prepares and ensures the coherence of the required statistical formulas for the simulation.

The preparation of formulas requires not only the knowledge of the structure and operation of an education system, but also the mastery of the relations between the parameters-hypotheses on the one hand, and of the impact they have on the evolution of the (baseline or projected) data, on the other. For example, at the secondary education level, the calculation to determine the number of teachers required is carried out not only in relation to the number of students and classrooms, but also in relation to the data on the modalities of the use of teachers, the attrition rate, the organization of the teaching service and the students' weekly hours, to quote only the most significant.

In general, the simulation results contain two categories of related information: the first includes the number of students and teachers, the infrastructure and equipments, the learning and teaching materials per level, the form and (public or private) sector of education, and the second relates to their consequences on the budgetary and financial resources.

The planner examines the human, physical and financial implications and evaluates the feasibility of the policy options in pedagogical, technical and budgetary terms. In analysing the results of the forecasts, it can prove necessary to review the data and the parameters for at least three reasons: first of all, it is necessary to verify the technical aspects of the simulation and their statistical coherence, then to detect possible errors which can have serious implications on the results of the forecasts, and finally, to reach a reference scenario from which variants and even other alternative scenarios can be easily developed.

- First of all, the forecasts are made on enrolments

As one can see in Table 3, the simulation first relates either to **the access to** or to **the participation in** education. Two methods are therefore possible to activate the simulation process: one, on the basis of access indicators, such as the intake rate in first grade of a given education level (primary education in general), and the other, on the basis of the enrolment

ratio. The two methods (or approaches) have their own advantages and disadvantages.

The approach by apparent intake rate (AIR) is meant to be closer to reality, because it follows the learning process. In this approach, AIR becomes the decision variable, while the gross enrolment ratio (GER) becomes the result. In other words, to increase the enrolment ratio, the managers will first act on the access to education by increasing entrants to Grade 1. On the other hand, the approach by GER considers the participation in education as the decision variable, which corresponds to the particular concerns the decision-makers have in ensuring the effective achievement of enrolment targets. The AIR is dependent on the enrolment ratio as well as other flow indicators, such as the promotion and repetition rates.

On the basis of the intake rate (AIR) or the enrolment ratio (GER) retained at the level of primary education, it is then necessary to measure the progression of pupils from one grade to another by applying the promotion, repetition and drop-out rates, as well as the transition rate from one cycle to another, to estimate the number of pupils and students per school year and their school grades. This exercise will provide the enrolment projections per year on a simulated period (5, 10 or 15 years), and this by private or public organizing bodies, by gender (girls and boys), by area (rural and urban), etc.

- The enrolment data will make it possible to forecast other inputs

On the basis of the number of pupils and students per year, it is now possible to calculate, thanks to the combination of parameters linked to the supervision ratios and the pedagogical organization: the number of teachers, classrooms, textbooks as well as all the other means necessary to the organization of education. The simulated results can calculate not only these requirements or other means, but also the new requirements on personnel and school constructions.

The annual forecasts on teachers, classrooms or other pedagogical means are obtained on a worksheet of a spreadsheet application and constitute the annual targets (quantified indicators) to be attained by the education system.

- Simulations relating to the means will lead to financial estimates

The purpose of a simulation is the quantification of the adopted decisions in education policy. The quantified data on human, physical, and financial resources provided by the simulation facilitate the policy dialogue concerning the budgetary implications of the decisions taken by the policy authorities.

The quantitative forecasts of educational development depend not only on the policy objectives, but also on the budgetary and macro-economic projections of the country. If the financial estimates relating to the education sector prove to be too high in relation to the economic development possibilities of the country, the planner should start again at the beginning of the process of simulation. In consultation with relevant educational authorities and other actors of the system, he should change the parameters used and search for alternative options for educational development.

b) Construction of development scenarios

The simulation model makes it possible to construct objective scenarios on which to base policy dialogue and thereby facilitate the conception of education policy. On the basis of major education policy orientations, several educational development scenarios can be constructed.

The design of a scenario proceeds *grosso modo* in two stages. At the first stage, the policy orientation documents are analysed to identify the education objectives and options. Once identified, these objectives and options are quantified and transformed into decision variables (also called simulation parameters or hypotheses).

The results of the simulation, arising from the application of these parameters, reveal, in general, a big gap between the total cost of the education policy objectives and the possibility of State financing during the period concerned. This situation is the logical consequence of a planning exercise without financial constraints. It inevitably leads to an exercise to refine policy objectives. The second stage will then be the modification of some decision variables in order to reduce the considerable deficit observed at the first stage. The final selection of objectives requires the consultations between the principal actors of the given education system. In other words, the baseline and the alternative scenarios are presented and discussed during policy consultations

with the view of retaining a reference scenario for the programming of educational development actions.

The scenario, which will finally be adopted for education sector development, results from a long process of trial and error that takes into consideration the quantified objectives and pedagogical options, as well as the financial constraints. In the process of constructing a development scenario, the simulation model is first used as a tool of *projection* in the literal sense of the word, and then as a tool of *prospection,* and finally as a tool of *forecasting.* Although there is no single pattern followed in the construction of a development scenario, we can nevertheless identify a commonly used method characterised by these three principal stages.

- **Establishment of a baseline scenario (projection)**

The first scenario which we will call a "baseline" scenario will consist of *a pure and simple projection of past trends.* It is about determining the consequences of the current education policy if this will remain unchanged during the planned period. In actual fact, it is an extremely rare case where one is satisfied with, and requires no change in the current policy. This scenario makes it possible to weigh the consequences of the laissez-faire policy, to identify and specify the desirable changes to adopt within the framework of a new sector development scenario.

- **The stage of alternative scenarios (prospection)**

The second stage consists in developing two or three alternative scenarios [11] based on the objectives and parameters resulting from the application of new policies in relation to past trends. These scenarios allow the persons in charge at the policy and technical level to weigh the consequences of adopting the new education options for sector development. These scenarios are developed on the basis of a given macro-economic and budgetary framework.

[11] One should not confuse scenarios with variants. The scenario is a collection of options and choices that are sufficiently reflected on, thus constituting a coherent policy for education development, whereas the variant is a slightly different version of the same scenario. Variants result from the sensitivity tests that are undertaken on a scenario with a view of appraising the implication of one or several secondary variables. The sensitivity tests of variables contribute to the refinement and finalisation of a scenario.

This stage allows *the prospection of options to retain and the verification of the socio-economic and financial sustainability of the education policy objectives considered,* in particular by studying the effect of the different combination of parameters, on the evolution of the sector. It is in the course of this stage that the feasibility – or the degree of realism – in the policies and strategies considered, is verified. The objectives and hypotheses are evaluated in terms of financial and budgetary consequences. The results of the different scenarios inform the deliberations and the policy dialogue with the view of reaching a consensus on the objectives of education policy. Once the different options are carefully weighed, one of the scenarios will progressively acquire a certain stability and will result in what is called a reference scenario.

It is recommended not to modify the variable which constitutes the main goal (for example the enrolment target) before using up all the other possibilities, in particular the parameters presenting a certain flexibility like the turnover of classrooms and teachers, etc. These parameters allow a substantial reduction in gaps between the financial cost of the retained options and the effective possibilities of financing. [12]

- **The definition of the reference scenario (prevision)**

The third phase is the adoption of one of the previously considered scenarios, or even a scenario resulting from the combination of several objectives and parameters coming from different sector development hypotheses, examined during the previous phase. Once verified on the policy and technical level, this scenario is refined with the degree of information which is required in the programming of actions. It becomes the reference scenario for the future education plan, making it possible *to foresee development actions and the financial resources required.*

All the possibilities should be explored with the view of developing alternative and reference scenarios which take into account the socio-cultural and economic context of the country and which do not lead to major

[12] It is possible to change the numerous hypotheses provided that incoherence is not introduced in the choices made by these changes. The changes of hypotheses which generate the alternative scenarios can be applied to those concerning the major orientations of education policy, such as the transition rate from one cycle to another, automatic promotion, the resource management policy, etc. They can also include other factors which may at first appear to be unrelated to the field of education, such as the growth of the share of education in the State budget or the recourse to new sources of financing.

institutional disruptions. In any event, particular attention should be given to the preservation of the objectives of equality.

4. A simulation model

A diskette containing a simulation model is provided with this guide.[13] Without considering it to be a completed model, this proposed model is generic to the extent that it does not refer to any particular education system. Having characteristics common to different education systems, it is ready to be configured according to the structural and pedagogical data which characterise a given education system. Provided that baseline data are available and that objectives and parameters are clearly formulated, it can allow the rapid design of development scenarios.

4.1 Characteristics of the model presented in this document

The simulation model that is presented in this Chapter was designed to address three major requirements regarding its adaptability, its demonstrability and its user-friendliness.

Adaptability

This requirement addresses the need to have a generic model. This model can adapt to a variety of structures which characterise the different education systems in the world, and can rapidly and methodically take into

[13] Aware of the fact that the computers available in the planning services of some developing countries are not equipped with CD-ROM drivers, we have chosen to save the model on a diskette, in a compressed form. The more developed final version of this model will later be available on CD.

account the principal data and variables, particularly at the design stage of education policy.

Without major changes, it can be configured by including the national education structures, their data, parameters, modalities of operation, and provide the principal results of their simulation in an aggregate and synthesised manner. It is structured to cover all the levels and types of formal education, their principal subdivisions, the public and private sectors, etc. It can also be used in a limited application, for a single sub-sector or type of education or training.

Demonstrability

This model guides the user in the definition of the system's structure (or that of its education sub-system) and guides him at the different stages of the simulation's construction, i.e. the entry of the baseline data, the definition of the simulation parameters, and the use of the forecast's results. Thanks to the different macros used, the tables and the forecast results are automatically constructed as soon as the raw data and the necessary simulation parameters are introduced by the user. As a demonstration tool, this model allows the rapid evaluation of the short or long-term physical and financial consequences of policy decisions. In the course of policy consultations, it can also provide background material on the financial feasibility of policy options, and propose alternative development scenarios.

User-Friendliness

Our model is designed to be user-friendly, in the sense that education planners and other users with a minimum knowledge of computers can easily manipulate it. It can be used to construct and test development scenarios of their education systems, by moving from one worksheet to another, to measure the impact of options, with the view of deciding whether or not a particular scenario should be maintained. [14]

[14] The construction and the refinement of scenarios require the incessant moving back and forth of variables, results and data tables, which are the interdependent components of the simulation. This back and forth action is necessary for verification and comparison, as well as for the changing of the data and the strategic variables. The proposed model allows to do this rapidly.

This model makes it possible to easily and rapidly move from one education sub-system to another (from primary to secondary for example), or from one section to another (from the enrolments to financial data). With the help of the pop-up menus and the multiple questions, the user is invited to configure the application on a given education system, and then enter the data and the parameters of simulation. It also includes dialogue boxes and offer help options for decision-making. The stages are programmed to unfold according to a logical flow of operations which does not require any skills, other than the minimum know-how an education planner usually should have.

In brief, as one would later see, the advantage of this model is its ability to save time and provide a ready-to-use base, which is usable for a great number of education systems. Its adaptation to a given education system is carried out in an easy manner, and it is not necessary to be skilled in microcomputers to properly perform the work of reconfiguration. In addition to the structural components which can be modified according to the given configuration of any education system, this model already contains pre-programmed macros which regulate the sequence of calculations which in turn leads to the production of the synthesis tables of the development scenarios.

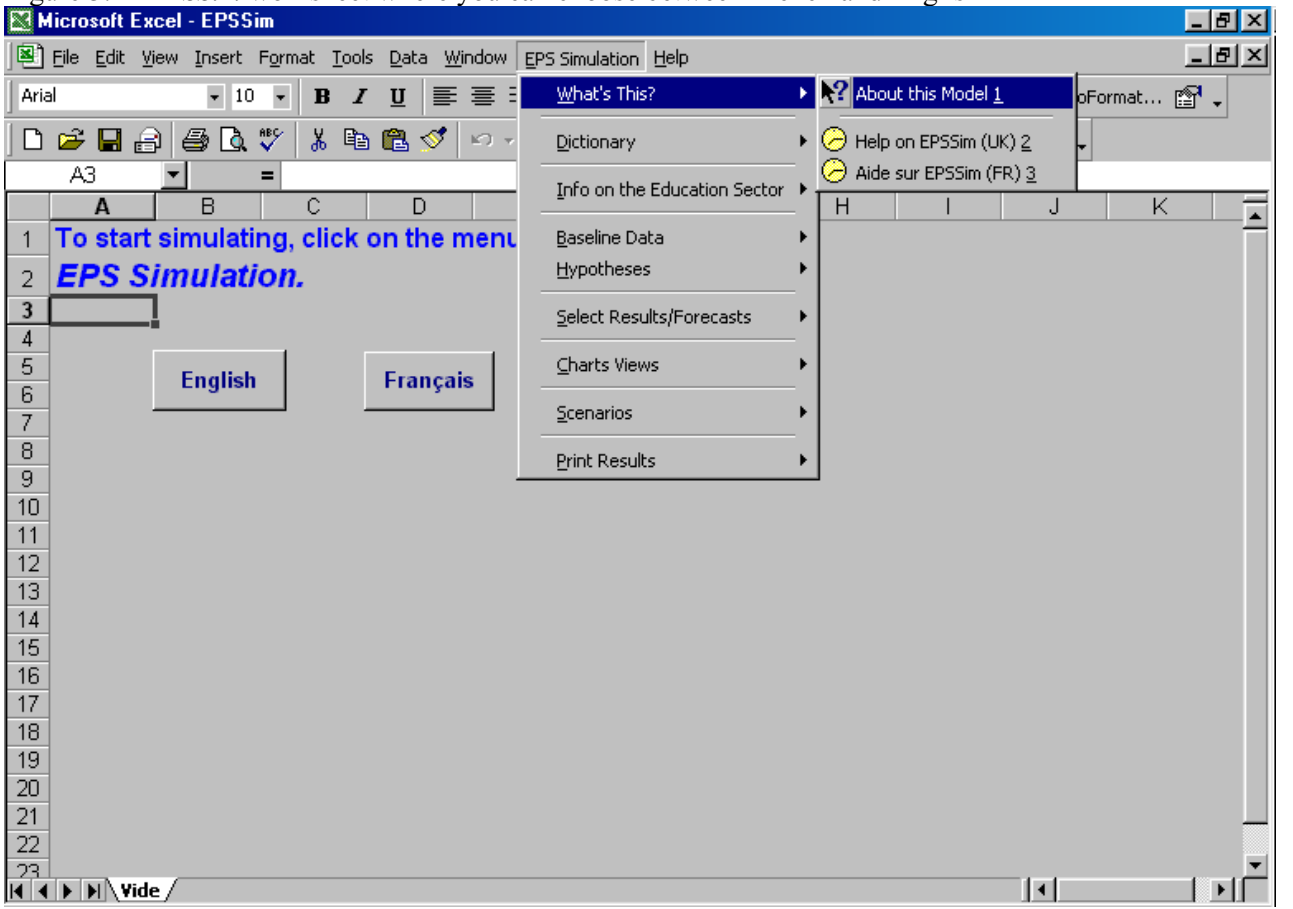
Although this model has been designed in order to address the diversity of forecasting needs in a large number of education systems in the world, in some cases, particularly at the stage of developing an action plan, a more sophisticated adaptation can help address the peculiarities in many education systems. Like all application programmes in their initial stage of design, it is perfectible (Figure 3).

4.2 The use of *EPSSim*

4.2.1 What is EPSSim?

EPSSim which is provided in this guide is a generic simulation model. UNESCO developed this model with the view of contributing to the planning and programming of development actions of national education systems. Being generic, this model therefore does not correspond to any given education system. But it can be used, after some adaptation by specific countries, for rapid simulations based on their education system's major development orientations and hypotheses. In particular, it can be used at the pre-definition stage of education policy options in so far as it can facilitate the policy dialogue and consensus building on the major orientations of educational development.

Figure 3. A *EPSSim* worksheet where you can choose between French and English



EPSSim, in its *v1.0* version, is a provisional version [15] meant to be improved. It was designed from three viewpoints:

- To rapidly make a planning tool [16] available to countries involved in developing their action plans for Education for All (EFA);
- To demonstrate the usefulness of a computer application in the evaluation of the educational and financial implications of the objectives of the retained policy;
- To allow the user of this model to test, after the required adaptation, the simulation of the probable evolution of his country's education system based on the available database and the policy options which he will have identified.

Recommended configuration

By the number of parameters it takes into account, and the levels of education it covers (from primary to higher education), *EPSSim* proved to be rather heavy in terms of storage volume and data processing. It is therefore advised to use a computer powerful enough to maximise the use of the functions it offers, to reduce the time of simulation and to speed up the production of results. Described below is the recommended configuration in which to use *EPSSim*.

Computer/processor	PC Compatible with Intel Pentium II 400 MHz processor or higher
Operating system	Windows 98, Windows 2000 or Windows NT 4.0
Hard disk capacity	100 MB
Memory	64 MB RAM
Software	Microsoft® Excel 97 or later version and WinZip

[15] The user of this model is invited to send to the Section for Support to National Education Development, Division of Educational Policies and Strategies, Education Sector, UNESCO (ED/EPS/NED), all useful comments to improve the simulation model *EPSSim v1.0.*

[16] The Dakar Framework for Action has set the deadline for the development of these plans by 2002.

4.2.2 How to use EPSSim*?*

Briefly explained below are the principal stages to follow to open the model *EPSSim* and carry out a simulation by going through the different stages, which are the reproduction of the education system's structure, the entry of the baseline data and the hypotheses, and the use of the simulation results and its adjustments. [17]

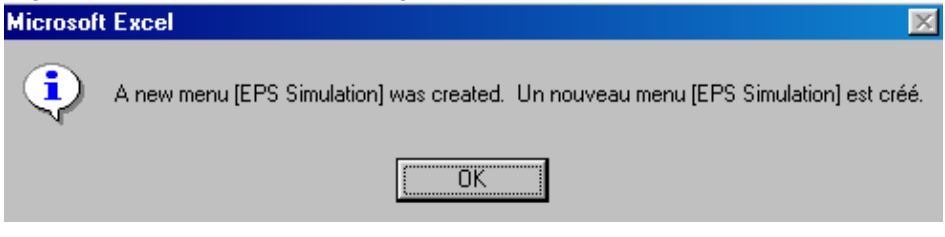
- **Decompression**

The model consists of one file named *EPSSim*, developed under Microsoft Excel. To save it on a single diskette, this file was compressed under the name *EPSSim.zip* thanks to the decompression software called WinZip. Before opening the file, it is therefore necessary to verify if this compression/decompression software is installed in your computer. Failing this, you can download an evaluation version of this software from the Internet site http://www.winzip.com and install it in your computer.

- **Opening the *EPSSim***

Once the file *EPSSim.zip* is decompressed, save the file Excel EPSSim.xls on your hard disk. You can then click on this Excel file and start the simulation by following the instructions which will be displayed on your screen. First of all, a menu called 'EPS Simulation' is temporarily created, wherein you will find all the sections (sub-menus) required to complete and use the simulation model (Figure 4).

Figure 4. The window announcing the creation of a new menu



[17] This file is protected by a password called "epssim". Should you need it, especially in cases of eventual bugs or should you wish to introduce changes on the macros VBA, please enter this password when the corresponding window is displayed.

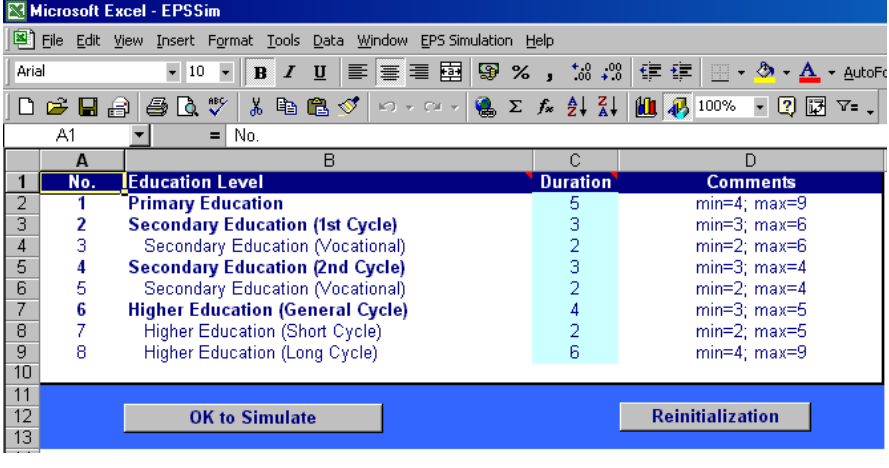
- **Entry of baseline data and simulation parameters**

"Entry" of your education system's structure

Before beginning the process of simulation, it is necessary to first enter the data on the structure of your education system in the simulation model. [18] To enter the information on the structure of your education system, select the menu 'EPS Simulation', the sub-menu 'Info on the Education Sector' and then 'Structure of the Education System'. On the activated worksheet, you shall enter the number of years of each level of education in your country.

In cases where a level or type of education does not exist in your own education system, enter the figure '0' in the corresponding cell (Figure 5). You can also modify the glossary so that your model could use the actual terms reflecting the structure of your education system. To do this, select the submenu 'Dictionary' and then 'English' or 'French' in order to modify the terms that are pre-defined in this model.

Figure 5. Entry of the structure and the duration of the education levels



	A	B	C	D
1	No.	Education Level	Duration	Comments
2	1	Primary Education	5	min=4; max=9
3	2	Secondary Education (1st Cycle)	3	min=3; max=6
4	3	Secondary Education (Vocational)	2	min=2; max=6
5	4	Secondary Education (2nd Cycle)	3	min=3; max=4
6	5	Secondary Education (Vocational)	2	min=2; max=4
7	6	Higher Education (General Cycle)	4	min=3; max=5
8	7	Higher Education (Short Cycle)	2	min=2; max=5
9	8	Higher Education (Long Cycle)	6	min=4; max=9
10				
11				
12				
13				

After entering the structure of your education system, click on the button 'OK to Simulate'. The model will restructure itself according to the data that you introduced on your education system.

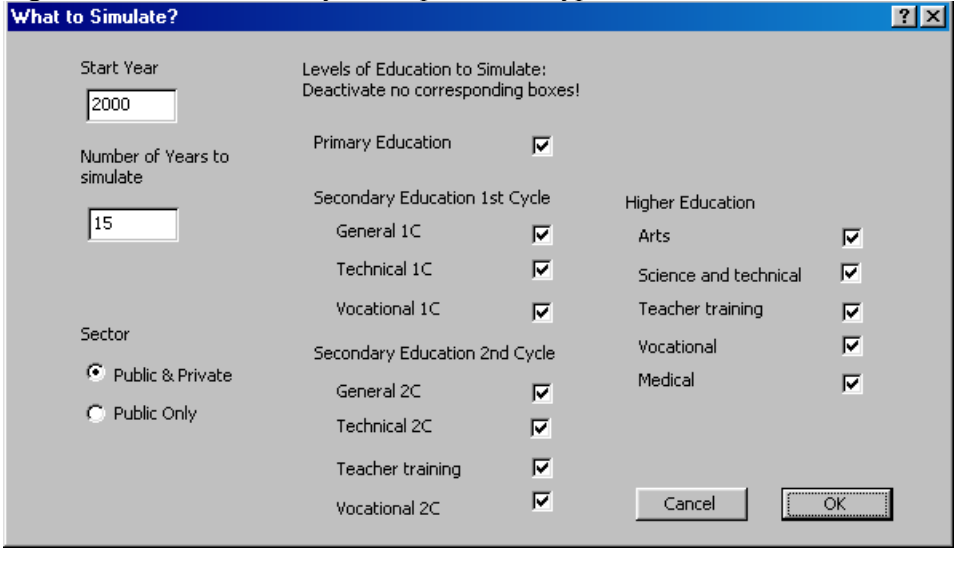
[18] It is necessary to carefully examine the structure of the current education system (or that which is coming if a restructuring is in view within a reform framework). It is desirable that the structure of the simulation model includes as much as possible those of the current and coming education systems.

Choice of periods and levels of education to simulate

The next step consists in introducing the information on the level and types of education on which you would like to carry out a simulation. To do this, select the menu 'EPS Simulation', the sub-menu 'Info on the Education Sector' and then 'What to Simulate?'.

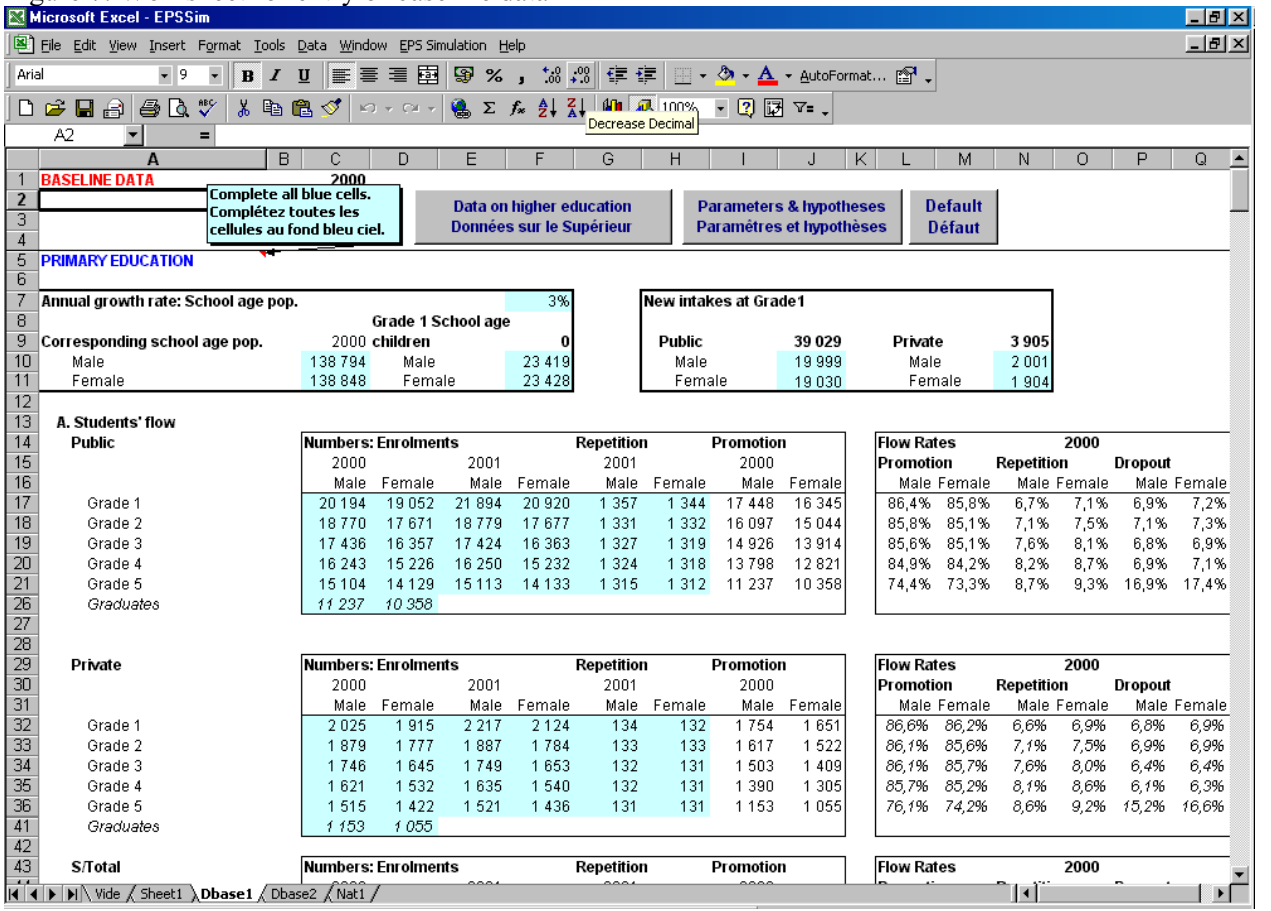
You are invited by the model to enter the information on the simulation period and the levels and types of education on which the simulation will be based. That is, on the form's window, enter the start year (base year) and the period of simulation (for example, '1999' et '10', which means that you would like to simulate until 2009). Then, define the levels, types and sectors of education to simulate by deactivating the cells which are not related to your simulation, before clicking on 'OK' (Figure 6).

Figure 6. The form for entry of the period and types of education



It should be remembered that once confirmed at the warning message, you would not be able to reactivate a deactivated level or type of education, unless you repeat the simulation from the beginning. It is therefore necessary to confirm the deactivation of this or that level of education only when you are sure that the simulation will not relate to this level.

Figure 7. Worksheet for entry of baseline data



Entry of baseline data and hypotheses of simulation

Before starting the construction of a simulation model, it is, first of all, necessary to regroup the baseline data to project or to identify them if they are not available[19], such as the data on the number of students and their flow, the personnel with their status, the salary scale and their movement, the school facilities and their utilisation, the teaching materials and equipments, the cost and financing, etc. These factual, statistical and financial data can also come from other socio-economic sectors. It is equally necessary to verify the coherence of these data coming from different sources of information.

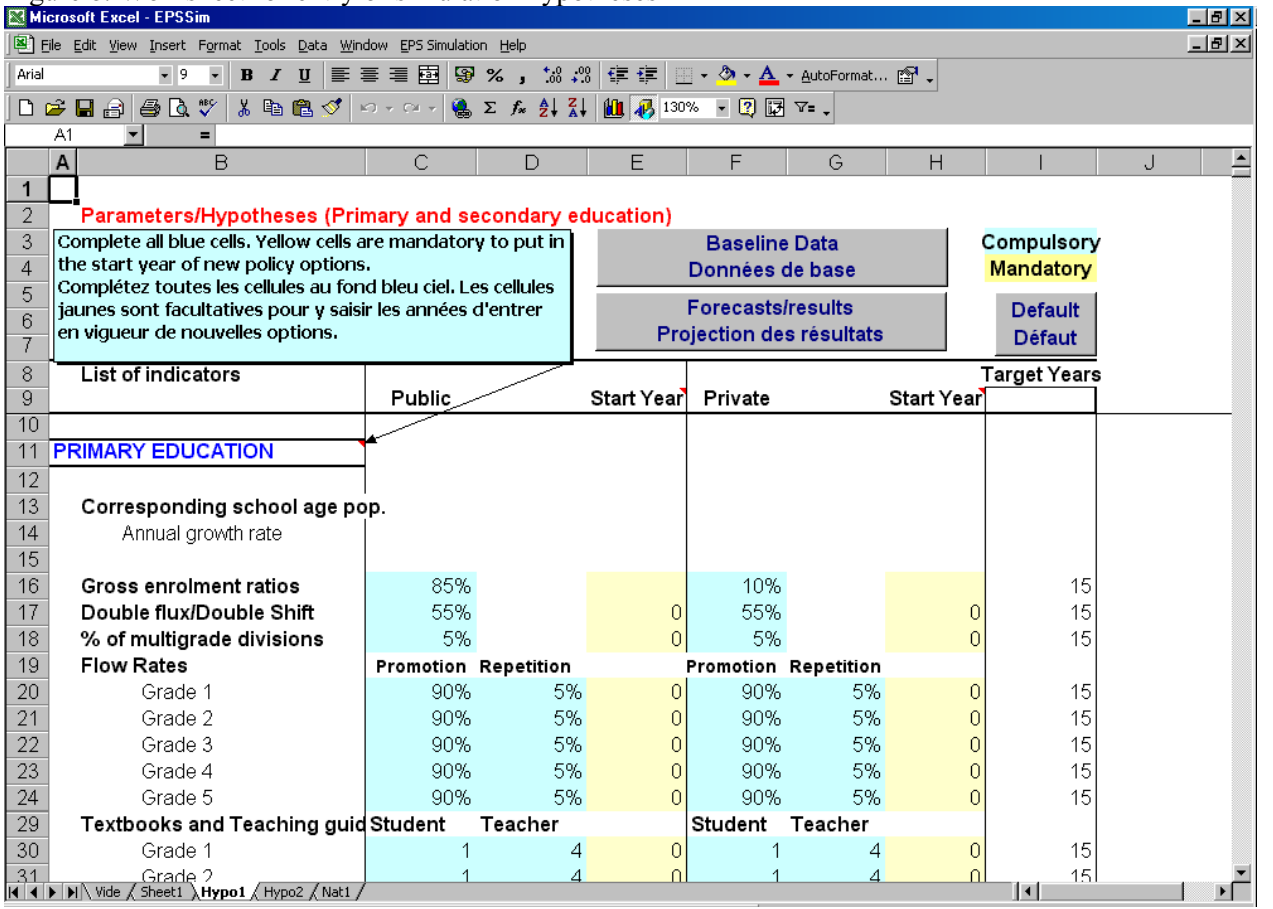
Once this information on your education system and the education levels are regrouped, the baseline data should be entered. To do this, select the level concerned by clicking on the menu 'EPS Simulation' and the sub-menu 'Baseline Data' (Figure 7). The entry of hypotheses will be done in the same manner by selecting the levels concerned by clicking on the menu 'EPS Simulation' and the sub-menu 'Hypotheses' (Figure 8).

The sky-blue coloured cells of the data and hypotheses worksheets are the cells to be filled in mandatorily. If you do not have some of the required data, you can stop the entry at any time, save the file under another name and continue the simulation once you have obtained them.

For demonstration, the entry worksheets of the baseline data and hypotheses have the button "Demo" which you can click on. The model itself will enter the pre-defined data and will allow you to rapidly visualise the results of the simulation.

[19] The diagnosis of the education system consists in collecting and verifying the quantitative and qualitative data of the education sector of the base year (and the preceding ones, to identify the significant trends) with the view of carrying out the critical analysis of its operation.

Figure 8. Worksheet for entry of simulation hypotheses

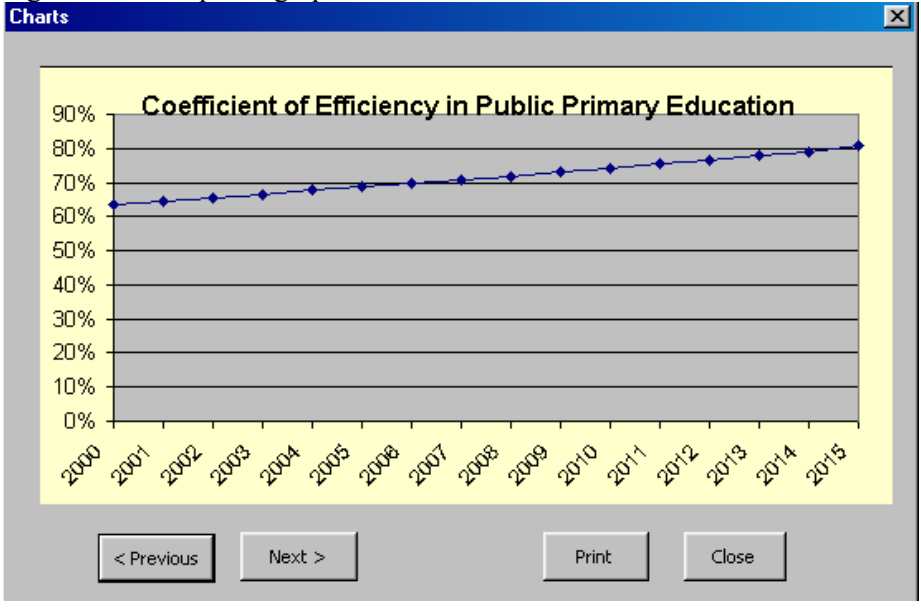


- **Using the results and scenarios**

You can use the results of the simulation in different forms of presentation (result tables by level of education and type of information, viewing and/or printing of graphs, production and consultation of scenarios, etc.). All the results are contained in the worksheets called 'Nat1' and 'Nat2'.[20]

You can select and print the levels and types of education concerned, visualise and print the graphics, etc. To consult these results, select the menu 'EPS Simulation', the sub-menu 'Select Results/Forecasts', 'Charts Views' or 'Print Results' and click on the item concerned.

Figure 9*a*. Example of graphs viewable in the model

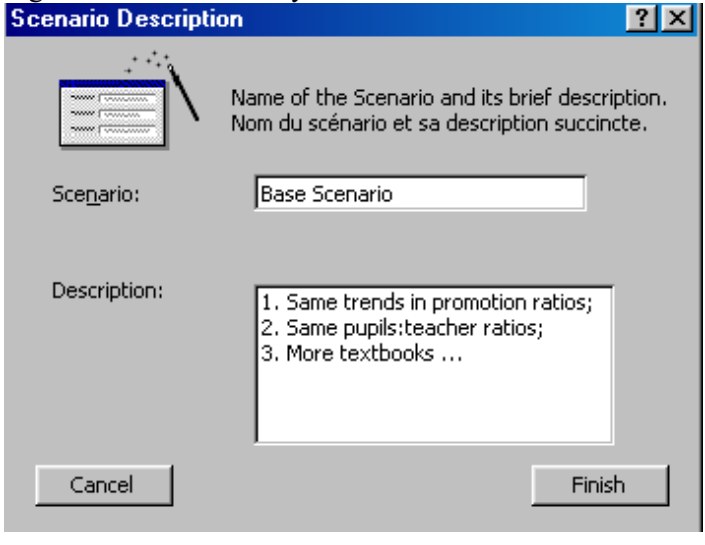


[20] These results worksheets contain statistical formulas, either pre-defined or generated by macros during the previous stages of configuration. The user of this model shall verify, in light of the forecast results, whether possible errors have been made and undertake necessary changes on the base data and hypotheses.

You can also create scenarios[21] and print them by selecting the menu 'EPS Simulation' and the sub-menu 'Scenarios' after having changed a certain number of simulation parameters. To do this, once the first forecast results are obtained, click on 'Generate Scenario' to create a baseline scenario. Then, you return back to the hypothesis worksheets and change one or several parameters (hypotheses) before clicking once again on 'Generate Scenario'. It will allow creating another scenario.

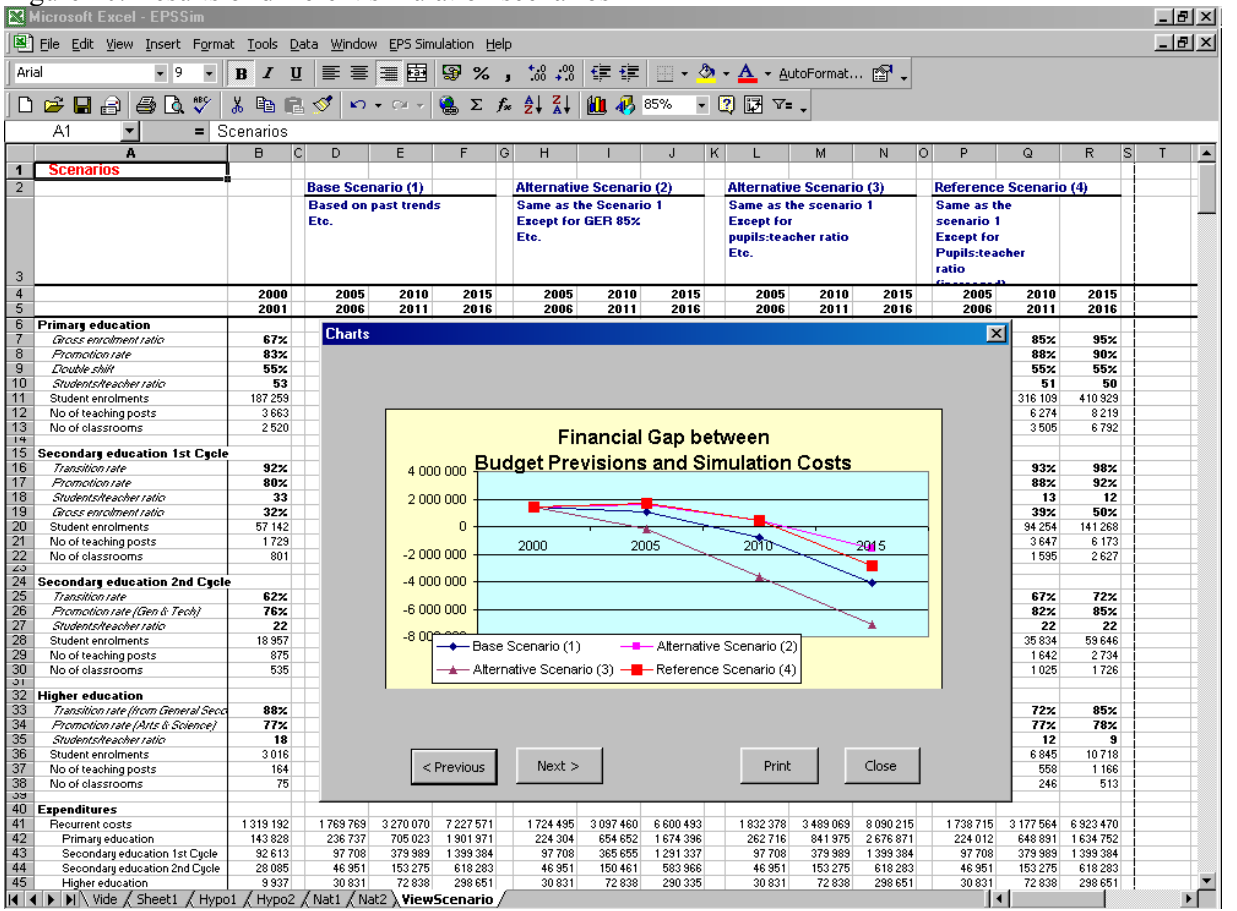
This model makes it possible to have several scenarios and compare them in the form of tables or graphs (Figures 9*b* and 10).

Figure 9*b*. Form for entry of scenario



[21] It is necessary, to begin with, to set up a baseline scenario which includes the past trends of the country's education system and which simulates the evolution of the education sector to attain the quantitative objectives of the education policy. Then, it is necessary to develop alternative scenarios by introducing the hypotheses related to the major policy options to improve the education system and the optimal use of human, physical and financial resources. One of these alternative scenarios will be retained as the reference scenario during the process of consultation and validation. Also, interactions exist between these decision variables. It is therefore recommended not to change these simultaneously for it will be difficult to measure the specific effect of each of these decision variables. A rigorous management of these variables and their interactions is therefore required.

Figure 10. Results of different simulation scenarios



4.2.3 The principal components of EPSSim

EPSSim was developed according to the demographic approach on the basis of gross enrolment ratios (GER). These rates are defined as decision (independent) variables whereas the intake rates are its results. The forecast results are therefore produced on the basis of the GER calculated from the baseline data. These baseline data make it possible, by their combination with the causal and temporal parameters (hypotheses), to measure the physical and financial implications of education policy.

- **Baseline data**

The first component of the *EPSSim* model relates to the baseline data. In this component they are classified by levels of education (primary, secondary, higher education, etc.) and by category (access and equality, quality and efficiency, pedagogical management, etc.).

Table 4. Baseline data and hypotheses

Initial values of parameters (baseline data)	Simulation parameters (hypotheses)
Access	***Access***
1. School-age population 2. Number of students 3. Gross enrolment ratios 4. Number of pedagogical groups 5. Number of classrooms	1. Gross enrolment ratio 2. Internal efficiency rate 3. Turnover of classrooms 4. Turnover of other rooms
Quality	***Quality***
6. Teaching personnel 7. Other personnel 8. Teaching and learning materials	5. Teachers' supervision ratio 6. Teachers' qualification ratio 7. School materials policy
Costs and Financing	***Costs and financing***
9. Salaries (including other emoluments) 10. Recurrent expenditures 11. Investment expenditures 12. Macro-economic data 12.1 GDP and annual growth rate 12.2 Budget/GDP ratio 12.3 Education budget/national budget ratio	8. Growth rate of national budget /GDP ratio 9. Growth rate of education/national budget ratio and other temporal indicators concerning access, quality and the budget

The user will have to fill in all these sky-blue coloured cells of the worksheets called 'Dbase1' and 'Dbase2' of the simulation model before proceeding to the next stage. If some indispensable data are not available, the planner should contact the relevant services to obtain them.

Table 4 presents a selection of essential baseline data under the name of initial values of parameters, as well as a sample of simulation hypotheses used in the model *EPSSim.*

- **Hypotheses**

The hypotheses which can also be called decision variables are presented in the *EPSSim* model in the same way as the baseline data, by levels of education and by category. The information required to fill in the sky-blue cells should be identified and entered in the worksheets 'Hypo1' and 'Hypo2'.

Table 5 presents a selection of decision variables and results. The latter can be called dependent variables, that is, the results of the forecast, as we will see in the following paragraph.

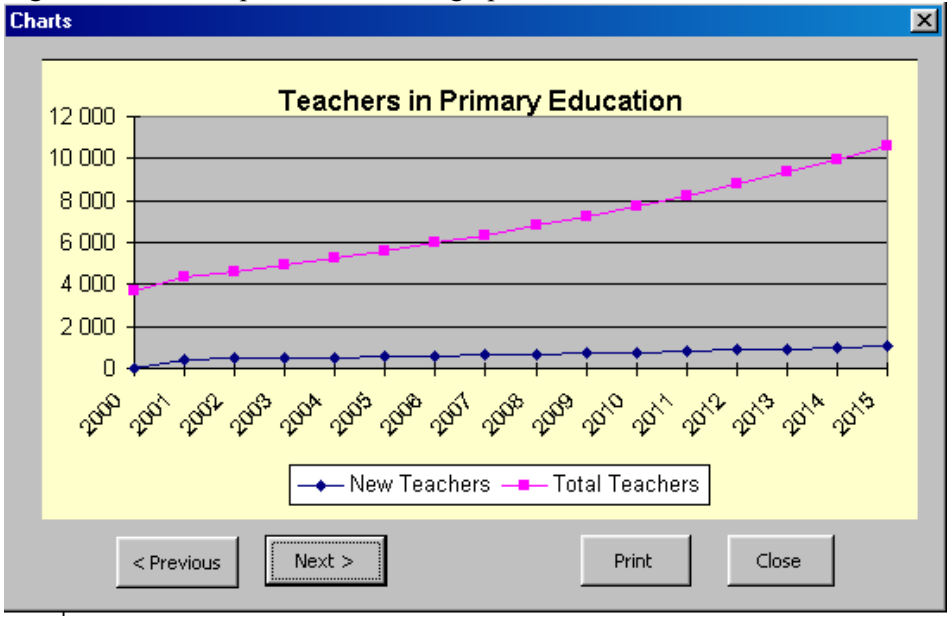
Table 5. Decision and result variables

Independent variables (decisions)	**Dependent variables (projected results)**
Access	***Access***
1. Gross enrolment ratios 2. Internal Efficiency rate 3. Turnover of classrooms 4. Turnover of other rooms	1. Number of students enrolled per year 2. Apparent Intake rate per year 3. Number of classrooms per year 4. New building requirements per year
Quality	***Quality***
5. Teacher supervision ratios 6. Teacher qualification ratio 7. Textbooks policy	5. Number of teachers and others per year 6. New recruitments per year 7. Number of materials required per year
Cost and financing	***Costs and financing***
8. Growth rate of national budget/GDP ratio 9. Growth rate of education/national budget ratio and other temporal indicators concerning access, quality and the budget	8. Salaries (including other emoluments) 9. Projection of other recurrent expenditures 10. Projection of investment expenditures 11. Annual financial gaps between projections and the country's real capacity

- **Results**

Once the baseline data and the parameters are entered, the model will make it possible to produce the forecasts on the number of students, the teaching and non-teaching personnel required, new school buildings needed, as well as the financial resources required to attain the objectives of the education policy. These results are presented in the worksheets called 'Nat1' and 'Nat2'. (Figures 11 and 12)

Figure 11. An example of results in a graph format



The user can also obtain up to four development scenarios, compare their respective advantages and disadvantages and choose the reference scenario for the programming of development actions.

Conclusions

It should be noted that *EPSSim v1.0* is a model that relates only to formal education. This does not mean that the simulation of non-formal education is not possible. Because of the importance of non-formal education in the overall development of the education system in some countries, its integration in the simulation can prove indispensable. In this case, it is imperative that the planners devote a special attention to this trend, and in

particular to a more systemic programming of development actions in this education sub-sector.

We have not included in this version of *EPSSim* the section on non-formal education for several reasons, the most important of which are the following:

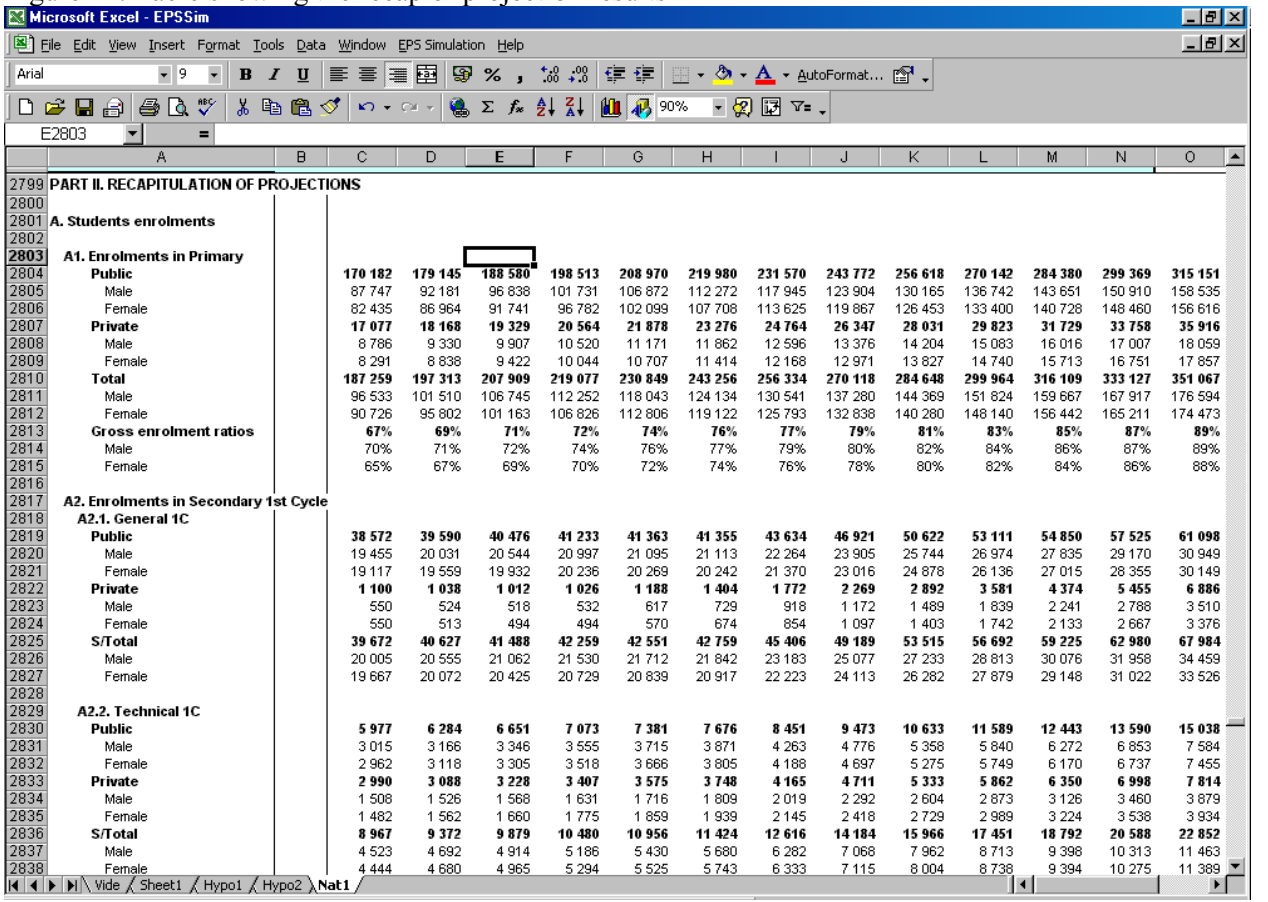
- On the technical and methodological level, if the planner can simulate the development of formal education, he can do the same for the simulation of non-formal education. The stages and the techniques of simulation are the same for both formal and non-formal education.

- On the conceptual level in determining field scopes to be covered by a simulation model, the diversity of policies and national practices is such that it is difficult to identify a general trend in the development of non-formal education. For example, some countries consider that non-formal education consists in organizing short-term training activities (for some weeks or months) while others view it as a longer training, sometimes similar to that of formal education. Some wish to organize non-formal education activities for university graduates, while others aim it at illiterate or out-of-school populations. We have not therefore included the non-formal education section to avoid giving a fixed image of something which by definition is diverse, fluid and in gestation.

- On the policy level, it is necessary to define the clear options and strategies on the non-formal education system before designing a simulation. The clarification of these policies will make it possible to simulate the short and long-term human, material, and financial needs, and to programme the development actions required for the attainment of the objectives of non-formal education.

EPSSim v1.0, in its provisional version, is meant to evolve. UNESCO plans to improve this simulation model so that it can adapt to diverse national realities, thanks to the suggestions and observations expected to come from potential users. It is worth noting that a generic simulation model, however inclusive it may be, can not in any way be used as a detailed programming tool for a specific education system, unless a careful and detailed adaptation is carried out on its basic structure, and the relevant data and parameters are diversified to the desired degree of detail.

Figure 12. Table showing the recap of projection results



Microsoft Excel - EPSSim

File Edit View Insert Format Tools Data Window EPS Simulation Help

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	A	C	D	E	F	G	H	I	J	K	L	M	N	O
2799	**PART II. RECAPITULATION OF PROJECTIONS**													
2800														
2801	**A. Students enrolments**													
2802														
2803	**A1. Enrolments in Primary**													
2804	**Public**	**170 182**	**179 145**	**188 580**	**198 513**	**208 970**	**219 980**	**231 570**	**243 772**	**256 618**	**270 142**	**284 380**	**299 369**	**315 151**
2805	Male	87 747	92 181	96 838	101 731	106 872	112 272	117 945	123 904	130 165	136 742	143 651	150 910	158 535
2806	Female	82 435	86 964	91 741	96 782	102 099	107 708	113 625	119 867	126 453	133 400	140 728	148 460	156 616
2807	**Private**	**17 077**	**18 168**	**19 329**	**20 564**	**21 878**	**23 276**	**24 764**	**26 347**	**28 031**	**29 823**	**31 729**	**33 758**	**35 916**
2808	Male	8 786	9 330	9 907	10 520	11 171	11 862	12 596	13 376	14 204	15 083	16 016	17 007	18 059
2809	Female	8 291	8 838	9 422	10 044	10 707	11 414	12 168	12 971	13 827	14 740	15 713	16 751	17 857
2810	**Total**	**187 259**	**197 313**	**207 909**	**219 077**	**230 849**	**243 256**	**256 334**	**270 118**	**284 648**	**299 964**	**316 109**	**333 127**	**351 067**
2811	Male	96 533	101 510	106 745	112 252	118 043	124 134	130 541	137 280	144 369	151 824	159 667	167 917	176 594
2812	Female	90 726	95 802	101 163	106 826	112 806	119 122	125 793	132 838	140 280	148 140	156 442	165 211	174 473
2813	**Gross enrolment ratios**	**67%**	**69%**	**71%**	**72%**	**74%**	**76%**	**77%**	**79%**	**81%**	**83%**	**85%**	**87%**	**89%**
2814	Male	70%	71%	72%	74%	76%	77%	79%	80%	82%	84%	86%	87%	89%
2815	Female	65%	67%	69%	70%	72%	74%	76%	78%	80%	82%	84%	86%	88%
2816														
2817	**A2. Enrolments in Secondary 1st Cycle**													
2818	**A2.1. General 1C**													
2819	**Public**	**38 572**	**39 590**	**40 476**	**41 233**	**41 363**	**41 355**	**43 634**	**46 921**	**50 622**	**53 111**	**54 850**	**57 525**	**61 098**
2820	Male	19 455	20 031	20 544	20 997	21 095	21 113	22 264	23 905	25 744	26 974	27 835	29 170	30 949
2821	Female	19 117	19 559	19 932	20 236	20 269	20 242	21 370	23 016	24 878	26 136	27 015	28 355	30 149
2822	**Private**	**1 100**	**1 038**	**1 012**	**1 026**	**1 188**	**1 404**	**1 772**	**2 269**	**2 892**	**3 581**	**4 374**	**5 455**	**6 886**
2823	Male	550	524	518	532	617	729	918	1 172	1 489	1 839	2 241	2 788	3 510
2824	Female	550	513	494	494	570	674	854	1 097	1 403	1 742	2 133	2 667	3 376
2825	**S/Total**	**39 672**	**40 627**	**41 488**	**42 259**	**42 551**	**42 759**	**45 406**	**49 189**	**53 515**	**56 692**	**59 225**	**62 980**	**67 984**
2826	Male	20 005	20 555	21 062	21 530	21 712	21 842	23 183	25 077	27 233	28 813	30 076	31 958	34 459
2827	Female	19 667	20 072	20 425	20 729	20 839	20 917	22 223	24 113	26 282	27 879	29 148	31 022	33 526
2828														
2829	**A2.2. Technical 1C**													
2830	**Public**	**5 977**	**6 284**	**6 651**	**7 073**	**7 381**	**7 676**	**8 451**	**9 473**	**10 633**	**11 589**	**12 443**	**13 590**	**15 038**
2831	Male	3 015	3 166	3 346	3 555	3 715	3 871	4 263	4 776	5 358	5 840	6 272	6 853	7 584
2832	Female	2 962	3 118	3 305	3 518	3 666	3 805	4 188	4 697	5 275	5 749	6 170	6 737	7 455
2833	**Private**	**2 990**	**3 088**	**3 228**	**3 407**	**3 575**	**3 748**	**4 165**	**4 711**	**5 333**	**5 862**	**6 350**	**6 998**	**7 814**
2834	Male	1 508	1 526	1 568	1 631	1 716	1 809	2 019	2 292	2 604	2 873	3 126	3 460	3 879
2835	Female	1 482	1 562	1 660	1 775	1 859	1 939	2 145	2 418	2 729	2 989	3 224	3 538	3 934
2836	**S/Total**	**8 967**	**9 372**	**9 879**	**10 480**	**10 956**	**11 424**	**12 616**	**14 184**	**15 966**	**17 451**	**18 792**	**20 588**	**22 852**
2837	Male	4 523	4 692	4 914	5 186	5 430	5 680	6 282	7 068	7 962	8 713	9 398	10 313	11 463
2838	Female	4 444	4 680	4 965	5 294	5 525	5 743	6 333	7 115	8 004	8 738	9 394	10 275	11 389

Vide | Sheet1 | Hypo1 | Hypo2 | Nat1

4.3 The conditions required in constructing a simulation

A simulation model cannot be properly designed unless two conditions are met: (i) the availability of a reliable information system; and (ii) a relatively clear definition of quantifiable development objectives and options of the sector.

4.3.1 The information system

The simulations established within the framework of the development of an education plan are based on a set of data. One should be able to find and enter all the relevant numerical data concerning the flow of enrolments, as well as those concerning the human, material and financial inputs. To prepare an action plan, it is necessary to collect and analyse a great number of relevant data with the view of developing operation indicators, and gather from the relevant services, the demographic and macro-economic data which are crucial in establishing the forecasts of educational development.

In order to carry out significant analyses it is indispensable that the data, at least for the last five years, are available. This will make it possible to identify well-documented past trends and thereby carry out finer analyses. At a minimum, the data of the two consecutive years are absolutely necessary to be able to construct dynamic indicators, in particular those concerning the student and teacher flows in the system. Without these indicators, it will not be possible to design valid simulations on educational development.

In general, information systems, notably in developing countries, have gaps in demographic, costs, financing, and macro-economic data. The lack of information on these fields, whose strategic use is respectively upstream and downstream of the education planning process, weakens the reliability of the simulations.

The demographic data, in particular those of the school-age population which one wishes to project, are not always available for the period considered. In many countries, these data exist, but, more often, they go back many years, ten or more years, in some cases. The more recent and detailed the data, the more the projections will be reliable. The non-availability of the cost, financing, and macro-economic data is another major obstacle to the establishment of valid simulations. The information details concerning them are often poorly

developed and sometimes simply ignored in the educational planning process. Before starting the development of a simulation, it is necessary to ensure their availability.

4.3.2 Clear development objectives

A simulation model is based on data, but also on education policy goals and objectives. The simulation in education planning is carried out within the context of education policy and choices in the organization and management of education services. These options and choices generally relate to the regulation of the student flows, training policies, recruitment and remuneration of teachers, school curricula, the use of infrastructure and of personnel, etc. All these should be defined for their integration in the simulation.

In general, the new education policy options are identified at the end of the education sector diagnosis, i.e. the sector analysis. The availability of the data makes it possible to analyse the evolution of the past to identify the significant trends, while a simulation is based on the analysis of these trends to define new options and refine objectives for the future. It goes beyond the static analysis of the present situation of the system by modifying and/or introducing new variables and development hypotheses which are the consequence of the retained options of the new education policy.

If the policy options and objectives are not clearly defined, it becomes necessary to carry out investigations prior to the development of simulations. Investigations and thematic researches are then conducted in the relevant fields to collect background material on the basis of which the development orientations and objectives are specified. For example, the factors influencing the schooling and learning achievement are important to know, in order to define the objectives aiming to improve the quality of the system, and proceed in their translation into development scenario parameters.

5. Conclusions

Simulation is now regarded as a fully-fledge planning tool that makes it possible to translate policy objectives in quantitative terms to facilitate decision-making in the education sector. It can also provide the most useful information concerning the probable evolution of the financial requirements and expenditures resulting from the development of a national education system.

Thanks to simulation, one can have a systemic vision of the probable evolution of an education system. The advantage of this vision lies in the sound structuring of the different education levels of the system, in terms of strategic options, and human, pedagogic, and financial resources.

Within the national macro-economic context and on the basis of the country's financial possibilities, the simulation makes it possible to formulate coherent education policies according to a hierarchical organization of main strategic lines and priority actions. The simulation provides policy-makers the means to determine the sectoral budgetary framework and the sub-sector budgetary ceilings with the view of ensuring a harmonious development of the system. This intention is financially expressed by the decision keys regarding the distribution of resources between education levels and/or by sections within a level.

Although a simulation model offers numerous possibilities, it has its own limits. However numerous or refined might be the parameters it uses, a simulation is first of all a virtual forecast. It provides the numerical information on the likelihood of a system in a given period but it does not allow the consideration of all the internal and external parameters which act on educational development, and even less, the unpredictable socio-economic hazards and uncertainties. A rigorous management, especially the regular updating of baseline data, parameters, and results, will make it possible to reduce the margin of uncertainty.

Despite these limits, the simulation model is a powerful tool for the forecasting, strategic planning, and development programming of an education system. Its first advantage lies in the fact that it provides a relatively complete and powerfully documented vision of the evolution of an education system. The

simulation clarify potential dysfunctions and deviations which one can not otherwise foresee, and which sometimes have serious consequences on the performance and the potential of educational development.

To close, a simulation model can be used at four levels: (a) it requires the collection of the most relevant and reliable data and the quantifying of policy decisions and pedagogical choices; (b) it makes it possible for the system's dynamic evolution to be represented in human, technical, physical, and budgetary terms, and evaluate the effects of the different decisions of the education policy; (c) it provides objective information to facilitate the dialogue on the quantitative, qualitative, and financial consequences of policy decisions; (d) if regularly updated, it makes it possible to avoid the dysfunctions and the deviations in the management of the education system's development.

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Annexes:

Sample projections of a simulation model

Annex 1. Recap of projection results for primary and secondary education: School enrolments and needs in teaching and non-teaching personnel, in constructions and in educational materials

A. School enrolments

	2000/01	*2001/02*	*2002/03*	*2003/04*	*2004/05*	*2005/06*	*2006/07*	*2007/08*	*2008/09*	*2009/10*	*2010/11*
A1. Enrolments in primary education											
Public	170 182	181 105	192 731	205 106	218 277	232 296	247 218	263 101	280 007	298 003	317 158
Male	87 747	93 095	98 768	104 788	111 174	117 950	125 138	132 765	140 856	149 441	158 548
Female	82 435	88 010	93 963	100 318	107 102	114 346	122 080	130 336	139 151	148 562	158 610
Private	17 077	18 465	19 965	21 588	23 342	25 240	27 292	29 511	31 911	34 506	37 313
Male	8 786	9 473	10 214	11 012	11 873	12 802	13 803	14 882	16 045	17 300	18 653
Female	8 291	8 992	9 751	10 575	11 469	12 438	13 489	14 629	15 865	17 206	18 660
Total	187 259	199 570	212 696	226 693	241 619	257 536	274 510	292 612	311 918	332 509	354 471
Male	96 533	102 568	108 982	115 800	123 048	130 751	138 941	147 647	156 902	166 741	177 201
Female	90 726	97 002	103 714	110 893	118 572	126 784	135 569	144 965	155 017	165 768	177 270
Gross enrolment ratios	67%	70%	72%	75%	77%	80%	83%	86%	89%	92%	95%
Male	70%	72%	74%	76%	79%	81%	84%	86%	89%	92%	95%
Female	65%	68%	70%	73%	76%	79%	82%	85%	88%	92%	95%
A2. Enrolments in lower secondary education – 1C											
A2.1. General 1C											
Public	38 572	39 471	40 244	40 885	40 959	40 927	43 726	47 800	52 462	55 658	57 989
Male	19 455	19 976	20 441	20 847	20 927	20 944	22 354	24 378	26 681	28 252	29 398
Female	19 117	19 495	19 803	20 038	20 032	19 983	21 373	23 423	25 781	27 406	28 591
Private	1 100	1 060	1 090	1 209	1 526	1 962	2 755	3 914	5 500	7 476	10 023

	2000/01	*2001/02*	*2002/03*	*2003/04*	*2004/05*	*2005/06*	*2006/07*	*2007/08*	*2008/09*	*2009/10*	*2010/11*
Male	550	536	558	627	793	1 019	1 424	2 013	2 815	3 811	5 091
Female	550	524	531	581	733	944	1 331	1 901	2 685	3 665	4 932
S/Total	39 672	40 531	41 334	42 094	42 485	42 889	46 482	51 714	57 963	63 134	68 012
Male	20 005	20 512	20 999	21 474	21 719	21 963	23 778	26 391	29 496	32 063	34 489
Female	19 667	20 018	20 334	20 620	20 765	20 927	22 704	25 324	28 466	31 071	33 524
A2.2. Technical 1C											
Public	5 977	6 309	6 748	7 289	7 747	8 213	9 360	10 893	12 686	14 256	15 754
Male	3 015	3 180	3 400	3 672	3 913	4 162	4 745	5 517	6 420	7 213	7 975
Female	2 962	3 129	3 348	3 617	3 834	4 051	4 615	5 376	6 267	7 043	7 779
Private	2 990	3 104	3 289	3 541	3 800	4 080	4 716	5 564	6 564	7 473	8 368
Male	1 508	1 536	1 602	1 707	1 842	1 996	2 322	2 754	3 264	3 737	4 211
Female	1 482	1 568	1 686	1 834	1 958	2 085	2 394	2 810	3 300	3 736	4 157
S/Total	8 967	9 413	10 036	10 830	11 547	12 294	14 076	16 457	19 250	21 729	24 123
Male	4 523	4 716	5 002	5 379	5 755	6 157	7 067	8 271	9 683	10 950	12 186
Female	4 444	4 697	5 034	5 451	5 792	6 136	7 010	8 186	9 566	10 779	11 936
A2.3. Vocational 1C											
Public	5 098	5 421	5 845	6 165	6 481	6 821	7 938	9 488	10 714	11 792	12 907
Male	2 900	3 061	3 265	3 413	3 558	3 712	4 265	5 028	5 603	6 089	6 581
Female	2 198	2 360	2 580	2 752	2 923	3 109	3 673	4 460	5 111	5 702	6 326
Private	3 405	3 635	3 886	4 004	4 100	4 201	4 754	5 537	6 100	6 547	6 987
Male	1 663	1 786	1 925	1 995	2 052	2 113	2 393	2 786	3 073	3 304	3 535
Female	1 742	1 849	1 961	2 010	2 048	2 089	2 361	2 751	3 028	3 243	3 453
S/Total	8 503	9 056	9 731	10 169	10 580	11 022	12 692	15 025	16 815	18 339	19 894
Male	4 563	4 847	5 190	5 408	5 610	5 825	6 658	7 814	8 676	9 394	10 116
Female	3 940	4 209	4 541	4 761	4 970	5 197	6 034	7 211	8 139	8 945	9 778

	2000/01	*2001/02*	*2002/03*	*2003/04*	*2004/05*	*2005/06*	*2006/07*	*2007/08*	*2008/09*	*2009/10*	*2010/11*
Gross enrolment ratios	32%	32%	32%	32%	32%	32%	34%	37%	41%	44%	46%
Male	32%	32%	33%	33%	33%	32%	35%	38%	42%	44%	47%
Female	31%	31%	31%	31%	31%	31%	33%	37%	40%	43%	46%
A3. Enrolments in upper secondary education – 2C											
A3.1. General 2C											
Public	5 999	6 595	7 191	7 825	8 544	9 308	10 238	11 196	12 230	14 138	16 847
Male	3 285	3 651	3 974	4 287	4 640	5 014	5 474	5 942	6 440	7 365	8 668
Female	2 714	2 945	3 217	3 538	3 904	4 294	4 763	5 254	5 790	6 774	8 179
Private	2 731	2 921	3 123	3 338	3 542	3 743	3 993	4 236	4 492	5 028	5 812
Male	1 381	1 475	1 572	1 675	1 781	1 884	2 013	2 140	2 275	2 550	2 944
Female	1 350	1 446	1 552	1 662	1 761	1 858	1 980	2 096	2 217	2 479	2 868
S/Total	8 730	9 517	10 315	11 163	12 086	13 050	14 230	15 432	16 722	19 167	22 658
Male	4 666	5 126	5 546	5 963	6 421	6 898	7 487	8 082	8 715	9 914	11 612
Female	4 064	4 391	4 769	5 200	5 665	6 152	6 743	7 350	8 007	9 252	11 046
A3.2. Technical 2C											
Public	2 371	2 501	2 697	2 979	3 344	3 764	4 284	4 833	5 445	6 508	8 010
Male	1 313	1 384	1 496	1 651	1 838	2 049	2 310	2 581	2 881	3 399	4 125
Female	1 058	1 117	1 201	1 329	1 506	1 715	1 974	2 251	2 565	3 109	3 885
Private	4 822	4 939	5 001	5 015	5 025	5 040	5 114	5 146	5 172	5 470	5 973
Male	2 404	2 450	2 477	2 485	2 498	2 516	2 565	2 593	2 618	2 776	3 035
Female	2 418	2 489	2 525	2 530	2 527	2 524	2 549	2 553	2 554	2 694	2 939
S/Total	7 193	7 440	7 699	7 994	8 369	8 804	9 397	9 978	10 617	11 978	13 983
Male	3 717	3 835	3 973	4 135	4 336	4 565	4 874	5 174	5 498	6 176	7 159
Female	3 476	3 606	3 726	3 858	4 033	4 239	4 523	4 804	5 118	5 803	6 824
A3.3. Teacher training 2C											
Public	885	940	1 015	1 061	1 137	1 226	1 318	1 412	1 502	1 738	2 098

	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Male	405	432	470	497	539	588	640	695	748	874	1 062
Female	480	508	545	564	598	638	677	717	754	864	1 036
Private	525	529	536	540	560	585	609	632	651	729	852
Male	276	297	315	315	321	330	338	345	349	383	438
Female	249	231	221	226	239	255	271	287	301	346	414
S/Total	1 410	1 468	1 551	1 601	1 697	1 811	1 927	2 044	2 153	2 467	2 950
Male	681	729	785	811	860	918	978	1 040	1 097	1 257	1 500
Female	729	739	766	790	837	893	948	1 004	1 055	1 210	1 450
A3.4. Vocational 2C											
Public	1 071	1 124	1 177	1 256	1 356	1 434	1 505	1 581	1 814	2 158	2 456
Male	634	664	690	729	777	811	841	871	982	1 146	1 280
Female	437	460	487	527	579	623	665	710	832	1 012	1 176
Private	553	618	678	740	812	873	932	995	1 161	1 404	1 625
Male	303	339	371	404	441	471	501	532	615	736	843
Female	250	279	307	337	372	402	431	464	546	668	782
S/Total	1 624	1 741	1 856	1 997	2 169	2 307	2 437	2 577	2 975	3 562	4 081
Male	937	1 002	1 062	1 133	1 218	1 283	1 341	1 403	1 597	1 882	2 123
Female	687	739	794	864	951	1 025	1 096	1 174	1 378	1 680	1 958

B. Number of teacher posts and non-teaching staff

	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
B1. Primary education											
B1.1. Primary Public											
Needs in new teacher posts	0	452	492	535	581	632	687	747	812	883	960
No. of teacher posts required	3 200	3 479	3 781	4 111	4 468	4 858	5 281	5 741	6 241	6 785	7 376

	2000/01	*2001/02*	*2002/03*	*2003/04*	*2004/05*	*2005/06*	*2006/07*	*2007/08*	*2008/09*	*2009/10*	*2010/11*
Teachers under statute	2 400	2 687	2 998	3 335	3 700	4 096	4 525	4 990	5 495	6 043	6 638
Category 1	1 500	1 769	2 060	2 378	2 723	3 098	3 506	3 950	4 434	4 959	5 532
Category 2	900	919	938	957	977	998	1 019	1 040	1 062	1 084	1 106
Teachers under contract	800	791	783	775	768	762	756	751	746	741	738
Category 3	500	485	470	456	443	429	416	404	392	380	369
Category 4	300	306	313	319	326	333	340	347	354	361	369
Needs in new non-teaching staff	0	29	33	37	41	46	52	58	65	73	82
No. of non-teaching staff	164	184	206	231	259	291	326	366	410	460	516
B1.2. Primary Private											
Needs in new teacher posts	0	55	58	62	66	70	75	80	85	90	96
No. of teacher posts required	463	493	525	559	595	634	675	719	765	815	868
Teachers under statute	303	343	384	426	470	516	564	615	667	723	781
Category 1	250	285	320	357	394	433	473	515	559	604	651
Category 2	53	58	63	69	76	83	91	99	109	119	130
Teachers under contract	160	150	141	133	125	118	111	104	98	92	87
Category 3	70	67	64	61	58	55	53	50	48	46	43
Category 4	90	84	78	72	67	62	58	54	50	47	43
Needs in new non-teaching staff	0	4	4	4	5	5	6	7	7	8	9
No. of non-teaching staff	21	23	26	29	32	36	40	44	49	55	61
B1.3. Primary Total											
Needs in new teacher posts	0	507	550	597	647	702	762	827	897	973	1 056
No. of teacher posts required	3 663	3 972	4 306	4 670	5 064	5 491	5 956	6 459	7 006	7 599	8 244
Teachers under statute	2 703	3 030	3 382	3 761	4 170	4 612	5 089	5 605	6 162	6 766	7 419
Category 1	1 750	2 053	2 381	2 734	3 117	3 531	3 980	4 465	4 992	5 563	6 183
Category 2	953	977	1 001	1 027	1 053	1 081	1 109	1 139	1 170	1 203	1 237

	2000/01	*2001/02*	*2002/03*	*2003/04*	*2004/05*	*2005/06*	*2006/07*	*2007/08*	*2008/09*	*2009/10*	*2010/11*
Teachers under contract	960	942	924	908	893	880	867	855	844	834	824
Category 3	570	552	534	517	500	484	469	454	440	426	412
Category 4	390	390	390	391	393	395	398	401	404	408	412
Needs in new non-teaching staff	0	33	37	41	46	51	58	65	72	81	91
No. of non-teaching staff	185	207	232	260	292	327	366	410	460	515	577
B2. Lower secondary education – 1st cycle											
B2.1. 1st cycle Public											
Needs in new teacher posts	0	169	186	194	185	195	373	493	547	524	538
No. of teacher posts required	1 378	1 474	1 581	1 690	1 786	1 887	2 152	2 519	2 919	3 280	3 636
Teachers under statute	926	1 013	1 107	1 205	1 294	1 385	1 599	1 891	2 215	2 512	2 808
Teachers under contract	452	461	473	485	493	501	553	628	705	768	828
Category 3	243	253	264	275	283	291	323	369	415	453	488
Category 4	209	209	209	210	210	210	230	260	289	315	340
Needs in new non-teaching staff	0	35	40	44	45	50	89	120	138	144	158
No. of non-teaching staff required	213	236	263	292	321	353	421	515	622	729	845
Needs in technical assistants	0	10	12	13	14	17	28	39	46	51	58
No. of technical assistants	44	51	60	69	80	92	114	146	184	223	268
Needs in supervision staff	0	16	18	20	20	22	38	52	60	61	66
No. of supervision staff	91	102	114	127	140	154	184	224	270	316	364
Needs in workers and others	0	9	11	11	11	11	22	29	32	32	33
No. of workers and others	78	83	89	95	101	107	123	145	169	191	213
B2.2. 1st cycle Private											
Needs in new teacher posts	0	39	49	53	61	69	133	182	202	215	247
No. of teacher posts required	351	372	401	432	469	513	615	758	914	1 075	1 260

	2000/01	*2001/02*	*2002/03*	*2003/04*	*2004/05*	*2005/06*	*2006/07*	*2007/08*	*2008/09*	*2009/10*	*2010/11*
Teachers under statute	200	219	244	270	302	340	418	528	652	785	940
Teachers under contract	151	153	157	162	167	173	197	230	262	291	320
Category 3	71	72	75	79	83	88	102	122	142	160	179
Category 4	80	80	82	83	84	85	95	108	121	131	141
Needs in non-teaching staff	0	8	10	11	14	17	31	45	56	68	87
No. of non-teaching staff required	32	38	46	55	65	79	104	142	189	244	315
Needs in technical assistants	0	3	4	4	5	6	11	16	19	23	30
No. of technical assistants	11	13	16	19	23	28	37	50	66	85	110
Needs in supervision staff	0	3	4	4	5	7	12	18	22	28	36
No. of supervision staff	12	14	17	21	25	30	40	55	73	96	126
Needs in workers and others	0	2	3	3	4	4	8	12	14	17	21
No. of workers and others	9	11	13	15	18	21	28	38	49	63	80
B2.3. 1st cycle Total											
Needs in new teacher posts	0	209	236	246	246	264	505	675	748	739	786
No. of teacher posts required	1 729	1 845	1 982	2 122	2 255	2 400	2 767	3 277	3 834	4 355	4 896
Teachers under statute	1 126	1 231	1 351	1 475	1 596	1 725	2 016	2 419	2 867	3 297	3 748
Teachers under contract	603	614	631	647	659	674	750	859	967	1 058	1 148
Category 3	314	325	339	354	366	379	426	491	557	613	667
Category 4	289	289	291	293	293	295	324	368	410	445	481
Needs in non-teaching staff	0	43	50	55	59	67	120	165	194	212	245
No. of non-teaching staff required	245	274	309	347	386	432	525	657	811	974	1 161
Needs in technical assistants	0	13	15	17	19	23	39	55	66	74	88
No. of technical assistants	55	64	76	89	103	120	151	196	250	309	378
Needs in supervision staff	0	19	22	24	25	29	50	69	82	89	103
No. of supervision staff	103	116	131	148	165	184	223	279	343	412	490
Needs in workers and others	0	12	13	14	14	16	30	41	46	48	54

	2000/01	*2001/02*	*2002/03*	*2003/04*	*2004/05*	*2005/06*	*2006/07*	*2007/08*	*2008/09*	*2009/10*	*2010/11*
No. of workers and others	87	94	102	110	119	128	151	183	218	253	293
B3. Upper secondary education – 2nd cycle											
B3.1. 2nd cycle Public											
Needs in new teacher posts	0	62	69	76	90	97	113	120	139	220	291
No. of teacher posts required	473	510	551	597	654	715	788	865	956	1 121	1 344
Teachers under statute	301	337	377	422	475	533	602	674	759	905	1 103
Teachers under contract	172	172	173	175	179	182	187	191	197	216	241
Category 3	95	94	94	93	94	94	95	96	98	106	117
Category 4	77	78	80	82	85	87	91	94	99	110	124
Needs in non-teaching staff	0	16	19	22	26	28	33	35	41	64	85
No. of non-teaching staff required	146	155	165	178	194	212	233	255	281	329	394
Needs in technical assistants	0	5	6	7	8	9	11	11	14	21	28
No. of technical assistants	40	43	47	51	57	63	70	77	87	103	124
Needs in supervision staff	0	8	9	11	13	14	16	17	19	31	41
No. of supervision staff	78	82	87	93	100	109	119	129	141	164	195
Needs in workers and others	0	3	4	4	5	5	6	7	8	12	16
No. of workers and others	28	30	32	34	37	40	44	48	54	63	75
B3.2. 2nd cycle Private											
Needs in new teacher posts	0	38	37	36	37	38	43	42	49	83	108
No. of teacher posts required	402	418	432	445	460	474	492	509	531	585	660
Teachers under statute	257	277	296	315	334	352	374	394	418	468	536
Teachers under contract	145	141	136	131	126	122	118	114	112	117	124
Category 3	68	66	64	62	60	58	56	55	54	56	59
Category 4	77	74	72	69	66	64	62	60	59	61	65
Needs in non-teaching staff	0	11	11	11	12	12	14	14	16	27	35

	2000/01	*2001/02*	*2002/03*	*2003/04*	*2004/05*	*2005/06*	*2006/07*	*2007/08*	*2008/09*	*2009/10*	*2010/11*
No. of non-teaching staff required	108	113	117	122	127	132	139	146	154	172	197
Needs in technical assistants	0	4	4	4	4	4	5	5	6	9	12
No. of technical assistants	34	35	37	38	40	42	44	46	50	56	65
Needs in supervision staff	0	5	5	5	6	6	7	7	8	13	17
No. of supervision staff	51	54	56	58	61	63	67	70	74	82	94
Needs in workers and others	0	2	2	2	2	2	3	3	3	5	6
No. of workers and others	23	24	24	25	26	27	28	29	30	34	38
B3.3. 2nd cycle Total											
Needs in new teacher posts	0	100	106	113	127	135	156	162	188	304	399
No. of teacher posts required	875	927	983	1 042	1 114	1 189	1 280	1 373	1 487	1 705	2 004
Teachers under statute	558	614	674	737	809	885	976	1 069	1 178	1 373	1 639
Teachers under contract	317	313	309	306	305	303	305	305	309	333	365
Category 3	163	161	158	155	154	152	152	151	152	162	176
Category 4	154	152	151	150	151	151	153	154	157	171	189
Needs in non-teaching staff	0	28	30	33	38	40	47	49	57	91	120
No. of non-teaching staff required	254	267	283	300	321	344	372	400	435	502	592
Needs in technical assistants	0	9	10	11	12	13	15	16	20	31	39
No. of technical assistants	74	79	84	90	97	105	114	124	136	159	189
Needs in supervision staff	0	13	15	16	18	19	23	23	27	43	58
No. of supervision staff	129	135	143	151	161	172	185	199	215	246	289
Needs in workers and others	0	5	6	6	7	8	9	9	11	17	22
No. of workers and others	51	53	56	59	63	67	72	77	84	97	113

C. Textbooks and teacher guides

	2000/01	*2001/02*	*2002/03*	*2003/04*	*2004/05*	*2005/06*	*2006/07*	*2007/08*	*2008/09*	*2009/10*	*2010/11*
Hypothesis 1: a book per subject, per year and per student											
C1.1. Primary education											
C1.1.1. Primary Public	308 360	320 536	333 552	347 581	377 287	412 343	439 236	463 944	489 458	524 264	565 824
Textbooks	291 586	302 561	314 275	326 890	354 624	387 304	412 003	434 485	457 617	489 586	527 836
Teaching guides	16 774	17 975	19 277	20 691	22 663	25 039	27 233	29 459	31 842	34 678	37 988
C1.1.2. Primary Private	31 684	33 274	34 964	36 778	40 533	45 019	48 585	51 951	55 468	60 201	65 864
Textbooks	29 257	30 731	32 299	33 983	37 532	41 767	45 121	48 283	51 588	56 063	61 423
Teaching guides	2 427	2 542	2 665	2 795	3 000	3 253	3 464	3 668	3 880	4 138	4 441
C1.1.3. Primary Total	340 044	353 810	368 515	384 359	417 820	457 363	487 821	515 895	544 926	584 465	631 688
Textbooks	320 843	333 293	346 574	360 873	392 156	429 071	457 123	482 768	509 204	545 649	589 259
Teaching guides	19 201	20 517	21 941	23 486	25 663	28 292	30 697	33 128	35 722	38 816	42 429
C1.2. Lower secondary education – 1st cycle											
C1.2.1. 1st cycle Public	364 576	375 062	385 427	394 948	399 366	403 059	436 265	483 549	536 176	575 134	606 794
Textbooks	353 755	363 573	373 225	382 022	385 849	388 944	420 425	465 330	515 272	551 919	581 406
Teaching guides	10 821	11 489	12 202	12 925	13 517	14 115	15 840	18 220	20 903	23 215	25 389
C1.2.2. 1st cycle Private	35 800	36 808	38 844	41 560	45 889	51 344	63 087	79 746	100 061	122 774	150 160
Textbooks	33 965	34 904	36 819	39 385	43 505	48 706	59 885	75 744	95 121	116 812	142 987
Teaching guides	1 835	1 904	2 025	2 175	2 383	2 638	3 202	4 002	4 941	5 962	7 173
C1.2.3. 1st cycle Total	400 376	411 870	424 271	436 508	445 255	454 403	499 352	563 295	636 237	697 907	756 954
Textbooks	387 720	398 476	410 044	421 408	429 354	437 651	480 310	541 073	610 393	668 731	724 392
Teaching guides	12 656	13 393	14 227	15 100	15 901	16 753	19 042	22 221	25 844	29 177	32 562
C1.3. Upper secondary education – 2nd cycle											
C1.3.1. 2nd cycle Public	75 714	82 105	89 018	96 588	105 676	115 415	127 062	139 149	152 995	178 333	213 462
Textbooks	72 282	78 405	85 019	92 263	100 950	110 257	121 389	132 937	146 153	170 340	203 884

	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Teaching guides	3 432	3 700	3 999	4 325	4 726	5 158	5 673	6 211	6 842	7 993	9 578
C1.3.2. 2nd cycle Private	55 681	58 235	60 616	62 824	65 120	67 392	70 366	73 080	76 374	84 356	95 739
Textbooks	52 923	55 383	57 674	59 801	62 005	64 187	67 041	69 648	72 803	80 429	91 308
Teaching guides	2 758	2 852	2 941	3 024	3 115	3 205	3 325	3 432	3 570	3 927	4 431
C1.3.3. 2nd cycle Total	131 395	140 340	149 634	159 412	170 796	182 807	197 428	212 228	229 368	262 689	309 200
Textbooks	125 205	133 788	142 693	152 063	162 955	174 444	188 430	202 585	218 956	250 768	295 191
Teaching guides	6 190	6 552	6 940	7 349	7 841	8 363	8 998	9 643	10 412	11 920	14 009
Hypothesis 2: a book per subject and per student, but the duration of the books is three to four years											
C2.1. Primary education											
C2.1.1. Primary Public	55 000	265 536	13 016	64 029	287 267	59 746	90 809	306 418	76 881	137 470	347 833
Textbooks	50 000	252 561	11 714	62 615	280 295	44 394	87 313	302 777	67 526	119 282	341 028
Teaching guides	5 000	12 975	1 302	1 414	6 972	15 351	3 496	3 640	9 355	18 187	6 805
C2.1.2. Primary Private	16 000	17 274	1 705	16 827	20 458	7 596	20 388	22 789	10 496	26 567	28 454
Textbooks	15 000	15 731	1 568	16 684	19 281	5 802	20 038	22 443	9 107	24 514	27 802
Teaching guides	1 000	1 542	138	143	1 177	1 795	350	347	1 390	2 053	652
C2.1.3. Primary Total	71 000	282 810	14 705	80 843	307 753	67 342	111 181	329 194	87 405	164 036	376 272
Textbooks	65 000	268 293	13 281	79 299	299 576	50 196	107 352	325 220	76 633	143 796	368 830
Teaching guides	6 000	14 517	1 424	1 544	8 178	17 146	3 830	3 974	10 772	20 240	7 442
C2.2. Lower secondary education – 1st cycle											
C2.2.1. 1st cycle Public	126 500	248 562	10 605	130 281	252 491	20 036	163 015	294 406	72 167	206 122	325 403
Textbooks	121 000	242 573	9 892	129 558	246 399	13 449	160 577	291 304	63 392	197 223	320 790
Teaching guides	5 500	5 989	713	723	6 092	6 587	2 438	3 102	8 776	8 899	4 612
C2.2.2. 1st cycle Private	16 260	20 548	2 625	18 465	23 554	9 180	30 184	39 554	28 824	53 686	66 681
Textbooks	15 600	19 304	2 481	18 297	22 728	7 682	29 476	38 586	27 059	51 167	64 761
Teaching guides	660	1 244	144	168	827	1 499	709	968	1 765	2 520	1 920
C2.2.3. 1st cycle Total	400 376	11 494	12 402	399 956	32 159	21 454	444 866	83 519	106 263	505 003	141 636

	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Textbooks	387 720	10 756	11 568	399 083	18 703	19 864	441 743	79 466	89 184	500 081	135 128
Teaching guides	12 656	737	834	873	13 456	1 590	3 123	4 052	17 079	4 922	6 508
C2.3. Upper secondary education – 2nd cycle											
C2.3.1. 2nd cycle Public	16 240	64 439	8 353	22 167	74 522	16 991	35 222	84 906	31 802	59 375	121 420
Textbooks	14 600	63 805	6 618	21 840	72 492	15 926	32 971	84 040	29 141	57 158	117 584
Teaching guides	1 640	634	1 735	327	2 030	1 066	2 251	865	2 660	2 217	3 836
C2.3.2. 2nd cycle Private	14 080	44 155	2 562	14 883	46 134	6 296	17 839	47 625	9 320	27 160	59 028
Textbooks	12 800	42 583	2 444	14 773	44 788	4 665	17 589	47 395	7 820	25 214	58 274
Teaching guides	1 280	1 572	118	110	1 346	1 631	250	231	1 500	1 946	754
C2.3.3. 2nd cycle Total	131 395	9 027	9 310	134 963	26 126	21 313	149 552	34 764	44 135	182 750	81 230
Textbooks	125 205	8 631	8 905	134 527	19 522	20 395	148 512	33 678	36 766	180 325	78 101
Teaching guides	6 190	396	405	436	6 604	918	1 040	1 086	7 369	2 426	3 129

D. Classrooms and other specialized rooms

	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
D1. Primary education											
D1.1. Primary Public											
No. of classrooms	2 200	2 448	2 724	3 031	3 373	3 754	4 178	4 649	5 174	5 757	6 407
Classrooms to build (Apparent)	0	322	358	398	443	493	549	611	680	757	842
Classrooms to build (Cumulated)	0	322	606	922	1 275	1 667	1 855	2 064	2 297	2 557	2 845
Classrooms built (Updated)	0	0	0	0	0	0	0	0	0	0	0
Classrooms to build (Cumul. gap)	0	322	606	922	1 275	1 667	1 855	2 064	2 297	2 557	2 845
D1.2. Primary Private											
No. of classrooms	320	349	380	414	451	491	535	583	635	692	754

	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Classrooms to build (Apparent)	0	39	43	46	51	55	60	65	71	78	85
Classrooms to build (Cumulated)	0	39	71	106	144	186	202	221	240	262	285
Classrooms built (Updated)	0	0	0	0	0	0	0	0	0	0	0
Classrooms to build (Cumul. gap)	0	39	71	106	144	186	202	221	240	262	285
D1.3. Primary Total											
No. of classrooms	2 520	2 797	3 104	3 445	3 824	4 245	4 713	5 232	5 809	6 449	7 161
Classrooms to build (Apparent)	0	361	400	445	494	548	609	676	751	834	927
Classrooms to build (Cumulated)	0	361	677	1 029	1 419	1 852	2 057	2 285	2 538	2 819	3 131
Classrooms built (Updated)	0	0	0	0	0	0	0	0	0	0	0
Classrooms to build (Cumul. gap)	0	361	677	1 029	1 419	1 852	2 057	2 285	2 538	2 819	3 131
D2. Lower secondary education – 1st cycle											
D2.1. 1st cycle Public											
No. of classrooms	657	696	739	783	819	856	965	1 116	1 282	1 427	1 565
Classrooms to build (Apparent)	0	60	65	67	61	63	138	184	204	187	186
Classrooms to build (Cumulated)	0	60	104	149	187	225	298	411	538	650	756
Classrooms built (Updated)	0	0	0	0	0	0	0	0	0	0	0
Classrooms to build (Cumul. gap)	0	60	104	149	187	225	298	411	538	650	756
No. of laboratories (Lab)	205	220	238	256	273	291	336	400	467	528	591
Labs to build (Apparent)	0	22	25	26	25	27	56	75	81	78	81
Labs to build (Cumulated)	0	22	40	59	76	95	126	174	224	271	318
Labs built (Updated)	0	0	0	0	0	0	0	0	0	0	0
Labs to build (Cumul. gap)	0	22	40	59	76	95	126	174	224	271	318
D2.2. 1st cycle Private											
No. of classrooms	144	154	165	177	192	209	251	309	373	440	518
Classrooms to build (Apparent)	0	14	16	17	21	24	49	67	76	80	93
Classrooms to build (Cumulated)	0	14	26	38	53	72	104	153	208	262	324
Classrooms built (Updated)	0	0	0	0	0	0	0	0	0	0	0
Classrooms to build (Cumul. gap)	0	14	26	38	53	72	104	153	208	262	324
No. of laboratories (Lab)	74	80	87	94	101	109	130	158	187	216	248

	2000/01	*2001/02*	*2002/03*	*2003/04*	*2004/05*	*2005/06*	*2006/07*	*2007/08*	*2008/09*	*2009/10*	*2010/11*
Labs to build (Apparent)	0	8	9	9	10	12	24	33	35	35	39
Labs to build (Cumulated)	0	8	15	22	30	39	53	76	99	121	146
Labs built (Updated)	0	0	0	0	0	0	0	0	0	0	0
Labs to build (Cumul. gap)	0	8	15	22	30	39	53	76	99	121	146
D2.3. 1st cycle Total											
No. of classrooms	801	850	904	959	1 011	1 066	1 216	1 425	1 655	1 867	2 083
Classrooms to build (Apparent)	0	74	81	85	82	87	187	252	280	268	279
Classrooms to build (Cumulated)	0	74	130	187	240	297	403	564	746	912	1 080
Classrooms built (Updated)	0	0	0	0	0	0	0	0	0	0	0
Classrooms to build (Cumul. gap)	0	74	130	187	240	297	403	564	746	912	1 080
No. of laboratories (Lab)	279	300	325	350	374	400	466	558	654	744	839
Labs to build (Apparent)	0	30	34	35	35	38	80	109	115	113	120
Labs to build (Cumulated)	0	30	56	81	106	133	180	250	324	393	464
Labs built (Updated)	0	0	0	0	0	0	0	0	0	0	0
Labs to build (Cumul. gap)	0	30	56	81	106	133	180	250	324	393	464
D3. Upper secondary education – 2nd cycle											
D3.1. 2nd cycle Public											
No. of classrooms	289	312	338	368	404	443	491	541	599	703	848
Classrooms to build (Apparent)	0	32	36	41	49	53	62	66	76	126	170
Classrooms to build (Cumulated)	0	32	59	90	127	168	194	219	250	321	430
Classrooms built (Updated)	0	0	0	0	0	0	0	0	0	0	0
Classrooms to build (Cumul. gap)	0	32	59	90	127	168	194	219	250	321	430
No. of laboratories (Lab)	82	88	94	102	112	122	135	148	165	194	232
Labs to build (Apparent)	0	8	10	11	13	14	16	17	22	35	45
Labs to build (Cumulated)	0	8	15	23	33	44	51	58	67	88	117
Labs built (Updated)	0	0	0	0	0	0	0	0	0	0	0
Labs to build (Cumul. gap)	0	8	15	23	33	44	51	58	67	88	117
D3.2. 2nd cycle Private											
No. of classrooms	246	257	267	277	287	296	309	320	333	367	415

	2000/01	*2001/02*	*2002/03*	*2003/04*	*2004/05*	*2005/06*	*2006/07*	*2007/08*	*2008/09*	*2009/10*	*2010/11*
Classrooms to build (Apparent)	0	19	18	18	18	18	22	21	24	45	60
Classrooms to build (Cumulated)	0	19	29	39	49	59	61	62	67	91	131
Classrooms built (Updated)	0	0	0	0	0	0	0	0	0	0	0
Classrooms to build (Cumul. gap)	0	19	29	39	49	59	61	62	67	91	131
No. of laboratories (Lab)	70	74	77	80	83	87	90	94	100	111	126
Labs to build (Apparent)	0	6	6	5	6	6	7	6	8	15	19
Labs to build (Cumulated)	0	6	9	13	16	19	19	20	22	31	43
Labs built (Updated)	0	0	0	0	0	0	0	0	0	0	0
Labs to build (Cumul. gap)	0	6	9	13	16	19	19	20	22	31	43
D3.3. 2nd cycle Total											
No. of classrooms	535	569	605	644	690	740	800	861	932	1 070	1 262
Classrooms to build (Apparent)	0	51	55	58	67	71	84	87	100	170	230
Classrooms to build (Cumulated)	0	51	89	129	176	227	255	281	316	412	561
Classrooms built (Updated)	0	0	0	0	0	0	0	0	0	0	0
Classrooms to build (Cumul. gap)	0	51	89	129	176	227	255	281	316	412	561
No. of laboratories (Lab)	152	161	171	182	196	209	225	242	264	305	358
Labs to build (Apparent)	0	14	15	16	19	20	23	24	30	50	64
Labs to build (Cumulated)	0	14	25	36	49	63	71	77	90	119	160
Labs built (Updated)	0	0	0	0	0	0	0	0	0	0	0
Labs to build (Cumul. gap)	0	14	25	36	49	63	71	77	90	119	160

Annex 2: Recap of results of financial forecasts for the education sector, including higher education

	2000/01	*2001/02*	*2002/03*	*2003/04*	*2004/05*	*2005/06*	*2006/07*	*2007/08*	*2008/09*	*2009/10*	*2010/11*
Salary index (Annual increase)	100	104	108	113	118	122	128	133	138	144	150

A. Primary education (public)

	Unit costs	*2000/01*	*2001/02*	*2002/03*	*2003/04*	*2004/05*	*2005/06*	*2006/07*	*2007/08*	*2008/09*	*2009/10*	*2010/11*
Recurrent costs												
1.1 Teachers (Wage, etc.)		1 048 900	1 178 673	1 325 654	1 492 127	1 680 680	1 894 244	2 136 140	2 410 127	2 720 464	3 071 974	3 470 120
Teachers Category 1	*311*	466 500	572 786	694 925	835 119	995 865	1 180 000	1 390 742	1 631 743	1 907 147	2 221 655	2 580 601
Teachers Category 2	*281*	252 900	268 846	285 801	303 828	322 996	343 375	365 045	388 085	412 584	438 634	466 334
Teachers Category 3	*265*	212 000	218 353	225 038	232 075	239 486	247 293	255 521	264 196	273 346	282 999	293 187
Teachers Category 4	*235*	117 500	118 688	119 890	121 105	122 334	123 576	124 832	126 102	127 386	128 685	129 998
1.2 Other staff costs		83 933	95 708	109 231	124 765	142 615	163 130	186 714	213 833	245 025	280 909	322 202
Administration	*2%*	20 978	23 573	26 513	29 843	33 614	37 885	42 723	48 203	54 409	61 439	69 402
Supervision staff	*3%*	31 467	35 360	39 770	44 764	50 420	56 827	64 084	72 304	81 614	92 159	104 104
Non-teaching staff	*192*	31 488	36 774	42 948	50 159	58 581	68 418	79 907	93 327	109 002	127 310	148 696
1.3 Teaching/learning material		33 500	160 619	7 940	38 559	173 058	37 382	54 835	184 215	47 064	84 300	209 381
Textbooks	*0.6*	30 000	151 537	7 028	37 569	168 177	26 637	52 388	181 666	40 516	71 569	204 617
Teaching guides	*0.7*	3 500	9 083	911	990	4 881	10 746	2 447	2 548	6 548	12 731	4 764
1.4 Other running costs		99 000	110 164	122 589	136 416	151 804	168 930	187 989	209 201	232 809	259 083	288 326
Maintenance	*20*	44 000	48 962	54 484	60 629	67 468	75 080	83 551	92 978	103 471	115 148	128 145
Water & electricity	*10*	22 000	24 481	27 242	30 315	33 734	37 540	41 775	46 489	51 735	57 574	64 072
Miscellaneous	*15*	33 000	36 721	40 863	45 472	50 601	56 310	62 663	69 734	77 603	86 361	96 109
S/Total		1 265 333	1 545 165	1 565 413	1 791 867	2 148 156	2 263 686	2 565 678	3 017 376	3 245 361	3 696 267	4 290 028

	Unit costs	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Constructions & other investments		2 716 994	3 023 624	3 364 893	3 744 717	4 167 455	4 637 963	5 161 642	5 744 507	6 393 253	7 115 335	5 209 377
Constructions	*6 500*	2 089 995	2 325 865	2 588 379	2 880 551	3 205 735	3 567 664	3 970 494	4 418 851	4 917 887	5 473 334	4 007 213
Equipment	*1 300*	417 999	465 173	517 676	576 110	641 147	713 533	794 099	883 770	983 577	1 094 667	801 443
Other maintenance costs	*650*	209 000	232 586	258 838	288 055	320 573	356 766	397 049	441 885	491 789	547 333	400 721
1.9 Total Primary Public		3 982 327	4 568 789	4 930 306	5 536 583	6 315 612	6 901 649	7 727 320	8 761 883	9 638 614	10 811 601	9 499 405

B. Lower secondary education (1st cycle public)

	Unit costs	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Recurrent costs												
2.1 Teachers (Wage, etc.)		640 850	714 141	798 092	888 651	978 040	1 075 572	1 276 918	1 555 634	1 876 396	2 193 484	2 530 275
Teachers under statute	*450*	416 700	474 500	540 471	612 394	684 610	763 585	917 516	1 129 947	1 378 488	1 628 150	1 895 598
Teachers Category 3	*340*	153 680	163 314	174 583	186 249	196 976	208 701	239 853	283 706	331 375	376 020	422 256
Teachers Category 4	*290*	70 470	76 327	83 038	90 008	96 454	103 286	119 549	141 982	166 533	189 314	212 422
Technical assistants	*270*	56 430	58 627	61 328	64 103	66 620	69 571	79 168	93 106	108 103	122 347	137 548
2.2 Other staff costs		56 952	64 546	73 428	83 231	93 340	104 669	126 889	157 955	194 443	232 129	273 641
Administration	*250*	22 750	26 465	30 883	35 875	41 196	47 257	58 535	74 356	93 379	113 618	136 359
Supervision staff	*3%*	19 226	21 424	23 943	26 660	29 341	32 267	38 308	46 669	56 292	65 805	75 908
Workers	*192*	14 976	16 657	18 603	20 696	22 803	25 144	30 047	36 930	44 772	52 706	61 373
2.3 Teaching/learning material		38 225	74 868	3 217	39 120	76 052	6 340	49 026	88 477	22 089	62 282	97 851
Textbooks	*0.30*	36 300	72 772	2 968	38 867	73 920	4 035	48 173	87 391	19 018	59 167	96 237
Teaching guides	*0.35*	1 925	2 096	250	253	2 132	2 305	853	1 086	3 071	3 114	1 614
2.4 Other running costs		47 410	50 386	53 738	57 134	60 059	63 102	71 599	83 388	96 172	107 512	118 627
Maintenance	*25*	21 550	22 903	24 426	25 970	27 299	28 683	32 545	37 904	43 715	48 869	53 922
Water & electricity	*12*	10 344	10 993	11 725	12 466	13 104	13 768	15 622	18 194	20 983	23 457	25 882
Miscellaneous	*18*	15 516	16 490	17 587	18 698	19 656	20 652	23 432	27 291	31 475	35 186	38 824

	Unit costs	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
S/Total		783 437	903 940	928 475	1 068 136	1 207 490	1 249 683	1 524 432	1 885 453	2 189 100	2 595 406	3 020 395
Constructions & other investments		795 528	879 929	905 969	837 847	875 053	1 887 113	2 533 370	2 777 680	2 581 990	2 601 389	2 679 730
Constructions	*7 500*	611 945	676 868	696 899	644 497	673 118	1 451 626	1 948 746	2 136 677	1 986 146	2 001 069	2 061 331
Equipment	*1 500*	122 389	135 374	139 380	128 899	134 624	290 325	389 749	427 335	397 229	400 214	412 266
Other maintenance costs	*750*	61 194	67 687	69 690	64 450	67 312	145 163	194 875	213 668	198 615	200 107	206 133
2.9 Total Secondary 1st cycle		1 578 964	1 783 869	1 834 444	1 905 983	2 082 544	3 136 797	4 057 803	4 663 133	4 771 091	5 196 795	5 700 124

C. Upper secondary education (2nd cycle public)

	Unit costs	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Recurrent costs												
3.1 Teachers (Wage, etc.)		237 230	264 639	296 227	332 810	377 972	428 661	490 129	557 993	640 672	779 622	971 380
Teachers under statute	*470*	141 470	164 999	192 297	223 981	262 801	307 042	360 743	420 943	493 609	612 438	777 636
Teachers Category 3	*380*	65 360	68 218	71 416	75 089	79 801	84 628	90 416	96 170	103 611	118 252	137 579
Teachers Category 4	*320*	30 400	31 422	32 514	33 741	35 370	36 991	38 971	40 880	43 452	48 932	56 165
Technical assistants	*300*	23 100	24 399	25 900	27 648	29 841	32 133	34 846	37 598	41 062	47 483	55 960
3.2 Other staff costs		35 393	38 913	43 143	48 146	54 401	61 440	69 991	79 386	90 724	109 960	136 633
Administration	*290*	22 620	24 738	27 320	30 388	34 237	38 577	43 860	49 648	56 542	68 327	84 783
Supervision staff	*3%*	7 117	7 939	8 887	9 984	11 339	12 860	14 704	16 740	19 220	23 389	29 141
Workers	*202*	5 656	6 236	6 936	7 774	8 825	10 003	11 428	12 999	14 962	18 245	22 709
3.3 Teaching/learning material		4 954	19 363	2 593	6 666	22 458	5 151	10 679	25 515	9 674	17 923	36 618
Textbooks	*0.30*	4 380	19 141	1 985	6 552	21 747	4 778	9 891	25 212	8 742	17 147	35 275
Teaching guides	*0.35*	574	222	607	114	710	373	788	303	931	776	1 343
3.4 Other running costs		20 405	21 950	23 766	25 834	28 382	31 128	34 413	37 866	41 999	49 359	59 394
Maintenance	*25*	9 275	9 977	10 803	11 743	12 901	14 149	15 642	17 212	19 091	22 436	26 997
Water & electricity	*12*	4 452	4 789	5 185	5 637	6 192	6 792	7 508	8 262	9 164	10 769	12 959

	Unit costs	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Miscellaneous	*18*	6 678	7 184	7 778	8 455	9 289	10 187	11 262	12 393	13 745	16 154	19 438
S/Total		297 982	344 866	365 728	413 457	483 212	526 380	605 213	700 761	783 070	956 865	1 204 025
Constructions & other investments		390 664	448 212	504 063	602 556	652 458	765 320	813 512	956 070	1 567 092	2 094 909	2 283 201
Constructions	*7 500*	300 511	344 779	387 741	463 504	501 891	588 708	625 778	735 438	1 205 455	1 611 469	1 756 308
Equipment	*1 500*	60 102	68 956	77 548	92 701	100 378	117 742	125 156	147 088	241 091	322 294	351 262
Other maintenance costs	*750*	30 051	34 478	38 774	46 350	50 189	58 871	62 578	73 544	120 546	161 147	175 631
3.9 Total Secondary 2nd cycle		688 646	793 078	869 791	1 016 013	1 135 670	1 291 700	1 418 724	1 656 830	2 350 161	3 051 774	3 487 226

D. Higher education

	Unit costs	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Recurrent costs												
4.1 Teachers (Wage, etc.)		106 305	135 583	162 733	188 502	226 427	269 848	310 749	346 055	381 370	425 821	482 418
Teachers under statute	*675*	57 375	76 632	94 574	111 649	135 999	163 679	189 803	212 183	234 391	262 159	297 381
Teachers Category 3	*600*	32 400	37 571	42 472	47 227	55 167	64 567	73 475	81 512	89 739	100 117	113 288
Teachers Category 4	*570*	16 530	21 380	25 687	29 626	35 262	41 602	47 471	52 360	57 240	63 545	71 749
Technical assistants	*400*	10 000	10 043	10 288	10 695	12 033	13 850	15 670	17 598	19 658	22 151	25 175
4.2 Other staff costs		16 089	18 763	21 415	24 050	28 385	33 459	38 209	42 326	46 331	51 246	57 376
Administration	*450*	8 100	9 316	10 552	11 804	13 891	16 352	18 677	20 761	22 811	25 287	28 322
Supervision staff	*3%*	3 189	4 067	4 882	5 655	6 793	8 095	9 322	10 382	11 441	12 775	14 473
Workers	*300*	4 800	5 379	5 981	6 591	7 701	9 012	10 210	11 183	12 079	13 185	14 582
4.3 Teaching/learning material		978	1 211	1 379	1 515	1 678	1 893	2 081	2 240	2 408	2 639	2 943
Books for students	*0.30*	814	1 020	1 163	1 273	1 394	1 554	1 688	1 788	1 889	2 031	2 224
Teaching guides	*1.00*	164	192	217	241	285	338	394	452	520	608	719
4.4 Other running costs		7 735	11 529	13 074	14 397	16 436	18 676	20 590	22 054	23 409	25 158	27 404
Maintenance	*30*	3 570	5 321	6 034	6 645	7 586	8 620	9 503	10 179	10 804	11 611	12 648

	Unit costs	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Water & electricity	*15*	1 785	2 660	3 017	3 322	3 793	4 310	4 752	5 089	5 402	5 806	6 324
Miscellaneous	*20*	2 380	3 547	4 023	4 430	5 057	5 747	6 335	6 786	7 203	7 741	8 432
S/Total		131 107	167 086	198 601	228 463	272 926	323 876	371 630	412 674	453 518	504 864	570 142
Constructions & other investments		742 903	373 774	347 378	486 379	539 541	500 347	436 306	429 275	511 198	614 713	650 832
Constructions	*8 500*	571 464	287 519	267 214	374 138	415 031	384 882	335 620	330 211	393 230	472 856	500 640
Equipment	*1 700*	114 293	57 504	53 443	74 828	83 006	76 976	67 124	66 042	78 646	94 571	100 128
Other maintenance costs	*850*	57 146	28 752	26 721	37 414	41 503	38 488	33 562	33 021	39 323	47 286	50 064
4.6 Bursaries		0	0	0	0	0	0	0	0	0	0	0
Inside the country	*0.0*	0	0	0	0	0	0	0	0	0	0	0
Within the region	*0.0*	0	0	0	0	0	0	0	0	0	0	0
Outside the region	*0.0*	0	0	0	0	0	0	0	0	0	0	0
4.9 Total Higher education		874 010	540 860	545 979	714 842	812 467	824 223	807 935	841 949	964 716	1 119 576	1 220 974

E. Other expenditures

	Unit costs	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
5.1 Minister's Cabinet	*25 000*	25 000	25 828	26 689	27 587	28 522	29 495	30 508	31 564	32 663	33 808	35 000
Staff	*20 000*	20 000	20 828	21 689	22 587	23 522	24 495	25 508	26 564	27 663	28 808	30 000
Material and misc.	*5 000*	5 000	5 000	5 000	5 000	5 000	5 000	5 000	5 000	5 000	5 000	5 000
5.2 Regional authorities (incl. Preschool)	*2*	622 612	661 158	700 292	740 249	780 755	824 275	887 607	960 745	1 039 784	1 124 253	1 216 685
5.3 Subsidies (Private education)	*5*	295 860	310 999	328 160	346 429	369 889	398 236	443 292	500 516	567 796	653 038	757 399
Subsidies (Primary	*5*	85 385	92 323	99 825	107 939	116 712	126 200	136 460	147 555	159 554	172 531	186 564

	Unit costs	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
education)												
Subsidies (Secondary 1st cycle)	*10*	74 950	77 990	82 643	87 537	94 256	102 444	122 254	150 151	181 642	214 957	253 784
Subsidies (Secondary 2nd cycle)	*15*	129 465	135 102	140 089	144 499	149 094	153 614	159 710	165 132	172 127	189 471	213 944
Subsidies (Higher education)	*20*	6 060	5 585	5 603	6 454	9 827	15 979	24 868	37 677	54 472	76 079	103 108
5.4 Miscellaneous, etc.	*3%*	213 718	230 598	245 416	275 203	310 389	364 631	420 353	477 714	531 737	605 392	597 232
5.3 Total Other expenditures		1 157 190	1 228 582	1 300 557	1 389 468	1 489 554	1 616 637	1 781 761	1 970 539	2 171 981	2 416 491	2 606 317

F. Costs from the simulation model and budgetary gaps ('000)

	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Cost forecasts	8 281	8 915	9 481	10 563	11 839	13 771	15 794	17 894	19 897	22 596	22 514
Recurrent costs	3 635	4 190	4 359	4 891	5 601	5 980	6 849	7 987	8 843	10 170	11 691
Investments	4 646	4 726	5 122	5 672	6 235	7 791	8 945	9 908	11 054	12 426	10 823
Distribution of costs (%)											
Preschool education	(See 5.2 Regional authorities)										
Primary education (public)	48%	51%	52%	52%	53%	50%	49%	49%	48%	48%	42%
Lower secondary education (1st cycle public)	19%	20%	19%	18%	18%	23%	26%	26%	24%	23%	25%
Upper secondary education (2nd cycle public)	8%	9%	9%	10%	10%	9%	9%	9%	12%	14%	15%
Higher education (public)	11%	6%	6%	7%	7%	6%	5%	5%	5%	5%	5%
Other expenditures (incl. Private)	14%	14%	14%	13%	13%	12%	11%	11%	11%	11%	12%

		2000/01	*2001/02*	*2002/03*	*2003/04*	*2004/05*	*2005/06*	*2006/07*	*2007/08*	*2008/09*	*2009/10*	*2010/11*
Total		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Budget forecasts												
GDP	*5%*	70 000	73 500	77 175	81 034	85 085	89 340	93 807	98 497	103 422	108 593	114 023
Government budget	*0.4%*	27 000	28 453	29 985	31 599	33 300	35 092	36 981	38 971	41 069	43 280	45 609
Education budget	*0.4%*	6 500	6 876	7 273	7 694	8 139	8 609	9 107	9 633	10 190	10 780	11 402
Costs from the simulation model		8 281	8 915	9 481	10 563	11 836	13 771	15 794	17 894	19 897	22 596	22 514
Gap between Budget forecasts & costs simulation model		-1 781	-2 039	-2 208	-2 869	-3 697	-5 162	-6 687	-8 261	-9 707	-11 817	-11 112
% Gap Budget forecasts & costs simulation model		-27%	-30%	-30%	-37%	-45%	-60%	-73%	-86%	-95%	-110%	-97%
Unit costs (public)		46.4	47.2	47.4	50.2	53.7	59.7	63.8	66.9	68.7	72.4	66.2
Primary Public		23.4	25.2	25.6	27.0	28.9	29.7	31.3	33.3	34.4	36.3	30.0
Secondary 1st cycle Public		31.8	34.8	34.7	35.1	37.7	56.1	66.5	68.4	62.9	63.6	65.8
Secondary 2nd cycle Public		66.7	71.1	72.0	77.4	79.0	82.1	81.8	87.1	112.0	124.3	118.6
Higher Public		322.2	159.2	140.9	168.4	174.9	159.1	143.6	141.3	153.2	165.3	164.7

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